



DAVIC 1.2 Specification Part 1

Description of DAVIC Functionalities

(Technical Report)

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FOREWORD

DAVIC

The Digital Audio-Visual Council (DAVIC) is a non-profit Association registered in Geneva. Its purpose is to advance the success of emerging digital audio-visual applications and services, initially of the broadcast and interactive type, by the timely availability of internationally-agreed specifications of open interfaces and protocols that maximise interoperability across countries and applications or services. The DAVIC concept of *Digital Audio-Visual Applications and Services* includes all applications and services in which there is a significant digital audio video component.

The goals of DAVIC are to identify, select, augment, develop and obtain the endorsement by formal standards bodies of specifications of interfaces, protocols and architectures of digital audio-visual applications and services. These are realised through the open international collaboration of all players in the field. DAVIC intends to make the results of such activities available to all interested parties on reasonable terms applied uniformly and openly and to contribute the results of its activities to appropriate formal standards bodies.

DAVIC Membership

Membership of DAVIC is open to any corporation or individual firm, partnership, governmental body or international organisation. DAVIC does not restrict membership on the basis of race, colour, sex, religion or national origin. By joining DAVIC each member agrees—both individually and collectively—to adhere to open competition in the development of digital audio-visual products, technology or services. Associate Member status is usually chosen by those entities, mostly government organisations, who do want to be members of the Council without taking an active role in the precise technical content of specifications.

DAVIC Members are not restricted in any way from designing, developing, marketing or procuring digital audio-visual hardware, software, systems, technology or services. Members are not bound to implement or use specific digital audio-visual standards, recommendations or DAVIC specifications by virtue of their participation in DAVIC.

In September 1996, DAVIC had membership of 219 corporations representing more than 20 countries from all over the world and virtually all business communities with a stake in the emerging field of digital audio-visual applications and services.

The DAVIC 1.2 Specification

This Specification has been developed by participating DAVIC members on the basis of DAVIC 1.0 and DAVIC 1.1 and submissions from both members and non-members in response to Calls For Proposals which were issued in October 1994, March 1995, September 1995, December 1995 and March 1996.

The DAVIC 1.2 Specification is a super-set of DAVIC 1.1 and was frozen in June 1996 in the sense that all multiple choices retained in preceding revisions were reduced to just one solution—either by consensus or, where necessary, by a process of voting within a full meeting of the relevant Technical Committee and subsequent formal approval by the DAVIC General Assembly. Choices were then allowed to be reconsidered before the meeting in December 1996 only where inadequacies or inconsistencies could be demonstrated with other parts of the Specification. The Specification has been openly available on the Internet since June 1996 for the purpose of soliciting comments from all interested parties - both members and non-members - on technical issues pertaining to this version. Comments were considered at the scheduled December 1996 meeting in Hong Kong.

This Specification is a public document. Electronic copies of the document can be obtained from the DAVIC Secretariat or from the DAVIC Website.

Intellectual Property Rights

The DAVIC Technical Committees were instructed to provide, to the best of their knowledge, a complete list of all items of Intellectual Property that are needed for implementation of the DAVIC 1.2 Specification. As a result of this process it was recognised that the ability to exploit Intellectual Property Rights (IPR) will be needed to implement some of the technologies selected by DAVIC for this Specification. As a condition for retaining their technologies, owners of IPR items that are required for implementing a part of the DAVIC specification have been asked to produce a statement of their availability and to either give free use of the patented items, or license on fair and reasonable terms and on a non-discriminatory basis following the IEC/ISO/ITU policy on IPR matters.

Information on such IPR items appears in document DAVIC/280, copy of which can be obtained from the DAVIC Secretariat.

In including an external standard or specification, DAVIC assumes the IEC/ISO/ITU IPR policy has been followed by the entity that produced the standard/specification but DAVIC is not in a position to make any expressed or implied guarantee in this regard.

Interoperability tests

DAVIC has requested its Systems Integration and Interoperability Technical Committee to organise interoperability tests of various implementations of its Specification to confirm interworking of the proposed technologies and protocols. A first interoperability event was held in conjunction with the New York Meeting in June 1996. Other events were held in Tokyo in October 1996 and are planned for Europe in 1997. Some results from interoperability tests conducted during the period September 1995 to September 1996 have already been taken into account in the DAVIC 1.2 Specification.

The DAVIC Website

Much more information which is being continually updated, is available on the Internet at the DAVIC Website at URL <http://www.davic.org> . The DAVIC Homepage has a brief outline of *What is DAVIC?* and *Latest News*. There are also hotlinks :-

Introduction to DAVIC Specifications	Membership Information Bulletin Board	Organisation DAVIC's FAQ's
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Membership Information points to membership guidelines and how to join DAVIC, gives a copy of the Statutes and a current list of members.

Bulletin Board provides recent press releases, Calls for Proposals, the DAVIC Workplan and the meeting schedule.

Organisation describes the structure of DAVIC and the people who populate its committees.

Specifications describes the philosophy of DAVIC's work and offers a directory structure from which the Specifications and Calls for Proposals can be downloaded.

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INTRODUCTION

The DAVIC approach to specifications

The figure below is a very general representation of the type of system addressed by DAVIC specifications. It comprises five entities: the Content Provider System, the Service Provider System and the Service Consumer System; connected by two other entities: a CPS-SPS Delivery System connecting the Content Provider System to the Service Provider System, and a SPS-SCS Delivery System connecting the Service Provider System to the Service Consumer System. In principle, DAVIC specifications can address any subsystem in a similar context.

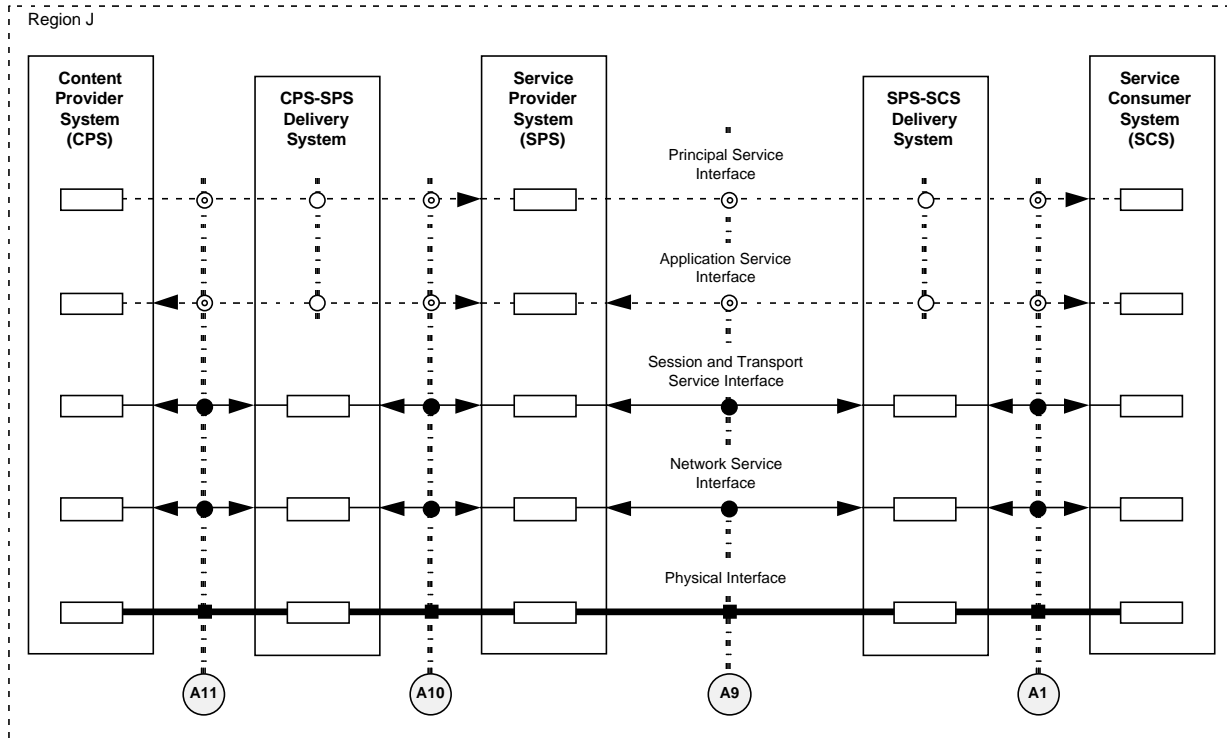


Figure 1. [The general DAVIC system](#)

In the analogue world all these systems were independently defined by groupings of companies (*industries*). This was quite natural because of the lack of flexibility of analogue technologies which favoured a tendency to keep services and applications tightly connected to the specific nature of delivery systems. This fact led to multiplication of devices, particularly in the users’ domain. The flexibility of digital technologies presents a unique possibility to overcome many of these problems and to realise end-to-end interoperability.

The DAVIC 1.2 Specifications have been developed based on the following guidelines.

1. **Openness of the specification process.** Although only DAVIC members are allowed to take part in DAVIC meetings, the specification development process provides total openness at two critical stages: when a request for technologies is issued, and later when specifications have reached sufficient maturity. Anybody is allowed to submit a response to a Call for Proposals, just as anybody is allowed to propose modifications to specifications which are made publicly available for comments. Of course DAVIC reserved the right to accept or reject a proposed technology or modification.
2. **Specification of “tools”.** DAVIC represents one of the most comprehensive systems integration activities ever undertaken. However, its main added value to the industries it serves comes from its focus and singular identification of tools. Typically the process of tool specification is carried out as follows:

- Analysis of target systems
- Breakdown of systems into components
- Identification of common components across systems
- Specification of all necessary components (tools)
- Verification that tools so defined can be used to assemble the target systems.

