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Information technology — Generic digital audio-visual systems — Technical Report on ISO/IEC 16500 — Description of digital audio-visual functionalities

Technologies de l'information — Systèmes audiovisuels numériques génériques — Rapport technique sur l'ISO/CEI 16500 — Description des fonctionnalités audiovisuelles numériques

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 16501 was prepared by DAVIC (Digital Audio-Visual Council) and was adopted, under the PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

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Introduction

ISO/IEC TR 16501 provides a detailed listing of the core functions, generic tool capabilities and sample applications required by users and providers of digital audio-visual applications and systems. It introduces the concept of a contour and defines the functions required for IDB (Interactive Digital Broadcast) and EDB (Enhanced Digital Broadcast) contours. The Technical Report complements ISO/IEC 16500. It is the source of the requirements used to identify the generic tool technologies defined in ISO/IEC 16500 and, in particular, it identifies the user needs and market requirements which are addressed by the contour technology toolsets defined in ISO/IEC 16500-3.

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Information technology — Generic digital audio-visual systems — Technical Report on ISO/IEC 16500 — Description of digital audio-visual functionalities

1 Scope

This Technical Report describes the functions that may be supported by systems using ISO/IEC 16500. These functions have been derived by analyzing the requirements of a number of example applications from the viewpoints of a range of participants, including:

- content providers
- service providers
- delivery system providers
- end-users
- equipment manufacturers
- IPR holders
- rights collection agencies
- regulatory authorities
- business support services
- financial services

Applications, tools and functions are described from a behavioral viewpoint. The report does not assume any technical implementation for a particular service.

The Technical Report consists of a main body, and a series of Annexes. The main body introduces the concept of a contour in the context of ISO/IEC 16500 and outlines its use in compliance and conformance definitions. The behaviour and parameters of sets of core functions and generic tools that can be derived from the functions are then presented. Nineteeen example applications are analysed and described in terms of generic and application specific functionalities. The main body concludes with an integrated summary listing of the functionalities required by users and providers of digital audio-visual applications and systems organised under a set of functional groupings . The User and Market Requirements and the corresponding Functional Requirements required for the IDB (Interactive Digital Broadcast) contour are defined in Annex A. Similar information is provided in Annex B for the EDB (Enhanced Digital Broadcast) contour. This overall structure is designed to readily incorporate future descriptions of new core functions, generic tools, sample applications and additional contours.

2 Sources for the identified audio-visual functions

The functions specified in this Technical Report were derived by analyzing the requirements of a number of example applications, and the generic requirements common to a range of applications. The applications considered were all taken from the responses to the calls for proposals issued by DAVIC, and prioritized during discussions within the DAVIC Applications Technical Committee. The example applications were used as the focus for requirements analysis, and it is expected that a wide range of applications can be implemented using this Technical Report and ISO/IEC 16500.

3 Definitions

This clause defines new terms, and the intended meaning of certain common terms used in this Report. ISO/IEC 16500-1 Annex A defines additional terms and, in some cases, alternative interpretations that are appropriate in other contexts.

3.1. Access Control: Provides means to access services and protection against the unauthorized interception of the services.

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3.2. **Access Network:** a part of the Delivery system consisting of a collection of equipment and infrastructures, that link a number of Service Consumer Systems to the rest of the Delivery system through a single (or a limited number of) common port(s).

3.3. **Application:** a set of objects that provides an environment for processing Application Service Layer information flows.

3.4. **Application Programming Interface (API):** set of inter-layer service request and service response messages, message formats, and the rules for message exchange between hierarchical clients and servers. API messages may be executed locally by the server, or the server may rely on remote resources to provide a response to the client.

3.5. **Assets:** Things that a user sees or hears, e.g., bitmap, audio, and text.

3.6. **Channel surfing:** Viewing of many broadcast channels in a short time period by the End user.

3.7. **Client:** a service consuming object or system (block); (a synonym for **user**)

3.8. **Compliance to a contour:** providing all of the system functions specified in a contour according to the mapping to ISO/IEC 16500 technologies specified in the corresponding annex of ISO/IEC 16500-3. *See* subclause 6.1.2

3.9. **Conditional Access:** A means of allowing system users to access only those services that are authorized to them.

3.10. **Confidentiality:** the protection of information from unauthorized disclosure

3.11. **Conformance to a contour:** providing system functions, as defined in a particular contour, used by the services in a system for which conformance is declared. *See* subclause 6.1.1

3.12. **Content Provider:** one who owns or is licensed to sell content.

3.13. **Control Word:** the secret key used for a scrambling algorithm.

3.14. **Control-information:** information that may change the state of the object intercepting the information flow, e.g., a remote control channel up command input. (In some cases an object may interpret a message but reject a request and remain in its current state.)

3.15. **Distribution Network:** a collection of equipment and infrastructures that delivers information flows from the Access Node to the Network Termination elements of the Access Network.

3.16. **Email**: Electronic mail. Email allows the sending of information in an electronic format from one Internet user to another. Users are identified on the Internet by a unique email address.

3.17. **Entitlement Control Message (ECM):** Conditional Access messages carrying an encrypted form of the control words or a means to recover the control words, together with access parameters, i.e., an identification of the service and of the conditions required for accessing this service.

3.18. **Entitlement Management Message (EMM):** Conditional Access messages used to convey entitlements or keys to users, or to invalidate or delete entitlements or keys.

3.19. **FTP**: File Transfer Protocol. FTP allows a connection to be made between two Internet computers in order to transfer files between them.

3.20. **Function:** Features of a Digital AudioVisual System that are realized through Services. For example, interactive play control (VCR-type controls) is a function. (See also **Service**)

3.21. **Hierarchy:** an arrangement of objects in order of rank; some objects in the arrangement are subordinate to others; objects of the same hierarchical rank are peer objects

3.22. **HTML**: Hypertext Mark-up Language. HTML is a document formatting language used to specify the format of Hypertext documents on the World Wide Web. HTML consists of ASCII text files with special tags to specify formatting information. This includes the specification of Hypertext links, graphics information and plain text.

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3.23. **HTTP**: Hypertext Transfer Protocol. HTTP is the protocol Web servers and browsers use to send request, accept request, send responses and receive response of documents on the World Wide Web. It also specifies how to initiate transfers of data using other protocols such as FTP and SMTP.

3.24. **Hypertext**: Hypertext is text that a user may select in some manner to cause some different set of information to be retrieved and displayed. A common example is a link on a Web page, which may be selected causing a new Web page to be retrieved.

3.25. **Interface:** a point of demarcation between two blocks through which information flows from one block to the other.. A DAVIC interface may be a physical-interface or a logical-interface.

3.26. **Internet**: The term Internet is used in many ways in this document. It is widely understood to mean the global network of computers tied together via different types of networks. These computers use a standard set of protocols to communicate, mainly TCP/IP and UDP/IP.

3.27. **Key management:** The generation, storage, distribution archiving, deletion, revocation, registration, and deregistration of cryptographic keys.

3.28. **Navigation:** the process of reaching a service objective by means of making successive choices; the term may be applied to the selection of a service category, a service provider or an offer within a particular service.

3.29. **Network:** a collection of interconnected elements that provides connection services to users

3.30. **Network control function:** The Network Control Function is responsible for the error-free receipt and transmission of content flow information to and from the Server.

3.31. **Non-repudiation:** the proof of the origin and reception of a message. This means that the sender cannot deny the sending of the message and the receiver cannot deny the reception of the message.

3.32. **Partition:** a decomposition or subdivision of an object into smaller objects; the created objects are peers with respect to each other, but are hierarchically subordinate to the original partitioned object

3.33. **Peer:** of the same rank or order: peer objects belong to the same layer (category or classification).

3.34. **Physical interface:** An interface where the physical characteristics of signals used to represent information and the physical characteristics of channels used to carry the signals are defined. A physical interface is an external interface. It is fully defined by its physical and electrical characteristics. Logical information flows map to signal flows that pass through physical interfaces.

3.35. **Plane:** a category that identifies a collection of related objects, e.g., objects that execute similar or complementary functions; or peer objects that interact to use or to provide services in a class that reflects authority, capability, or time period. Management-plane service objects, for example, may authorize ISP-clients' access to certain control-plane service objects that in turn may allow the clients to use services provided by certain user-plane objects.

3.36. **Privacy:** privacy protects authorized participants from illegal utilization or knowledge of information related to their components in the DAVIC System

3.37. **Protocol:** set of message formats (semantic, syntactic, and symbolic rules) and the rules for message exchange between peer layer entities (which messages are valid when)

3.38. **Real-time**: Quality of a process, the execution of which is determined or controlled in time. The term is sometimes extended to refer to a delivery process which is perceived fast enough to be considered as almost instantaneous.

3.39. **Reference point:** a set of interfaces between any two related blocks through which information flows from one block to the other. A reference point comprises one or more logical (non-physical) information-transfer interfaces, and one or more physical signal-transfer interfaces.

3.40. **Server:** any service providing system.

3.41. **Service provider:** an entity that provides a service to a client.

3.42. **Session:** an interval during which a logical, mutually agreed correspondence between two objects exists for the transfer of related information. A session defines a relationship between the participating users in a service instance.

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3.43. Specification: a definition of the requirements of a system. A specification consists of general parameters required of the system and the functional specification of its required behavior. Specification may also be used as shorthand for specification and/or description, e.g., in SDL specification or system specification.

3.44. Symbol: a bit or a defined sequence of bits.

3.45. System: a collection of interacting objects that serves a useful purpose; typically, a primary subdivision of an object of any size or composition (including domains)

3.46. User: a service consuming object or system

3.47. Virtual channel: communication channel that provides for the sequential unidirectional transport of ATM cells

4 Acronyms and abbreviations

This clause defines the acronyms and abbreviations used in this Technical Report. Additional acronyms and abbreviations relevant to digital audio-visual applications is available in Annex B of ISO/IEC 16500-1.

CA	Conditional Access
DVB	Digital Video Broadcasting
DVB-SI	DVB - Service Information
ECM	Entitlement Control Message
EMM	Entitlement Management
EPG	Electronic Program Guide
HDTV	High Definition Television
HTML	HyperText Markup Language
IP	Internet Protocol
IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunications Union
JPEG	Joint Photographic Experts Group
KOD	Karaoke-On-Demand
Mbps	Megabits per second
MOD	Movies-On-Demand
MPEG	Moving Picture Experts Group
MPEG-TS	MPEG Transport Stream
NVOD	Near Video-On-Demand (Also N-VOD)
PG	Parental Guidance
PIN	Personal Identification Number
PPV	Pay-Per-View
QoS	Quality of Service
STB	Set-Top Box
STU	Set-Top Unit

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UPI	User Premises Interface
VASP	Value Added Service provider
VOD	Video-On-Demand

5 Conventions

The style of this Report follows the general guidelines of the *Guide for ITU-T and ISO/IEC JTC 1 cooperation. Appendix II: Rules for presentation of ITU-T | ISO/IEC common text (March 1993)*

6 DAVIC Contours

The purpose of contours is to enable the building of marketable products by translating market requirements into functional specifications and then to technological solutions. The whole process is shown in Figure 6.1.

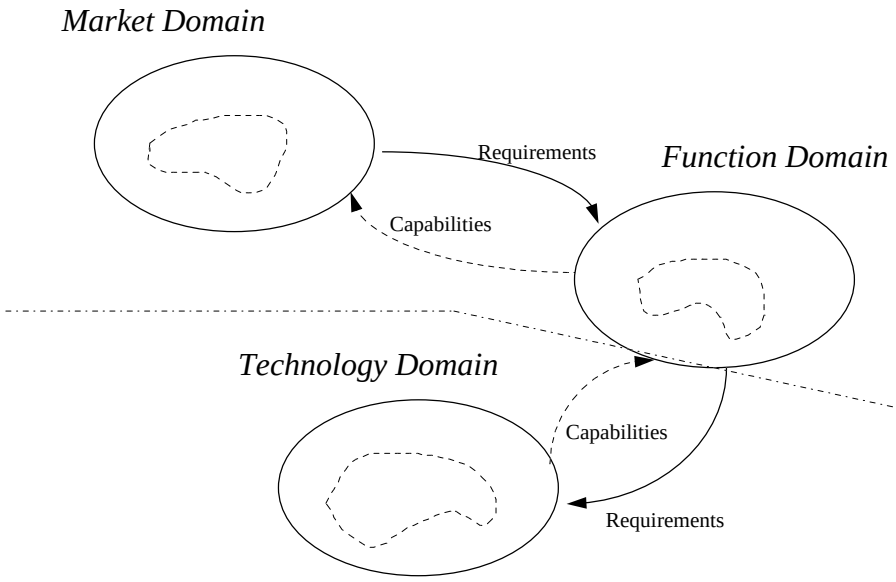

Figure 6.1 — Contour Domains

A contour is expressed in three domains:

- in the Market domain, as a set of market and user requirements;
- in the Function domain, as a set of functional requirements; and
- in the Technology domain, as a set of system functions and selected tools.

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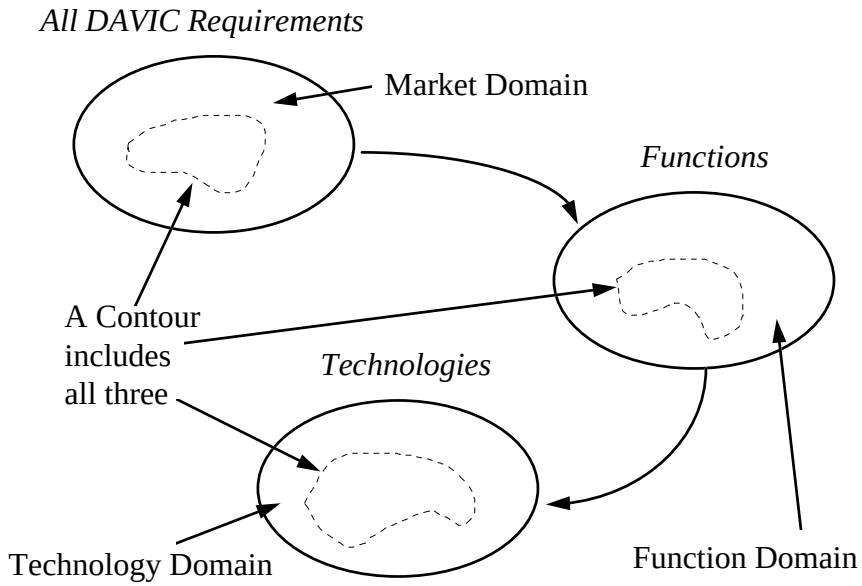

Figure 6.2 — Contour Definition

A contour consists of three separate essential items of information which describe:

- a set of user and market requirements with a focus on a market segment;
- a set of functional specifications for interoperable DAVIC system components derived from the user and market requirements; and
- a set of technologies supporting the functional requirements.

Each contour is developed in a two step approach and is best understood using the following two documents:

- This Technical Report which describes the User & Market Requirements and provides a list of Functional Requirements. These are system-level requirements, not sub-system level and they do not define physically where in the system a particular function has to be executed;

and

- ISO/IEC 16500-3 which contains a corresponding Annex which lists the technologies required to fulfil the functionality identified for each contour and, where appropriate, assigns specific DAVIC components from ISO/IEC 16500 to achieve the required technologies.

DAVIC contours are used to define systems, derived from User & Market requirements. They describe fully the functions and their mapping to the DAVIC technologies required to implement marketable solutions. There is no implied relationship between one contour and another. A contour may be a superset, a subset or be completely independent of another.

Systems, which are implemented according to the contour, may also implement functions and technologies outside the contour (including those outside DAVIC).

6.1 Conformance and Compliance

The following definitions apply.

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6.1.1 Conformance

DAVIC defines a system to be *conformant* to a contour when it uses the contour as a guide but may omit functions where appropriate (for example in the case of regional solutions to optimize cost-effectiveness). All functions that are selected from the contour must be executed according to the mapping to DAVIC technologies specified in the appropriate annex to ISO/IEC 16500-3.

6.1.2 Compliance

DAVIC defines a system to be *compliant* with a contour when it is capable of executing all functions that are specified in the appropriate annex to ISO/IEC TR 16501, according to the mapping to DAVIC technologies specified in the corresponding annex to ISO/IEC 16500-3, and meets all of the requirements of the contour.

7 Functions Required to Support DAVIC Applications

7.1 Core Functions

DAVIC compliant systems are intended to facilitate the introduction of a wide variety of applications. These applications will consume system resources and have functionality that is spread across a number of DAVIC subsystems. Examples of applications are given in clause 9. These applications have both common and specific functionality. Future applications which require the definition of additional and new functions can easily be accommodated by adding them to the current list of core functions below.

However, it is possible to identify core DAVIC functions that are basic to the system's operation, integrity and development. These functions provide core functionality to the system and all its running applications. They may be subdivided into the following groups: -

- Bit Transport
- Session
- Access Control
- Navigation, Program Selection & Choice
- Application Launch
- Media Synchronization Links
- Application Control
- Presentation Control
- Usage Data
- User Profile

Figure 7.1 depicts the interrelationship of these core functional groups and running applications.

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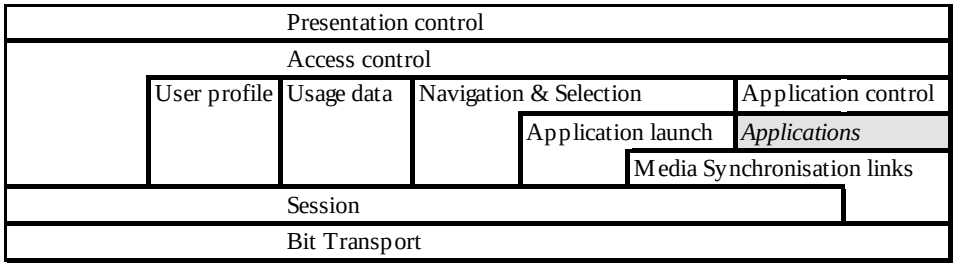

Figure 7.1 — Core Functional groups

Applications will invoke the core functions as required, or replace or extend them with more specific functions (which may in turn invoke core functions). An application will comprise specific code with many calls to the core functions.

A function element used by more than one application is almost certainly “core”. However, a function element used by only one application is still considered "core” if it cannot be synthesized from other “core” functions. If the function can be synthesized then it is an application-specific function.

7.1.1 Bit Transport

This group of functions provides physical and logical links of a given bandwidth, facilities to combine such links, and switching information to achieve logical connections between points. Signal splitting and combination functions and facilities will enable point to point, point to multipoint, multipoint to point and multipoint to multipoint connections to be established.

The physical data stream provided by the bit-transport functions may be multiplexed between several services and/or applications so that each is given the logical connections it requires. Each application session must be able to negotiate the data rate of each logical connection established depending on requirements and current transmission resource occupancy.

7.1.2 Session

This group of functions controls the *Bit Transport* functions, calling upon them to establish or change a logical connection. Such a connection may be point to point, point to multipoint, multipoint to point or multipoint to multipoint, and it may be at a predetermined or a variable data rate. The establishment of connection criteria such as data rate will be by the use of protocols mutually agreed between *Session* and *Bit Transport*.

The *Session* functions provide common facilities such as data encryption, file transfer and verification to all applications.

7.1.3 Access Control

This group of functions provides facilities to authenticate a user, and to determine and verify access rights to the network. They also control a user’s access to specific applications and related content, goods and services, and provide verification of credit and payment.

7.1.4 Navigation, Program Selection & Choice

This group of functions provides the user with menu selection facilities, enabling the choice of application or content. Selection will be aided by appropriate user specific criteria (including access-control rights, preferences, interests etc.) and knowledge of prior behavior, and will almost certainly be hierarchical, involving several levels of menu. At the lowest level, the user’s response will result in the launch of a resident or downloaded application.

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7.1.5 Application Launch

This group of functions provides the facilities to run an application. The application code may be already resident in the STU or may be obtained via a session to a remote server. Having been loaded, the application is then launched, execution transferring to the new code. It is the launched application's responsibility to obtain and dispose of system resources, to initiate and terminate any new sessions and to conclude in an orderly and clean fashion.

7.1.6 Media Synchronization Links

This group of functions provides links between objects, such as sound segments, subtitles, still images, moving images and applications to achieve a multimedia presentation. Examples of usage would be: to allow the viewer to select and subsequently order products seen on-screen during a TV broadcast; to display subtitles or to listen to audio description for hearing or sight-impaired viewers; to provide text translation to another language, or to synchronize language dubbed audio.

7.1.7 Application Control

This group of functions provides control of the applications, and should be distinguished from *Presentation Control*. Communication between the user and an application will result in modifications to the application's behavior or content options selected according to the user's commands and preferences. Examples would be pausing, rewind, forward wind, audio pitch & tempo control, bookmarking and content interaction such as the choice of a sad or happy ending to a play.

7.1.8 Presentation Control

This group of functions provides the provision to users of control for the delivery and display of multimedia information, such as subtitle activation and positioning, choice of language etc. Such control does not involve any control of the server or the information flowing therefrom.

7.1.9 Usage Data

This is a group of functions that collect, store and supply data concerning users' consumption of material, resources and applications. The data supports payment, and gives feedback to content providers for market research and planning purposes. It also enables system management to monitor resource utilization.

The underlying data collected by these functions is likely to be covered by data protection regulations, and needs to have controlled dissemination. Individuals will need to receive bills for applications used and content supplied, and content providers will need to have demographic and socioeconomic information about audiences.

Payment for services may be from a variety of sources, from the user, from the service provider or from the Content Provider, in a similar way to telephone services today. Costs are likely to involve a number of elements, including the royalty costs of copyrighted material, the cost of storage and the cost of supply. Some cost elements may well be fixed; others may vary from time to time during the day. So for example, an old film viewed at peak time could have a low royalty cost but a high access cost, a new film viewed late at night could have a high royalty cost but a low access charge.

7.1.10 User Profile

This group of functions stores and utilizes information about the individual user and their prior behavior in order to control access (e.g. Identification and Password), to assist navigation, and to correctly bill for services received.

Demographic, socioeconomic and geographic information will also be stored and used to provide statistics (not individual Usage Data) to service and content providers.

7.2 Home Networks

As multiple digital services begin to penetrate the consumer market, the need will arise for an in-home digital network that will provide selectable access to these services from multiple in-home devices. Furthermore, the introduction of digital storage devices in the home will expand this need. Home networks for DAVIC must support the functions required to link digital consumer devices so that information may be exchanged among these devices in a simple and direct manner.

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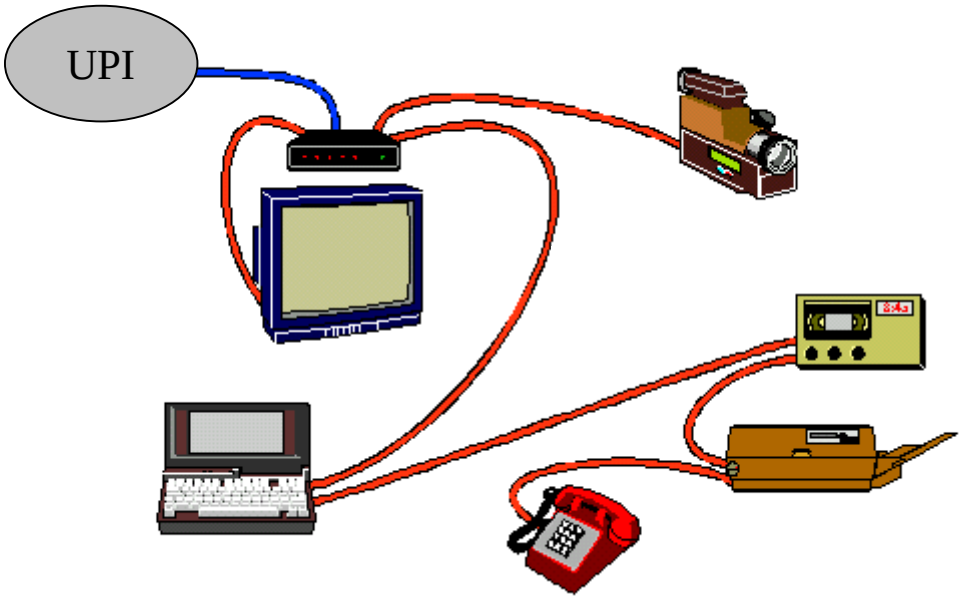

Figure 7.2 — Home Network

7.3 Function Decomposition Table

A listing of digital audio-visual functional groups and function descriptions is provided in clause 10. Table 10-1 lists the functional groups and function descriptions anticipated for a fully defined DAVIC system. In each of the annexes attached to this Technical Report, a subset of these is recommended for a specific contour.

8 Common Requirements of Applications and Services

This clause defines a set of functions that apply to all applications that may be deployed on a DAVIC system.

Subclause 8.1 describes functions of navigation and interaction. These functions provide capabilities to find and select content and to control playback and presentation of this content. Subclause 8.2 describes common functions for service and content management. Subclause 8.3, describes functions concerning the IPR and security functions a DAVIC system must provide. The final subclause 8.4, describes the general aspects of the DAVIC environment. These include functions concerning interoperability, portability and latency.

8.1 Navigation and Interaction

8.1.1 Navigation

8.1.1.1 Definition

The navigation functions enable:

- users to find, choose and select content items or products and to obtain information about corresponding charges and other conditions for use,
- service providers to offer products to the user,
- delivery systems operators or service brokers to offer a choice of services to a user.

These functions are enhanced by the use of intelligent agents. An intelligent agent is a specific set of functionalities that matches content availability with user profiles and requirements. Intelligent agents need to utilize structured meta-data describing the content from the providers.

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8.1.1.2 Functions

The presentation of navigational information to the user can range from simple presentation of text to a full-featured system with graphics, text, animation and video and audio clips. This requires:

- Presentation to the user of the available set of services on the delivery network. This may be structured by the logical hierarchy of services, or by service types (entertainment, shopping etc. from any service provider).
- Browsing, filtering and previewing functions. These may be supported by enhanced features (intelligent agents, customization, etc.) to assist in searching. This could span over several service providers as well as the presentation of the available elements within a service.
  Electronic program guides (EPG) permit navigation to content by date, time and content provider. The EPG can use static and dynamic filtering mechanisms to adapt the EPG to specific user requirements.
- Selection by the user of an element (e.g. program) for:
  - immediate consumption
  - future consumption
  - review of list of advance-booked elements
  - cancellation of advance-booked elements

Specific navigation requirements that may need to be addressed are:

- the multi-lingual presentation of navigation functions;
- integration with Access Control mechanisms to allow limited access to non-subscribed services;
- the need for a low channel response time;
- the ability to switch rapidly between applications;
- the need to display several items simultaneously to allow comparative choice;
- the use of navigation tools (bookmark, go back, etc.);
- flexibility in presentation style to allow freedom of branding and differentiation of products.

8.1.2 Interactive Play control

8.1.2.1 Definition

The Interactive play control functions enable the end user to interact and control the delivery of time-based media such as audio or video media.

8.1.2.2 Functions

Basic functions of Interactive Play control are:

- Control of the audio-visual media presentation through VCR playback commands (such as Play, Pause, Fast Forward, Rewind, etc.)
  - These control functions can include video control, audio control as well as control of animation sequences.
- Control of the audio media presentation parameters, e.g. audio volume.

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Additional functions are:

- Slow Motion, Scan Forward, (menu based) Skip, etc.
- Ability, at authoring time and/or at run time, to indicate bookmarks in a video or an audio sequence;
- Control of audio pitch.

8.1.2.3 Constraints

- The response time associated with the Interactive Play control has to be comparable with a VCR.

8.1.3 Multimedia Interactive Presentation

8.1.3.1 Definition

The Multimedia Interactive Presentation is the function by which the user may have the ability to interact and select or modify media presentation elements. It presents to the end user multiple media components in a synchronized way. The synchronization applies in space (e.g. relative position of media elements on the screen) and in time (relative position of media elements on a time line).

8.1.3.2 Functions

- Synchronized presentation of media elements, e.g. verbal description of the information being visually presented;
- User input facilities for interaction (e.g. through text entry field).

There may be an additional need to allow a single user to select a package of several content items in succession.

8.1.3.3 Constraints

- Synchronization of the media presentation must meet the specified requirements;
  - in complex cases, the various media that have to be synchronized may be stored separately and possibly delivered through different links (e.g. Karaoke-On-Demand).
- Ability to offer the media elements (video, audio, etc.) at various levels of quality. This can include picture, audio, and control of latency.
- The response time between the user's action and the effective presentation have to fulfil the specified requirements.

8.1.4 User interface

8.1.4.1 Definition

The User Interface is the means by which the end user interacts with the applications. The Navigation, Multimedia Interactive Presentation and the Interactive Play control functions (described above) are perceived by the user through media elements (pictures, audio, and graphics) and interaction structures which compose the User Interface.

8.1.4.2 Functions

- User customization of the user interface must be supported, to allow for a simple structured as well as a sophisticated appearance.
- Multilingual User Interface may be supported.

8.1.4.3 Constraints

- The syntax which describes these elements and structures should not constrain the look and feel of applications and the ability for Information Providers, to differentiate between themselves and to preserve their own brand image.

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- A Content Provider may deliver an application in which interaction with the user is described only at a high and virtual level. The rendering of the interaction objects (e.g. buttons) may be supported in that case by a resident GUI interfaced with the application, whatever the Look and Feel of this GUI.

- Sophisticated user interface applications must also work in a ‘degraded’ form on low end STUs.

- A Content Provider may wish that the interaction objects conform exactly to a precise and specific Look and Feel, and that this Look and Feel should be reproduced exactly in the same manner, whatever STU is being used. This may however be limited by STU hardware constraints.

- From the user's point of view, it is desirable that a certain consistency between the various application user interfaces exists, in order to avoid user's disorientation.

8.2 Service and Content Management

8.2.1 Billing / Charging / Trading

This subclause gives an overview of the different tasks to be considered. ISO/IEC 16500-9 covers the Usage Data, and these aspects in greater detail.

8.2.1.1 Definition

Billing/Charging/Trading covers all aspects of determining how usage of the system is to be credited to the providers of the various elements of the system. The providers include at least the intellectual property owners, the service providers and the network providers. Users can include the end users and service providers (e.g., those who may use the network to load their servers).

Information relative to Billing/Charging/Trading is one example of data that needs to be collected for a variety of reasons at different places in the overall system. Such data has value for market research (e.g., viewing broadcast channels), for network planners (to properly define growth), and subscriber behavior (e.g., how many times was 'pause' used in VOD, what was the total time taken to view a movie). Data also needs to be collected for reporting to such bodies as the official regulator, for IPR tracking, etc. The Billing System is outside of the scope of DAVIC. However, the data that needs to be gathered to allow a Billing System to perform is required to be defined such that DAVIC applications and elements can collect and deliver to external support systems.

DAVIC standardizes methods (including protocols) for Usage Data capture and release at all appropriate points in the system, ranging from Applications, to Servers, to STUs, to Delivery systems. This includes requirements for all internal handling of Usage Data, as well as an external interface format for release of Usage Data. This allows System Designers, Market Researchers, Network Designers, as well as those responsible for all aspects of Accounting (i.e. Billing) to get access to the information they need in a standardized way.

The functions listed are the defined needs for support of the DAVIC system, such that applications can be designed to offer complete services. These assume some functionality within the DAVIC system, and some is provided by the external support systems. Until the interface is defined, it is not possible to separate these functions.

8.2.1.2 Functions

User point of view:

- Ability to be informed on the price of any product or service for which the user will be charged, prior to use.

- Ability of the user to accept the charge for the service.

- Ability to enter the means of payment, establish different means of payment for different products

- Ability to review account

- Ability to subscribe to a new service

- Filtering according to trading conditions such as the price

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- User budgeting

Service provider:

Needs to be able to:

- Offer services to the user
- Inform users on the price of offer
- Inform the user on conditions for use
- Offer different prices according to packages, ability to sell packages, ability to have special charge strategies (e.g. Buy 3 and get one for free, cheaper rates on Monday 10 am, etc.),
- Support subscription services
- Monitor their costs and tariffs
- Ensure application billing service will be provided
- Contract for supply of contents from Content providers
- Monitor the use of the contents against the trading conditions
- Obtain payment for services provided
- Support content import to the system

8.2.1.3 Constraints

Intellectual Property Rights (IPR) constraints must be regarded.

8.2.2 Content Loading

8.2.2.1 Introduction

In the DAVIC system reference model defined in ISO/IEC 16500-1, the Service provider supplies content to the user directly, or may act as a broker for material between the User and the Content Provider. The supply of such material is to be accomplished using the A10 interface of the DAVIC system reference model. The A10 interface may be furnished in a variety of ways, from the supply of tape and disc-borne material, to the provision of an electronic link, with or without a return/request path capability.

Complete content items, to be supplied by Content providers, comprise a number of separate, distinguishable and usable elements. These elements are available at differing points in the content production process, and serve to support the promotion of the content and its selection for consumption using navigation systems. Examples are:

- program title
- program description
- still picture
- promotional a/v segments; and
- final program material.

An illustrative example is a movie, which comprises a title, cast list, synopsis, still picture promotions, promotion trailers, actual content and subtitles for foreign languages. These items may be used to watch or preview the movie, and to find the content through suitable navigators and browsers.

The A10 interface must support the progressive delivery of such content item elements into the Service Provider's domain. It must also support the delivery of content item elements that are used by the Service provider to automatically load the content into the Server and to make the material available to Users and to navigators. An

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example of such information would be the terms of sale to the Service provider - price, number of showings etc., and embargo restrictions.

8.2.2.2 Content and Control Flows

The following diagrams depict examples of content flows and control information:

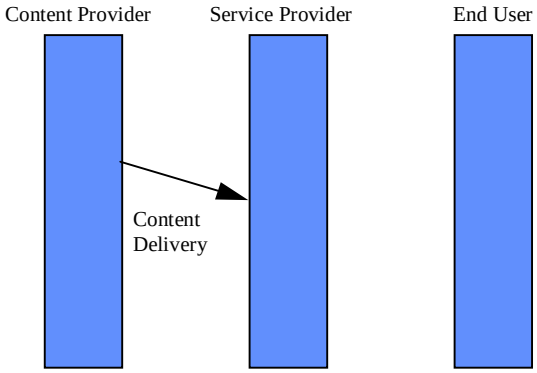

Figure 8.1 — Content delivery, Content Provider to Service provider

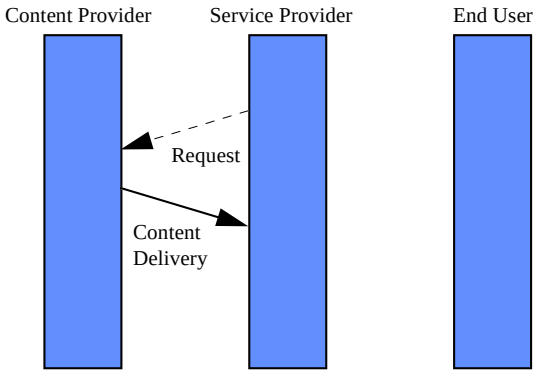

Figure 8.2 — Delivery of content on request from Service provider

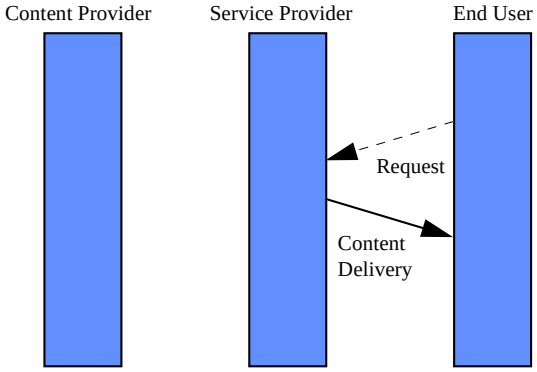

Figure 8.3 — Onward delivery of content from Service provider to User

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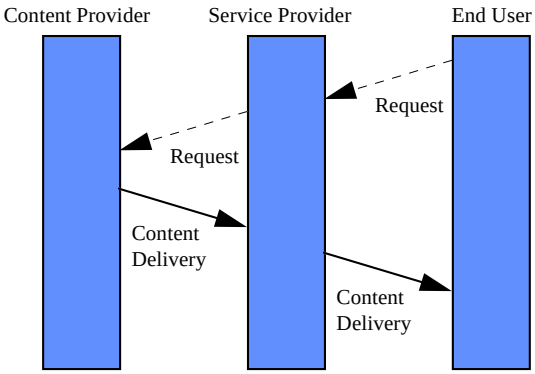

Figure 8.4 — Delivery from Content Provider to Service provider on request by User

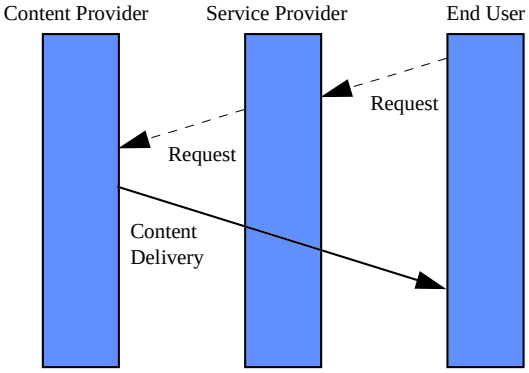

Figure 8.5 — Content stream supplied to User from Content Provider via Service provider

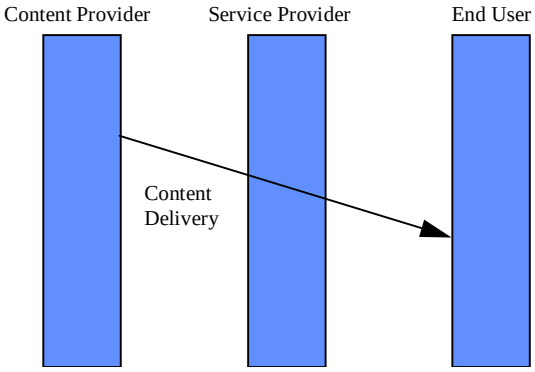

Figure 8.6 — Content delivery to User via Service provider

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8.2.2.3 Delivery of content elements

- Authentication of transfers

  Content exchange between the Content Provider and Service provider must be authenticated, i.e. the Service provider must be able to establish the identity of the Content Provider and the Content Provider must be able to establish the identity of the Service provider.

- Types of Element

  Content items are to be considered as a number of distinct elements, which may be delivered in one package at one time, or in different packages at different times. Such elements may be audio-visual material, audio material, still pictures, graphics, data files, content management data or navigational data. Each content element must describe the type of element it is. The content element must identify the item to which it relates, which particular element of that item it is, and the version number of that particular element.

- Identification of Content Item Elements

  The collection of content elements relating to a particular content item will all bear a common identifier. This may be a unique number or string assigned to the content item worldwide, nationally, or locally, but must be unique to the instance of that content item to the Service provider and Content Provider.

- Delivery Functions

  Content items are composed of one or more content item elements, which may be generated and delivered together or separately over a period of time. Elements may be replaced with newer versions, and new elements may be added. An example of such use is the gradual delivery of the elements that comprise a television program. Firstly, the program title and description may be released; then additional navigational data - a cast list and still picture; a number of trailers. During the release process different versions of trailers and still pictures may be used in order in order to enhance audience expectation. Finally, on the day of production, the final audio-visual material is released.

  Content item elements from a variety of content items may be packaged together and carried as one from the Content Provider to the Service provider as schematically indicated in Figure 8.7.

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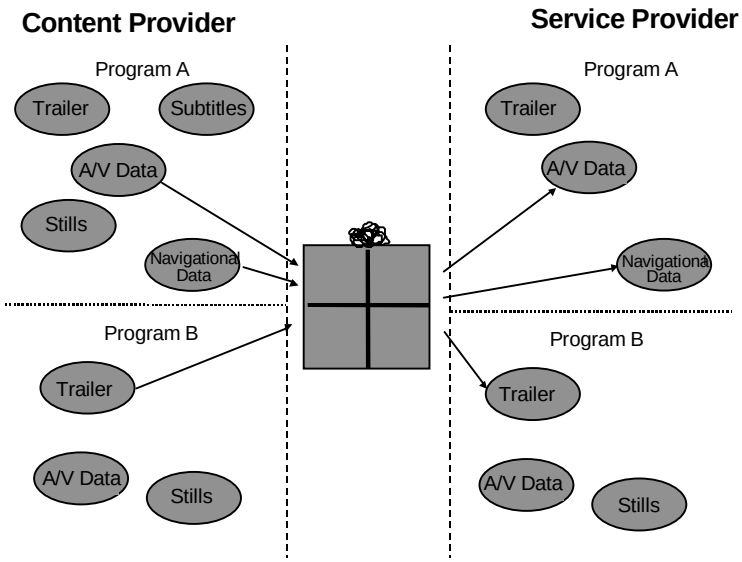

Figure 8.7 — Packaging of Content Item Elements

- Security

  The content transfer process between Content Provider and Service provider should have the possibility of security, using encryption or other techniques, and there should be means to ensure that transfers, with or without encryption, may not be repudiated.

  Where material is brokered from the Content Provider to the User via the Service provider, content material may be transferred in encrypted form from the Content Provider, via the Service provider to the User. In such situations, the Service provider may not be able to decrypt the content item.

- Real time content delivery

  Content material may be delivered in real time from the Content Provider, through the Service Provider, to the User (or Users). Such flow may be initiated by the User, by the Service provider, or by the Content Provider. See Figures 8.5 and 8.6.

8.2.2.4 Content management data

The content management data describes how the Service provider should handle (manage) the content provided by or fetched from the Content Provider. It determines how and when the material should be made available and whether it may be subsequently modified by the Service provider or copied by the User according to the copyright and rights granted by the Content Provider.

- Content loading and deletion

  It must be possible for the Content Provider to automatically load content item elements into the Service Provider's system, and for these to be made available to Users or denied according to the rights afforded by the Content Provider. It should also be possible for the Service provider to request the provision of content from the Content Provider. Material loaded onto the Service provider's system by a given Content Provider may be accompanied by a deletion time/date or expressly and automatically deleted by the Content Provider at any time.

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- Embargo and deletion information

  Content management data stored on the Service provider's system may contain an embargo time/date, before which the content may not be made available to the User, and a deletion time/date, beyond which the material is automatically no longer available to the User or to the Service provider. These trigger points may be set differently on servers in different areas, providing the opportunity to give access to material at different times in different regions (e.g. the broadcast or VOD for a football match in a city might be delayed to the local community).

- Copyright control

  The management data should include copyright information, including the rights to alter (e.g. edit the data used for navigation, censorship) and distribute the material (e.g. number of distributions or broadcasts at a certain price). This leads to an extensible set of features only to be used by the Service Provider (e.g. price, number of plays for a movie, ownership of the content).

8.2.2.5 Navigation data

Navigation data refers to the information provided with the content for the purpose of helping the end user to locate the content. It is intended for use by navigators, intelligent agents, browsers, etc. Navigation data will result in the content becoming visible and accessible.

- Content Label

  Each content item, comprising one or more elements, must be uniquely identifiable to and by every navigation system. It is foreseen that such identification will need to be unique worldwide for each an every piece of published audio-visual material. This label, which must accompany every content item, is to be distinguished from the common identifier which links together content item elements for delivery to the Service provider.

- Features

  The main part of the Navigation data will be an extensible set of features for facilitating EPGs, browsers, intelligent agents, etc. These features, or a subset of them, could be provided by the Content Provider. The Service provider might add, delete and edit the features. Examples of features could be title, rating, synopsis, producer, length, price and "attractors" like stars etc.

8.2.2.6 Links

In order to characterize the content loading process it is necessary to consider the nature of the links that may be utilized, and the way in which these may be used.

Three classes of link are considered:

1. The use of physical media to transport packages of content elements from the Content Provider to the Service provider.

2. The use of a data link to transport packages to the Service provider.

3. The use of a data link to transport real time streams to the Service provider.

In each case, content packages may be "pushed" from the Content Provider, or "pulled" by the Service provider. These terms refer to the selection of content for transfer, not to the operation of the link itself.

Where a data link of sufficient bandwidth is employed to transfer content the opportunity is afforded for content to be transferred in real-time, i.e. a program transport stream may be used. Such a stream may be carried transparently through the Service provider to the User.

These links will require two distinct types of data flow:

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- Content Packages

  To carry and load content into the Service provider's domain. If a data network provides this capability then a high bit-rate will be required in order to carry real-time data. Where this functionality is realized using interchangeable media (magnetic, optical, magneto-optical disks or tape etc.), then standard internal or external drive capabilities need to be provided at Content Provider and Service provider systems.

- Session

  To manage the communication link between the Content Provider and Service provider. Providing the means to authenticate set-up, negotiate and manage the exchange of content item packages. A considerably lower bit rate will be required in order to realize these functions, and will still be required even if a "pulled" system is to be realized using exchangeable media.

8.2.3 Exception Procedures

8.2.3.1 Definition

The functions required to indicate and recover from failure conditions.

8.2.3.2 Functions

- Mechanisms to handle indication of and recovery from:
  - delivery system or server failure
  - delivery system or server congestion
  - selected content not available
  - user error (wrong PIN, after n retries, IPR violation)
  - incompatibility between content and delivery (display) platform
  - set-top unit failure / downloaded application or operating system corruption
- The billing system must account for pay-per-view items which are not delivered completely
- Some regions will require public service warnings that will need to be regionally broadcasted.
- A piracy detection alert may be required.

8.2.4 Commercial Insertion

8.2.4.1 Definition

The insertion of commercials into the content that is provided to users.

8.2.4.2 Functions

- There is a need for a mechanism to indicate where commercials may be inserted into content.
- The set of commercials to be inserted may change through the life of the content, at different times of day/week, according to region, and according to user profile.
- There may be different priced services showing the same content with/without commercials.
- Commercials may provide a direct link to Home Shopping (impulse buy of advertised item), or user management system (impulse advance pay-per-view of trailed program), and payment system.

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- The commercial content may be located on a different server from the content requested by the user.

8.2.5 Session Management

8.2.5.1 Definition

Session management is about connecting and disconnecting from one or more services.

8.2.5.2 Functions

- The user may interrupt use of a service (e.g. viewing a movie) and:
  - return to the original service
  - use another service, then return to the original service
  - cancel and not view the remainder of the program
- There will be a need for a time-out whenever a session is temporarily inactive.
- Enhanced mechanisms may be supported to transfer a session between terminals within a house, or between terminals in different houses.
- The end to end system will retain sets of bookmarks for part-viewed videos for each user for a period of time. Each user/household may have several such part-viewed videos or programs.
- Account control for billing may be by user, instead of by terminal location

8.2.6 Polling

8.2.6.1 Definition

Collection of information made with the purpose of:

- Producing statistics about Service usage
- Collecting audience responses.

8.2.6.2 Functions

- Ability to gather information about content usage.
- Measurement of service availability
- Interactive audience polling

8.2.6.3 Constraints

- Real-time statistics may be needed to manage content demand and provision, or to provide audience polling live to a Content Provider or advertisers.
- There are regional constraints on what data may be collected and how this data is organized and presented.

8.2.7 Multiple Access to content

8.2.7.1 Definition

The ability for more than one user in the same customer premises to access applications and the ability for a user to access multiple applications simultaneously.

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8.2.7.2 Functions

Basic

It must be possible to have more than one STU to be used in a single customer premise:

- where there is only one STU in use at a time;
- where there are two or more STUs in use simultaneously possible accessing different applications or content.

Advanced

It must be possible for a user to access more than one content item simultaneously to allow, for example, picture-in-picture, or comparison of data/content. The content may be at different locations.

8.2.8 Operation and Maintenance

Operation and maintenance functions and information allow monitoring of the end-to-end system for:

- identification and correlation of system failures and threshold limits
- system management operations
- configuration management operations
- collection of system status and performance information
- collection of usage information
- dynamic provisioning of resources to meet services demands
- determination of current resource levels
- determination of system resource limits

These functions should be supported programmatically through pro-active and re-active means. System failures and threshold alerts should be trapped. All other functions should be available through automated and interactive means to authorized participants.