Therefore DAVIC-specified tools tend to be *non-system-specific* because they have to be usable by different industries in different systems.

3. **Relocation of tools.** Because DAVIC specifications have to satisfy business and service models of multiple industries, DAVIC tools need not only to be usable in a variety of different systems but also in different parts of the same systems. DAVIC defines its tools in such a way that they can be relocated, whenever this relocation is technically possible and practically meaningful.
4. **One functionality—one tool.** Tools should be unique, a principle sometimes hard to enforce, but compliance to this principle gives substantial benefits in terms of interoperability and availability of technology thanks to the easier achievement of a critical mass because of a wider field of applicability of the technology. Sometimes tools can contain normative improvements to specifications that do not affect backwards compatibility.
5. **DAVIC specifies the minimum.** In the case of specifications developed for a particular purpose in general there is no boundary between what is mandatory and what is added to it because it fits well in the particular application. A multi-industry environment like DAVIC can only produce specifications of tools with the minimum of detail that is needed for interoperability.

Nature of DAVIC specifications

DAVIC specifications contain normative and informative parts. Normative parts have to be implemented as in the specifications in order to claim conformity of a subsystem to DAVIC Specifications. Informative parts are included as well for the purpose of clarifying the normative parts of the specifications and to give general assistance to implementors of specifications.

DAVIC specifications contain the reference model of the DAVIC system and its subsystems. DAVIC specifications also define reference points, i.e., points of particular interest in the system. These points have a normative value if they are accessible. Therefore a digital audio-visual subsystem conforms to DAVIC specifications if its accessible reference points do. This means that a subsystem can be considered as a black box and DAVIC specification conformity is only assessed at the external reference points.

DAVIC specifications define the technical *tools* whose use allows the provision of *functionalities* required by the DAVIC system and the applications that make use of it and with grades that determine the level of performance of a given tool, e.g., mono/stereo/multichannel audio, TV-HDTV, bandwidth of a return channel, etc. Definition of tools may also contain normative extensions that do not affect backwards compatibility.

DAVIC specifications are issued in versions: DAVIC 1.0, DAVIC 1.1, DAVIC 1.2, etc. DAVIC 1.0 which was published in January 1996, selected a set of tools for example which allowed specification of a common interface to most forms of network access, and a convergent view of end-to-end (user/user) signalling, including a download protocol. DAVIC 1.0 aimed to support basic applications such as TV distribution, near video on demand, video on demand and simple forms of teleshopping. DAVIC 1.1 added tools to support basic “Internet Compatibility”, the addition of MMDS and LMDS forms of access, network independent STU’s and STU’s which can behave as a Virtual Machine. Each future version will specify different grades of previously defined tools or more tools in addition to previously specified tools.

DAVIC specifications define only one tool per functionality. However, the exact definition and scope of a tool may change with time depending on the evolution of technology. For instance, at the current state of the art the tools for decoding audio or video at bit rates needed for entertainment-quality moving video require dedicated hard-wired processors. However, with the progress of technology it is quite likely that audio or video decoding at those bit rates will be done by generic processors which are easily reconfigurable under software control to decode a broad class of algorithms.

DAVIC specifications define tools in such a way that they can be relocated in different parts of the DAVIC system whenever this is technically feasible.

DAVIC specifications are developed by making use of the best available technologies or combinations thereof and as far as feasible are validated by technical interoperability tests. Because of the toolkit nature of the specifications, however, no claim can be made as to the suitability of DAVIC specifications or of any of its parts for any intended purpose of a user.

As a rule DAVIC specifications are accompanied by documents specifying methods to test the conformity of reference points to the specifications.

Overview of DAVIC 1.2 Specification

The structure of the DAVIC 1.2 Specification begins with applications, which are of course the driving factor for all players in the audio-visual industry. It then defines some essential vocabulary, and provides an initial Systems Reference Model as the basis for understanding and unifying the parts that follow. Two approaches are subsequently developed:

- Functional blocks and interfaces of the three major components of the audio-visual system (Service Provider System, Delivery System, and Service Consumer System) are described. Content creators and service providers are expected to favour this approach.
- A toolbox of: a) high and mid-layer protocol stacks, modulation, coding, and signalling techniques; and b) a set of protocol walk-throughs, or “*Application Notes*”, that rehearse both the steady state and dynamic operation of the system at relevant reference points using specified protocols. Equipment vendors and system designers are expected to find this approach more appropriate to understanding DAVIC specifications.

Two other self-contained parts deal with representation of the audio-visual information and usage information gathering. These parts have more universal relevance to the component documents of the DAVIC 1.2 Specification.

Summary of DAVIC 1.2 Specification parts

<i>Part</i>	<i>Title</i>	<i>Major Sections</i>
Part 1	Description of DAVIC Functionalities (Technical Report)	Functionalities required to support DAVIC Applications Common Requirements of Applications and Services Descriptions of Example Applications
Part 2	System Reference Models and Scenarios (Technical Report)	Abstract System Reference Model DAVIC System Reference Model DAVIC System transaction flow scenarios Annexes : Supplementary definitions, Acronyms and abbreviations, Bibliography, Normative references and Interface examples.
Part 3	Service Provider System Architecture and Interfaces (Technical Report)	Architecture Service Interfaces Service Elements Networked Server Objects Informative Annexes : Conceptual Server Model, Service Provider Instance, Content Provision and VoD Scenario
Part 4	Delivery System Architecture And Interfaces (Technical Report)	The Delivery System Cabled networks Wireless networks Service Architecture Network and service related control Network and service management
Part 5	Service Consumer System Architecture and High Level API (Technical Specification)	Service Consumer System (Informative) STU Reference Points Run-time execution environment Annexes - Examples of DSM-CC file structure for an application, of mapping high level API actions on DSM-CC primitives, and of an OSI NSAP address format
Part 6	Reserved	
Part 7	High and Mid-Layer Protocols (Technical Specification)	S1 Flow : high and mid layer protocols S2 Flow : high and mid layer protocols S3 Flow : high and mid layer protocols S4 Flow : high and mid layer protocols S5 Flow : high and mid layer protocols Common protocols Connection block descriptors and initialisation protocols for A0 STU Dataport Annexes : STU MIB (Management Information Base) and Server MIB

<i>Part</i>	<i>Title</i>	<i>Major Sections</i>
Part 8	Lower-Layer Protocols and Physical Interfaces (Technical Specification)	<p>Tools for digitising the Core network</p> <p>Tools for digitising the Access network :-</p> <ul style="list-style-type: none"> Low speed symmetrical physical layer interface (PHY) on the PSTN Low speed symmetrical PHY on the ISDN Low speed symmetrical PHY on public land mobile networks Long-range baseband asymmetrical PHY on copper Medium-range baseband asymmetrical PHY on copper Short-range baseband asymmetrical PHY on copper and coax Passband unidirectional PHY on coax Passband bi-directional PHY on coax Passband unidirectional PHY on satellite Passband unidirectional PHY on MMDS Passband PHY on LMDS Baseband symmetrical PHY on copper Baseband symmetrical PHY on fiber <p>Network-Interface-Unit to Set-Top-Unit Interface (A0)</p> <p>STU Dataport Interface</p>
Part 9	Information Representation (Technical Specification)	<p>Monomedia components (Character , Text , Language , Service , Telephone Numbers, Compressed & Linear Audio, Compressed Video, Still Pictures, Uncompressed & Compressed Graphics, Compressed Character Data)</p> <p>Monomedia streams</p> <p>Transport of monomedia streams and components</p> <p>Application Format (Interchange Format, MHEG-5 profile , Set of Java API's, and mapping of MHEG Content Classes to monomedia content formats)</p> <p>DAVIC Reference Model for contents decoding</p> <p>Content packaging and Method data</p> <p>Annexes : Coding of linear audio, uncompressed graphics and compressed character data, packetization of monomedia components, stream representation of uncompressed graphics and compressed character data, definition of dsmdcu package, Carriage of private data, Video input format, STU Video decoding capabilities</p>
Part 10	Basic Security for DAVIC	<p>Security tools</p> <ul style="list-style-type: none"> S1 Scrambling S2/S3 Authentication S2/S3 Confidentiality and Integrity S2 Digital Signatures DSM-CC Commands for S1 Security Management Secure Download Parental Control <p>Flows and protocol stacks</p> <p>Security Interfaces :</p> <p>Security Interface CA0</p> <p>Normative Annexes (profiles/contours, Security Interface CA1, Additional resources for the DAVIC CA0 interface, Methodology)</p>

<i>Part</i>	<i>Title</i>	<i>Major Sections</i>
Part 11	Usage Information Protocols (Technical Specification)	Usage information : - Purpose - Telecommunications Management Network (TMN) Usage Data Functions (Usage Data Generation, Accumulation, Validation, Assembly, Formatting, Correlation Support and Collection Administration) Architecture Usage data collection element DAVIC system manager Usage data collection interface Usage data transfer interface
Part 12	Reference Points, Interfaces and Dynamics (Technical Specification)	Requirements for DAVIC Compliant systems Implementation procedure Instance Development Tool DAVIC System dynamic modelling Configuration : Configuration (Boot) STU and Service Provider Configuration Download Specification of the usage of DAVIC protocol tools Annex : Rationale behind the selection of the DAVIC 1.2 specification dynamic systems behaviour
Part 13	Conformance and Interoperability	Testing and verification Testing of systems Testing of technology tools Testing of protocols

How to use this Specification

It may be helpful to briefly indicate how designers of different parts of the audio-visual system might use the DAVIC 1.2 Specification—a kind of route map to implementors in terms of which parts of the Specification are relevant to their task, and how to proceed. Implementors will typically include Content Providers, Service Providers and Network Operators, and Designers or Manufacturers of servers, set-tops and delivery system components.