8.3 IPR and Security

8.3.1 Introduction and General Requirements for Security

ISO/IEC 16500-7 contains details of the Security specifications. Following are some general requirements that are applied to all the security tools. They are not prioritized:

- Security measures applied to content should not negatively impact delivered quality
- Security must be reliable
- Control for clear digital stream output should be provided
- Control for degraded digital copying capability should be provided
- All instances of delivery to be securely reported (a loss of less than 1 in 100,000 is recommended)
- Upgrades in face of a breach are to be easy/fast fixes (replacement)
- Delivery in the face of security failure may be allowed by the Service provider
- Security will not impose significant overhead

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- Security will not cause non-delivery of authorized media (no more than 1 loss in 100,000 is recommended)
- Billing to be accurate (to better than 1 error in 100,000 is recommended)
- Support commercial electronic transaction protocol(s)
- Transport with minimal loss (<1 in 2^64 for Content is recommended)
- Transport with minimal loss (<1 in 2^64 for Delivery is recommended)

8.3.2 Viewpoints for Security Requirements

The Security Functionalities matrix has been derived from the analysis of responses to the DAVIC call for proposals from the viewpoints of one or more of the following:

- IPR Holders
- Content providers
- Service providers
- Network Providers
- End Users
- Equipment Manufacturers
- External Business Support Services
- Financial Transactors
- Rights Collection Agencies
- Regulatory Authorities
- Legal Monitors

8.3.3 Security Category Definitions

Table 8.1 lists the Security Categories:

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Table 8.1 — Security Categories

	Function	Description
1	Conditional Access	A means of allowing system users to access only those services that are authorized to them.
2	Secure Session	
2a	Secure Point-to-Point	Establishment of a secure point-to-point connection between two DAVIC entities.
2b	Secure Multi-Party	Establishment of a secure connections between more than two DAVIC entities.
3	Authentication	
3a	Entity Authentication	The proof that an entity has the claimed identity.
3b	Message Authentication	The corroboration that the source of data received is as claimed.
4	Data	The detection of unauthorized modification of data.
5	Secure Download and Execution	The secure provision and use of executable or other data to the STU.
6	Security Audit Data	A security audit trail, or log, is data collected and potentially use to facilitate a security audit.
7	Content Control	Selection by the end user to filter services and content.
8	Privacy	Privacy protects authorized participants from unauthorized utilization or knowledge of information in the DAVIC system.
9	IPR Tracking	The logging of the movement of the material within the DAVIC system and marking the material leaving the DAVIC system.
10	Copy Protection	The controlled processing of output to inhibit the unauthorized copying of material.
11	Non-repudiation and Commitment of Contract	The proof of the origin and reception of a message. This means that the sender cannot deny the sending of the message and the receiver cannot deny the reception of the message.

8.4 General aspects on systems environment

8.4.1 Interoperability

8.4.1.1 Definition

The definition of interoperability within DAVIC is that it is guaranteed that any DAVIC compliant STU will work with any DAVIC compliant Service provider System and any DAVIC compliant application.

There are two kinds of interoperability:

- Signals interoperability permits video, audio and data signals intended for delivery by a given medium to be easily transcoded for other delivery by other media.
- Equipment interoperability ensures that a set top unit can process signals from a multiplicity of delivery media.

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8.4.1.2 Objectives

Both kinds of interoperability are required in a DAVIC environment to ensure that the set of applications available at any user terminal is independent of the types of media used to deliver them. Thus, any combination or configuration of DAVIC-compliant servers, networks, and set top units will provide the following benefits:

- the largest possible market to application providers.
- the largest possible choice of applications to users.

8.4.1.3 Examples of Interoperability

Some examples of interoperability are:

- Access to any application at any geographical location
- Quality of service independent of geographical location
- Use of any STU at any geographical location
- Support for different voltages

8.4.2 Platform Independence

8.4.2.1 Definition

In a DAVIC environment, platform independence will ensure that it will be sufficient for a Content Provider to supply one version only of the content or application software to any service provider regardless of server or STU platforms. This implies transfer from any Content Provider to any service provider platform and from there to any set top unit platform without restriction.

Platform independence ensures the largest possible market to application providers and the largest possible choice of content to users.

8.4.2.2 Objectives of platform independence

It must be possible for a Content Provider to supply a single version of the content or application to any service provider regardless of server of STU platform.

This could be reached by fulfilling the following objectives:

- To provide functionality transparency from any Content Provider to any service provider platform.
- To provide functionality transparency from any service provider to any set top unit.
- To provide the largest possible market to application providers.
- To eliminate STU-type and server-type as a parameter in application versions.
- To enhance user friendliness of content packages.
- To provide the user with the largest possible choice of content.
- Make it possible to have one application available to any server and any client.

8.4.3 Latency

8.4.3.1 Definition of Latency

Latency is the perceived delay between an action and the corresponding reaction. Different elements of an overall system may contribute to the overall latency of an action. Latency is very much implementation specific, and may vary with system load.

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8.4.3.2 Latency Budget

The requirement for control of Latency is an issue that is the responsibility of the Service provider, and the Application Designer; the various system elements together have to meet such requirements. The System Integrator will then choose how this latency is distributed amongst the various contributing elements. For instance, take the example of a MOD application running on an HFC network. If the Application Requirement for starting a selected Movie from a Stopped situation is a latency not to exceed 400ms, System Integrators may design this differently:

Item	Contribution A	Contribution B
Infra Red Delay	100ms	50ms
STU Processing	20ms	10ms
Upstream Channel	50ms	100ms
Server Processing	15ms	5ms
Stream Processing	15ms	5ms
Downstream Channel	0ms	0ms
STU Video Resynch	200ms	230ms
TOTALS>	**400ms**	**400ms**

In this (purely fictitious) example, both systems meet the overall requirement, but with different allocations of delay.

There are requirements regarding latency for certain functions defined in this document. These requirements have not been assigned to the different element that may contribute to the overall latency. It is up to the System Integrator, and the Service provider to jointly agree on the requirements for individual contributors based on any given implementation.

8.4.3.3 Example of functions with latency

Examples of functions that would have latency as a parameter are:

- Acknowledge Input
- Channel Change
- VCR Pause/Stop
- Other VCR functions
- Movie Select-> Start
- Internet access

8.4.3.4 Comments

- IR recognition and interpretation delay needs to be included in user input.
- Resynchronization of the analogue TV signal may or may not be a factor, depending on the design of the MPEG decoder.
- The resynchronization time of a switched MPEG-2 stream, with unsynchronized sources will depend on the encoding parameters used (which is, how often the 'I' frames are inserted)
- VCR Pause where there is a frame store in the STU could appear to be fast, as going to freeze frame is a purely local function, however, there may be a longer delay before the control signal reaches the Server. The Application has the responsibility of restarting delivery at a point that takes in to account the differences between the STU-based Pause, and the real Server Pause.

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9 Descriptions of Example applications

Nineteen DAVIC prioritized core applications are described. The applications given high priority are specified in detail in subclause 9.1 up to and including subclause 9.8. For the other applications a brief description is presented in 9.9 - 9.19.

This clause identifies functions that the DAVIC specifications should support, but does not specify where exactly in the system they should reside (i.e. whether they should be implemented in STU, server or network). Also, the base specifications contain some items that are specific to application or service provider, and must not be specified by DAVIC. A full list of the functions needed by these Applications is presented in the Table in Clause 10.

9.1 Movies on Demand

9.1.1 Description

NOTE: In spite of its name, this application is not limited to the content type ‘movie’: any type of audio-visual data can be used. The name was chosen because ‘Video on Demand’ means too many different things to different people. The description in this category can be used to build applications like ‘News’, Music on Demand’, etc.

MOD refers to a network-delivered service that offers the functionality of the home VCR (as a player only) without having need to get a copy of the chosen material. The user has the ability to use the following features: select/cancel, start, stop, pause (with or without freeze frame), fast forward, reverse, scan forward or reverse (both with images), setting and resetting memory markers, showing counters, jumping to different scenes. Not all these features are required for the service to be MOD.

Previewing and interactive browsing are typical functions. Data transported to (and presented to) the user can also include information like the user’s account.

Involved are the end user (domestic or business setting) and providers of content, service and network. The Content Provider and service provider can be different.

9.1.2 Base Specification

9.1.2.1 End user functions

1. Select and order content.
2. Interactively view the content (this includes the following VCR type functions: play, pause (still picture) fast forward, fast rewind, scan forward, scan rewind, jump to point in time or (e.g. menu based) to a certain scene.
3. To choose a language for audio, video and sub-titling
4. To choose whether to see subtitles/close captioning, and to be able to choose from different languages.
5. To be able to get, before and during viewing, additional information with regard to the content playing.
6. Make reservations in the case of limited availability of content or connections.
7. Perform Access Control (blocking certain types of content from being viewed at certain times and/or by certain people).
8. Setting up personal preferences (such as ‘I normally want to see only sports items’).
9. To have presentation control, such as changing the sound volume.
10. To view data concerning the service and the relationship between user and service provider (such as usage, billing and account details).

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11. To perform action related to subscription, e.g. to subscribe, to cancel the subscription, to give permission for payment (credit card, money transfer).
12. Select movie by rating.
13. Go to bookmark.
14. Select text presentation format (e.g. left-to-right, top-to-bottom).

9.1.2.2 Service provider Functions

1. To offer content to end-users.
2. To handle subscriber billing/accounting.
3. To act as a broker between end user and Content Provider.
4. To keep track of Usage Data. (Used e.g. to mark where the user ‘left’ a movie, so that at a later point in time the movie can be started at that exact point, or to give the user information about which films have already been viewed.)
5. Allow for multiple brokers as well as service providers.
6. To keep track of user data (e.g. payment messages).
7. Mail availability visible to user.

9.1.2.3 Content Provider Functions

1. Make content available and make known that content is available.
2. Deliver content to Service provider.
3. Deliver content to end-user if service provider only acts as a broker.
4. Indexing of content scene.
5. Categorize content for selection.

9.1.2.4 Network provider functions

1. Transports audio/video/data to user.
2. Transports control signals to and from user.
3. Can support billing by generating charge records.

9.1.3 Characteristics

1. Point-to-point application.
2. Large downstream channel relatively small control channel.
3. A maximum time from ordering content to start viewing.
4. A maximum time from entering action to visual feedback on screen.
5. A maximum time from issuing VCR type command to execution.

9.1.4 Extensions

The user is able to choose dynamically between several Qualities of Service, such as different bit rates.

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9.2 Teleshopping

9.2.1 Description

Teleshopping allows the user to browse video catalogues or virtual shops to purchase products and services. The user may select items to get more information that may be presented using many different media, e.g. video, text, motion video with audio, audio or graphics (still or animated). After the user has selected a product, he or she may ‘order’ the product. Once the product has been ordered, the method of delivery depends on the service provider’s implementation & user agreements.

The following "players" are involved with Teleshopping:

- The end user uses the application and possibly purchases goods,
- A VASP provides this service,
- A Content Provider may provide media content delivered during the use of the application,
- A second VASP may provide the Back-End of the application

9.2.2 Base Specification

9.2.2.1 End user functions

1. Move through the shopping environment
2. Select items of interest
3. Receive pictures of items
4. Receive text describing the items
5. Receive audio describing items
6. Receive motion video (with or without audio) describing items
7. Receive graphics (still and animated) describing items
8. Talk to a real sales person (audio only or audio video), who knows the context of the application (for future consideration)
9. Control media clips, including repeat, pause, and abort (note: since media clips are "short" it is not required to have fast forward/rewind type functions although they may be provided)
10. Authorize payment / purchase of goods
11. Inquire about and alter previous purchase (orders) including requesting exchange / return authorization
12. Being able to make a hard copy
13. Reserve products/services
14. Select payment method

9.2.2.2 Service provider Functions

1. Provide the shopping environment
2. Request media clips to be sent to the user
3. Send media clips to the user
4. Process user’s order

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5. Keep an intermediate list of acquired items

9.2.2.3 Content Provider Functions

1. Provide media clips for products
2. Provide information about price, availability, delivery times, special conditions
3. Categorization of material for electronic selection
4. Determine layout of virtual store
5. Assign products to virtual departments

9.2.2.4 Network provider functions

1. Transport various data formats down to the user including: motion video, still pictures, audio, text and graphics.
2. Transport information from the content providers or service providers to the server, in order to have rapid updates on product information
3. Allow for the dynamic addition / deletion of connections between the end user and additional servers (i.e., if the user "clicks" on an item that has a video clip, then a video "pipe" must be set-up to the user).

9.2.3 Characteristics

Teleshopping can be implemented in a wide range of complexity. This subclause describes a more complex implementation.

- All user actions (selections and movement through the shopping environment) should be acknowledged immediately
- Many different multimedia objects with different data size must be sent dynamically downstream
- A single bi-directional, symmetric channel will remain during the entire session. This channel will have bursty traffic characteristics.

9.2.4 Extensions

- This application may be extended to allow for personal digital agents who may (electronically) visit the virtual shop (or "flip" through the video catalogue) to shop for the agents owner. This extension would place additional functions onto the network and service provider equipment to support these personal agents. Also, personal digital agents requires system wide support for the movement of the agents from one service provider to the next, as well as providing the agent with a "place to live".
- Teleshopping could (or probably will) provide for application interaction. For example, it may be possible that during the viewing of a video (in MOD), the user may be able to "break-out" of the video and shop for video related products (i.e., during the viewing of a Disney movie the user may visit the "Virtual Disney Store"). Some of the requirements that this type of extension would demand include methods for one service provider to invoke another service provider on behalf of the customer.
- Keep user profiles (such as shoe size, R-rated restricted, etc.)
- Perform collaborative shopping
- Add videoconferencing capabilities to the discussion with the sales person

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9.3 Broadcast

9.3.1 Description

Broadcasting is an application providing multiple users with immediate, real-time access to multiple sources of TV/Radio/Data programming.

Broadcasting can provide interactivity between the user and processes running purely local on the processor of the STU as well as between the user and the service/network/Content Provider.

The first configuration, which is a subset of the second one, has no requirements for an upstream information flow from the user to the service/network/Content Provider. Programs can comprise real-time video, audio, text and data streams from which the user can select a program for immediate access. Beyond that, programs can comprise real-time, continuous transmissions of sets of software modules (data), such as games software or other applications software, from which the user can select a module for downloading into the STU, providing local interactivity with the user when running on the local processor.

The second configuration providing interactivity between the user and the service/network/Content Provider requires an upstream information via a narrow back channel. Thus, the user can be enabled to participate in a program or get control over a program or parts of it. User inputs to games, polls and elections can possibly alter the content of the broadcasting program.

Broadcasting includes applications such as Pay-Per-View (PPV), subscription TV (Pay-TV) as well as conventional open access TV.

9.3.2 Base Specification

9.3.2.1 End user Functions

1. To get at any time and to browse through information about the network, the services (programs) and the events through easy to use user interfaces such as on screen menus and graphics
2. To initiate a self-configuration of the STU for the available channels of the connected network
3. To perform fast channel hopping
4. To select among the available service providers, a service or a single event
5. To select language for audio and sub-titles
6. To check account data and to retrieve billing record
7. Participate in an interactive program
8. Selection among various options provided by a program, e.g. different camera positions or alternative outcomes of a movie
9. To personalize their selection of services, for example through easy connection to preferred services, pre-selection of favorite services and applications, and personal filtering

9.3.2.2 Service provider Functions

1. Provide information about the services (service names, service provider names, free/CA-mode, etc.)
2. Provide information about the program events (start times, duration, free/CA-mode, audio modes, languages, subtitles, content types, additional text) to support the end user selection
3. Provide means for Conditional Access (CA).
4. Allow an end user to subscribe to services
5. Control Conditional Access

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6. STU to call to service provider to set-up control channel
7. Establish control channels
8. Provide Service-Provider-specific "Look-and-Feel" of the graphical user interface for selecting between optional program parts

9.3.2.3 Content Provider Functions

1. Provide information to the Service provider about the program events (start times, duration, free/CA-mode, audio modes, languages, subtitles, content types, additional text) to support the end user selection
2. Make content available and make known that content is available, and against which conditions
3. Deliver content to Service provider
4. Deliver content to end user if service provider only acts as a broker

9.3.2.4 Network Provider Functions

1. Transport A/V/text/data/graphics/control data streams via a large unidirectional point to multipoint channel
2. Transport control data streams via a narrow bi-directional channel
3. Provide equal access to all Service providers including those providing traditional broadcast programs
4. Provide and transport the network name information
5. Provide and transport tuning information (e.g. frequency, symbol rate, FEC) for all channels of the network
6. Transport program related information for services and program events
7. To perform seamless transition between broadcast and interactive services

9.3.3 Characteristics

1. Large unidirectional channel and small (or no) return channel required
2. Protocol for return channel required
3. Transmission of service information required
4. Conditional Access system required
5. Support services with multiple small videos on one screen
6. Connection and access to servers via small bi-directional return channel
7. A maximum time for moving from one channel to another

9.3.4 Extensions

Some addressing mechanism could enable point-to-point links using broadcast channel (Conditional Access).

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9.4 Near Video on Demand

9.4.1 Description

Near Video on Demand (NVOD, also known as Enhanced/Advanced Pay per View) is a specific broadcast application that improves the availability of (typically) movies, without requiring a dedicated point-to-point connection to each viewer.

Basic NVOD covers pure broadcast of video, in a multiplex manner, with no real interactivity between the user and the service/network provider. On a regular satellite or CATV system, the titles are all broadcast all the time, the user merely selects the channel that provides him with the closest start time, which is eventually supported by an Electronic Program Guide (EPG). To effect a ´PAUSE´, the user selects another copy of the same title that started at a different time. The minimum pause period is equal to the Stagger Time, which is the difference between two successive start times of the same movie, e.g. 15-min.

Intelligent NVOD (INVOD) offers the users a more friendly and effective handling of the PAUSE feature. Effectively, the INVOD application handles the activity of finding the appropriate channel to re-select after a pause is executed. This intelligence may reside in the STU, or in the network (e.g. service provider or network provider). There is also some interactivity between the STU and the service or network provider for billing and feature data.

9.4.2 Base Specification

9.4.2.1 End user functions

The NVOD and INVOD application shall enable the user to perform the following functions:

1. Select: The ability to select and purchase a title to be viewed. The method for presentation and selection of a title is outside the scope of this definition. In a broadcast version, there is no need to communicate that choice to other elements of the service delivery platform, such as the server. In a switched approach, there is need to communicate the path set-up request. Enhanced NVOD may require authorization, Conditional Access and billing data by some bi-directional path to the service/network provider.

2. Cancel: The ability to cancel a choice, either before viewing, or during a time period defined below (cancellation time)

3. Pause: The ability to stop the running title, with an optional freeze frame picture left on display. The delivery path may be dropped, maintained or released after pause is selected in the switched scenario. In the broadcast version, it is only necessary to do anything in the enhanced case, to allow return to the appropriate copy later.

4. Resume: The ability to start viewing the title again, after a pause. In the enhanced case, the system handles the choice of which running copy to display. Otherwise, the user selects the best channel, and resumes viewing.

5. Fast Forward/Reverse: The ability to move quickly to another part of the title, without a picture being displayed. This represents 'leaps' equal to the Stagger Time (see below)

9.4.2.2 Service provider Functions

The Service provider may define values for the following times that can vary from service provider to service provider and from title to title.

1. Access Time: The amount of time the movie is available for viewing on a per purchase basis. This might be the same as the viewing time or it could be for example 48 hours.

2. Stagger Time: The difference between two successive start times of the same movie - (In currently available services this is typically 15 min.)

3. Viewing Time: The maximum amount of time that a user can view a title for a single charge. Viewing time does not include the time the movie is paused or the remind time. The viewing time is expected to be less than twice the run time.

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4. Run Time: Length of the movie viewed in a linear fashion. The run time is dependent on the title chosen.

5. Start Time: Time when the next copy of the movie is to start.

6. Cancellation Time: Amount of time that the viewer may watch without being billed. This time is based on the movie being viewed linearly from the start. If a user watches or fast forwards past this point (time into the movie exceeds the cancellation time) billing takes place. The cancellation time depends on the title chosen.

7. Remind Time: Amount of time in the movie that is guaranteed to repeat when resuming play after a pause. (This is an overlap to catch up.) Expected to be 1 minute.

8. Pay-per-View Window: The movie is available for purchase during this time. Usually a 30-60 day period.

9.4.2.3 Content Provider Functions

1. Make content available and make known that content is available, and against which conditions.

2. Deliver content to Service provider

3. Deliver content to end user if service provider only acts as a broker

4. Collect money from end user

5. Collect money from service provider

6. Pay money to service provider (e.g. when the service provider does 'pay per view' advertising for the Content Provider)

9.4.2.4 Network provider functions

1. Transports audio/video/data to user

2. Transports control signals to user and if supported from the user.

3. Support billing, Conditional Access and authorization

9.4.3 Characteristics

1. Point-to-multipoint application

2. Large downstream channel and, in enhanced systems, a relatively small control channel

3. Response times are critical characteristics

4. A maximum time from entering action to visual feedback on screen

5. A maximum time from issuing VCR type command to execution

9.5 Delayed Broadcast

9.5.1 Description

Delayed Broadcast is a specific broadcasting application where the Service provider or the end user selects a scheduled broadcast program to be stored at the network or service provider for delivery at a later time. The time of delivery may or may not be scheduled at the time of the application request. Later delivery may be MOD, NVOD or repetitively Broadcast. The information broadcasted does not have to be TV-programs only. Electronic newspapers, computer software, commercial brochures, travel information and other digital information could be broadcasted and fetched from the network in the same manner.

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9.5.2 Base Specification

9.5.2.1 End user functions

1. Authentication/Identification. To use in the dialogue with the service provider.
2. Navigation. To look for what is, or will be (after a request) available to view.
3. Content presentation. Content decoding
4. Billing/Charging. Information about the account.
5. User Interface. A superset of navigation.
6. Interoperability and Platform independence. Independent of STU and TV-set.

None of these functions are restricted to be used in only this specific application.

9.5.2.2 Service provider Functions

1. Authentication/Identification. Known users could be stored in a distributed database.
2. Billing/Charging. The recording part.
3. Intellectual property protection. Management of royalty tasks.
4. Content management. Recording, (encoding & compression of analogue/uncompressed information), storing, managing, sending and deletion of broadcasted information.
5. Exception. Signaling downstream when recording failed.
6. Content presentation. Play and send.
7. Ad (commercial) insertion. Could be distributed with geographical differences.

9.5.2.3 Content Provider Functions

1. Content presentation. Digitizing, coding and compressing content which is broadcasted with some sort of label attached.
2. Indexing, ”Tagging” of the digitized content. I.e. marking up the parts within a TV-program in a way that the end users navigation system recognize and is able to utilize.

9.5.2.4 Network provider functions

1. Exception. Signaling to local servers when broadcast has failed.
2. Session Management. Many point to point connections. More than one Content Provider feeds many local video servers. More than one local video server reports usage back to more than one database.
3. Distribution of commercials "off-line". To update local video servers with relevant commercial materials.

9.5.3 Characteristics

1. Delayed Broadcast could be implemented by means of a central broadcaster which digitizes, codes and compress programs and distributes them over a network to local video servers.
2. There is a need for a broadband downstream channel from the Content Provider(s) to the local server(s).
3. There is also a need for one broadband channel from the local video server to the end users equipment.

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4. In the other direction there is need for a narrow control channel from the end user to the local server database and another narrow channel from the local server backwards to the service providers central database.

5. The service provider’s registered-and-allowed-user database and the now-and-in-the-future-available-programs database are distributed databases with relevant data residing on the local server.

9.5.4 Extensions

1. The user should also be able to inspect what programs that are residing on the server at that point of time to watch them, even if they was not ordered to be saved at an earlier point by this particular user.

2. More enhanced end user interactions: To stop a video-stream should be possible. To withdraw an order for recording before it is completed and avoid billing is another possible extension.

3. A more selective type of commercials The actual commercial sent to each user during the available commercial time slots could be depending on the end users profile or in which geographical region the local video server is placed in.

4. The user can request for a start at any time after the recording time has begun.

5. To have individual play back control (VCR functions)

9.6 Games

9.6.1 Description

A games application will allow a user to play a game via a network-delivered service. This is in contrast to a traditional video game that is played on a specialized player (e.g., Nintendo, Sega). The user will be presented with a menu of games that are available from their service provider. Once the user selects a game to be played. The game program is then loaded into either the user's STU, or into a "game machine" located at the service provider. Game play is then started. Input from the user will alter the state of the game, and the appropriate changes shown in the graphic / video stream that the user is viewing. Play will continue until the game is finished, or the user decides to end the game. Usage records will be prepared for billing the user.

A multi-user game will function the same as a local game with the addition of more than one-user inputs affecting the state of the game.

The requirements following from this application depend greatly on the interactivity level. Some types of games have low interactivity and no critical delay requirements, such as chess and other 'intelligence games'. Other games, characterized by speed and reaction time, have very strict delay requirements and more often they require high-speed graphics. To not pose too heavy and expensive requirements on server and network, the games may be downloaded and played locally.