1. Guidance to Content Creators

Part 9 defines what the user will eventually see and hear and with what quality.

Part 5 outlines the actions that can take place with the tools and the kinds of objects and elements of Part 9.

Part 3 defines how to load an application, once created, onto a server.

Part 1 gives introductory guidance on what kind of applications are supported by DAVIC 1.2 and identifies the functionalities which must be provided.

Part 11 relates to formats for the collection of usage data.

2. Guidance to Service Providers

Part 3 is the principal source of information on server architecture. Part 9 defines how information is presented to end-users. Together, these two parts define the *core* DAVIC services that determine what the user actually sees and hears. Part 3 also gives guidance on the protocols in Part 7, transmitted from the set-top user to the server, used to control the set-up and execution of a selected application.

Usage data collected as defined in Part 11 can be used for billing, and other business-related operations such as customer profile maintenance.

Part 8 specifies the delivery system requirements for the server with relevant information in Part 4.

3. Guidance to implementors of sub-systems

A digital audio-visual subsystem conforms to DAVIC specifications if its accessible reference points do. Purchasers or designers/manufacturers of set-tops, servers, delivery systems, etc., seeking to be sure of, or to claim compliance to the DAVIC 1.2 Specification, can therefore check against the appropriate reference point(s) A1, A4, A9, or A10 defined in Parts 7 and 8.

Instantiations of the protocols specified in Part 12 may also illustrate the detailed conformance required in order that a given sub-system will correctly reflect the characteristics of the rest of the DAVIC system at each relevant reference point.

Parts 5, 3, and 4, respectively, define the requirements for set-top, server and delivery-system architectures, and provide frameworks for the *toolbox* of all protocols listed in Parts 7 and 8.

Description of DAVIC Functionalities

1. Scope

This informative document, Part 1 of [DAVIC 1.2](#) Specifications, describes the functions which may be supported by systems using the DAVIC specifications. These functions have been derived by analysing the requirements of a number of [example applications](#) from the viewpoints of a range of actors, including:

- the [content provider](#)
- the [service provider](#)
- the [delivery system](#) provider
- the end user

This document describes the applications and functions from a behavioural viewpoint, and does not assume any technical implementation for a particular service.

1.1 Document Structure of Part 1

The overall structure of this document is:

Scope (this section)

Outlines the document and the process by which the table of DAVIC functions in [section 6](#) was derived.

Functionalities ([section 6](#))

Lists and defines the functions supported by the DAVIC interfaces, and defines the behaviour and parameters of the functions.

Generic Aspects ([section 7](#))

Describes, for information, generic ‘tools’ which can be implemented with the functionalities listed in [section 6](#), and can be used in a number of applications.

[Example Applications](#) ([section 8](#))

Describes, for information, the detailed behaviour of [example applications](#) which can be implemented with the functionalities described in [section 6](#) and [section 7](#) of this document, as supported by the DAVIC specifications.

1.2 Context of the Functions in the DAVIC Specifications

The functions specified in this document were derived by analysing the requirements of a number of [example applications](#), and the generic requirements common to a range of applications. The functions, defined in [section 6](#), are then supported by the protocols and interfaces defined in the other parts of the DAVIC specifications, as indicated in [figure 2](#) below. There is no intention for DAVIC to specify applications: 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 the DAVIC specifications.

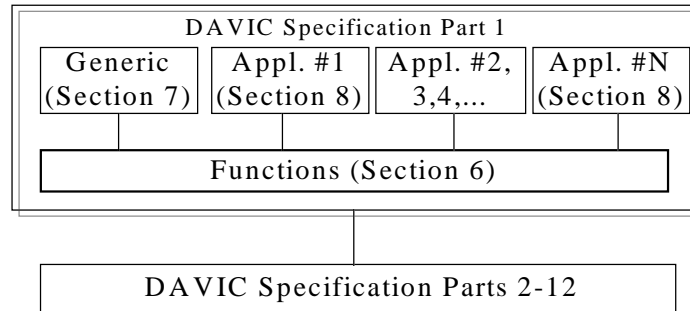


Figure 2.

The behaviour of the first 10 [example applications](#) in [section 8](#) is described in detail, and these provided the focus for deriving the functions in [section 6](#). The remaining applications are described in outline, and will be developed further at a later stage. The applications themselves were all taken from the first, second and third call for proposals to DAVIC, and prioritised during discussions within the Applications Technical Committee.

2. Normative references

The following documents contain provisions which through reference in this text, constitute provisions of this Specification. At the time of publication, the editions indicated were valid. All referenced documents are subject to revision, and parties to agreements based on this Specification are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardisation Bureau (TSB) maintains a list of currently valid ITU-T Recommendations.

There is no normative references in this informative document, Part 1 of the [DAVIC 1.2](#) Specifications.

3. Definitions

This Section defines new terms, and the intended meaning of certain common terms used in this Specification. Part 02 Annex A defines additional terms and, in some cases, alternative interpretations that are appropriate in other contexts. The definitions in the annex were derived from various sources: some are direct quotes, others have been modified.

Supplementary definitions in Part 02 Annex A are not normative and are provided for reference purposes only. (For convenience, copies of the normative definitions below are included in the annex.)

For the purposes of this Specification, the following definitions apply.

access control: Provides means to access services and protection against the unauthorised interception of the services.

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).

Access Node (AN): The element of the [Access Network](#) containing centralised functions responsible for processing [information flows](#) in preparation for transport through the selected [distribution network](#).

Account Access: the on-line access to historical and current account information. For example, this information might include past purchases and associated chosen payment methods for provider accounts, current charges for utility accounts and three-month debits and credits for financial accounts.

application: a set of objects that provides an environment for processing [Application Service Layer information flows](#).

Application Entity (AE): The entity that accepts or generates application services in the Settop Box. The Application Entity will provide the interactive information processing for the consuming device.

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.

Application Service Access Point (ASAP): an interface between a [Principal Service Layer](#) and an [Application Service Layer](#) through which SL1 (server) objects provide services to SL0 (client) objects; (ASAPs are introduced as a distinct interface between [Principal Service Layer](#) and [Application Service Layer](#) objects to allow clear segregation of hierarchical application-client and application-server objects. In the OSI Reference Model, such interfaces are hidden within Application Layer 7.)

Application Service Element (ASE): This entity accepts and transmits application [control-information](#) flows and provides the processing of this information for the [Service Provider System](#).

Application Service Layer (SL1): a collection of associated objects that use or provide an application service to peers and to SL0 client objects, e.g., application control such as audio/video stream playback functions and ISP-provided applications such as LIGW services.

assets: Things that a user sees or hears, e.g., bitmap, audio, text.

Basic Level 1 Gateway (BasicLIGW): This provides direct access to a single [service provider](#) via the connection functionality within the network.

CGI: Common Gateway Interface. CGI allows [HTTP](#) servers on the Internet to execute external programs. [HTTP](#) servers invoke external programs via the Common Gateway Interface by passing arguments in, and receive results from the external program via the same interface.

channel surfing: Viewing of many [broadcast](#) channels in a short time period by the End user.

client: a service consuming object or system (block); (a synonym for user)

conditional access: A means of allowing system users to access only those services that are authorised to them.

confidentiality: the protection of information from unauthorised disclosure

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

Content Service Element: The Content Service Element provides the processing required by the [Service Provider System](#) when content-information is being loaded to the server.

content-information: information that does not alter the state of the object intercepting the [information flow](#), e.g., audio, video, or data in a television program that is processed transparently by a television receiver (the control state of the receiver will not change as a result of such information)

Control Plane (CP): a classification for objects that interact to establish, maintain, and release resources and provide session, transport, and connection control functions that facilitate [transparent information](#) transfers between ISP clients.

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

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.)

Core Network: a portion of the [Delivery System](#) composed of networks, systems, equipment and infrastructures, connecting the [Service Providers](#) to the [Access Networks](#).

NOTE: The term Core Network, in the DAVIC use, is wide sense as it includes the notion of the [access networks](#) that are needed to link the [Service Providers](#) Systems to the core network in strict sense (i.e., exclusive of any [access network](#)). This kind of [access network](#) is not under consideration within DAVIC.

Correlation Key: A component of an event message header that serves as a globally unique identifier for the service session that generated the event. It can be used by the [Event Data Manager](#) to correlate (i.e., associate and collect together) all of the events that have been produced during a service session.

Custom Event Data: [Event Data](#) whose meaning is not specified in this specification. Data of this type is not expressible using any of the Core [Event Data](#) types.

Data Aggregation: the process of summarising usage events

Data Correlation: the association of [Event Data](#) generated by different [DAVIC Elements](#) for the same service usage instance.

Data Distribution: process of sending [Event Data](#) to specific External Support Systems based on pre-established information about the data needed by those systems

Data Formatting: the process of creating a structured representation of the unformatted usage records using a pre-defined format

Data Generation: the process of determining what [Event Data](#) must be measured and recorded, and producing the necessary data.

data integrity: the fact that data are not modified.

data origin authentication: proof that the identity of the source of data received is correct.