9.6.2 Base Specification

9.6.2.1 End user functions

1. Game machine may be the STU or attached to it.

2. Game selection: presentation of options.

3. Start / Stop of game play - access help panels.

4. Game play controls: (up, down, left right, Button "A", Button "B" Pause, Fire, etc.).

5. Access Control & user authorization.

6. Billing approval.

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7. Profile recording (e.g., record high scores).
8. Know about status/position/score of other players in a multi-user game

9.6.2.2 Service provider Functions

1. May have the “game machine”.
2. Download game into STU/game machine or to network game machine.
3. React to game inputs within a "max. response" time.
4. Provide billing / usage records to billing processor.
5. Pay royalties to Content Provider
6. Commercial insertion - Tell user about new games.
7. Store user information (e.g., high scores)
8. In multi-user environment: process multiple input sources simultaneously, and keep all users' game status synchronized.

9.6.2.3 Content Provider Functions

1. Provide current content (games) to service provider
2. Provide royalties billing to the service provider
3. Provide advertisement content for commercial insertion

9.6.2.4 Network provider functions

1. Asymmetrical connection
2. Service selection - Display game selection options
3. Session management - connect user to service provider
4. Transport control channel (constrained latency)
5. Transport video stream - reserve required bandwidth
6. Multicast video / graphic streams (in case of distributed games)
7. Connect multiple users to one game program (in case of distributed games)
8. Exception - recovery from network errors

9.6.3 Characteristics

1. Response time from user input to video display update. Highly interactive games need much lower marks for latency.
2. Multi user connections to one game program
3. High interactivity from user to game program

9.6.4 Extensions

1. User controls (remote control) must have "game-type" control buttons (i.e., specialized "game" remote)
2. Multiple user must access/control one game program

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3. Game machine may be users STU or may be machine located at service provider
4. Game machine may be an additional device that interfaces (plugs into) the STU
5. Multiple users may need to access on STU to play the same game together

9.7 Telework

(Multimedia collaboration, telecooperation, Multimedia conference, CSCW which stands for Computer Supported Co-operative Work.)

9.7.1 Description

Involved are: end user (teleworker), service provider, one collaborator.

The user establishes a session via a service provider, activates and controls local and distant applications; communicates with a collaborator (through audio, video and data).

The application provides for the user:

- directory service, bulletin/message board service;
- conferencing service in real time with two users;
- distribution service of information one to one user -> joint viewing;
- joint editing with control of application;
- signature commutation.

9.7.2 Base Specification

9.7.2.1 End user functions

1. Establish session via service provider
2. Send ID, PIN for identification and access permission
3. Select collaborator
4. Send message to bulletin/ message board
5. Send mail with MM attachments to correspondent
6. Activate/deactivate video information (at front-end or far-end)
7. Activate shared application at front-end, at service provider, or far-end
8. Jointly view application at far end site(s)- without any control (not synchronized)- only with pointer control- with full control (scrolling, sizing, moving) (synchronized)
9. Jointly edit shared application- Send/accept edit request(s) - Synchronize application control and output management (may also be Service provider)- Request, grant or deny control of shared application
10. Send/ accept electronic signatures
11. Remote LAN functionality, rapid access to remotely stored data.
12. Have access to on-line services (Internet, CompuServe, etc.)
13. Have integrated access to telecommunication

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14. Receive mail announcements
15. Receive mail
16. Read bulletin board

9.7.2.2 Service provider Functions

1. Provide directory service
2. Prove bulletin/message board
3. Accept session scheduling
4. Accept and distribute MM-mail
5. Establish collaboration session with requested collaborator(s)
6. Manage and control collaboration session
7. Synchronize application control and output management
8. Secure access and session
9. Allow on-line subscription
10. Enable and control signature commutation
11. Send billing information
12. Provide access to telecommunication and on-line services
13. Mail announcement to end user

9.7.2.3 Content Provider Functions

9.7.2.4 Network provider functions

1. Establish connection links to requested collaborators
2. Negotiate connection parameters (bandwidth, protocol)
3. Set connection
4. Control connection during session
5. Provide billing information
6. Provide access to telecommunication and on-line services

9.7.3 Characteristics

1. Multipoint-to-multipoint connection management
2. Bi-directional AV channel at high speed
3. Real time connection for AV and application channel
4. Synchronization of shared application and pointers at low response time (if applied) synchronization with token holder synchronization with latest changes.

9.7.4 Extensions

Telework multipoint-to-multipoint

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- End user functions
    1. Confirm, schedule and activate connection(s)
    2. Moderate/ control collaboration session
    3. Add users to or remove them from a shared application
- Content Provider Functions
    4. Provide selection of SW applications for Telework
    5. Navigation and selection of SW applications
    6. Download SW applications
    7. Have billing/charging capabilities
- Network provider functions
    8. Set connection to highest level commonly possible.

9.8 Karaoke on Demand

9.8.1 Description

Karaoke on Demand is the networked version of Karaoke. It involves a service provider and a user or a group of users, possibly located at different places. A user will typically select a song from a catalogue provided by the service/Content Provider. The latter then provides the user with an aural and/or visual setting for the song, where the setting may consist of instrumental music, vocal music, highlighted display of lyrics, video scenes, or subset of these items, properly synchronized. The user may select or alter the key and tempo of the chosen song. The user sings into a microphone and the voice is played along with the instrumental and/or the vocal music, at the user's location.

If a conferencing option is available, the audio/video content and the real time voice/image may be sent to other locations.

9.8.2 Base specification

The application Karaoke on Demand (KOD) is very much the same as the application Movies (MOD). In this section, only the extra requirements are highlighted.

9.8.2.1 End user functions

1. Instrumental music and vocal lines can be separately turned on. There may be more than one vocal 'channel'. (NB: in MOD this translates to being able to use different languages.)
2. Lyrics are shown as close captions, and there is a mechanism showing to which point exactly the song has progressed. This requires a timing/synchronization mechanism that is stricter than for Movies
3. The user can change the pitch of the song, without changes in the presentation speed. (NB: This can be done in the STU itself.)
4. The user's voice is mixed with the music and amplified; possibly effects like echo are added (Also an STU function)

9.8.2.2 Service provider functions

See Movies.

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9.8.2.3 Content Provider functions

See Movies. Content Provider has to allow separate access to the different data streams, notably audio streams.

9.8.2.4 Network provider functions

See Movies.

9.8.3 Characteristics

1. Point-to-point application.
2. Large downstream channel relatively small control channel.
3. A maximum time from ordering content to start viewing.
4. A maximum time from entering action to visual feedback on screen.

9.8.4 Extensions

In advanced versions, the user can:

1. Change the speed of the audio-visual presentation, (without the pitch changing). Advanced version also allow (like for MOD) the user to change the Quality of Service.
2. Sing along with people at a different location; their voice and possible image are transmitted to other places (requires a KOD Multipoint Control Unit and a return channel)

9.9 Internet access

9.9.1 Description

The scope of this subclause is to specify requirements for full Internet Access by a DAVIC STU. Access is defined as: the STU has access to all possible services offered via the Internet (with the possible limitation of what the service provider deliberately wants to exclude). The STU is a consumer of services, not a provider. The STU does not have to be able to behave as a server to other entities on the Internet.

This subclause also considers hybrid services, using DAVIC compliant systems and Internet services.

The above description enables several architectural models, some of which are detailed below. These examples are by no means exhaustive, but are listed for purposes of clarity.

STU connected to a PC

An STU can be a convenient device to connect a personal computer to a broadband network, and can be used as such to access Internet services. In this configuration, the end user uses a PC to access Internet information, download files, send mail, and so on. The STU is simply a communication device as a modem would be.

STU as a PC

An STU including PC functionality, or indeed a PC incorporating an STU. In such case, it is possible to imagine Internet applications running directly on the STU

STU as a simple terminal

The STU can be used as a simple display device. Internet services can be accessed and run remotely on a server, and images can be sent to the STU for display to the end user.

9.9.2 Base Specification

9.9.2.1 End User Functions

1. Provide automatic download via use of a scheduler.
2. Provide a Web client function to interpret requests from the user and interface with the Web server to retrieve requested information.

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3. Navigate through all information on the WWW using hypertext links.
4. Search for specific information.
5. Send and receive email.

9.9.2.2 Service provider Functions

1. Provide access to a Domain Name Service to allow conversion of domain names to IP addresses.
2. Provide data download via the Internet.
3. Provide data upload via the Internet.
4. Provide a proxy Web server to retrieve data from the Internet and store it locally.
5. Provide unique Internet and E-mail addresses to users.
6. Provide the best router for Internet Access.
7. Provide direct IP connectivity to other STUs.
8. Allow an end user to subscribe to Internet services.
9. Provide information about the service (service names, service provider names)
10. To handle subscriber billing/accounting.
11. To keep track of user data (who accessed what, etc.).
12. Provide Internet Access interface software to the end user (WWW browser, email, FTP, Telnet).
13. Automatic insertion of information into downloaded data (e.g. graphical commercial insertion into web pages, promotional messages, etc.)

9.9.2.3 Content Provider Functions

Internet Content providers are outside the scope of this report.

9.9.2.4 Network Provider Functions

1. Transport various data formats down to the user including motion video, still pictures, audio text and graphics.
2. Transport various data formats from the user to an Internet host.

9.9.3 Characteristics

1. Internet Access allows many semi-permanent links to be set up between the client and a number of servers.
2. Combine broadcasting and communication simultaneously.
3. Cannot control how long it takes to deliver requested data.
4. All user actions should be acknowledged immediately.
5. Many different multimedia objects with different data sizes must be sent dynamically.
6. Downstream channel typically has higher bandwidth requirement than the upstream channel (end users download much more than upload).

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9.9.4 Extensions

1. Provide a symmetric interface to allow transmission at the same rate as received signals.
2. The system should provide a means of text entry (e.g. conventional keyboard).
3. Support local data storage for caching.
4. The following applications should be considered extensions:

   – Network News (Usenet)

   – Terminal Emulation (Telnet)

9.10 News on Demand

9.10.1 Description

Involved are end user, service provider(s), Content Provider(s), network provider(s).

The user interactively obtains information about news items. The service also provides summaries and headlines. The user can choose news items to view, the presentation level and the presentation material (e.g. only text or also moving video). In this application, a seamless integration of navigation and content is important.

Extensions can be:

- collecting news from different sources based on user queries;
- (generating and) using a personal profile to change the items presented and the way of presentation.

These two extensions combined give an application that can be called ‘Personalized News’.

9.11 TV Listings

9.11.1 Description

Once the TV-listings are selected, the end-user is provided with a (scrolling) display of distribution programs and their related schedules. The end user may select a listed distribution program to get additional information (situation, actors, when made, etc.), potentially in progressive queries.

9.12 Distance learning

(Tele-teaching/tele-learning/remote learning)

9.12.1 Description

Users are students, educational institutions, educators (teachers), not all at the same location during the virtual class.

This application aims at providing ‘the virtual classroom’.

The application makes classes available regardless of the whereabouts of the instructor or students, and makes the class/course economically feasible (more students per instructor for less popular subjects).

Users can schedule classes, browse through classes, join or leave classes, or (as a teacher) end the class.

During a class, the following functions may be available: control camera’s, display documents (on an electronic overhead), control what is displayed on the monitor. Students can interact with the instructor.

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9.13 Videotelephony

9.13.1 Description

Involved are two users at separate locations, and optionally a service provider. The user initiates and controls the conversation, and additional information may be exchanged. The application provides the user a real time, bi-directional exchange of audio, video and other data.

9.14 Home Banking

9.14.1 Description

Application which provides electronic access to offerings available in the typical retail bank, which may include retrieving account balances, making payments to third parties, applying for loans and browsing through bank offerings.

The ‘end user’ is a banking customer (or will become so) of a bank which is a ‘Content Provider’. The end user navigates through a certain bank offerings in order to access the offerings.

- Personal banking information (account balances, interest rates, terms)
- Transaction capability (vendor point, dir. debit, transfers)
- Other banking services (credit cards, savings)
- Application / request capability (loan application, order, checks)
- Smart counselor (tailored financial advisor, [”you spend too much on restaurants and cars”])

This is a Point to Point bi-directional application, and security will play an important role.

9.15 Telemedicine

9.15.1 Description

Similar to the combination of VOD, multimedia information retrieval application and videoconferencing application. X-ray images (annotated) may be retrieved by the authorized end user or distributed by such end user to other authorized end users for consultation or further evaluation. In addition, real surgical procedures can be broadcast to students (end users) or other consultants. This data may be (compressed and) stored by the network or service provider.

9.16 Content production

9.16.1 Description

Users produce content that can be offered as an application to end-users. The production process involves recording, feeding in or entering several types of data and combining them into an application. The application is meant to be made available to end-users. Content producers range from people who do this for a hobby, via small businesses to professional companies.

9.17 Transaction Services

9.17.1 Description

Services which are used to present information to a user, which the user then acts upon. These actions then alter information in a database. The results of a transaction may involve the transfer of monetary units from the user to a business entity. At least one owner of information must be involved in a transaction.

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9.18 Videoconferencing

9.18.1 Description

Videoconferencing provides a real time bi-directional exchange of audio, video, and data information between multiple users. Involved are one or more people at two or more geographically separated sites, and possibly a multipoint service provider. The user announces, establishes controls/moderates the conference. During the conference several information types may be exchanged (like data, fax).

9.19 Virtual CD-ROM

9.19.1 Description

Service that offers users the possibility to individually retrieve, observe and interact with structured data of various types, that are located remotely. The objective can be information gathering, learning, entertainment, playing games, audio listening, etc. Can be used in office or residential setting.

NOTE: This service supports many applications.

10 Digital audio-visual functional groups and function descriptions

Table 10-1 lists functional groups and function descriptions anticipated for a fully defined DAVIC system. In each of the attached Annexes, a subset of these is recommended for a specific contour.

Table 10-1 Function Table

Ref.	Functional groups and function descriptions
	CONTENT FUNCTIONS
1.01	The system must support the delivery of content material from the Content Provider to the Service Provider via physical media.
1.02	The system must support the delivery of content material from the Content Provider to Service Provider via an electronic link.
1.03	The system must enable the Service provider to request content from the Content Provider.
1.04	Content items are composed of one or more content item elements, which may be generated and delivered together or separately over a period of time.
1.05	The system must support the delivery of content from the Content Provider to Service provider as separate, distinguishable content item elements.
1.06	Content item elements on the Service provider's system may be replaced with new versions.
1.07	Additional content item elements may be added on the Service provider's system.
1.08	Content item elements from a variety of content items may be packaged together and carried as one package from the Content Provider to the Service provider.
1.09	The Service provider must be able to extract mixed content item elements from a package into constituent content items.
1.10	Each content item element must identify the item to which it relates (e.g. Content Item 12579). This is to be an identifier unique to the instance of that content item for the Service provider and Content Provider, common to all its elements.
1.11	Each content item element must identify which element of the item it is (e.g. Trailer #1).
1.12	Each content item element must describe the type of element it is (e.g. MPEG 2 MP @ ML).
1.13	Each content item element must identify its version number (e.g. #3).

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Ref.	Functional groups and function descriptions
1.14	The Content Provider must be able to authenticate the identity of the Service provider.
1.15	The Service provider must be able to authenticate the identity of the Content Provider.
1.16	Transfer of material between a Content Provider and Service provider should have the possibility of being secure, using encryption or other techniques.
1.17	Transfer of material between a Content Provider and a Service provider should be accomplished in a manner that may not be repudiated.
1.18	It should be possible for encrypted material to be passed from the Content Provider to the End User via the Service provider. In such cases, it may not be possible for the Service provider to decrypt the material.
1.19	The system must support the delivery of content material in non real-time from the Content Provider to the Service provider.
1.20	The system must support the delivery of content material in real-time from the Content Provider, through the Service provider to the End User).
1.21	The flow of content material in real-time may be initiated by the Content Provider.
1.22	The flow of content material in real-time may be initiated by the Service provider or User.
1.23	It must be possible for a Content Provider to automatically load content item elements into a Service Provider's system.
1.24	It must be possible for a Content Provider to delete content item elements from a Service provider's system.
1.25	One or more content item elements must be able to carry Content Management Data, describing how the Service provider should manage the content item provided by, or fetched from, the Content Provider.
1.26	It must be possible for Content Manager system to grant or deny User access to content material.
1.27	It must be possible for Content Manager system to employ embargo dates/times to deny and grant access to content material.
1.28	It must be possible for Content Manager system to cause the content to be automatically deleted at a prescribed date and time.
1.29	It must be possible for embargo and deletion dates/times to be set differently in different areas.
1.30	It must be possible for Content Management Data to include copyright information.
1.31	It must be possible for Content Management Data to include the rights to alter the material.
1.32	It must be possible for Content Management Data to include the rights to distribute the material.
1.33	It must be possible for Content Management Data to include an extensible set of features (e.g.. price, number of plays and ownership).
1.34	One or more content item elements must be able to carry Navigation Data, enabling End Users to locate content.
1.35	It must be possible for Content Navigation Data to carry a content label for unique identification of the content item.
1.36	It must be possible for Content Navigation Data to include an extensible set of features (e.g. title, rating, synopsis, producer, length, price, "attractions" like stars etc., presentation format and Content Provider name).
1.37	The STU must be able to decode at least MPEG-2 TS MP@ML.

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Ref.	Functional groups and function descriptions
1.38	Display normal and wide-screen material on either normal or wide-screen displays.
1.39	The STU must be able to decode and display 4:3 and 16:9 formats.
1.41	The Content Management System must retain all appropriate information for respecting Intellectual Property Rights.
	BIT TRANSPORT FUNCTIONS
2.01	The system should provide connection from the Service provider to the STU at a specified bit-rate.
2.02	The system should provide transmission means from the STU to the Service provider at a specified bit-rate.
2.03	The system should enable transmission of bit-stream from the Service provider to a single STU destination (Unicasting).
2.04	The system should enable simultaneous transmission of bit-stream from Service provider to selected multiple STU destinations (Multicasting).
2.05	The system should enable simultaneous transmission of bit-stream from Service provider to all STU destinations (Broadcasting).
2.06	The system should provide a return channel from each STU to the Service provider.
2.07	The system should provide a broadcast control channel from the Service provider to all STUs.
2.08	The system should be able to add address information to the user information to allow it to be delivered to a single user
2.09	The system should provide a dedicated control channel from the Service provider to each STU.
2.10	The system should enable the transportation of application program code from the Service provider to the STU.
2.11	The system should enable the transportation of program content (audio, video, text, graphics etc.) and data from the Service provider to the STU.
2.12	The system should enable the transportation of program service information (Station Identification, descriptive material about program content etc.)
2.13	The transport link should provide error -resilience.
2.14	The system should provide a transport link between the Content Provider and the Service provider.
2.15	The system should provide a bi-directional means of control between the Content Provider and the Service provider.
2.16	The system should provide the capability for communication between two STUs.
2.17	The system should provide the capability for communication between three or more STUs.
2.18	The system should provide multi-point interactive facilities to include video and audio switching and mixing.
2.19	The system should enable a Service provider to identify the make, model, profile and capabilities of each STU.
2.20	Support the transport of multi-lingual audio
	NETWORK MANAGEMENT FUNCTIONS
3.01	The system should facilitate the Operation, Administration, Maintenance & Provisioning functions required by Network Providers.

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Ref.	Functional groups and function descriptions
3.02	The system should signal faults and failures to Service providers and Network Providers, and facilitate rapid recovery under such failure conditions.
	SESSION FUNCTIONS
	General
4.01	The Service provider should be able to download information to allow the STU to locate material carried on a variety of media (including satellite, terrestrial and cable delivery).
4.02	Applications should be able to access databases, systems and applications external to DAVIC.
4.03	Applications should be able to access databases and files located on the STU and Server.
4.04	Each application should be able to establish a communications session.
4.05	Each application should be able to establish two or more simultaneous communications sessions.
4.06	The application should be able to transfer a session to another STU in the same location (for example to transfer a program to a unit in a different room in a home).
4.07	The application should be able to transfer a session to another STU in a different location (for example to transfer a program to a unit in another home).
4.08	The application should be able to terminate a session in an orderly fashion.
4.09	The application should be able to reserve a session in advance.
4.10	The application should be able to cancel a communications session that has been reserved in advance.
4.11	The application should be able to provide information to the user about the reserved session, and to provide control and warning signals when required.
4.12	The application should be able to provide a range of choices of audio, video, textual and graphical quality and definition.
4.13	An application should be able to dynamically change the quality of audio, video, text and graphics of an existing session during operation.
4.14	A user should be able to request an application to change the quality of audio, video, text and graphics of an existing session during operation.
4.15	An application should be able to establish new sessions during its operation.
	Session types
4.16	A user should be able to suspend an active session.
4.17	A user should be able to resume a suspended session.
4.18	A user should be able to start another session during suspension of a current session (e.g.. to use a navigation facility to access different program content or to run other applications).
4.19	A user should be able to cancel a suspended session.
4.20	It should be possible for a suspended session to be cancelled automatically after a timeout.
4.21	Enable multi-party AV conference - may include existing participants calling in others, or people outside joining a pre-arranged conference. Can include a human interacting with a non-human service calling in another human for collaborative work session.
4.22	It should be possible to dynamically add or remove users to a shared application - requires decision on whether to close and who pays if original user removes himself whilst others still active.

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Ref.	Functional groups and function descriptions
	Content aspects of sessions
4.23	A Service provider should be able to broker a direct interactive session between a Content Provider and an STU.
4.24	The system should be able to encode content material.
4.25	The STU should be able to decode content material.
4.26	The Service provider should be able to encrypt content material.
4.27	The STU should be able to decrypt content material.
4.28	The system should be able to transfer audio-visual clip material.
4.29	The system should be able to transfer still picture material.
4.30	The system should be able to transfer a text description of audio-visual material.
4.31	The system should be able to transfer audio-description of audio-visual material
4.32	The system should be able to transfer audio material
4.33	The system should be able to transfer text material
4.34	The system should be able to transfer motion audio-video material
4.35	The system should be able to transfer graphics material
4.36	The system should be able to transfer monophonic audio material.
4.37	The system should be able to transfer stereophonic audio material
4.38	Provide data carousel functionality
	ACCESS CONTROL FUNCTIONS
	General
5.01	The system should provide secure access to customer databases.
5.02	The system should provide secure access to user profile data.
5.03	The system should provide effective, yet unobtrusive means to prevent unauthorized access to the network.
5.04	The system should provide means to prevent unauthorized access to Service provider by STUs.
5.05	The system should provide means to prevent unauthorized access to the STU.
5.06	The system should provide means to prevent unauthorized access to Service provider by Content Providers.
5.07	The system should provide means to limit access to certain content and applications on the Server.
5.08	The system should provide means to prevent unwanted material from being sent to a user.
5.09	The system should provide means to protect against viruses etc.
5.10	A Service provider should be able to dynamically authorize or deny access to services according to contract with customer.
5.11	A system needs to provide means to authenticate the identity of Service provider.
5.12	A Service provider needs to be able to authenticate the identity of the user.
5.13	A Service provider needs to be able to utilize a user's identity to select a particular User Profile.

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Ref.	Functional groups and function descriptions
5.14	The system should provide the means by which a customer account may apply to several users, each to be separately identified with a different service level (for example parents / children).
5.15	Each customer account may apply to several users, each to be separately identified with a different User Profile (covering preferences, shoe sizes etc.).
5.16	The system should provide the means to detect security violations.
5.17	The system should provide the means to notify security violation and generate appropriate alarms.
5.18	The system should support and control Conditional Access services.
5.19	The account owner should have the ability to control access to material by subsidiary users of the same account.
5.20	Users should be able to control access to certain applications and content.
5.21	The system should provide means for the Service provider to control access services according to credit status and payment history (or customer characteristics).
5.22	The system should provide means to limit service usage according to amount of resources requested even if service is permitted.
5.23	The system should enable Access Control limits to be dynamic (for example peak/off peak hours)
5.24	The system should facilitate the non-repudiation of downloaded data.
	IPR aspects
5.25	The system should provide means to control access to copyright material (applications, program content etc.).
5.26	The system should provide means to generate records of usage of copyright material to facilitate payment.
5.27	The system should permit the use of a "watermarking" or "fingerprinting" facility to enable detection of copying violations or to track IPR.
5.28	The system should include mechanisms to prohibit copies of material being made if not authorized.
5.29	The Service provider should be able to control access to material in given geographical areas (e.g. local football match not available in real time to area from which spectators will be drawn).
	Authorization
5.30	The system should provide means to enable the user to authorize the supply of Service provider-delivered services (applications, VoD, etc.).
5.31	The system should provide means to enable a user to authorize the supply of goods and services.
5.32	The system should provide means to enable a user to authorize payment of goods and services.
5.33	The system should provide means to enable a user to arrange for delivery of goods and services (not necessarily to user's address).
5.34	The system should provide a secure validation system for financial transactions (such as the transmission, reception, validation and transfer to third parties of electronic signatures).
5.35	Provide means for user to acquire rights to access-limited content.
5.36	The system should allow secure access to customer databases at service provider premises.
5.37	The system should allow secure access to user profile data.
5.38	The system should provide means to prevent unwanted material from being received by the user.