DAVIC Element: A component of a DAVIC system. A possible source generator of [Usage Data](#).

Delivery System (DS): The portion of the DAVIC System that enables the transfer of information between DS-users.

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](#).

domain: a scope that delimits (makes clear what is included and what is not) the extent of influence of one object on another. Domain boundaries may represent regulatory, ownership, span-of-control and other influence factors.

downstream: [information flow](#) direction is from an End [Service Provider System](#) to an End Service Consumer System

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.

encryption: a mathematical technique used to ensure the confidentiality of security management information.

End-Service Consumer (ESC): a user, either human or machine, whose primary interaction with the system is through the STU.

End-Service Consumer System (ESCS): A system that (predominantly) consumes information. ESCSs are ISPS and ESPS clients. The ESCS includes the STU and the ESC.

End-Service Provider (ESP): an entity with jurisdiction over a domain that contains a system that (predominantly) provides information to clients

End-Service Provider System (ESPS): a system that (predominantly) provides information to clients. ESPSs are ISP clients and may also be clients of other ESPSs. ESPSs consists of hardware and software sub-systems that use ISP services to provide video and multimedia services to ESCSs.

End-Service Consumer (ESC): a user whose primary interaction with the system is through the STU.

Enhanced Level 1 Gateway (EnhancedL1GW): This provides the first-point-of-connection for the customer to the service environment. It supplies the customer with the top level navigation information, allowing a choice of multiple [service gateways](#) or [service providers](#).

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.

Entitlement Management Message (EMM): [conditional access](#) messages used to convey entitlements or keys to users, or to invalidate or delete entitlements or keys.

Event Data: Data relating to events and usage of resources, typically needed for financial transactions involving end service consumers, network providers, end [service providers](#) and [content providers](#). This data is collected from the system by an [Event Data Manager](#) and made available at the External Transfer Interface.

Event Data Collection Element: A portion of each [DAVIC Element](#) which aggregates internal usage events that occur within the [DAVIC Element](#) and then produces Event Messages which it transmits over the [Event Data Interface](#) to the [Event Data Manager](#).

Event Data File: A collection of [Event Data Records](#) sent by an [Event Data Manager](#) to an External Support System over the Bulk External Transfer Interface.

Event Data Functions: The functions that the [Event Data Collection Element](#) and the [Event Data Manager](#) perform on [Event Data](#). These functions are [Data Generation](#), [Data Aggregation](#), [Data Formatting](#), [Data Correlation](#), and [Data Distribution](#).

Event Data Interface: The interface between a [DAVIC Element](#) and the Event Data Manager. This interface supports: (1) registration by the [DAVIC Elements](#) with the Event Data Manager, and (2) the delivery of [Event Data](#) to the Event Data Manager.

Event Data Manager: A DAVIC system component that supports the [Event Data Interface](#) and the External Transfer interface. It accepts [Registration Messages](#) and Event Data Messages over the [Event Data Interface](#). For received [Event Data](#), it performs the [Event Data Functions](#) of [Data Formatting](#), [Data Correlation](#), and [Data Distribution](#).

Event Data Message: A message containing [Event Data](#) sent to report a usage event of a registered event type.

Event Data Record: A set of associated [Event Data](#). These records are sent in transactional messages and files from an [Event Data Manager](#) to an External Support System over the External Transfer Interface.

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

function: Features of a Digital Audio Visual System that are realised through Services. For example, interactive play control (VCR-type controls) is a function. (see also Service)

Gopher: File and information retrieval system that presents distributed documents and directories on the Internet in an integrated manner to the user. Gopher clients are typically text based information retrieval tools.

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

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.

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.

Hypertext: Hypertext is text which 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.

information flow: the transfer of information from an information-source-object to an information-destination-object.

information flow entities: The Information Flow Entities define the various types of information that pass through the DSRM. These flows encompass the User, Control and [Management plane](#) functions defined in the abstract system reference model. (S1-S5).

Interactive External Transfer Interface: The portion of the External Transfer Interface used for transactional transfer of [Event Data Records](#).

inter layer interface: an interface between a subordinate and superior [service layer](#)

interface: a point of demarcation between two blocks through which [information flows](#) from one block to the other. See logical and physical interface definitions for further details. A DAVIC interface may be physical-interface or a logical-interface.

interface definition: Interface definitions are the detailed physical definitions used to define the method of interaction between system entities. These definitions are provided for the various [reference points](#). A finite set of interfaces may exist at each particular [reference point](#).

interface image: a [logical interface](#) through which [transparent information](#) flows from one block to another; the characteristics of the interface image are defined at another [reference point](#)

Intermediate-Service Provider (ISP): ISPs provide adjunct services and convey information among ESPs and ESCs.

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.

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

layer: a collection of objects of the same hierarchical rank

layer management: a set of objects in a given [service layer](#) that establish and control what services are provided by servers to what users on any plane in the [service layer](#)

layer service: functions provided by a layer to a layer above through a [Service Access Point](#)

Level 1 Gateway (L1GW): see [Basic Level 1 Gateway](#) and [Enhanced Level 1 Gateway](#)

Level 2 Gateway (L2GW): provides components offering navigational services allowing choice of [service providers](#) and listings of services provided.

logical information flow path: a sequence of information transfers from an initial information source object to a terminal information destination object either directly or through intermediate objects; different [physical information flow paths](#) may be associated with a logical information flow path segment or with the entire path in different implementations.

logical interface: an interface where the semantic, syntactic, and symbolic attributes of [information flows](#) is defined. Logical interfaces do not define the physical properties of signals used to represent the information. A logical interface can be an internal or external interface. It is defined by a set of [information flows](#) and associated protocol stacks.

Management Entity: The Management Entity is responsible for the operation and maintenance functions of a network. Several instances of [information flow S5](#) exist for the Management entity.

Management Plane (MP): a plane that contains those interfaces and functions which support interactions which may be typified as being temporally disjoint from an off-hook interaction. Interactions among Management Plane objects may also occur concurrently with an off-hook interaction.

management-information: information exchanged by [Management Plane](#) objects; may be [content-information](#) or [control-information](#).

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.

network: a collection of interconnected elements that provides connection services to users

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.

Network Interface Unit (NIU): The NIU accepts network specific [content-information](#) flows from the [Delivery System](#) and provides a non-network specific interface to the Connectivity Entity in the STU. (additional definitions of the NIU may exist)

Network Related Control: The Network Related Control entity provides control functions for network configuration, connection establishment and termination and information routing in a network instance of a [Delivery System](#).

Network Service Access Point (NSAP): an interface between SL2 Session and Transport [Service Layer](#) and SL3 Network Service Layer objects through which the SL3 (server) objects provide services to the SL2 (client) objects

Network Service Layer (SL3): a collection of objects that enable client objects to communicate with remote peers: SL3 objects provide basic lower-layer network services such as addressing/routing, connection services, and physical [layer services](#) to SL2 clients

Network Termination (NT): the element of the [Access Network](#) performing the connection between the infrastructure owned by the [Access Network](#) operator and the Service Consumer System (ownership decoupling). The NT can be passive or active, transparent or not.

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.

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

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

peer-entity authentication: the proof that an entity has the claimed identity.

physical information flow path: a channel or a sequence of channels that constitutes a real or virtual connection between an information source object and an information destination object.

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.

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 authorise 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.

port: an abstraction used by transport protocols to distinguish among multiple destinations associated with particular applications running on a host computer: an application can specify the ports it wants to use; some ports are reserved for standard applications/services such as e-mail (also known as well-known ports).

primitive: an abstract interaction between a user of a [layer service](#) and the provider of a [layer service](#); four basic primitive types are commonly used: (service-) request, indication, response, and confirmation

principal service: the top service class of peer objects interacting in some defined context.

Principal Service Layer (SL0): a collection of associated objects that interact with peers to use or provide [principal service](#), e.g., sending or receiving and presenting [content-information](#) such as movies, music, or stock market data to the end information users (human or machine); SL0 objects rely on services provided by SL1 objects.

privacy: privacy protects authorised participants from illegal utilisation or knowledge of information related to their components in the DAVIC System

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)

provider: an object that interacts with clients or users.

randomisation: the process of removing auto-correlation from a signal, i.e. white noise spectrum shaping at the transmitter side to ease symbol or bit timing recovery at the receiver side.

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.

Real-time Payment: the determination of the payment method desired by the end service consumer and the access to corresponding account information, if any.

Real-time Pricing: the determination of the price of a service soon after a pre-defined event occurs, for example an end service consumers request for information about a service or the conclusion of a service usage instance.

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.

Registration Message: A message used to register to send (for a [DAVIC Element](#)) or receive (for an External Support System) [Event Data](#).

S1: [content-information](#) flow, from a source to a destination object on the [User Plane](#) of any [service layer](#).

S2: [control-information](#) flow from a source to a destination object on the [Control Plane](#) of the [Application Service Layer](#) (SL1).

S3: [control-information](#) flow from a source to a destination object on the [Control Plane](#) of the Session and Transport [Service Layer](#) (SL2)

S4: [control-information](#) flow from a source to a destination object on the [Control Plane](#) of the [Network Service Layer](#) (SL3).

S5: [management-information](#) flow from a source to a destination object on the [Management Plane](#) of the container object: the objects may be peers ([service layer](#) is known), or the [service layer](#) may be unspecified.

scrambling: The process of making a signal unintelligible at the transmission point in order that it can only be received if an appropriate descrambling system is in place at the point of reception. Scrambling can be applied to audio, video or data signals

SDL (CCITT Specification and Description Language): a formal language providing a set of constructs for the specification of the behaviour of a system.

SDL/GR: the graphical representation in SDL. The grammar for SDL/GR is defined by the concrete graphical grammar and the common textual grammar.

security auditing: A security audit trail, or log, is data collected and potentially used to facilitate a security audit. A security audit is an independent review and examination of system records and activities in order to test for adequacy of system controls, to ensure compliance with established policy and operational procedures, to detect breaches in security, and to recommend any indicated changes in control, policy and procedures.

server: any service providing system.

Service Access Point (SAP): an interface between two [service layers](#) through which the higher layer may access services provided by the lower layer.

Service Data: Data, such as prices and account (e.g., credit card) numbers, needed dynamically by [DAVIC Elements](#) or External Support Systems. This data is required or provided by an end service consumer during the billing-related part of a service session (e.g., when the price of a service is being provided, when the end service consumer chooses a method of payment) and, therefore, must be delivered promptly through the [Service Data Interface](#).

Service Data Functions: The functions implemented by External Support Systems and offered to [DAVIC Elements](#) through the Service Data Interface. These functions include [Real-time Pricing](#), [Spending Control](#), [Real-time Payment](#) and [Account Access](#).

Service Data Interface: A transactional interface between [DAVIC Elements](#) and External Support Systems used by [DAVIC Elements](#) and External Support Systems to promptly deliver [Service Data](#).

Service Data Message: A message containing [Service Data](#) sent over the [Service Data Interface](#).

Service Gateway (SGW): an element of the service domain through which a client can browse available services; also a mechanism for a client to obtain an object reference (message connection) to an instance of a service.

service layer: a set of service objects of the same hierarchical rank

service object: an object characterised in terms of the services it uses or provides, and not in terms of the physical attributes: different real systems may use or provide identical services.

Service Provider: an entity that provides a service to a client.

Service Provider System (SPS): a general reference to a CP, ESP, ISP, or ESC system.

Service Related Control: an entity that provides all control functions for the services that are offered by a network instance of the [Delivery System](#). The DSRM allows for SL0, SL1 and SL2 Service Related Control subsets.

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.

Session and Transport Service Layer (SL2): a collection of objects that interact to establish and maintain an environment for local or remote application-layer services; client of network services when remote services are used or provided: SL2 objects provide session services over reliable transport to SL1 clients.

Session Control Function: This entity, in a [Service Provider System](#), is responsible for establishing and terminating the environment in which an application will operate. This environment includes the quality of service requirements for both the application and product entities.

Session Service Access Point (SSAP): an interface between an [Application Service Layer](#) and a Sessions and Transport [Service Layer](#) through which SL2 (server) objects provide services to SL1 (client) objects

session services: provide basic functions to create, modify, maintain, and teardown sessions (negotiate and allocate network resources)

signal: an instance of a defined signal type representing information meaningful to a process instance

signal route: indicates the flow of signals between a process type and either another process type in the same block or the channels connected to the block

socket: communications transport API that provides applications interprocess communication services using the underlying services provided by TCP/IP; the API allows an application to open a socket, request delivery services, and bind the socket to the desired destination and then send or receive data

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 behaviour. Specification may also be used as a shorthand for specification and/or description, e.g., in SDL specification or system specification.

Spending Control: the monitoring of spending during and across service usage instances, and the indication that a budget limit or credit limit has been reached.

Stream Service Element: This [Service Provider System](#) entity allows for the processing of the [content-information](#) flows at the stream level. The content stream is a sub-set of the actual [content-information](#) flow and processing at the stream level allow the ability to uniquely align a service offering.

symbol: a bit or a defined sequence of bits.

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)

System Entity: The main DSRM System Entities are the [Service Provider System](#) (SPS), [Delivery System](#) (DS), and Set Top Unit (STU).

Telecommunications Management Network (TMN): A telecommunications management network provides the means used to transport and process information related to the management functions for telecommunication network. (ITU-T Rec. M.60)

telecommunication service: That which is offered by an Administration to its customers in order to satisfy a specific telecommunication requirement. (ITU-T Recs. I.112, M.60, Q.9)

Telnet: Application providing a direct connection from one computer to a another computer. The first computer behaves as a terminal of the host. All process are executed on the host computer.

Time Division Multiple Access (TDMA): method to access a shared transmission medium where time is divided into slots and the nodes connected to the medium are synchronised by assigning each one of them one or more specific time slots to transmit

trading conditions: commercial or contractual terms which, for instance, may be negotiated between a [Content Provider](#) and a [Service Provider](#)

transparent information: information that is not significant semantically to an object used to transport the information

upstream: [information flow](#) direction is from an ESC System to an ESP System.

Usage Data: [Event Data](#) and/or [Service Data](#).

Usage Data Interface: The [Event Data Interface](#), the [Service Data Interface](#) and/or the External Transfer Interface. The main subject of this part of the specification.

user: a service consuming object or system

User Plane (UP): A classification for objects whose principal function is to provide transfer of (end) user information: user information may be user-to-user content (e.g., a movie), or private user-to-user data.

Value-Added Service Provider (VASP): This provider offers, for example, a Video-on-Demand Service to the end user. Within the Systems Reference Model this is the ESP.

virtual channel: communication channel that provides for the sequential unidirectional transport of ATM cells

WAIS: Wide Area Information Search. WAIS is a network service for database browsing using specific search criteria. Requests must be made to a given WAIS server and the response consists of a list of documents and references to other WAIS servers.

World Wide Web: The WWW consists of a collection of servers on the Internet, which through a common communication protocol (**HTTP**), appear as a large distributed collection of information. Originally intended to regroup capabilities of gopher and **WAIS** and to extend them, it is now thought of as a network containing **HTML** documents that are accessed by a specific tool called a Web browser.

4. Acronyms and abbreviations

Part 2 Annex A, B and C contain a complete set of acronyms and abbreviations used throughout the **DAVIC 1.2**. Specification. The following acronyms and abbreviations are used in this Specification:

NOTE: For convenience, copies of the normative acronyms and abbreviations listed in section **Error! Reference source not found.** are included below.

AAL	ATM Adaptation Layer
AC	Access Control
ACSE	Application Control Service Element
ACU	Access Control Unit
ADSL	Asymmetric Digital Subscriber Line
AE	Application Entity
AFI	Authority and Format Identifier
AIFF	Audio Interchange File Format
AII	Active Input Interface
AIS	Alarm Indication Signal
AN	Access Network
AN	Access Node (this is the interpretation within DAVIC)
ANSI	American National Standards Institute
ANT	Active Network Termination
API	Application Programming Interface
AOI	Active Output Interface
ASAP	Application(-Service-Layer) Service Access Point
ASCII	American Standard Code for Information Exchange
ASE	Application Service Element
ASN.1	Abstract Syntax Notation 1
ASRM	Abstract System Reference Model
ATM	Asynchronous Transfer Mode
AWG	American Wire Gauge
BasicL1GW	Basic Level 1 Gateway
BCC	Bearer Channel Connection

BER	Bit Error Ratio
BER	Basic Encoding Rules (re.: ASN.1)
B-ETI	Bulk External Transfer Interface
bslbf	bit string left bit first
CA	Conditional Access
CAP	Carrierless Amplitude and Phase modulation
CATV	Cable TeleVision
CATV	Community Antenna TeleVision
CBD	Connection Block Descriptor
CCIR	Comite Consultatif International de la Radiodiffusion
CCITT	Comité Consultatif International Telegraphique et Telephonique
CGM	Computer Graphics Metafile
CLNP	Connectionless Network Protocol
CLP	Cell Loss Priority
CLUT	Colour LookUp Table
CMB	CRC Message Block
CMIP	Common Management Information Protocol
CMISE	Common Management Information Service Element
CN	Core Network
CORBA	Common Object Request Broker Architecture
CP	Common Part
CP	Control Plane
CPS	Content Provider System
CRC	Cyclic Redundancy Check
CRM	Connection Resource Manager
CW	Control Word
DFP	Downstream Frame Period
DIS	Draft International Standard
DLL	Data Link Layer
DS	Delivery System
DS	Descrambling
DS	Downstream
DSA	Digital Signature Algorithm
DSRM	DAVIC System Reference Model
DSM-CC	Digital Storage Media - Command and Control
DSM-CC U-N	DSM-CC User-Network
DSM-CC U-U	DSM-CC User-User
DSS	Digital Signature Standard
DTS	Decoding Time Stamp
DVB	Digital Video Broadcasting
DVB-SI	DVB - Service Information
ECM	Entitlement Control Message
EDCE	Event Data Collection Element
EDI	Event Data Interface
EDM	Event Data Manager
EL-FEXT	Equal Level - Far End Cross Talk
EnhancedL1GW	Enhanced Level 1 Gateway
EMM	Entitlement Management Message
EPG	Electronic Program Guide
ESC	End Service Consumer