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Ref.	Functional groups and function descriptions
	NAVIGATION FUNCTIONS
	General
6.01	Set-top units should offer a start-up function to allow user to make initial choice of service or application.
6.02	Set-top units should offer other menus as a result of subsequent user command or system response.
6.03	The system should offer equally easy access to the full range of available Service providers.
6.04	The system should permit a Service provider to present a range of services and products to the user.
6.05	The system should permit the user to create and maintain a list of favorite places (Services Providers and Services frequently used).
6.06	The user should be able to find/choose/select an application using a navigation system.
6.07	The user should be able to find/choose/select a content item using a navigation system.
6.08	The user should be able to find/choose/select a product/service using a navigation system.
6.09	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of applications delivery to users.
6.10	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of content delivery to users.
6.11	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of product/service delivery to users.
6.12	Navigation system should permit the prices of a given application, content item, product or service to vary with time.
6.13	Navigation systems should permit the user to select the language used for presentation of menus, functions and options.
6.14	Navigation systems should offer each Service provider the opportunity to create an individual "look and feel" to the services.
6.15	Navigation systems should offer the user a set of consistent or obvious controls and tools in order to facilitate easy operation and migration.
6.16	Navigation systems should be able to display a single screen image, which comprises a "mosaic" of still or moving pictures.
6.17	Navigation systems should be able to display a multitude of independent image objects as a "mosaic" of still or moving pictures.
6.18	Navigation systems should be able to display options for selection as a menu of textual items.
6.19	Navigation systems should be able to recognize that a selection has been made, and which item from the available options has been selected.
6.20	Navigation systems should be able to trigger the launch of the selected item.
6.21	Navigation systems should be able to employ intelligent agents to optimize the choices presented to the user.
6.21.1	Navigation system must only present material available for viewing (e.g. respect regional blackouts).
6.22	Navigation systems should provide the means by which a Service provider may act as a broker and enable a direct interactive session between a Content Provider and an STU.

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Ref.	Functional groups and function descriptions
	AV program aspects
6.23	The system should support the use of Electronic Program Guides for current and future events.
6.24	The system should enable the use of Electronic Program Guides to plan program content selection.
6.25	The system should permit personally tailored Electronic Guides.
6.26	The system should permit the user to select a content element for immediate consumption using an Electronic Program Guide.
6.27	The system should permit the user to select a content element for future consumption using an Electronic Program Guide.
6.28	Electronic Program Guides may be user driven by date/ time/ source/ program type etc.
6.29	Electronic Program Guides may present information as text, graphics, audio or video.
6.30	Electronic Program Guides should support the categorization of material by program-type (e.g. Sports).
6.31	Electronic Program Guides should support the inclusion of additional information (e.g. cast lists).
6.32	The system should include means to allow Content providers to supply information to support Electronic Program Guides.
6.33	Electronic Program Guides should permit content presentation format and resolution to be described.
6.34	Electronic Program Guides should permit the use of a customized filter to prevent display of unwanted material (e.g. regionally blacked out programs).
6.35	Electronic Program Guides should permit users to select content material by rating.
6.36	The system should permit a user to review the available combinations of delivery dates/times and prices.
6.37	The system should permit a user to review the available combinations of presentation format/resolution and prices.
6.38	The system should enable a Service provider to be able to display the time interval between consecutive copies of content (e.g. for NVoD).
6.39	The system should enable a user to review lists of content items booked in advance.
6.40	The system should enable a user to cancel a content element item booked in advance.
6.41	The system should enable a user to express a desired delivery time for material.
6.42	User should be able to build and manage a "play list" of material to be delivered in a given sequence.
6.43	The system should permit the user to browse through any audio-visual clips.
6.44	The system, when NVoD content viewing has been paused, should enable the display of the time remaining before viewing may recommence.
6.45	The system should facilitate the display of lists on multiple pages.
6.46	85% of the users must be able to use 75% of the user terminal functions within 2 minutes without reading an instruction manual.
6.47	The system should permit the use of Electronic Program Guides for current and future events.

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Ref.	Functional groups and function descriptions
	APPLICATION LAUNCH
	General
7.01	The system should support applications that run on the STU, the Service provider, or both.
7.02	The system should provide the means to transfer data (executable code, files etc.) to ancillary equipment connected to the STU (Computer, Printer, Games Machine etc.).
7.03	The system should provide the means to select and download platform-independent application programs to the STU.
7.04	The system should provide the means to select and download platform-independent application programs to the STU (e.g. Java classes)
7.05	The system should provide the means to select and download platform-dependent application programs (outside the scope of DAVIC) to the STU.
7.06	The system should enable an STU-specific application program (outside the scope of DAVIC) to be launched on the STU.
7.07	The system should enable the STU to automatically identify and preload channels and services available on cable, satellite and terrestrial networks.
	MEDIA SYNCHRONIZATION LINK FUNCTIONS
8.01	The system should enable media components, which may be delivered and stored separately, to be presented in a synchronized manner.
8.02	The system should enable text and graphics to be scrolled on the screen within a defined window size.
8.03	The system should enable text and graphics windows to be repositioned during the program.
8.04	The system should enable text and graphics displays to be transparent or colored as defined by the program content.
8.05	The system should provide the means to cue user activity (e.g. a moving cursor, a bouncing ball, or a moving color change).
8.06	The system should enable the transfer and subsequent synchronization of media components.
8.07	The system should permit insertion points to be defined within content to enable sequential media components to be synchronized (e.g. advertisements).
8.08	The system should enable the sequential components inserted at the synchronization points to change.
8.09	The system should enable one application to launch another (e.g. advertisements providing links to Home Shopping).
8.10	The system should provide the means by which users may be linked in real time to a general broadcast message.
8.11	The system should allow linkages to general broadcast messages to be regionally focused.
8.12	The system should allow links to be bookmarked for later access.
8.13	The system should permit applications residing on one Server to operate on content items residing on different Servers.
8.14	An application running on one STU should be able to communicate with, and synchronize with, a related application running on a different STU.

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Ref.	Functional groups and function descriptions
	APPLICATION CONTROL FUNCTIONS
9.01	A user should be given visual/audio feedback within 250ms whenever an application control function is utilized.
9.02	The STU should provide at least a defined set of user-activated command "keys" (e.g. on a remote control, keyboard etc.).
9.03	The STU should provide direct selection of any "broadcast" channel within 300ms.
	Functions operating on Linear Material
9.04	The user should be able to start and stop the presentation of the material.
9.05	The user should be able to pause (with frame freeze) and resume the presentation of the material.
9.06	The user should be able to move rapidly to any point in the material before or after the current position, expressed in terms of a relative time offset.
9.07	The user should be able to move rapidly to any point in the material before or after the current position, expressed in terms of an absolute time from the start of the material.
9.08	The user should be able to move rapidly to any point in the material before or after the current position, expressed by index marks and/or bookmarks.
9.09	The user should be able to view the material at speeds slower than normal play speed.
9.10	The user should be able to view the material (forwards and backwards) at speeds higher than normal play speed.
9.11	The user should be able to select a key change to be applied to the audio of the material without changing the playback speed.
9.12	The user should be able to select a speed change to be applied to the audio and video material whilst maintaining the audio pitch.
	Program presentation functions for linear material.
9.13	The user should be able to choose the language for the audio presentation from those available.
9.14	The user should be able to choose whether the material is presented with subtitles overlaid on the picture.
9.15	The user should be able to choose the language for the presentation of subtitles and other text from those available.
9.16	The system should be able to present additional overlaid text/graphics, either application demanded or user-selected (e.g. optional supplementary information for the hearing impaired or lyrics for Karaoke-on-Demand).
9.17	The STU should present the user with options for presentation for subtitles, text and graphics (e.g. position, font, size and style).
	Indexing functions
9.18	The system should allow index marks to be supplied by the Content Provider in order that users may locate items (e.g. topics or scenes) within the program material.
9.19	The system should enable the user to return to a known point of interruption (or just before).
9.20	The system should enable the user to be able to place "bookmarks" at any point in the material.

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Ref.	Functional groups and function descriptions
	Parallel Stream material
9.21	The system should enable the use of content material comprised of linked objects, in which one object may link to two or more objects (e.g. sad/happy ending to a movie).
9.22	The system should allow the end-user to select the link utilized at a decision point.
9.23	The system should enable the use of multiple related parallel broadcast streams, offering the user the ability to select between these streams.
	Games
9.24	The STU should provide action controls (e.g. left/right, up/down, select).
9.25	The STU should provide these facilities for two simultaneous players on the same STU.
9.26	Provide the ability to synchronize STU applications with the audio/video stream.
	PRESENTATION CONTROL FUNCTIONS
10.01	A user should be given visual/audio feedback within 250ms whenever a presentation control function is utilized.
10.02	The system should permit the user to make hard copy from the application, subject to copyright controls.
10.03	The receiving site will contain an appropriate user interaction device able to invoke all functionality.
10.04	Display normal and wide-screen material on either normal or wide-screen displays.
	USAGE DATA FUNCTIONS
11.01	The system should provide a standard interface to external agencies and systems to permit access to Usage Data for Billing, Service Monitoring and Royalty purposes.
11.02	The system should record user interaction (e.g. use of pause, the position at which viewing of material stopped).
11.03	The system should record use of network, Server and content resources.
11.04	The system should be able to track use by different users within one customer account (e.g. parents/children).
11.05	The system should be able to track use by terminal/location as well as by individual (e.g. usage away from home).
11.06	The system should be able to track the use of Copyright (IPR) material.
	Real-time pricing functions
11.07	The system should enable Service providers to offer flexible charging structures to individual users.
11.08	The system should enable a user to be advised of the duration of free viewing time before charging starts.
11.09	The system should enable users to cancel viewing within free time, and to precept default action at end of free time.
11.10	The user should be able to see the cost of current or just-finished transaction or service.
11.11	The system should enable the user to be able to obtain information on the up-to-date credit limit and bill liabilities.
11.12	The system should allow a Service provider to obtain information on bill liabilities.

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Ref.	Functional groups and function descriptions
	USER PROFILE FUNCTIONS
12.01	The system should enable the creation of personal profiles for user(s) that record preferences (e.g. shoe size for applications such as teleshopping).
12.02	The system should support portable user profiles (e.g. smart card or central database).
	SECURITY FUNCTIONS
13.01	The reporting of distribution and Usage Data, must be protected
13.02	Security measures applied to content should not negatively impact the delivered quality of the content
13.03	Reporting of distribution and Usage Data must be Auditable
13.04	All copies (authorized and unauthorized) of content must be traceable
13.05	All instances of delivery should be securely reported, with minimal loss
13.06	IPR tracking should be supported at the elemental level (picture, audio, piece of picture or audio)
13.07	The availability of the clear digital stream is controllable by the system
13.08	Clear digital stream can be authorized for release
13.10	Usage Data must be secure
13.11	The system must support a hierarchical security approach, such that .a security failure may translate into loss of e.g. 1 frame, 5 minutes, or a large amount
13.12	Security measures should not significantly increases latency for e.g. channel up/down
13.13	Security should not require multiple formats and/or versions of content for distribution
13.14	Meta-data should be subject to security as audio and video content
13.15	The system must support Regional blackout
13.16	The system should support a degraded digital stream output capability for recording
13.17	Unauthorized intrusion should not compromise end-to-end security
13.18	Security management should not be complex
13.19	All cases of entity authentication must be traceable and auditable
13.20	The system should support Irrefutability and non-repudiation functions such that they are usable as legal proof
13.21	Data to and from the DAVIC system should be protected such that it is secure and private within the DAVIC system
13.22	Upgrades to security elements in face of a breach should be easy and quick
13.23	Delivery in the face of security failure may be allowed by the Service provider
13.24	The system must support secure download of software
13.25	Source of security related problems should be readily determinable
13.26	Security processes will not impose significant overheads on the DAVIC system performance
13.27	Security processes should not cause non-delivery of authorized media
13.28	Security processes should be transparent to running (operating) of network

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Ref.	Functional groups and function descriptions
13.29	Unauthorized intrusion should not compromise end-to-end security
13.30	Multiple scramble/descramble processes are allowed
13.31	Scrambling for network security reasons should be allowed
13.32	Access to the Network must be controllable
13.33	Media delivery should be controllable based on e.g. rating, time of day, user, etc.
13.34	Purchases should be controllable based on e.g. user, credit, existing billings, etc.
13.35	All transactions must be secure
13.36	Access to profile data must be controllable by user
13.37	Usage Data should be anonymous for statistical analyses
13.38	Individual user data will be secure
13.39	A user's service set, profile, authentication parameters may be portable within DAVIC systems
13.40	The system will support both subscriber and user authentication
13.41	Usage Data reporting must be accurate, auditable
13.42	All equipment must allow testing under secure environments for all features (including clear digital stream)
13.43	Inclusion of security features must still allow for export
13.44	Security should not significantly increase complexity
13.45	Manufacturing must minimize requirements for secure facilities
13.46	Access to data limited to authorized users only
13.47	The two-way Usage Data interface must be secure
13.48	The one-way (bulk) Usage Data interface must be secure
13.49	The DAVIC system must support authentication to and from external support systems
13.50	The DAVIC system should support commercial electronic transaction protocol(s)
13.51	The system must support identification of consumed material
13.52	The system must support identification of the IPR holder
13.53	The system must support identification of author
13.54	The system must support identification of the source/provider of material
13.55	Content control and supervision must be authenticatable
13.56	Proof/tracing data for Legal proceedings must be authenticatable
13.57	Transmission logging data should be secure and authenticatable
13.58	The system should support the ability to allow counter-intelligence and intelligence gathering
13.59	The system should be able to detect 'clones'
13.60	Provide plug and play capability for connection to in-home digital consumer electronic equipment.
13.61	66% of customers can install the STU successfully without requiring assistance.
13.62	Provide data carousel functionality.

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Ref.	Functional groups and function descriptions
	Internet Access FUNCTIONS
14.01	The system must provide the capability to download data from the Internet.
14.02	The system must provide the capability to upload data to the Internet.
14.03	The system must provide the capability to transport various data formats from the user to an Internet host.
14.04	The system may be used to provide access to the Internet from a PC connected to a data port on the STU.
14.05	The system must provide access to a Domain Name Service to allow conversion of domain names to IP addresses.
14.06	The system shall allow a user to navigate through all information on the WWW using hypertext links.
14.07	The system shall allow the user to submit a search query in order to locate specific information on the Internet.
14.08	The system must provide for insertion of HTML links into WWW documents downloaded from the Internet (e.g. CGI, promotional messages, dynamic HTML creation.
14.09	The system must provide a Web client function to interpret requests from the user and interface with the Web server to retrieve requested information from the Internet.
14.10	The system must provide the capability to cache Internet data locally to reduce access time.
14.11	The system should support Internet applications independently of the type of network connections (e.g. direct connect from STU, DAVIC gateway, router gateway).
14.12	The system should support Internet applications with different IP addresses.
14.13	The system should support Internet applications independent of the protocols used by the network to set up the connection.
14.14	The system should support applications which are independent of the connection / session set-up (or initiation) and management.
14.15	Each Internet application should support a different IP address from each other.
14.16	The system should support full Internet Access by the STU as defined in subclause 9.9.1
14.17	The system should enable bi-directional exchange of information, being control/signaling or content.
14.18	The system should support hybrid services (e.g. Internet session simultaneously with DAVIC session).
14.19	The system should provide the content in a data format compatible with the Internet applications.
14.20	The system should enable each application to have and reserve a different QoS.
	HOME NETWORK FUNCTIONS
15.1	The network should be capable of transferring data at rates greater than, less than, or equal to the real-time rate of the data.
15.2	The network should support inexpensive and simple network node connectivity (e.g. connection of a TV to a VCR).
15.3	Network nodes should be capable of transmitting and/or receiving applicable control commands to and/or from other network nodes.
15.4	The network should not require extensive or obtrusive in-home wiring.

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Ref.	Functional groups and function descriptions
15.5	The network should be capable of transferring information between nodes in a point-to-point, point-to-multipoint, multipoint-to-point, or multipoint-to-multipoint manner.
15.6	Network signal splitting or duplication should be inexpensive and simple to configure (e.g. one VCR to two TVs).
15.7	The network should allow a node to receive information from multiple sources simultaneously (e.g. picture-in-picture).
15.8	A fault or power loss by any node should not bring the network down.
15.9	Network health, status, and management should be available at one or more nodes.
15.10	The network should allow users to name nodes (e.g. Bedroom TV).
15.11	The network should be capable of determining its limitations (e.g. resource management).
15.12	The network should be simple to diagnose, operate, and administer.
15.13	The network should be able to detect network failures or inadequacies and to take appropriate actions.
15.14	The network should be reasonably EMI resistant.
15.15	The network should support the notion of users, privileges, and priorities.
15.16	The network should support a single wall-clock time capability.
15.17	The network should support remote access (i.e. access from a device outside of the home).
15.18	Network-compatible devices should be connectable directly to the network.
15.19	Network-incompatible devices should be connectable to the network through an inexpensive adapter or proxy node (e.g. an analog TV connected to the network via a proxy device).
15.20	The network should be capable of maintaining synchronization of a program source (e.g. synchronization between audio and video of a program).
15.21	The network itself should operate in the event of a power loss if another power source is available (although some network nodes may not).
15.22	The network may be wireless.
15.23	The network should be secure and support private network traffic.
15.24	A network node may be physically placed anywhere on the network (location independence).
15.25	The network should scale simply and incrementally in terms of bandwidth and number of nodes.
15.26	The network should support at least one video signal between two nodes.
15.27	The network should support traffic prioritization. Real-time traffic should generally be given priority over bursty traffic. However, this should be user configurable (e.g. a security camera may be given top priority).
15.28	The network should permit tunneling to and from other networks.
15.29	The network should provide quality of service functions for real-time data transfers.
15.30	The network should allow selection of any available service at any point on the network.
15.31	The network should support any combination of compatible devices.
15.32	The network should allow multiple devices to access the same signal source without duplication (e.g. multi-casting).
15.33	Individual network hop distances up to 50 meters should be supported.

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Ref.	Functional groups and function descriptions
15.34	Physical network connectors should be simple to attach and detach while maintaining firm connections.
15.35	Physical network connectors should be small.
	FUNCTIONS CONSIDERED TO BELONG TO APPLICATIONS
	Mail applications
101.01	The system should enable the creation and management of bulletin boards.
101.02	The system should enable users to be able to write messages to bulletin boards.
101.03	The system should enable users to read messages from bulletin boards.
101.04	The system should enable the creation and management of mailboxes.
101.05	The system should permit mailboxes to be continuously available, and accessible from any location.
101.06	The system should enable users to be able to send mail items to other users.
101.07	The system should permit users to store and retrieve mail items.
101.08	The system should support user access to email directory services.
101.09	The system should permit users to create and manage distribution lists for mail items.
101.10	The system should enable mail items to be translated to and delivered in a different format (e.g. fax or conventional mail)
101.11	The system should enable users to retrieve mail from mailbox.
101.12	The system should enable users to store and delete received mail items.
101.13	The system should enable a user to reply to received mail.
101.14	The system should enable a user to forward received mail to another user.
101.15	The system should enable a user to redirect mail to another user.
101.16	The system should enable mail to be automatically forwarded to another user.
101.17	The system should permit a sender to receive an acknowledgement that a mail item has been received.
101.18	The system should enable a user to be advised of new mail in mailbox, e.g. by radio paging alert or text or icon superimposed on screen or light on STU.
101.19	The system should permit mail items to be distributed to classes of users, including all users.
101.20	The system should permit mail items to comprise components in more than one medium (e.g. text with multiple voice annotations, or moving picture of item described in text).
101.21	The system should enable the communication between on-line diaries to book a conference session or physical meeting.
	Gateway application
102.01	The user should be able to use the system to access on-line services
	Teleshopping applications
103.01	The system should permit multiple items to be displayed simultaneously (e.g. comparative choice).
103.02	The system should enable a transaction to take place between a user and a product supplier.
103.03	A user, within a teleshopping environment should be able to request exchange or return of goods.

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Ref.	Functional groups and function descriptions
103.04	The system should enable a service provider to create a shopping environment.
103.05	The system should enable a Content Provider to determine the layout of the 'virtual store'.
103.06	The Content Provider should be able to assign products to 'virtual departments'.
103.07	The user should be able to store / readily retrieve product information from one "store" for comparison with offers found elsewhere (virtual shopping list).
103.08	The user should be able to place selections in a "virtual shopping basket" prior to committing to purchase these items, maintain a record of total cost, an be able to adjust contents as better alternatives are found in other "stores" or "departments".
103.09	The user should be able to commit to purchase items in a "virtual shopping basket" using a choice of methods of payment.
103.10	The user should be able to amend an order already placed, or enquire of the status of an existing order.
103.11	The system should enable an order placed by a user to be processed, and for status of the order to be reported.
103.12	The system should permit collaborative (group) shopping.
103.13	The system should facilitate the use of intelligent agents (aware of user preferences and parameters) to locate items matching needs.
	Games applications
104.01	The system should permit high scores for games to be recorded.
104.02	The system should enable a service provider to provide advertisements for new games.
104.03	The system should permit a service provider to record and distribute high scores for games.
104.04	The system should enable a user to access the high scores of other users.

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Annex A: Enhanced Digital Broadcast Contour

A1 Introduction

This annex defines the user and market requirements for the Enhanced Digital Broadcast market segment. User requirements are defined from the point of view of the ultimate end user (e.g., the retail consumer). Market requirements are defined from the point of view of the provider that supplies the Enhanced Digital Broadcast service to the consumer.

For the description of conformance, compliance refer to subclause 6.1. For technical implementation and interoperability, refer to ISO/IEC 16500-3.

A2 Scope

The Enhanced Digital Broadcast contour describes a system that:

- Can transport digital equivalents of programs now carried by conventional analog broadcast;
- Provides broadcast data services to a user or group of users;
- Provides a means of delivering data uniquely associated with broadcast video and audio streams;
- Uses client-side filtering of services to present data according to user preferences;
- Services are provided on a free, subscription, or pay-per-use basis.

A3 Supported Applications

The Enhanced Digital Broadcast contour provides support for the following example applications.

- Broadcast (subclause 9.3)
- Near Video on Demand (subclause 9.4)
- Delayed Broadcast (subclause 9.5)
- TV EPG (subclause 9.11)
- Broadcast Information Services
- Subscription Data Services

A4 User and Market Requirements

The following User and Market requirements for an Enhanced Digital Broadcast system have been identified. They have been separated into the two categories of end-user requirements and service provider requirements based on the nature of the requirement.

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Table A1-1: User and market needs

NOTE: The categories are: CA - Conditional Access/Security, CP - Content Presentation, EU - ease of use, IN- interactivity; SP - service provider concerns.