ESCS	End-Service Consumer System
ESF	Extended SuperFrame
ESI	End System Identifier
ESIGN	Efficient digital SIGNature scheme for smart cards
ESP	End Service Provider
ESPS	End-Service Provider System
ESS	External Support System
ETI	External Transfer Interface
ETS(I)	European Telecommunications Standard(s Institute)
FEC	Forward Error Correction
FEXT	Far End Cross Talk
FFS	For Further Study
FIFO	First In First Out
FTP	File Transfer Protocol
FTTB	Fiber to the Building
FTTC	Fiber to the Curb
FTTH	Fiber to the Home
GIOP	Generic Inter-ORB Protocol
GPS	Global Positioning System
HDTV	High Definition Television
HEC	Header Error Control
HFC	Hybrid Fiber Coax
HMSC	Human Machine Service Consumer
HO-DSP	High Order - Domain Specific Part
HRM	High Reliability Marker
HTML	HyperText Markup Language
ID	Identification
IDL	Interface Definition Language
IEC	International Electrotechnical Commision
IETF	Internet Engineering Task Force
I-ETI	Interactive External Transfer Interface
I2C	Inter-Integrated Circuit
IIOP	Internet Inter-ORB Protocol
ILMI	Interim Local Management Interface
IMA	Interactive Multimedia Association
IOP	Inter-ORB Protocol
IP	Internet Protocol
IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
ISO	International Standardization Organization
ISP	Intermediate Service Provider
ITU	International Telecommunications Union
IWU	Interworking Unit
JBIG	Joint Bi-level Image Group
JPEG	Joint Photographic Experts Group
KOD	Karaoke-On-Demand
L1GW	Level 1 Gateway
L2GW	Level 2 Gateway ,
LAN	Local Area Network
LAPB	Link Access Procedure Balanced

LAPD	Link Access Procedure D-Channel
LE	Local Exchange
LFSR	Linear Feedback Shift Register
LMDS	Local Microwave Distribution System
LSB	Least Significant Bit
MAC	Medium Access Control
Mbps	Megabits per second
MHEG	Multimedia and Hypermedia information coding Experts Group
MIB	Management Information Base
MIME	Multimedia Internet Mail Extensions
MMDS	Multi-channel Microwave Distribution System
MOD	Movies-On-Demand
MP	Management Plane
MPEG	Moving Picture Experts Group
MPEG-TS	MPEG Transport Stream
MSB	Most Significant Bit
MUX	Multiplex
NIF	Network Interface Function
N-ISDN	Narrowband ISDN
NIU	Network Interface Unit
NMS	Network Management System
NNI	Network Node Interface
NOD	Network Ownership Decoupling
NPT	Normal Play Time
NRC	Network Related Control
NRSS	National Renewable Security Standard committee
NRZ	Non-Return to Zero
NSAP	Network Service Access Point
NT	Network Termination
NTSC	National Television Systems Committee
NVOD	Near Video-On-Demand (Also N-VOD)
NW	Network
OAM	Operation Administration and Maintenance
OAM&P	Operations, Administration, Maintenance and Planning
OMG	Object Management Group
OMG-CDR	Object Management Group - Common Data Representation
OMG-UNO	Object Management Group - Universal Networked Object
ONC	Open Network Computing
ONU	Optical Network Unit
ORB	Object Request Broker
OS	Operating System
OSB	Output Signal Balance
OSI	Open Systems Interconnection (Reference Model)
PC	Personal Computer
PCMCIA	Personal Computer Memory Card International Association
PCR	Program Clock Reference
PDH	Plesiochronous Digital Hierarchy
PES	Packetized Elementary Stream
PG	Parental Guidance
PHY	Physical Layer

PID	Packet Identifier
PID	Program Identification
PIN	Personal Identification Number
PKP	Public Key Partner
PM	Phase Modulation
PMD	Physical Medium Dependent
PMT	Program Map Table
PN	Program Number (MPEG-2)
PON	Passive Optical Network
POST	Power On Self Test
POTS	Plain Old Telephone System
PPM	Pulses Per Million
PPP	Point-to-Point Protocol
PPV	Pay-Per-View
PRBS	Pseudo Random Binary Sequence
PSI	Program Specific Information (MPEG-2)
PSK	Phase Shift Keying
PSTN	Public Switched Telephone Network
PTI	Payload Type Identifier
PTS	Presentation Time Stamp
PVC	Permanent Virtual Channel
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
QPSK	Quaternary Phase Shift Keying (Quadrature?)
RDM	Reference Decoder Model
RF	Radio Frequency
RGB	Red Green Blue
RL	Return Loss
ROSE	Remote Operation Service Element
RPC	Remote Procedure Call
RS	Reed-Solomon
RSA	Rivest Shamir Adleman
RTE	RunTime Engine
SAAL	Signaling ATM Adaptation Layer
SAP	Service Access Point
SC	Scrambling
SCS	Service Consumer System
SDIE	Service Data Interaction Element
SDH	Synchronous Digital Hierarchy
SDL	Specification and Description Language
SDL/GR	The Graphical Representation in SDL
SDU	Service Data Unit
SEL	Selector
SFP	SuperFrame Period
SFSC	SuperFrame Synchronization Control
SGW	Service Gateway
SI	Service Information
SK	Secret Key
SL0	Principal Service Layer identifier
SL1	Application Service Layer identifier

SL2	Session and Transport Service Layer identifier
SL3	Network Service Layer identifier
SL-ESF	Signaling Link Extended SuperFrame
SM	Security Management
SMATV	Satellite Master Antenna TeleVision
SMPTE	Society of Motion Picture and Television Engineers
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
SPIFF	Still Picture Image File Format
SPS	Service Provider System
SPv	Service Provider
SRC	Service Related Control
SRP	Security Reference Point
SSAP	Session Service Access Point
SSCF	Service Specific Coordination Function
SSCOP	Service Specific Connection Oriented Protocol
STB	Set-Top Box
STP	Shielded Twisted Pair
STS	Satellite Transmission System
STU	Set-Top Unit
SVC	Switched Virtual Channel
SUS	Service User System
TBD	To be defined
TC	Transmission Convergence
TCP	Transmission Control Protocol
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
TIFF	Tag Image File Format
TMN	Telecommunication Management Network
TS	Transport Stream
TSB	Telecommunication Standardization Bureau
T-STD	Transport System Target Decoder
TTD	Transmission Technology Decoupling
TV	Television
UD	User Data
UDP	User Datagram Protocol
uimsbf	unsigned integer most significant bit first
UNI	User-Network Interface
UNO	Universal Networked Object
UP	User Plane
UPI	User Premises Interface
US	Upstream
UTC	Universal Coordinated Time
UTP	Unshielded Twisted Pair
VASP	Value-Added Service Provider
VC	Virtual Channel
VCI	Virtual Channel Identifier
VCR	Video Cassette Recorder
VDSL	Very high speed Digital Subscriber Line
VOD	Video-On-Demand

VP	Virtual Path
VPI	Virtual Path Identifier
VPCI	Virtual Path Connection Identifier

5. Conventions

The style of this Specification follows the general guidelines of ISO/IEC 0001 : 1993: Information Technology Rules For Presentation of ITU-T | ISO/IEC Common Text.

Divisions and subdivisions are all in this document referenced to as a "Section" with its number. The terms clause, subclause and paragraphs will be introduced in a later revision.

Other parts of the DAVIC Specifications is called "Part" with its number.

6. Functionalities required to support DAVIC Applications

6.1 Core Functionalities

DAVIC compliant systems are intended to facilitate the introduction of a wide variety of applications. These applications will consume system resources and have functionality which is spread across a number of DAVIC subsystems. Examples of applications are given in [section 8](#). These applications have both common and specific functionality. Future applications will require the definition of additional and new functions.

However, it is possible to identify core DAVIC functions which 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, Programme Selection & Choice](#)
- [Application Launch](#)
- [Media Synchronisation Links](#)
- [Application Control](#)
- [Presentation Control](#)
- [Usage Data](#)
- [User Profile](#)

These are depicted in [Fig. 6.1](#) below, which depicts the interrelationship of the core functional groups and running applications.

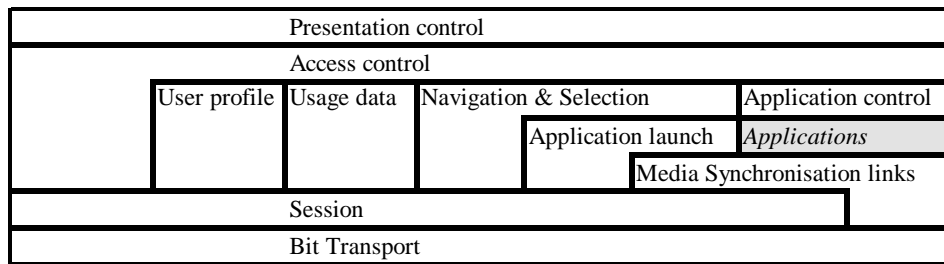


Figure 6.1: Core Functional groups

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 to be “core” if it cannot be synthesised from other “core” functions. If the function can be synthesised then it is an application-specific function.

6.1.1 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.

6.1.2 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.

6.1.3 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.

6.1.4 Navigation, Programme Selection & Choice

This group of functions provide 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 behaviour, 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.

6.1.5 Application Launch

This group of functions provide 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.

6.1.6 Media Synchronisation 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 synchronise language dubbed audio.

6.1.7 Application Control

This group of functions provide 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 behaviour 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.

6.1.8 Presentation Control

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.

6.1.9 Usage Data

This is a group of functions which 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 utilisation.

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 socio-economic information about audiences.

Payment for services may be from a wide 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 copyright 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.

6.1.10 User Profile

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

Demographic, socio-economic and geographic information will also be stored and used to provide statistics (not individual [usage data](#)) to service and [content providers](#).

6.2 Function Decomposition Table

The following table lists functionalities anticipated for a fully defined DAVIC system. In the table, a separate column indicates functions that are required for DAVIC 1.1 applications. Other functions are shown, and will be addressed in future versions of the DAVIC specification.

Ref.	Description	1.1
	<i>CONTENT LOADING FUNCTIONS</i>	
1.01	The system must support the delivery of content material from the Content Provider to the Service Provider via physical media.	Y
1.02	The system must support the delivery of content material from the Content Provider to Service Provider via an electronic link.	Y
1.03	The system must enable the Service Provider to request content from the Content Provider.	Y
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.	Y
1.05	The system must support the delivery of content from the Content Provider to Service Provider as separate, distinguishable content item elements.	Y
1.06	Content item elements on the Service Provider 's system may be replaced with new versions.	Y
1.07	Additional content item elements may be added on the Service Provider 's system.	Y
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.	Y
1.09	The Service Provider must be able to extract mixed content item elements from a package into constituent content items.	Y
1.10	Each content item element must identify the item to which it relates (e.g. Content Item 12579). This is to be a identifier unique to the instance of that content item for the Service Provider and Content Provider , common to all its elements.	Y

Ref.	Description	1.1
1.11	Each content item element must identify which element of the item it is (e.g. Trailer #1).	Y
1.12	Each content item element must describe the type of element it is (e.g. MPEG 2 MP @ ML).	Y
1.13	Each content item element must identify its version number (e.g. #3).	Y
1.14	The Content Provider must be able to authenticate the identity of the Service Provider.	Y
1.15	The Service Provider must be able to authenticate the identity of the Content Provider.	Y
1.16	Transfer of material between a Content Provider and Service Provider should have the possibility of being secure, using encryption or other techniques.	Y
1.17	Transfer of material between a Content Provider and a Service Provider should be accomplished in a manner which may not be repudiated.	Y
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.	Y
1.19	The system must support the delivery of content material in non real-time from the Content Provider to the Service Providern (<i>Definition of real-time may be required</i>)	Y
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. (<i>Definition of real-time may be required</i>)	Y
1.21	The flow of content material in real-time may be initiated by the Content Provider.	Y
1.22	The flow of content material in real-time may be initiated by the Service Provider or User.	Y
1.23	It must be possible for a Content Provider to automatically load content item elements into a Service Provider's system.	Y
1.24	It must be possible for a Content Provider to delete content item elements from a Service Provider's system.	Y
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.	Y
1.26	It must be possible for Content Management Data stored on the Service Provider's system to grant or deny User access to content material.	Y
1.27	It must be possible for Content Management Data stored on the Service Provider's system to employ embargo dates/times to deny and grant access to content material.	Y
1.28	It must be possible for Content Management Data stored on the Service Provider's system to cause the content to be automatically deleted at a prescribed date and time.	Y
1.29	It must be possible for embargo and deletion dates/times to be set differently in different areas.	Y
1.30	It must be possible for Content Management Data to include copyright information.	Y
1.31	It must be possible for Content Management Data to include the rights to alter the material.	Y
1.32	It must be possible for Content Management Data to include the rights to distribute the material.	Y
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).	Y

Ref.	Description	1.1
1.34	One or more content item elements must be able to carry Navigation Data, enabling End Users to locate content.	Y
1.35	It must be possible for Content Navigation Data to carry a content label for unique identification of the content item.	Y
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).	Y
<u>BIT TRANSPORT FUNCTIONS</u>		
2.01	The system should provide connection from the Service Provider to the STU at a specified bit-rate.	Y
2.02	The system should provide transmission means from the STU to the Service Provider at a specified bit-rate.	Y
2.03	The system should enable transmission of bit-stream from the Service Provider to a single STU destination (Unicasting).	Y
2.04	The system should enable simultaneous transmission of bit-stream from Service Provider to selected multiple STU destinations (Multicasting).	Y
2.05	The system should enable simultaneous transmission of bit-stream from Service Provider to all STU destinations (Broadcasting).	Y
2.06	The system should provide a return channel from each STU to the Service Provider.	Y
2.07	The system should provide a broadcast control channel from the Service Provider to all STUs.	Y
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	Y
2.09	The system should provide a dedicated control channel from the Service Provider to each STU.	Y
2.10	The system should enable the transportation of application program code from the Service Provider to the STU.	Y
2.11	The system should enable the transportation of programme content (audio, video, text, graphics etc.) and data from the Service Provider to the STU.	Y
2.12	The system should enable the transportation of programme service information (Station Identification, descriptive material about programme content etc.)	Y
2.13	The transport link should provide error -resilience.	Y
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.	Y
<u>NETWORK MANAGEMENT FUNCTIONS</u>		

Ref.	Description	1.1
3.01	The system should facilitate the Operation, Administration, Maintenance & Provisioning functions required by Network Providers.	
3.02	The system should signal faults and failures to Service Providers and Network Providers, and facilitate rapid recovery under such failure conditions.	
	<u>SESSION FUNCTIONS</u>	
	<i>General</i>	
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).	Y
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.	Y
4.04	Each application should be able to establish a communications session.	Y
4.05	Each application should be able to establish two or more simultaneous communications sessions.	Y
4.06	The application should be able to transfer a session to another STU in the same location (for example to transfer a programme 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 programme to a unit in another home).	
4.08	The application should be able to terminate a session in an orderly fashion.	Y
4.09	The application should be able to reserve a session in advance.	Y
4.10	The application should be able to cancel a communications session which has been reserved in advance.	Y
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.	Y
4.12	The application should be able to provide a range of choices of audio, video, textual and graphical quality and definition.	Y
4.13	An application should be able to dynamically change the quality of audio, video, text and graphics of an existing session during operation.	Y
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.	Y
4.15	An application should be able to establish new sessions during its operation.	
	<i>Session types</i>	
4.16	A user should be able to suspend an active session.	Y
4.17	A user should be able to resume a suspended session.	Y
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 programme content or to run other applications).	Y
4.19	A user should be able to cancel a suspended session.	Y
4.20	It should be possible for a suspended session to be cancelled automatically after a timeout.	Y

Ref.	Description	1.1
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.	
	<i>Content aspects of sessions</i>	
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.	Y
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.	Y
4.29	The system should be able to transfer still picture material.	Y
4.30	The system should be able to transfer a text description of audio-visual material.	Y
4.31	The system should be able to transfer audio-description of audio-visual material	Y
4.32	The system should be able to transfer audio material	Y
4.33	The system should be able to transfer text material	Y
4.34	The system should be able to transfer motion audio-video material	Y
4.35	The system should be able to transfer graphics material	Y
4.36	The STU should be able to store transferred material for future display/use.	Y
	<u>ACCESS CONTROL FUNCTIONS</u>	
	<i>General</i>	
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 unauthorised access to the network.	
5.04	The system should provide means to prevent unauthorised access to Service Provider by STUs.	
5.05	The system should provide means to prevent unauthorised access to the STU.	
5.06	The system should provide means to prevent unauthorised 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 authorise 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 utilise a user's identity to select a particular User Profile.	

Ref.	Description	1.1
5.14	The system should provide the means by which a customer account may cover several users, each to be separately identified with a different service level (for example parents / children).	
5.15	Each customer account may cover 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	Even when authorised, users should be able to control and block 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.	
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.	
	<i>IPR aspects</i>	
5.25	The system should provide means to control access to copyright material (applications, programme 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 authorised.	
5.29	The Service Provider should be able to bar 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).	
	<i>Authorisation</i>	
5.30	The system should provide means to enable the user to authorise the supply of Service Provider -delivered services (applications, VoD etc.).	
5.31	The system should provide means to enable a user to authorise the supply of goods and services.	
5.32	The system should provide means to enable a user to authorise 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).	
	<i>NAVIGATION FUNCTIONS</i>	

Ref.	Description	1.1
	<i>General</i>	
6.01	Set-top units should offer a start-up function to allow user to make initial choice of service or application.	Y
6.02	Set-top units should offer other menus as a result of subsequent user command or system response.	Y
6.03	The system should offer equally easy access to the full range of available Service Providers.	Y
6.04	The system should permit a Service Provider to present a range of services and products to the user.	Y
6.05	The system should permit the user to create and maintain a list of favourite places (Services Providers and Services frequently used).	Y
6.06	The user should be able to find/choose/select an application using a navigation system.	Y
6.07	The user should be able to find/choose/select a content item using a navigation system.	Y
6.08	The user should be able to find/choose/select a product/service using a navigation system.	Y
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.	Y
6.14	Navigation systems should offer each Service Provider the opportunity to create an individual "look and feel" to the services.	Y
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.	Y
6.16	Navigation systems should be able to display a single screen image which comprises a "mosaic" of still or moving pictures.	Y
6.17	Navigation systems should be able to display a multitude of independent image objects as a "mosaic" of still or moving pictures.	Y
6.18	Navigation systems should be able to display options for selection as a menu of textual items.	Y
6.19	Navigation systems should be able to recognise that a selection has been made, and which item from the available options has been selected.	Y
6.20	Navigation systems should be able to trigger the launch of the selected item.	Y
6.21	Navigation systems should be able to employ intelligent agents to optimise the choices presented to the user.	
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.	Y
	<i>AV programme aspects</i>	