NReq.	Description of user need or market requirement	Reference to function table
1. CA	Provide Conditional Access capability	**1.26, 1.27, 1.28, 1.29, 1.32, 1.33, 2.03, 2.04, 2.05, 2.06, 2.07, 2.13, 3.01, 4.24, 4.25, 5.03, 5.04, 5.05, 5.06 5.07, 5.18, 5.10, 5.12, 5,13, 5.14, 5.15, 5.18, 5.19, 5.20, 5.21, 5.23, 5.25, 5.26, 5.28, 5.29, 5.31, 5.38, 6.09, 6.10, 6.11, 13.02, 13.07, 13.11 till 13.15, 13.17 till 13.22, 13.25 till 13.32, 13.35, 13.40, 13.42 to 13.46, 13.49, 13.55, 13.56, 13.57**
2. CA	Provide Conditional Access so subscribers can be grouped by some characteristic(s)	**1.27, 1.29, 2.04, 2.11, 5.07, 5.10, 5.20, 5.21, 5.29, 6.21.1, 6.34, 8.11, 13.11, 13.12, 13.13, 13.15, 13.17, 13.18, 13.19, 13.20, 13.21, 13.23, 13.32, 13.33, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.55, 13.56**
3. CA	Provide Conditional Access to programs grouped by some characteristic(s)	**1.36, 5.07, 5.10, 5.38, 6.05, 6.06, 6.07, 6.08, 6.21.1, 6.28, 6.30, 6.31, 6.33, 6.35, 13.11, 13.12, 13.13, 13.15, 13.17, 13.18, 13.19, 13.20, 13.23, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.55, 13.56**
4. CA	Permit single event Conditional Access.	**1.29, 5.07, 5.10, 5.14, 5.20, 5.23, 6.21.1, 6.30, 6.31, 6.34, 6.35, 13.11, 13.12, 13.13, 13.15, 13.17 till 13.21, 13.22, 13.32, 13.33, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.50, 13.56**
4.1 CA	Permit Conditional Access for individual components of the broadcast stream	**5.07, 510**
5. CA	Ensure that communications are secure from eavesdropping and imposture.	**2.03, 2.06, 2.07, 2.10, 2.11, 4.24, 4.25, 5.03, 5.04, 505, 5.06, 5.07, 5.09, 5.11, 5.12, 5.13, 5.18, 5.31, 5.32, 5.36, 5.37, 5.38, 11.07, 13.01, 13.06, 13.10, 13.17 till 13.21, 13.24, 13.25, 13.31, 13.33, 13.34, 13.35, 13.36, 13.38, 13.40, 13.41, 13.43, 13.44, 13.46, 13.47, 13.49, 13.55, 13.56, 13.57**
6. CA	Support standard copy control and protection system(s)	**1.15, 1.25, 1.26, 1.30, 1.31, 1.32, 1.35, 4.24, 4.25, 5.03, 5.05, 5.10, 5.11, 5.12, 5.20, 5.25, 5.26, 5.28, 5.29, 13.06, 13.07, 13.09, 6.11, 13.02, 1, 13.06, 13.07, 13.11, 13.12, 13.16, 13.22, 13.26, 13.20, 13.31, 13.43, 13.44, 13.46, 13.47, 13.51, 13.52, 13.53, 13.54**
7. CP	The system shall provide the capability for additional graphic and text overlays	**2.11, 4.30, 4.33, 4.35, 6.29, 8.02, 8.03, 8.04, 9.16, 9.17**
8. CP	The receiver site shall contain at least a STU functionality, an appropriate resolution display device, and a user interaction device able to invoke all required functionality	**10.03**
9. CP	Provide decoders capable of at least MPEG-2 TS	**1.37, 2.01, 4.24**

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NReq.	Description of user need or market requirement	Reference to function table
10. CP	Provide decoders capable of 4:3 and 16:9 formats	**1.39, 10.05**
11. CP	Display normal and widescreen material on either normal or widescreen displays	**1.38, 10.05**
12. CP	Ensure predictable system behavior when processing and displaying audio/video to minimize end user confusion	**13,28**
13. CP	Provide ability to synchronize STU side application with audio/video	**6.30, 8.01, 8.06, 9.26**
14. CP	Support multi-channel audio	**2.11, 4.12 , 4.32**
14.1 CP	Must support monophonic audio	**2.11, 4.12, 4.37**
14.2 CP	Must support stereophonic audio	**4.12, 4.38**
15.CP	Support multi-lingual audio	**2.11, 2.20, 4.12, 9.13, 9.13**
16. EU	Provide means to select specific (graphics) objects on the TV screen	**4.13, 4.14, 4.35, 6.06, 6.07, 6.08, 6.13, 6.14, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20, 6.29, 8.01, 8.02, 8.04, 8.05, 9.16, 9.17,**
17. EU	Provide option to the user to activate a application such as play along	**2.11, 2.12, 4.04, 4.08, 4.16, 4.17, 4.18, 4.19, 4.20, 6.06, 6.07, 6.08, 6.20**
18. EU	Application must be able to generate feedback on users requests	**2.01, 2.03, 9.01, 104.01, 104.02, 104.03**
19. EU	Provide means to navigate through a stack of information pages. (Graphics, text, audio and video)	**2.11, 2.12, 4.29, 6.07, 6.16, 6.17, 6.18, 6.43, 6.45**
20. EU	Provide means to access specific data from the broadcast content	**2.11, 4.29, 6.07, 6.19, 6.20**
21. EU	90% of entitlement requests shall be fulfilled within 30 seconds	**2.03, 2.06, 2.07, 5.10**
22. EU	User terminal must be ease to use.	**1.34, 6.01, 6.02, 6.03, 6.06, 6.07, 6.08, 6.09, 6.10, 6.21.1, 6.13, 6.15, 6.16, 6.18, 6.19, 6.24, 6.25, 6.26, 6.27, 6.29, 6.30, 6.31, 6.33, 6.34, 6.35, 6.37, 6.38, 6.39, 6.40, 6.44, 6.45, 6.46, 6.47, 7.07, 8.03,8.05, 9.01, 9.02, 9.03, 9.04, 9.05, 9.14, 9.15, 9.17, 9.22, 9.23, 10.01, 10.05, 11.08, 11.09, 11.10, 11.11, 21.01, 12.02**
23. EU	User terminal must be easy to install	**1.34**
24. EU	User should be able to identify the services that can be accessed	**1.34, 6.03, 6.04, 6.06, 6.07, 6.08, 6.11, 6.10, 6.21.1, 6.11, 6.47, 6.26, 6.27, 6.32, 6.36, 6.37**
26. EU	Provide fast, easy, cheap diagnostic means for the end user to distinguish receiver / STU side problems from incoming signal problems.	**3.02, 13.42**
27. EU	Provide fast, easy, cheap fault diagnosis for the end user to help identify problems internal to the STU.	**3.02, 11.01, 11.03, 13.42**
28. EU	Provide simple, attractive, uniform user interface with easy navigation (electronic program guide or EPG).	**6.01, 6.02, 6.06, 6.16, 6.47, 6.24, 6.25, 6.26, 6.27, 6.28, 6.29, 6.30, 6.31, 6.32, 6.33, 6.34, 6.35, 6.36, 6.37, 6.38, 6.39, 6.40, 6.43**
29. EU	Provide a means for the STU user to enforce content access on an individual viewer basis (e.g., parental control)	**5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.18, 5.19, 5.20, 5.21, 5.30, 5.31, 5.32, 11.04**
30. EU	Provide means to define and modify personal profile to affect what information is presented.	**5.37, 5.10, 5.13, 5.15, 5.19, 5.20, 6.05, 12.01, 12.02, 13.36**

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NReq.	Description of user need or market requirement	Reference to function table
31. IN	Provide electronic or other means to send information from the User to the Service provider so the User and Service provider can collaborate for access to some part(s) of the broadcast streams.	**5.33, 5.34**
32. IN	Support emergency alert messages	**2.04, 4.11, 8.10, 8.11, 9.16,**
33. IN	Provide closed captions/subtitles.	**2.11, 4.12, 4.35, 8.01, 8.02, 8.03, 8.04, 9.14, 9.15, 9.16, 9.17**
34. SP	Provide one way datagram service	**2.03, 2.11, 4.35**
36. SP	Provide data carousel functionality	**1.23, 2.01, 2.03, 2.04, 2.10, 2.11, 2.12, 4.38, 7.04, 8.01,**
37. SP	Provide appropriate interface to a scheduling facility for the service provider	**1.02, 1.20, 1.23, 1.28, 1.29, 1.33, 3.01, 6.14, 6.47, 6.36, 8.01, 8.06, 13.33**
38. SP	Provide appropriate interface to an automation system to execute schedules	**1.27, 1.28, 1.29, 1.33, 2.01, 2.03, 2.04, 2.07, 2.10, 2.11, 2.12, 3.01, 4.09, 4.11, 4.24, 4.28, 4.34, 8.01, 8.06, 8.07, 8.08, 8.09, 8.11, 9.21, 13.33, 13.57**
39. SP	Provide appropriate interface to a Billing System	**3.01, 3.02, 5.36, 5.32, 11.01, 11.03, 11.04, 11.11, 11.12, 13.34, 13.35, 13.49**
40. SP	Provide appropriate interface to a Subscriber Management System	**2.06, 3.01, 3.02, 5.10, 5.36, 7.05, 7.06, 11.03,11.04, 11.06, 11.11, 12.01, 12.02, 13.01, 13.37, 13.41, 13.46, 13.47, 13.49, 13.57**
41.SP	Provide appropriate interface to a fault detection system	**2.09, 2.10, 2.13, 3.01, 3.02**
42. SP	Provide capability for insertion of program material in compressed video stream (caveat statistical multiplexing)	**1.01, 1.05, 1.06, 1.08, 1.16, 1.22, 1.28, 1.29, 3.01, 8.07, 8.08,**
43. SP	Permit downloading new or modified applications to end user terminal in a secure manner	**2.09, 2.10, 3.01, 4.01, 5.09, 5.24, 7.03, 7.04, 7.05, 13.24, 13.26 13.44**
44. EU	Provide plug-and-play capability for connection to in-home digital consumer electronic equipment	**7.02, 7.03, 7.04, , 13.60**
45. SP	Provide a mechanism to comply with customer request in ten second's in case of a switched on return channel	**2.06, 9.01, 9.03, 10.01**
46. SP	The receiver / STU side must provide a data port for the pass through of broadcast information	**7.02, 7.03, 10.02**
47. EU	Provide means for user to acquire rights to access limited access material	**5.35**

A5 Functional Requirements

The first level architectural realization of a system to meet the above user and market requirements will use the base DAVIC architecture of Service provider, Network, and Service Consumer. The following functions were extracted from the function table in Clause 10 at the level of abstraction of the architectural realization for this architectural specificity. Reference numbers in the table refer to those functions.

Table A1-2 cites appropriate requirements from Table A1-1 for each function. Because some requirements are superordinate, and some subordinate, in general subordinate requirements are cited only when they are likely to add a unique constraint to the function implementation. Otherwise, super ordinate requirements only are cited. Note that Functions do not necessarily implement the entire controlling Requirement.

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Table A1-2: Function requirements mapping to user and market needs

Ref.	Description	Table A1-1
	CONTENT FUNCTIONS	
1.01	The system must support the delivery of content material from the Content Provider to the Service provider via physical media.	42
1.02	The system must support the delivery of content material from the Content Provider to Service provider via an electronic link.	37
1.05	The system must support the delivery of content from the Content Provider to Service provider as separate, distinguishable content item elements.	42
1.06	Content item elements on the Service provider's system may be replaced with new versions.	42
1.08	Content item elements from a variety of content items may be packaged together and carried as one package from the Content Provider to the Service provider.	42
1.15	The Service provider must be able to authenticate the identity of the Content Provider.	6
1.16	Transfer of material between a Content Provider and Service provider should have the possibility of being secure, using encryption or other techniques.	42
1.20	The system must support the delivery of content material in real-time from the Content Provider, through the Service provider to the End User.	37
1.22	The flow of content material in real-time may be initiated by the Service Provider or User.	42
1.23	It must be possible for a Content Provider to automatically load content item elements into a Service provider's system.	36, 37
1.26	It must be possible for Content Management system to grant or deny User access to content material.	1,6
1.27	It must be possible for Content Management system to employ embargo dates/times to deny and grant access to content material.	1, 2, 38
1.28	It must be possible for Content Management system to cause the content to be automatically deleted at a prescribed date and time.	42, 37, 38
1.29	It must be possible for embargo and deletion dates/times to be set differently in different areas.	1, 2, 4, 37,42, 38
1.30	It must be possible for Content Management Data to include copyright information.	6
1.31	It must be possible for Content Management data to include the rights to alter the material.	6
1.32	It must be possible for Content Management data to include the rights to distribute the material.	1, 6
1.33	It must be possible for Content Management system to include an extensible set of features (e.g.. price, number of plays and ownership).	1, 37, 38
1.34	One or more content item elements must be able to carry Navigation Data, enabling End Users to locate content.	22,23,24

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Ref.	Description	Table A1-1
1.35	It must be possible for Content Navigation Data to carry a content label for unique identification of the content item.	6
1.36	It must be possible for Content Navigation Data to include an extensible set of features (e.g. title, rating, synopsis, producer, length, price, "attractors" like stars etc., presentation format and Content Provider name).	3
1.37	The STU must be able to decode at least MPEG-2 TS MP @ ML	9
1.38	Display normal and wide screen material on either normal or wide screen displays	11
1.39	The STU must be able to decode and display 4:3 and 16:9 formats	10
1.41	The Content Management System must retain all appropriate information for respecting Intellectual Property Rights.	6
	BIT TRANSPORT FUNCTIONS	
2.01	The system should provide connection from the Service provider to the STU at a specified bit-rate.	9,18,36,38
2.03	The system should enable transmission of control signals from the Service Provider to a single STU destination (Unicasting).	1, 5, 18, 21, 34, 36, 38
2.04	The system should enable simultaneous transmission of bit-stream from Service Provider to selected multiple STU destinations (Multicasting).	1, 2, 32, 36, 38
2.05	The system should enable simultaneous transmission of bit-stream from Service Provider to all STU destinations (Broadcasting).	1, 18
2.06	The system should provide a return channel from each STU to the Service Provider.	1, 5, 21, 40, 45
2.07	The system should provide a broadcast control channel from the Service Provider to all STUs.	1, 5, 21, 38
2.09	The system should provide a dedicated control channel from the Service Provider to each STU.	41, 43
2.10	The system should enable the transportation of application program code from the Service provider to the STU.	5, 35, 36, 38 41, 43
2.11	The system should enable the transportation of program content (audio, video, text, graphics etc.) and data from the Service provider to the STU.	5, 7, 14, 15, 17,19, 20,33, 34, 36, 38
2.12	The system should enable the transportation of program service information (Station Identification, descriptive material about program content etc.)	17,19, 36, 38
2.13	The transport link should provide error -resilience.	1, 41
2.20	Support the transport of multi-lingual audio	15
	NETWORK MANAGEMENT FUNCTIONS	
3.01	The system should allow operation, Administration, Maintenance & Provisioning functions required by Network Providers.	1, 37, 38, 39, 40, 41, 42, 43
3.02	The system should signal faults and failures to Service providers and Network Providers, and facilitate rapid recovery under such failure conditions.	26, 27, 39, 40, 41
	SESSION FUNCTIONS	
	General	

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Ref.	Description	Table A1-1
4.01	The Service provider should be able to download information to allow the STU to locate material carried on a variety of media (including satellite, terrestrial and cable delivery).	43
4.04	Each application should be able to establish a communications session.	17
4.08	The application should be able to terminate a session in an orderly fashion.	17
4.09	The application should be able to reserve a session in advance.	38
4.11	The application should be able to provide information to the user about the reserved program timeslot, and to provide control and warning signals when required.	38
4.12	The application should be able to provide a range of choices of audio, video, textual and graphical quality and definition.	14,15,33
4.13	An application should be able to dynamically change the quality of audio, video, text and graphics of an existing session during operation.	16
4.14	A user should be able to request an application to change the quality of audio, video, text and graphics of an existing session during operation.	16
	Session types	
4.16	A user should be able to suspend an active session.	17
4.17	A user should be able to resume a suspended session.	17
4.18	A user should be able to start another session during suspension of a current session (e.g.. to use a navigation facility to access different program content or to run other applications).	17
4.19	A user should be able to cancel a suspended session.	17
4.20	It should be possible for a suspended session to be cancelled automatically after a timeout.	17
	Content aspects of sessions	
4.24	The system should be able to encode content material.	1, 5, 6, 9, 38
4.25	The STU should be able to decode content material.	1, 5, 6,
4.28	The system should be able to transfer audio-visual clip material.	38
4.29	The system should be able to transfer still picture material.	19, 20
4.30	The system should be able to transfer a text description of audio-visual material.	7
4.32	The system should be able to transfer multi-channel audio material	14
4.33	The system should be able to transfer text material	7
4.34	The system should be able to transfer motion audio-video material	38
4.35	The system should be able to transfer graphics material	7, 16, 33, 34
4.36	The system should be able to transfer monophonic audio material	14.1
4.37	The system should be able to transfer stereophonic audio material	14.2
4.38	Provide data carousel functionality	36
	ACCESS CONTROL FUNCTIONS	
	General	

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Ref.	Description	Table A1-1
5.03	The system should provide effective, yet unobtrusive means to prevent unauthorized access to the network.	1, 5, 6
5.04	The system should provide means to prevent unauthorized access to Service Provider by STUs.	1, 5
5.05	The system should provide means to prevent unauthorized access to the STU.	1, 5, 6
5.06	The system should provide means to prevent unauthorized access to Service Provider by Content providers.	1, 5
5.07	The system should provide means to limit access to certain content and applications on the Server.	1, 2, 3, 4, 4.1, 5
5.09	The system should provide means to protect against viruses etc.	5, 43
5.10	A Service provider should be able to dynamically authorize or deny access to services according to contract with customer.	1, 6, 2, 3, 4, 4.1, 21, 29, 30, 40,
5.11	A system needs to provide means to authenticate the identity of Service Provider.	5, 6, 29
5.12	A Service provider must be able to authenticate the identity of the user.	1, 5, 6, 29,40
5.13	A Service provider must be able to utilize a user's identity to select a particular User Profile.	1, 5, 29, 30, 40
5.14	The system should provide the means by which a customer account may apply to several users, each to be separately identified with a different service level (for example parents / children).	1, 4, 29
5.15	Each customer account may apply to several users, each to be separately identified with a different User Profile (covering preferences, shoe sizes etc.).	1, 29, 30
5.18	The system should support and control Conditional Access services.	1, 5, 29
5.19	The account owner should have the ability to control access to material by subsidiary users of the same account.	1, 29, 30, 40
5.20	Users should be able to control access to certain applications and content.	1, 2, 3, 4, 6, 29, 30, 40
5.21	The system should provide means for the Service provider to control access services according to credit status and payment history. (or customer characteristics)	1, 2, 3, 29, 40
5.23	The system should enable Access Control limits to be dynamic (for example peak/off peak hours)	1, 40, 4, 18, 31
5.24	The system should facilitate the non-repudiation of downloaded data.	43
	IPR aspects	
5.25	The system should provide means to control access to copyright material (applications, program content etc.).	1, 6
5.26	The system should provide means to generate records of usage of copyright material to facilitate payment.	1, 6, 40
5.28	The system should include mechanisms to prohibit copies of material being made if not authorized.	1, 6

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Ref.	Description	Table A1-1
5.29	The Service provider should be able to control access to material in given geographical areas (e.g. local football match not available in real time to area from which spectators will be drawn).	1, 2, 40, 6
	Authorization	
5.30	The system should provide means to enable the user to authorize the supply of Service provider-delivered services (applications, VoD etc.).	29
5.31	The system should provide means to enable a user to authorize the supply of goods and services.	1, 5, 29, 40
5.32	The system should provide means to enable a user to authorize payment of goods and services.	5, 39
5.33	The system should provide means to enable a user to arrange for delivery of goods and services (not necessarily to user's address).	31
5.34	The system should provide a secure validation system for financial transactions (such as the transmission, reception, validation and transfer to third parties of electronic signatures).	31
5.35	Provide means for user to acquire rights to access-limited content	48
5.36	The system should allow secure access to customer databases at service provider premises	5, 39, 40
5.37	The system should allow secure access to user profile data.	5, 30, 40
5.38	The system should provide means to prevent unwanted material from being received by the user.	1, 3, 5
	NAVIGATION FUNCTIONS	
	General	
6.01	Set-top units should offer a start-up function to allow user to make initial choice of service or application.	22, 28
6.02	Set-top units should offer other menus as a result of subsequent user command or system response.	22, 28
6.03	The system should offer equally easy access to the full range of available Service Providers.	22, 24, 28
6.04	The system should permit a Service provider to present a range of services and products to the user.	24
6.05	The system should permit the user to create and maintain a list of favorite places (Services Providers and Services frequently used).	3, 30
6.06	The user should be able to find/choose/select an application using a navigation system.	3, 16, 17, 22, 24, 28
6.07	The user should be able to find/choose/select a content item using a navigation system.	3, 16, 17, 19, 20, 22, 24, 28
6.08	The user should be able to find/choose/select a product/service using a navigation system.	3, 16, 17, 22, 28, 24
6.09	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of applications delivery to users.	1, 22
6.10	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of content delivery to users	1, 22, 24

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Ref.	Description	Table A1-1
6.11	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of product/service delivery to users.	1, 6, 24
6.12	Navigation system should permit the prices of a given application, content item, product or service to vary with time.	40
6.13	Navigation systems should permit the user to select the language used for presentation of menus, functions and options.	16, 22, 28
6.14	Navigation systems should offer each Service provider the opportunity to create an individual "look and feel" to the services.	16, 28, 37
6.15	Navigation systems should offer the user a set of consistent or obvious controls and tools in order to facilitate easy operation and migration.	16, 22, 28
6.16	Navigation systems should be able to display a single screen image which comprises a "mosaic" of still or moving pictures.	16, 19, 22, 28
6.17	Navigation systems should be able to display a multitude of independent image objects as a "mosaic" of still or moving pictures.	16,19
6.18	Navigation systems should be able to display options for selection as a menu of textual items.	16, 19, 22, 28
6.19	Navigation systems should be able to recognize that a selection has been made, and which item from the available options has been selected.	16, 20, 22, 28
6.20	Navigation systems should be able to trigger the launch of the selected item.	16, 17, 20, 28
6.21	The system should allow Navigation systems to optimize the choices presented to the user.	16
6.21.1	Navigation system must only present material available for viewing (e.g. respect regional blackouts)	2, 3, 4, 22, 24, 28
	AV program aspects	
6.24	The system should enable the use of Electronic Program Guides to plan program content selection.	22, 24, 28
6.25	The system should permit personally tailored Electronic Guides	22, 28, 40
6.26	The system should permit the user to select a content element for immediate consumption using an Electronic Program Guide.	22, 24, 28
6.27	The system should permit the user to select a content element for future consumption using an Electronic Program Guide.	22, 24, 28, 37
6.28	Electronic Program Guides may be user driven by date/ time/ source/ program type, etc.	3, 4, 28
6.29	Electronic Program Guides may present information as text, graphics, audio or video.	7, 22, 28
6.30	Electronic Program Guides should support the categorization of material by program-type (e.g. Sports).	3, 4, 13, 22, 28
6.31	Electronic Program Guides should support the inclusion of additional information (e.g. cast lists).	3, 4, 22, 28
6.32	The system should include means to allow Content providers to supply information to support Electronic Program Guides.	24, 28, 37, 40

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Ref.	Description	Table A1-1
6.33	Electronic Program Guides should permit content presentation format and resolution to be described.	3, 22, 28
6.34	Electronic Program Guides should permit the use of a customized filter to prevent display of unwanted material. (e.g. regionally blocked out programs)	2, 4, 22, 28
6.35	Electronic Program Guides should permit users to select content material by rating.	3, 4, 22, 28
6.36	The system should permit a user to review the available combinations of delivery dates/times and prices.	24, 28, 37
6.37	The system should permit a user to review the available combinations of presentation format/resolution and prices.	22, 24, 28, 40
6.38	The system should enable a Service provider to be able to display the time interval between consecutive copies of content (e.g. for NVoD).	22, 28
6.39	The system should enable a user to review lists of content items booked in advance.	22, 28
6.40	The system should enable a user to cancel a content element item booked in advance.	22, 28
6.43	The system should permit the user to browse through any audio-visual clips.	19,28
6.44	The system, when NVoD content viewing has been paused, should enable the display of the time remaining before viewing may recommence.	22
6.45	The system should facilitate the display of lists on multiple pages.	19, 22, 28
6.46	85% of the users must be able to use 75% of the user terminal functions within 2 minutes without reading an instruction manual	22, 28
6.47	The system should permit the use of Electronic Program Guides for current and future events.	22, 24, 28, 37
	APPLICATION LAUNCH	
	General	
7.02	The system should provide the means to transfer data (executable code, files etc.) to ancillary equipment connected to the STU (Computer, Printer, Games Machine etc.).	44, 46
7.03	The system should provide the means to select and download platform-independent application programs to the STU.	43, 44, 46
7.04	The system should provide the means to select and download platform-independent application programs to the STU (e.g. Java classes)	36, 43, 44
7.05	The system should provide the means to select and download platform-dependent application programs (outside the scope of DAVIC) to the STU.	43, 40
7.06	The system should enable an STU-specific application program (outside the scope of DAVIC) to be launched on the STU.	40
7.07	The system should enable the STU to automatically identify and preload channels and services available on cable, satellite and terrestrial networks.	22, 28
	MEDIA SYNCHRONIZATION LINK FUNCTIONS	
8.01	The system should enable media components, which may be delivered and stored separately to be presented in a synchronized manner.	13, 16, 33, 36, 37, 38
8.02	The system should enable text and graphics to be scrolled on the screen within a defined window size.	7, 16, 33

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Ref.	Description	Table A1-1
8.03	The system should enable text and graphics windows to be repositioned during the program.	7, 16, 22, 33
8.04	The system should enable text and graphics displays to be transparent or colored as defined by the program content.	7,16,33
8.05	The system should provide the means to cue user activity (e.g. a moving cursor, a bouncing ball, or a moving color change).	16, 22, 28
8.06	The system should enable the transfer and subsequent synchronization of media components.	13, 37, 38
8.07	The system should permit insertion points to be defined within content to enable sequential media components to be synchronized (e.g. advertisements).	42, 38
8.08	The system should enable the sequential components inserted at the synchronization points to change.	42, 38
8.09	The system should enable one application to launch another (e.g. advertisements providing links to Home Shopping).	38
8.10	The system should provide the means by which users may be linked in real time to a general broadcast message.	32
8.11	The system should allow linkages to general broadcast messages to be regionally focused.	32, 2, 38
	APPLICATION CONTROL FUNCTIONS	
9.01	A user should be given visual/audio feedback within 250ms whenever an application control function is utilized.	18, 22, 28, 45
9.02	The STU should provide at least a defined set of user-activated command "keys" (e.g. on a remote control, keyboard etc.).	22
9.03	The STU should provide direct selection of any "broadcast" channel within 300ms.	45, 22
	Functions operating on Linear Material	
9.04	The user should be able to start and stop the presentation of the material.	22
9.05	The user should be able to pause (with frame freeze) and resume the presentation of the material.	22
9.13	The user should be able to choose the language for the audio presentation from those available.	15
9.14	The user should be able to choose whether the material is presented with subtitles overlaid on the picture.	22, 33
9.15	The user should be able to choose the language for the presentation of subtitles and other text from those available.	22, 33
9.16	The system should be able to present additional overlaid text/graphics, either application demanded or user-selected (e.g. optional supplementary information for the hearing impaired or lyrics for Karaoke-on-Demand).	7, 16, 32, 33
9.17	The STU should present the user with options for presentation for subtitles text and graphics (e.g. position, font, size and style).	7, 16, 22, 33
	Parallel Stream material	
9.21	The system should enable the use of content material comprised of linked objects, in which one object may link to two or more objects (e.g. sad/happy ending to a movie).	38

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Ref.	Description	Table A1-1
9.22	The system should allow the end-user to select the link utilized at a decision point.	22
9.23	The system should enable the use of multiple related parallel broadcast streams, offering the user the ability to select between these streams.	22
	Games	
9.26	Provide the ability to synchronize STU applications with the audio/video stream	13
	PRESENTATION CONTROL FUNCTIONS	
10.01	A user should be given visual/audio feedback within 250ms whenever a presentation control function is utilized.	22, 45
10.02	The system should permit the user to make hard copy from the application, subject to copyright controls.	46
10.03	The receiving site will contain an appropriate user interaction device able to invoke all functionality	8, 9
10.04	Display normal and widescreen material on either normal or widescreen displays	10, 11, 22
	USAGE DATA FUNCTIONS	
11.01	The system should provide a standard interface to external agencies and systems to permit access to Usage Data for Billing, Service Monitoring and Royalty purposes.	39
11.03	The system should record use of network, Server and content resources.	27, 39, 40
11.04	The system should be able to track use by different users within one customer account (e.g. parents/children).	29, 39, 40
11.06	The system should be able to track the use of Copyright (IPR) material.	40
	Real-time pricing functions	
11.07	The system should enable Service providers to offer flexible charging structures to individual users.	5
11.08	The system should enable a user to be advised of the duration of free viewing time before charging starts.	22
11.09	The system should enable users to cancel viewing within free time, and to precept default action at end of free time.	22
11.10	The user should be able to see the cost of current or just-finished transaction or service.	22
11.11	The system should enable the user to be able to obtain information on the up-to-date credit limit and bill liabilities.	22, 39, 40
11.12	The system should allow a Service provider to obtain information on bill liabilities.	3
	USER PROFILE FUNCTIONS	
12.01	The system should enable the creation of personal profiles for user(s) that record preferences (e.g. shoe size for applications such as teleshopping).	22, 28, 30, 40
12.02	The system should support portable user profiles (e.g. smart card or central database).	22,30
	SECURITY FUNCTIONS	
13.01	The system should enable the reporting of distribution and Usage Data to be protected	5, 40

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Ref.	Description	Table A1-1
13.02	Security measures applied to content should not negatively impact the delivered quality of the content	1, 6
13.03	Reporting of distribution and Usage Data must be Auditable	40
13.04	All copies (authorized and unauthorized) of content must be traceable	6
13.05	The system should enable the secure reporting of all instances of delivery , with minimal loss	1, 5, 6, 40
13.06	IPR tracking should be supported at the elemental level (picture, audio, piece of picture or audio)	5, 6
13.07	The availability of the clear digital stream is controllable by the system	1, 6
13.10	Usage Data must be secure	5,
13.11	The system must support a hierarchical security approach, such that .a security failure may translate into loss of e.g. 1 frame, 5 minutes, or a large amount	1, 2, 3, 4, 6
13.12	Security measures should not significantly increases latency for e.g. channel up/down	1, 2, 3, 4, 6
13.13	Security should not require multiple formats and/or versions of content for distribution	1, 2, 3, 4
13.14	Meta-data should be subject to security as audio and video content	1
13.15	The system must support Regional blackout	1, 2, 3, 4
13.16	The system should support a degraded digital stream output capability for recording	6
13.17	Unauthorized intrusion should not compromise end-to-end security	1, 2, 3, 4, 5
13.18	Security management should not be complex	1, 2, 3, 4, 5
13.19	All cases of entity authentication must be traceable and auditable	1, 2, 3, 4, 5
13.20	The system should support Irrefutability and non-repudiation functions such that they are usable as legal proof	1, 2, 3, 4, 5
13.21	Data to and from the DAVIC system STU should be protected such that it is secure and private within the DAVIC system	1, 2, 4, 5
13.22	Upgrades to security elements in face of a breach should be easy and quick	1, 6
13.23	Delivery in the face of security failure may be allowed by the Service provider	1, 2, 3, 4
13.24	The system must support secure download of software	5, 43
13.25	Source of security related problems should be readily determinable	1, 5
13.26	Security processes will not impose significant overheads on the DVIC system performance	1, 6, 43
13.27	Security processes should not cause non-delivery of authorized media	1
13.28	Security processes should be transparent to running (operating) of network	1, 12
13.29	Unauthorized intrusion should not compromise end-to-end security	1
13.30	Multiple scramble/descramble processes are allowed	1, 6
13.31	Scrambling for network security reasons should be allowed	1, 5, 6

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Ref.	Description	Table A1-1
13.32	Access to the Network should be controllable	1, 2, 3, 4, 5
13.33	Media delivery should be controllable based on e.g. rating, time of day, user, etc.	2, 3, 4, 37, 38
13.34	Purchases should be controllable based on e.g. user, credit, existing billings, etc.	5, 39
13.35	All transactions should be secure	1, 2, 3, 4, 5, 39
13.36	Access to profile data should be controllable by user	5, 30
13.37	Usage Data should be anonymous for statistical analyses	40
13.38	Individual user data will be secure	5
13.40	The system will support both subscriber and user authentication	1, 2, 3, 4, 5
13.41	Usage Data reporting should be accurate, auditable	5, 40
13.42	All equipment should allow testing under secure environments for all features (including clear digital stream)	1, 2, 3, 4, 26, 27
13.43	Inclusion of security features should still allow for export	1, 2, 3, 4, 5, 6
13.44	Security should not significantly increase complexity	1, 5, 6, 43
13.45	Manufacturing should minimize requirements for secure facilities	1
13.46	Access to data limited to authorized users only	1, 2, 3, 4, 5, 6, 40
13.47	The two-way Usage Data interface must be secure	5, 6, 40
13.49	The DAVIC system should support authentication to and from external support systems	1, 5, 39, 40
13.51	The system should support identification of consumed material	2, 3, 4, 6
13.52	The system should support identification of the IPR holder	6
13.53	The system should support identification of author	6
13.54	The system should support identification of the source/provider of material	6
13.55	Content control and supervision should be authenticatable	1, 2, 3, 4, 5
13.56	Proof/tracing data for Legal proceedings should be authenticatable	1, 2, 3, 4, 5
13.57	Transmission logging data should be secure and authenticatable	1, 5, 38, 40
13.60	Provide plug and play capability for connection to in home digital consumer electronic equipment	44
	FUNCTIONS CONSIDERED TO BELONG TO APPLICATIONS	
	Games applications	
104.01	The system should permit high scores for games to be recorded.	18
104.02	The system should enable a service provider to provide advertisements for new games.	18
104.03	The system should permit a service provider to record and distribute high scores for games.	18

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Annex B: Interactive Digital Broadcast Contour

B1 Introduction

This annex defines the user and market requirements for the Interactive Digital Broadcast market segment. The service provider can offer different kinds of return channels. User requirements are defined from the point of view of the ultimate end user (e.g., the retail consumer). Market requirements are defined from the point of view of the provider that supplies the Interactive Digital Broadcast service to the consumer.

For the description of conformance, compliance refer to subclause 6.1. For technical implementation and interoperability, refer to ISO/IEC 16500-3.

B2 Scope

The Interactive Digital Broadcast contour describes a system that:

- Can transport digital equivalents of programs now carried by conventional analog broadcast;
- Is designed for digital broadcast content delivery whereby all users can, if suitably equipped and permitted, receive all digital broadcast content
- Provides an electronic return channel to communicate between the User and the Service provider whereby the User and Service provider collaborate for access to some part(s) of the broadcast services
- Does not necessarily maintain an active return channel connection between the User and the Service provider
- Provides a return channel that will support unique communication between the user and Service provider
- Permits the user to input unique text and data, or to respond to unique messages sent by the Service provider, or to respond to non-unique messages embedded in the broadcast stream
- Permits User/Service provider interaction via the return channel to cause unique data to be inserted into the broadcast stream which is intended for a specific user or group of users
- Permits the user to select different sub-sets of broadcast content within the scope of one program or transport stream

B3 Supported Applications

The Interactive Digital Broadcast contour provides support for the following example applications.

- Tele-shopping (subclause 9.2)
- Broadcast (subclause 9.3)
- Play along broadcasting
- Near Video on Demand (subclause 9.4)
- Delayed Broadcast (subclause 9.5)
- Games (subclause 9.6)
- TV EPG (subclause 9.11)
- Broadcast Information Services

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B4 User and market requirements

The following User and Market requirements for an Interactive Digital Broadcast system have been identified. They have been separated into the two categories of end-user requirements and service provider requirements based on the nature of the requirement.

Table B1-1: User and market needs

NOTE: The categories are: CA - Conditional Access/Security, CP - Content Presentation, EU - ease of use, IN-interactivity; SP - service provider concerns.

Nreq.	Description of user need or market requirement	Reference to function table
1. CA	Provide Conditional Access capability	**1.26, 1.27, 1.28, 1.29, 1.32, 1.33, 2.03, 2.04, 2.05, 2.06, 2.07, 2.13, 3.01, 4.24, 4.25, 5.03, 5.04, 5.05, 5.06 5.07, 5.10, 5.12, 5,13, 5.14, 5.15, 5.18, 5.19, 5.20, 5.21, 5.23, 5.25, 5.26, 5.28, 5.29, 5.31, 5.38, 6.09, 6.10, 6.11, 13.02, 13.05, 13.07, 13.11, 13.12, 13.13, 13.14, 13.15, 13.17, 13.18, 13.19, 13.20, 13.21, 13.22, 13.23, 13.25, 13.26, 13.27, 13.28, 13.29, 13.30, 13.31, 13.32, 13.35, 13.40, 13.42, 13.43, 13.44, 13.45, 13.46, 13.49, 13.55, 13.56, 13.57**
2. CA	Provide Conditional Access so subscribers can be grouped by some characteristic(s)	**1.27, 1.29, 2.04, 2.11, 5.07, 5.10, 5.20, 5.21, 5.29, 6.21.1, 6.34, 8.11, 13.11, 13.12, 13.13, 13.15, 13.17, 13.18, 13.19, 13.20, 13.21, 13.23, 13.32, 13.33, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.55, 13.56**
3. CA	Provide Conditional Access to programs grouped by some characteristic(s)	**1.36, 5.07, 5.38, 5.10, ,5.20, 5.21, 5.38, 6.05, 6.06, 6.07, 6.08, 6.21.1, 6.28, 6.30, 6.31, 6.33, 6.35, 13.11, 13.12, 13.13, 13.15, 13.17, 13.18, 13.19, 13.20, 13.23, 13.32, 13.33, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.55, 13.56**
4. CA	Permit single event Conditional Access.	**1.29, 5.07, 5.10, 5.14, 5.20, 5.23, 6.21.1, 6.28, 6.30, 6.31, 6.34, 6.35, 13.11, 13.12, 13.13, 13.15, 13.17, 13.18, 13.19, 13.20, 13.21, 13.22, 13.23, 13.32, 13.33, 13.35, 13.40, 13.42, 13.43, 13.46, 13.51, 13.55, 13.56**
4.1 CA	Permit Conditional Access for individual components of the broadcast stream	**5.07, 510**
5. CA	Ensure that communications are secure from eavesdropping and imposture.	**2.03, 2.06, 2.07, 2.10, 2.11, 4.24, 4.25, 5.03, 5.04, 505, 5.06, 5.07, 5.09, 5.11, 5.12, 5.13, 5.18, 5.31, 5.32, 5.36, 5.37, 5.38, 11.07, 13.01, 13.05, 13.06, 13.10, 13.13, 13.15, 13.17 13.18, 13.19, 13.20, 13.21, 13.24, 13.25, 13.31, 13.32, 13.33, 13.34, 13.35, 13.36, 13.38, 13.40, 13.41, 13.43, 13.44, 13.46, 13.49, 13.55, 13.56, 13.57**
6. CA	Support standard copy control and protection system(s)	**1.15, 1.26, 1.30, 1.31, 1.32, 1.35, 1.41, 4.24, 4.25, 5.03, 5.05, 5.10, 5.11, 5.12, 5.20, 5.25, 5.26, 5.28, 5.29, 6.11, 13.02, 13.04, 13.05, 13.06, 13.07, 13.11, 13.12, 13.16, 13.20, 13.22, 13.26, 13.30, 13.31, 13.43, 13.44, 13.46, 13.51, 13.52, 13.53, 13.54**
7. CP	The system shall provide the capability for additional graphic and text overlays	**2.11, 4.30, 4.33, 4.35, 6.29, 8.02, 8.03, 8.04, 9.16, 9.17**
8. CP	The receiver site shall contain at least a STU functionality, an appropriate resolution display device, and a user interaction device able to invoke all required functionality	**10.03**

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9. CP	Provide decoders capable of at least MPEG-2 TS MP@ML	**1.37, 2.01, 4.24, 10.03**
10. CP	Provide decoders capable of 4:3 and 16:9 formats	**1.39, 10.04**
11. CP	Display normal and widescreen material on either normal or widescreen displays	**1.38, , 10.04**
12. CP	Ensure predictable system behavior when processing and displaying audio/video to minimize end user confusion	**13, 28**
13. CP	Provide ability to synchronize STU side application with audio/video	**6.30, 8.01, 8.06, 9.26**
14. CP	Support multi-channel audio	**2.11, 4.12 , 4.32**
14.1CP	Must support monophonic audio	**2.11, 4.12, 4.36**
14.2CP	Must support stereophonic audio	**2.11, 4.12, 4.37**
15. CP	Support multi-lingual audio	**2.11, 2.20, 4.12, 9.13, 9.13**
16. EU	Provide means to select specific (graphics) objects on the TV screen (participation in Television shows discussion programs)	**4.13, 4.14, 4.35, 6.06, 6.07, 6.08, 6.13, 6.14, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20, 6.21, 6.29, 8.01, 8.02, 8.03, 8.04, 8.05, 9.16, 9.17**
17. EU	Provide option to the user to activate a application such as play along	**2.11, 2.12, 4.04, 4.08, 4.16, 4.17, 4.18, 4.19, 4.20, 6.06, 6.07, 6.08, 6.20**
18. EU	Application must be able to generate feedback on users requests	**2.01, 2.02, 2.03, 2.05, 4.09, 4.11 , 5.23, 9.01, 104.01, 104.02, 104.03**
19. EU	Provide means to navigate through a stack of information pages. (Graphics, text, audio and video)	**2.11, 2.12, 4.24, 4.25, 4.28, 4.29, 4.30, 4.32, 4.33, 4.34, 4.35, 6.07, 6.16, 6.17, 6.18, 6.43, 6.45,**
20. EU	Provide means to access specific WEB pages from the broadcast content	**2.02, 2.06, 2.11, 4.24, 4.25, 4.28, 4.29, 4.30, 4.32, 4.33, 4.34, 4.35, 6.07, 6.19, 6.20**
21. EU	90% of entitlement requests shall be fulfilled within 30 seconds	**2.02, 2.03, 2.06, 2.07, 5.10**
22. EU	User terminal must be easy to use.	**1.34, 6.01, 6.01, 6.02, 6.03, 6.06, 6.07, 6.08, 6.09, 6.10, 6.13, 6.15, 6.16, 6.18, 6.19, 6.21.1, 6.47, 6.24, 6.25, 6.26, 6.27, 6.29, 6.30, 6.31, 6.33, 6.34, 6.35, 6.37, 6.38, 6.39, 6.40, 6.44, 6.45, 6.46, 7.07, 8.03,8.05, 9.01, 9.02, 9.03, 9.04, 9.05, 9.14, 9.15, 9.17, 9.22, 9.23, 10.01, 10.04, 11.08, 11.09, 11.10, 11.11, 21.01, 12.02**
23. EU	User terminal must be easy to install	**1.34**
24. EU	User should be able to identify the services that can be accessed	**1.34, 6.03, 6.04, 6.06, 6.07, 6.08, 6.10, 6.11, 6.21.1, 6.24, 6.26, 6.27, 6.32, 6.36, 6.37, 6.47**
25. EU	It shall be possible to safely terminate the use of the return channel expeditiously.	**3.02, 4.08, 4.16, 4.17, 4.18, 4.19**
25.1 E.U	The return channel connection between User and Service provider may be switched off when not needed	**2.06**
26. EU	Provide fast, easy, cheap diagnostic means for the end user to distinguish receiver / STU side problems from incoming signal problems.	**3.02, 13.42**
27. EU	Provide fast, easy, cheap fault diagnosis for the end user to help identify problems internal to the STU.	**3.02, 11.01, 11.03, 13.42**

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28. EU	Provide simple, attractive, uniform user interface with easy navigation (electronic program guide or EPG).	**6.01, 6.02, 6.03, 6.06, 6.07, 6.08, 6.13, 6.14, 6.15, 6.16, 6.18, 6.19, 6.20, 6.21.1, 6.24, 6.25, 6.26, 6.27, 6.28, 6.29, 6.30, 6.31, 6.32, 6.33, 6.34, 6.35, 6.36, 6.37, 6.38, 6.39, 6.40, 6.43, 6.47, 7.07, 8.05, 9.01, 12.01**
29. EU	Provide a means for the STU user to enforce content access on an individual viewer basis (e.g., parental control)	**5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.18, 5.19, 5.20, 5.21, 5.30, 5.31, 5.32, 11.04**
30. EU	Provide means to define and modify personal profile to affect what information is presented.	**5.10, 5.13, 5.15, 5.19, 5.20, 5.37, 6.05, 12.01, 12.02, 13.36**
31. IN	Provide electronic or other means to send information from the User to the Service provider so the User and Service provider can collaborate for access to some part(s) of the broadcast streams	**2.01, 2.02, 2.06, 5.11, 5.12, 5.23, 5.30, 5.31, 5.32, 5.33, 5.34**
32. IN	Support emergency alert messages	**2.04, 4.11, 8.10, 8.11, 9.16**
33. IN	Provide closed captions/subtitles.	**2.11, 4.12, 4.35, 8.01, 8.02, 8.03, 8.04, 9.14, 9.15, 9.16, 9.17**
34. SP	Provide one way datagram service	**2.03, 2.11, 4.35**
35. SP	Provide data transport capability	**2.03, 2.04, 2.05, 2.10, 2.11, 4.35, 7.01, 7.02, 7.03 7.05, 8.01, 8.06, 13.21**
36. SP	Provide data carousel functionality	**1.23, 2.01, 2.02, 2.03, 2.04, 2.10, 2.11, 2.12, 4.38, 7.04, 8.01**
37. SP	Provide appropriate interface to a scheduling facility for the service provider	**1.02, 1.23, 1.20, 1.28, 1.29, 1.33, 3.01, 6.14, 6.27, 6.32, 6.36, 6.47, 8.01, 8.06, 13.33**
38. SP	Provide appropriate interface to an automation system to execute schedules	**1.27, 1.28, 1.29, 1.33, 2.01, 2.03, 2.04, 2.07, 2.10, 2.11, 2.12, 3.01, 4.09, 4.11, 4.24, 4.28, 4.34, 6.47, 8.01, 8.06, 8.07, 8.08, 8.09, 8.11, 9.21, 13.33, 13.57**
39. SP	Provide appropriate interface to a Billing System	**3.01, 3.02, 5.36, 5.32, 11.01, 11.03, 11.04, 11.11, 11.12, 13.34, 13.35, 13.49**
40. SP	Provide appropriate interface to a Subscriber Management System	**2.06, 3.01, 3.02, 5.10, 5.12, 5.13, 5.19, 5.20, 5.21, 5.23, 5.26, 5.29, 5.31, 5.36, 5.37, 6.12, 6.25, 6.32, 6.37, 6.45, 6.46, 6.47, 7.05, 7.06, 11.03,11.04, 11.06, 11.11, 12.01, 12.02, 13.01, 13.03, 13.05, 13.37, 13.41, 13.46, 13.49, 13.57**
41. SP	Provide appropriate interface to a fault detection system	**2.09, 2.10, 2.13, 3.01, 3.02**
42. SP	Provide capability for insertion of program material in compressed video stream (caveat statistical multiplexing)	**1.01, 1.05, 1.06, 1.08, 1.16, 1.22, 1.28, 1.29, 3.01, 8.07, 8.08**
43. SP	Permit downloading new or modified applications to end user terminal in a secure manner	**2.09, 2.10, 5.24, 7.03, 7.04, 7.05, 13.24, 13.26 13.44, 3.01, 4.01, 5.09, 5.24**
44. EU	Provide plug-and-play capability for connection to in-home digital consumer electronic equipment	**7.02, 7.03, 7.04, 13.60**
45. SP	Provide a mechanism to comply with customer request in ten second's in case of a switched on return channel	**2.02, 2.06, 9.01, 9.03, 10.01**
46. SP	The receiver / STU side must provide a data port for the pass through of broadcast information	**7.02, 7.03, 10.02**
47. EU	Provide means for user to acquire rights to access limited access material	**5.35**

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B5 Functional Requirements

The first level architectural realization of a system to meet the above user and market requirements will use the base DAVIC architecture of Service provider, Network, and Service Consumer. The following functions were primarily extracted from the function tables in clause 10 at the level of abstraction of the architectural realization for this architectural specificity. Reference numbers in the table refer to those functions.

Table B2-2 cites appropriate requirements from Table B1-1 for each function. Because some requirements are superordinate, and some subordinate, in general subordinate requirements are cited only when they are likely to add a unique constraint to the function implementation. Otherwise, super ordinate requirements only are cited. Note that Functions do not necessarily implement all the controlling Requirement.

Table B2-2 — Functional requirements mapping to user and market needs

Ref.	Description	Table B1-1
	CONTENT FUNCTIONS	
1.01	The system must support the delivery of content material from the Content Provider to the Service provider via physical media.	42
1.02	The system must support the delivery of content material from the Content Provider to Service provider via an electronic link.	37
1.05	The system must support the delivery of content from the Content Provider to Service provider as separate, distinguishable content item elements.	42
1.06	Content item elements on the Service provider's system may be replaced with new versions.	42
1.08	Content item elements from a variety of content items may be packaged together and carried as one package from the Content Provider to the Service provider.	42
1.15	The Service provider must be able to authenticate the identity of the Content Provider.	6
1.16	Transfer of material between a Content Provider and Service provider should have the possibility of being secure, using encryption or other techniques.	42
1.20	The system must support the delivery of content material in real-time from the Content Provider, through the Service provider to the End User.	37
1.22	The flow of content material in real-time may be initiated by the Service Provider or User.	42
1.23	It must be possible for a Content Provider to automatically load content item elements into a Service provider's system.	36, 37
1.26	It must be possible for Content Management system to grant or deny User access to content material.	1, 6
1.27	It must be possible for Content Management system to employ embargo dates/times to deny and grant access to content material.	1, 2, 38
1.28	It must be possible for Content Management system to cause the content to be automatically deleted at a prescribed date and time.	1, 37, 38, 42
1.29	It must be possible for embargo and deletion dates/times to be set differently in different areas.	1, 2, 4, 37, 38, 42
1.30	It must be possible for Content Management Data to include copyright information.	6
1.31	It must be possible for Content Management data to include the rights to alter the material.	6

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Ref.	Description	Table B1-1
1.32	It must be possible for Content Management data to include the rights to distribute the material.	1, 6
1.33	It must be possible for Content Management system to include an extensible set of features (e.g.. price, number of plays and ownership).	1, 37, 38
1.34	One or more content item elements must be able to carry Navigation Data, enabling End Users to locate content.	22, 23, 24
1.35	It must be possible for Content Navigation Data to carry a content label for unique identification of the content item.	6
1.36	It must be possible for Content Navigation Data to include an extensible set of features (e.g. title, rating, synopsis, producer, length, price, "attractors" like stars etc., presentation format and Content Provider name).	3
1.37	The STU must be able to decode at least MPEG-2 TS MP @ ML	9
1.38	Display normal and wide screen material on either normal or wide screen displays	11
1.39	The STU must be able to decode and display 4:3 and 16:9 formats	10
1.41	The Content Management System must retain all appropriate information for respecting Intellectual Property Rights.	6
	BIT TRANSPORT FUNCTIONS	
2.01	The system should provide connection from the Service provider to the STU at a specified bit-rate.	9, 18, 31, 36, 38
2.02	The system should provide transmission means from the STU to the Service Provider at a specified bit-rate.	18, 20, 21, 31, 36, 45
2.03	The system should enable transmission of control signals from the Service Provider to a single STU destination (Unicasting).	1, 5, 18, 21, 34, 35, 36, 38
2.04	The system should enable simultaneous transmission of bit-stream from Service Provider to selected multiple STU destinations (Multicasting).	1, 2, 32, 35, 36, 38
2.05	The system should enable simultaneous transmission of bit-stream from Service Provider to all STU destinations (Broadcasting).	1, 18, 35
2.06	The system should provide a return channel from each STU to the Service Provider.	1, 5, 20, 21, 25.1, 31, 40, 45
2.07	The system should provide a broadcast control channel from the Service Provider to all STUs.	1, 5, 21, 38
2.09	The system should provide a dedicated control channel from the Service Provider to each STU.	41, 43
2.10	The system should enable the transportation of application program code from the Service provider to the STU.	5, 35, 36, 38 41, 43
2.11	The system should enable the transportation of program content (audio, video, text, graphics etc.) and data from the Service provider to the STU.	2, 5, 7, 14, 14.1, 14.2, 15, 17, 19, 20, 33, 34, 35 , 36, 38
2.12	The system should enable the transportation of program service information (Station Identification, descriptive material about program content etc.)	17, 19, 36, 38
2.13	The transport link should provide error -resilience.	1, 41

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Ref.	Description	Table B1-1
2.20	Support the transport of multi-lingual audio	15
	NETWORK MANAGEMENT FUNCTIONS	
3.01	The system should allow operation, Administration, Maintenance & Provisioning functions required by Network Providers.	1, 37, 38, 39, 40, 41, 42, 43
3.02	The system should signal faults and failures to Service providers and Network Providers, and facilitate rapid recovery under such failure conditions.	25, 26, 27, 39, 40, 41
	SESSION FUNCTIONS	
	General	
4.01	The Service provider should be able to download information to allow the STU to locate material carried on a variety of media (including satellite, terrestrial and cable delivery).	43
4.04	Each application should be able to establish a communications session.	17
4.08	The application should be able to terminate a session in an orderly fashion.	17, 25
4.09	The application should be able to reserve a session in advance.	18, 38
4.11	The application should be able to provide information to the user about the reserved program timeslot, and to provide control and warning signals when required.	18, 32, 38
4.12	The application should be able to provide a range of choices of audio, video, textual and graphical quality and definition.	14, 14.1, 14.2, 15, 33
4.13	An application should be able to dynamically change the quality of audio, video, text and graphics of an existing session during operation.	16
4.14	A user should be able to request an application to change the quality of audio, video, text and graphics of an existing session during operation.	16
	Session types	
4.16	A user should be able to suspend an active session.	17, 25
4.17	A user should be able to resume a suspended session.	17, 25
4.18	A user should be able to start another session during suspension of a current session (e.g.. to use a navigation facility to access different program content or to run other applications).	17, 25
4.19	A user should be able to cancel a suspended session.	17, 25
4.20	It should be possible for a suspended session to be cancelled automatically after a timeout.	17
	Content aspects of sessions	
4.24	The system should be able to encode content material.	1, 5, 6, 9, 19, 20, 38
4.25	The STU should be able to decode content material.	1, 5, 6, 19, 20
4.28	The system should be able to transfer audio-visual clip material.	19, 20, 38
4.29	The system should be able to transfer still picture material.	19, 20
4.30	The system should be able to transfer a text description of audio-visual material.	7, 19, 20
4.32	The system should be able to transfer multi-channel audio material	14, 19, 20
4.33	The system should be able to transfer text material	7, 19, 20
4.34	The system should be able to transfer motion audio-video material	19, 20, 38

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Ref.	Description	Table B1-1
4.35	The system should be able to transfer graphics material	7, 16, 19, 20, 33, 34, 35
4.36	The system should be able to transfer monophonic audio material	14.1
4.37	The system should be able to transfer stereophonic audio material	14.2
4.38	Provide data carousel functionality	36
	ACCESS CONTROL FUNCTIONS	
	General	
5.03	The system should provide effective, yet unobtrusive means to prevent unauthorized access to the network.	1, 5, 6
5.04	The system should provide means to prevent unauthorized access to Service Provider by STUs.	1,5
5.05	The system should provide means to prevent unauthorized access to the STU.	1, 5, 6
5.06	The system should provide means to prevent unauthorized access to Service Provider by Content providers.	1, 5
5.07	The system should provide means to limit access to certain content and applications on the Server.	1, 2, 3, 4, 4.1, 5
5.09	The system should provide means to protect against viruses, etc.	5, 43
5.10	A Service provider should be able to dynamically authorize or deny access to services according to contract with customer.	1, 2, 3, 4, 4.1, 6, 21, 29, 30, 40
5.11	A system needs to provide means to authenticate the identity of Service Provider.	5, 6, 29, 31
5.12	A Service provider must be able to authenticate the identity of the user.	1, 5, 6, 29, 31, 40
5.13	A Service provider must be able to utilize a user's identity to select a particular User Profile.	1, 5, 29, 30, 40
5.14	The system should provide the means by which a customer account may apply to several users, each to be separately identified with a different service level (for example parents / children).	1, 4, 29, 29
5.15	Each customer account may apply to several users, each to be separately identified with a different User Profile (covering preferences, shoe sizes etc.).	1, 29, 30
5.18	The system should support and control Conditional Access services.	1, 5, 29
5.19	The account owner should have the ability to control access to material by subsidiary users of the same account.	1, 29, 30, 40
5.20	Users should be able to control access to certain applications and content.	1, 2, 3, 4, 6, 29, 30, 40
5.21	The system should provide means for the Service provider to control access services according to credit status and payment history (or customer characteristics)	1, 2, 3, 29, 40
5.23	The system should enable Access Control limits to be dynamic (for example peak/off peak hours)	1, 4, 18, 31, 40
5.24	The system should facilitate the non-repudiation of downloaded data.	43

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Ref.	Description	Table B1-1
	IPR aspects	
5.25	The system should provide means to control access to copyright material (applications, program content etc.).	1, 6
5.26	The system should provide means to generate records of usage of copyright material to facilitate payment.	1, 6, 40
5.28	The system should include mechanisms to prohibit copies of material being made if not authorized.	1, 6
5.29	The Service provider should be able to control access to material in given geographical areas (e.g. local football match not available in real time to area from which spectators will be drawn).	1, 2, 6, 40
	Authorization	
5.30	The system should provide means to enable the user to authorize the supply of Service provider-delivered services (applications, VoD etc.).	29, 31
5.31	The system should provide means to enable a user to authorize the supply of goods and services.	1, 5, 29, 31, 40
5.32	The system should provide means to enable a user to authorize payment of goods and services.	5, 29, 31
5.33	The system should provide means to enable a user to arrange for delivery of goods and services (not necessarily to user's address).	31
5.34	The system should provide a secure validation system for financial transactions (such as the transmission, reception, validation and transfer to third parties of electronic signatures).	31
5.35	Provide means for user to acquire rights to access-limited content	47
5.36	The system should allow secure access to customer databases at service provider premises	5, 39, 40
5.37	The system should allow secure access to user profile data.	5, 30, 40
5.38	The system should provide means to prevent unwanted material from being received by the user.	1, 3, 5
	NAVIGATION FUNCTIONS	
	General	
6.01	Set-top units should offer a start-up function to allow user to make initial choice of service or application.	22, 28
6.02	Set-top units should offer other menus as a result of subsequent user command or system response.	22, 28
6.03	The system should offer equally easy access to the full range of available Service Providers.	22, 24, 28
6.04	The system should permit a Service provider to present a range of services and products to the user.	24,
6.05	The system should permit the user to create and maintain a list of favorite places (Services Providers and Services frequently used).	3, 30
6.06	The user should be able to find/choose/select an application using a navigation system.	3, 16, 17, 22, 24, 28
6.07	The user should be able to find/choose/select a content item using a navigation system.	3, 16, 17, 19, 20, 22, 24, 28

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Ref.	Description	Table B1-1
6.08	The user should be able to find/choose/select a product/service using a navigation system.	3, 16, 17, 22, 24, 28
6.09	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of applications delivery to users.	1, 22
6.10	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of content delivery to users.	1, 22, 24
6.11	Navigation systems should permit Service providers to identify the commercial conditions (cost etc.) of product/service delivery to users.	1, 6, 24
6.12	Navigation system should permit the prices of a given application, content item, product or service to vary with time.	40
6.13	Navigation systems should permit the user to select the language used for presentation of menus, functions and options.	16, 22, 28
6.14	Navigation systems should offer each Service provider the opportunity to create an individual "look and feel" to the services.	16, 28, 37
6.15	Navigation systems should offer the user a set of consistent or obvious controls and tools in order to facilitate easy operation and migration.	16, 22, 28
6.16	Navigation systems should be able to display a single screen image that comprises a "mosaic" of still or moving pictures.	16, 19, 22, 28
6.17	Navigation systems should be able to display a multitude of independent image objects as a "mosaic" of still or moving pictures.	16, 19
6.18	Navigation systems should be able to display options for selection as a menu of textual items.	16,19, 22, 28
6.19	Navigation systems should be able to recognize that a selection has been made, and which item from the available options has been selected.	16, 20, 22, 28
6.20	Navigation systems should be able to trigger the launch of the selected item.	16, 17, 20, 28
6.21	The system should allow Navigation systems to optimize the choices presented to the user.	16
6.21.1	Navigation system must only present material available for viewing (e.g. respect regional blackouts)	2, 3, 4, 22, 24, 28
	AV program aspects	
6.24	The system should enable the use of Electronic Program Guides to plan program content selection.	22, 24, 28
6.25	The system should permit personally tailored Electronic Guides	22, 28, 40
6.26	The system should permit the user to select a content element for immediate consumption using an Electronic Program Guide.	22, 24, 28
6.27	The system should permit the user to select a content element for future consumption using an Electronic Program Guide.	22, 24, 28, 37
6.28	Electronic Program Guides may be user driven by date/ time/ source/ program type etc.	3, 4, 28
6.29	Electronic Program Guides may present information as text, graphics, audio or video.	7, 16, 22, 28
6.30	Electronic Program Guides should support the categorization of material by program-type (e.g. Sports).	3, 4, 13, 22, 28

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Ref.	Description	Table B1-1
6.31	Electronic Program Guides should support the inclusion of additional information (e.g. cast lists).	3, 4, 22, 28
6.32	The system should include means to allow Content providers to supply information to support Electronic Program Guides.	24, 28, 37, 40,
6.33	Electronic Program Guides should permit content presentation format and resolution to be described.	3, 22, 28
6.34	Electronic Program Guides should permit the use of a customized filter to prevent display of unwanted material. (e.g. regionally blocked out programs)	2, 4, 22, 28
6.35	Electronic Program Guides should permit users to select content material by rating.	3, 4, 22, 28
6.36	The system should permit a user to review the available combinations of delivery dates/times and prices.	24, 28, 37
6.37	The system should permit a user to review the available combinations of presentation format/resolution and prices.	22, 24, 28, 40
6.38	The system should enable a Service provider to be able to display the time interval between consecutive copies of content (e.g. for NVoD).	22, 28
6.39	The system should enable a user to review lists of content items booked in advance.	22, 28
6.40	The system should enable a user to cancel a content element item booked in advance.	22, 28
6.43	The system should permit the user to browse through any audio-visual clips.	19, 28
6.44	The system, when NVoD content viewing has been paused, should enable the display of the time remaining before viewing may recommence.	22
6.45	The system should facilitate the display of lists on multiple pages.	19, 22, 28
6.46	85% of the users must be able to use 75% of the user terminal functions within 2 minutes without reading an instruction manual	22, 28
6.47	The system should permit the use of Electronic Program Guides for current and future events.	22, 24, 28, 37
	APPLICATION LAUNCH	
	General	
7.01	The system should support applications that run on the STU, the Service Provider, or both.	35
7.02	The system should provide the means to transfer data (executable code, files etc.) to ancillary equipment connected to the STU (Computer, Printer, Games Machine etc.).	35, 44, 46
7.03	The system should provide the means to select and download platform-independent application programs to the STU.	35, 43, 44 ,46
7.04	The system should provide the means to select and download platform-independent application programs to the STU (e.g. Java classes)	36, 43, 44
7.05	The system should provide the means to select and download platform-dependent application programs (outside the scope of DAVIC) to the STU.	35, 40, 43
7.06	The system should enable an STU-specific application program (outside the scope of DAVIC) to be launched on the STU.	40

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Ref.	Description	Table B1-1
7.07	The system should enable the STU to automatically identify and preload channels and services available on cable, satellite and terrestrial networks.	22, 28
	MEDIA SYNCHRONIZATION LINK FUNCTIONS	
8.01	The system should enable media components that may be delivered and stored separately to be presented in a synchronized manner.	13, 16, 33, 35, 36, 37, 38
8.02	The system should enable text and graphics to be scrolled on the screen within a defined window size.	7, 16, 33
8.03	The system should enable text and graphics windows to be repositioned during the program.	7, 16, 22, 33
8.04	The system should enable text and graphics displays to be transparent or colored as defined by the program content.	7, 16, 33
8.05	The system should provide the means to cue user activity (e.g. a moving cursor, a bouncing ball, or a moving color change).	16, 22, 28
8.06	The system should enable the transfer and subsequent synchronization of media components.	13, 35, 37, 38
8.07	The system should permit insertion points to be defined within content to enable sequential media components to be synchronized (e.g. advertisements).	38, 42
8.08	The system should enable the sequential components inserted at the synchronization points to change.	38, 42
8.09	The system should enable one application to launch another (e.g. advertisements providing links to Home Shopping).	38
8.10	The system should provide the means by which users may be linked in real time to a general broadcast message.	32
8.11	The system should allow linkages to general broadcast messages to be regionally focused.	2, 32, 38
	APPLICATION CONTROL FUNCTIONS	
9.01	A user should be given visual/audio feedback within 250ms whenever an application control function is utilized.	18, 22, 28, 45
9.02	The STU should provide at least a defined set of user-activated command "keys" (e.g. on a remote control, keyboard etc.).	22
9.03	The STU should provide direct selection of any "broadcast" channel within 300ms.	22, 45
	Functions operating on Linear Material	
9.04	The user should be able to start and stop the presentation of the material.	22
9.05	The user should be able to pause (with frame freeze) and resume the presentation of the material.	22
9.13	The user should be able to choose the language for the audio presentation from those available.	15
9.14	The user should be able to choose whether the material is presented with subtitles overlaid on the picture.	22, 33
9.15	The user should be able to choose the language for the presentation of subtitles and other text from those available.	22, 33

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Ref.	Description	Table B1-1
9.16	The system should be able to present additional overlaid text/graphics, either application demanded or user-selected (e.g. optional supplementary information for the hearing impaired or lyrics for Karaoke-on-Demand).	7, 16, 32, 33
9.17	The STU should present the user with options for presentation for subtitles, text and graphics (e.g. position, font, size and style).	7, 16, 22, 33
	Parallel Stream material	
9.21	The system should enable the use of content material comprised of linked objects, in which one object may link to two or more objects (e.g. sad/happy ending to a movie).	38
9.22	The system should allow the end-user to select the link utilized at a decision point.	22
9.23	The system should enable the use of multiple related parallel broadcast streams, offering the user the ability to select between these streams.	22
	Games	
9.26	Provide the ability to synchronize STU applications with the audio/video stream	13
	PRESENTATION CONTROL FUNCTIONS	
10.01	A user should be given visual/audio feedback within 250ms whenever a presentation control function is utilized.	22, 45
10.02	The system should permit the user to make hard copy from the application, subject to copyright controls.	46
10.03	The receiving site will contain an appropriate user interaction device able to invoke all functionality	8, 9
10.04	Display normal and widescreen material on either normal or widescreen displays	10, 11, 22
	USAGE DATA FUNCTIONS	
11.01	The system should provide a standard interface to external agencies and systems to permit access to Usage Data for Billing, Service Monitoring and Royalty purposes.	27, 39
11.03	The system should record use of network, Server and content resources.	27, 39, 40
11.04	The system should be able to track use by different users within one customer account (e.g. parents/children).	29, 39, 40
11.06	The system should be able to track the use of Copyright (IPR) material.	40
	Real-time pricing functions	
11.07	The system should enable Service providers to offer flexible charging structures to individual users.	5
11.08	The system should enable a user to be advised of the duration of free viewing time before charging starts.	22
11.09	The system should enable users to cancel viewing within free time, and to precept default action at end of free time.	22
11.10	The user should be able to see the cost of current or just-finished transaction or service.	22
11.11	The system should enable the user to be able to obtain information on the up-to-date credit limit and bill liabilities.	22, 39, 40
11.12	The system should allow a Service provider to obtain information on bill liabilities.	39
	USER PROFILE FUNCTIONS	

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Ref.	Description	Table B1-1
12.01	The system should enable the creation of personal profiles for user(s) that record preferences (e.g. shoe size for applications such as teleshopping).	22, 28, 30, 40
12.02	The system should support portable user profiles (e.g. smart card or central database).	22, 30, 40
	SECURITY FUNCTIONS	
13.01	The system should enable the reporting of distribution and Usage Data to be protected	5, 40
13.02	Security measures applied to content should not negatively impact the delivered quality of the content	1, 6
13.03	Reporting of distribution and Usage Data must be Auditable	40
13.04	All copies (authorized and unauthorized) of content must be traceable	6,
13.05	The system should enable the secure reporting of all instances of delivery , with minimal loss	1, 5, 6, 40
13.06	IPR tracking should be supported at the elemental level (picture, audio, piece of picture or audio)	5, 6
13.07	The availability of the clear digital stream is controllable by the system	1, 6
13.10	Usage Data must be secure	5
13.11	The system must support a hierarchical security approach, such that .a security failure may translate into loss of e.g. 1 frame, 5 minutes, or a large amount	1, 2, 3, 4, 6
13.12	Security measures should not significantly increases latency for e.g. channel up/down	1, 2, 3, 4, 6
13.13	Security should not require multiple formats and/or versions of content for distribution	1, 2, 3, 4
13.14	Meta-data should be subject to security as audio and video content	1
13.15	The system must support Regional blackout	1, 2, 3, 4
13.16	The system should support a degraded digital stream output capability for recording	6
13.17	Unauthorized intrusion should not compromise end-to-end security	1, 2, 3, 4, 5
13.18	Security management should not be complex	1, 2, 3, 4, 5
13.19	All cases of entity authentication must be traceable and auditable	1, 2, 3, 4, 5
13.20	The system should support Irrefutability and non-repudiation functions such that they are usable as legal proof	1, 2, 3, 4, 5
13.21	Data to and from the DAVIC system STU should be protected such that it is secure and private within the DAVIC system	1, 2, 4, 5, 35
13.22	Upgrades to security elements in face of a breach should be easy and quick	1, 4, 6
13.23	Delivery in the face of security failure may be allowed by the Service provider	1, 2, 3, 4
13.24	The system must support secure download of software	5, 43
13.25	Source of security related problems should be readily determinable	1, 5
13.26	Security processes will not impose significant overheads on the DVIC system performance	1, 6, 43

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Ref.	Description	Table B1-1
13.27	Security processes should not cause non-delivery of authorized media	1
13.28	Security processes should be transparent to running (operating) of network	1, 12
13.29	Unauthorized intrusion should not compromise end-to-end security	1
13.30	Multiple scramble/descramble processes are allowed	1, 6
13.31	Scrambling for network security reasons should be allowed	1, 5, 6,
13.32	Access to the Network should be controllable	1, 2, 3, 4, 5
13.33	Media delivery should be controllable based on e.g. rating, time of day, user, etc.	2, 3, 4, 5, 37, 38
13.34	Purchases should be controllable based on e.g. user, credit, existing billings, etc.	5, 39
13.35	All transactions should be secure	1, 2, 3, 4, 5, 39
13.36	Access to profile data should be controllable by user	5, 30
13.37	Usage Data should be anonymous for statistical analyses	40
13.38	Individual user data will be secure	5
13.40	The system will support both subscriber and user authentication	1, 2, 3, 4, 5
13.41	Usage Data reporting should be accurate, auditable	5, 40
13.42	All equipment should allow testing under secure environments for all features (including clear digital stream)	1, 2, 3, 4, 26, 27
13.43	Inclusion of security features should still allow for export	1, 2, 3, 4, 5, 6
13.44	Security should not significantly increase complexity	1, 5, 6, 43
13.45	Manufacturing should minimize requirements for secure facilities	1
13.46	Access to data limited to authorized users only	1, 2, 3, 4, 5, 6, 40
13.49	The DAVIC system should support authentication to and from external support systems	1, 5, 39, 40
13.51	The system should support identification of consumed material	2, 3, 4, 6
13.52	The system should support identification of the IPR holder	6
13.53	The system should support identification of author	6
13.54	The system should support identification of the source/provider of material	6
13.55	Content control and supervision should be authenticatable	1, 2, 3, 4, 5
13.56	Proof/tracing data for Legal proceedings should be authenticatable	1, 2, 3, 4, 5
13.57	Transmission logging data should be secure and authenticatable	1, 5, 38, 40
13.60	Provide plug and play capability for connection to in home digital consumer electronic equipment	44
	FUNCTIONS CONSIDERED TO BELONG TO APPLICATIONS	
	Games applications	
104.01	The system should permit high scores for games to be recorded.	18
104.02	The system should enable a service provider to provide advertisements for new games.	18

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Ref.	Description	Table B1-1
104.03	The system should permit a service provider to record and distribute high scores for games.	18

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Part 2: System dynamics, scenarios and protocol requirements
Part 3: Contours: Technology domain
Part 4: Lower layer protocols and physical interfaces
Part 5: High and mid-layer protocols
Part 6: Information representation
Part 7: Basic security tools
Part 8: Management architecture and protocols
Part 9: Usage information protocols

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Part 4: Delivery system architecture and interfaces
Part 5: Service consumer system architecture
Part 13: Conformance and interoperability

NOTE: Available from http://www.davic.org

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