Ref.	Description	1.1
6.23	The system should support the use of Electronic Programme Guides for current and future events.	Y
6.24	The system should enable the use of Electronic Programme Guides to plan programme content selection.	Y
6.25	The system should permit personally tailored Electronic Guides to be produced and used.	
6.26	The system should permit the user to select a content element for immediate consumption using an Electronic Programme Guide.	Y
6.27	The system should permit the user to select a content element for future consumption using an Electronic Programme Guide.	Y
6.28	Electronic Programme Guides may be user driven by date/ time/ source/ programme type etc.	Y
6.29	Electronic Programme Guides may present information as text, graphics, audio or video.	Y
6.30	Electronic Programme Guides should support the categorisation of material by programme-type (e.g. Sports).	Y
6.31	Electronic Programme Guides should support the inclusion of additional information (e.g. cast lists).	Y
6.32	The system should include means to allow Content Providers to supply information to support Electronic Programme Guides.	Y
6.33	Electronic Programme Guides should permit content presentation format and resolution to be described.	Y
6.34	Electronic Programme Guides should permit the use of a customised filter to prevent display of unwanted material.	Y
6.35	Electronic Programme Guides should permit users to select content material by rating.	Y
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).	Y
6.39	The system should enable a user to review lists of content items booked in advance.	Y
6.40	The system should enable a user to cancel a content element item booked in advance.	Y
6.41	The system should enable a user to express a desired delivery time for material.	Y
6.42	User should be able to build and manage a "play list" of material to be delivered in a given sequence.	Y
6.43	The system should permit the user to browse through any audio-visual clips.	Y
6.44	The system, when NVoD content viewing has been paused, should enable the display of the time remaining before viewing may recommence.	Y
6.45	The system should facilitate the display of lists on multiple pages.	Y
	<u>APPLICATION LAUNCH</u>	
	<i>General</i>	
7.01	The system should support applications which run on the STU, the Service Provider , or both.	Y

Ref.	Description	1.1
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.	Y
7.04	The system should provide the means to select and download platform-independent application programs to the STU (e.g. Java classes)	Y
7.05	The system should provide the means to select and download platform-dependent application programs (outside the scope of DAVIC) to the STU.	Y
7.06	The system should enable an STU-specific application program (outside the scope of DAVIC) to be launched on the STU.	Y
7.07	The system should enable the STU to automatically identify and preload channels and services available on cable, satellite and terrestrial networks.	Y
	<u>MEDIA SYNCHRONISATION LINK FUNCTIONS</u>	
8.01	The system should enable media components which may be delivered and stored separately to be presented in a synchronised manner.	Y
8.02	The system should enable text and graphics to be scrolled on the screen within a defined window size.	Y
8.03	The system should enable text and graphics windows to be repositioned during the programme.	Y
8.04	The system should enable text and graphics displays to be transparent or coloured as defined by the programme content.	Y
8.05	The system should provide the means to cue user activity (e.g. a moving cursor, a bouncing ball, or a moving colour change).	Y
8.06	The system should enable the transfer and subsequent synchronisation of media components.	Y
8.07	The system should permit insertion points to be defined within content to enable sequential media components to be synchronised (e.g. advertisements).	Y
8.08	The system should enable the sequential components inserted at the synchronisation points to change.	Y
8.09	The system should enable one application to launch another (e.g. advertisements providing links to Home Shopping).	Y
8.10	The system should provide the means by which users may be linked in real time to a general broadcast message.	Y
8.11	The system should allow linkages to general broadcast messages to be regionally focused.	Y
8.12	The system should allow links to be bookmarked for later access.	Y
8.13	The system should permit applications residing on one Server to operate on content items residing on different Servers.	Y
8.14	An application running on one STU should be able to communicate with, and synchronise with, a related application running on a different STU.	
	<u>APPLICATION CONTROL FUNCTIONS</u>	
9.01	A user should be given visual/audio feedback within 250ms whenever an application control function is utilised.	Y
9.02	The STU should provide at least a defined set of user-activated command "keys" (e.g. on a remote control, keyboard etc.).	Y

Ref.	Description	1.1
9.03	The STU should provide direct selection of any "broadcast" channel within 300ms.	Y
	<i>Functions operating on Linear Material</i>	
9.04	The user should be able to start and stop the presentation of the material.	Y
9.05	The user should be able to pause (with frame freeze) and resume the presentation of the material.	Y
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.	Y
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.	Y
9.09	The user should be able to view the material at speeds slower than normal play speed.	Y
9.10	The user should be able to view the material (forwards and backwards) at speeds higher than normal play speed.	Y
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.	Y
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.	Y
	<i>Programme presentation functions for linear material.</i>	
9.13	The user should be able to choose the language for the audio presentation from those available.	Y
9.14	The user should be able to choose whether the material is presented with subtitles overlaid on the picture.	Y
9.15	The user should be able to choose the language for the presentation of subtitles and other text from those available.	Y
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).	Y
9.17	The STU should present the user with options for presentation for subtitles, text and graphics (e.g. position, font, size and style).	Y
	<i>Indexing functions</i>	
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 programme material.	
9.19	The system should enable the user to return to a known point of interruption (or just before).	Y
9.20	The system should enable the user to be able to place "bookmarks" at any point in the material.	Y
	<i>Parallel Stream material</i>	
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).	Y
9.22	The system should allow the end-user to select the link utilised at a decision point.	Y
9.23	The system should enable the use of multiple related parallel broadcast streams, offering the user the ability to select between these streams.	Y
	<i>Games</i>	
9.24	The STU should provide action controls (e.g. left/right, up/down, select).	Y

Ref.	Description	1.1
9.25	The STU should provide these facilities for two simultaneous players on the same STU.	Y
	<u>PRESENTATION CONTROL FUNCTIONS</u>	
10.01	A user should be given visual/audio feedback within 250ms whenever a presentation control function is utilised.	Y
10.02	The system should permit the user to make hard copy from the application, subject to copyright controls.	
	<u>USAGE DATA FUNCTIONS</u>	
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.	Y
11.02	The system should record user interaction (e.g. use of pause, the position at which viewing of material stopped).	Y
11.03	The system should record use of network, Server and content resources.	Y
11.04	The system should be able to track use by different users within one customer account (e.g. parents/children).	Y
11.05	The system should be able to track use by terminal/location as well as by individual (e.g. usage away from home).	Y
11.06	The system should be able to track the use of Copyright (IPR) material.	Y
	<u>Real-time pricing functions</u>	
11.07	The system should enable Service Providers to offer flexible charging structures to individual users.	Y
11.08	The system should enable a user to be advised of the duration of free viewing time before charging starts.	Y
11.09	The system should enable users to cancel viewing within free time, and to precept default action at end of free time.	Y
11.10	The user should be able to see the cost of current or just-finished transaction or service.	Y
11.11	The system should enable the user to be able to obtain information on the up-to-date credit limit and bill liabilities.	Y
11.12	The system should allow a Service Provider to obtain information on bill liabilities.	Y
	<u>USER PROFILE FUNCTIONS</u>	
12.01	The system should enable the creation of personal profiles for user(s) which record preferences (e.g. shoe size for applications such as teleshopping).	Y
12.02	The system should support portable user profiles (e.g. smart card or central database)..	Y
	<u>SECURITY FUNCTIONS</u>	
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 (authorised and unauthorised) of content must be traceable	
13.05	All instances of delivery should be securely reported, with minimal loss	

Ref.	Description	1.1
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 authorised for release	
13.09	All instances of delivery must be securely reportable with minimal loss	
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 increase 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 the same level of 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	Unauthorised 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 authorised media	
13.28	Security processes should be transparent to running (operating) of network	
13.29	Unauthorised 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	

Ref.	Description	1.1
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 minimise requirements for secure facilities	
13.46	Access to data limited to authorised 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'	
	<i>INTERNET ACCESS FUNCTIONS</i>	
14.01	The system must provide the capability to download data from the Internet.	Y
14.02	The system must provide the capability to upload data to the Internet.	Y
14.03	The system must provide the capability to transport various data formats from the user to an Internet host.	Y
14.04	The system may be used to provide access to the Internet from a PC connected to a data port on the STU.	Y
14.05	The system must provide access to a Domain Name Service to allow conversion of domain names to IP addresses.	Y
14.06	The system shall allow a user to navigate through all information on the WWW using hypertext links.	Y
14.07	The system shall allow the user to submit a search query in order to locate specific information on the Internet.	Y
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).	Y
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.	Y
14.10	The system must provide the capability to cache Internet data locally to reduce access time.	Y
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).	Y
14.12	The system should support Internet applications with different IP addresses.	Y

Ref.	Description	1.1
14.13	The system should support Internet applications independent of the protocols used by the network to set up the connection.	Y
14.14	The system should support applications which are independent of the connection / session set-up (or initiation) and management.	Y
14.15	Each Internet application should support a different IP address from each other.	Y
14.16	The system should support full Internet access by the STU as defined in section 8.18.1	Y
14.17	The system should enable bi-directional exchange of information, being control/signalling or content.	Y
14.18	The system should support hybrid services (e.g. Internet session simultaneously with DAVIC session).	Y
14.19	The system should provide the content in a data format compatible with the Internet applications.	Y
14.20	The system should enable each application to have and reserve a different QoS.	Y
	<i>FUNCTIONS CONSIDERED TO BELONG TO APPLICATIONS</i>	
	<i>Mail applications</i>	
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 mail boxes.	
101.05	The system should permit mail boxes 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).	

Ref.	Description	1.1
101.21	The system should enable the communication between on-line diaries to book a conference session or physical meeting.	
	<u>Gateway application</u>	
102.01	The user should be able to use the system to access on-line services	
	<u>Teleshopping applications</u>	
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.	
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, and 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.	
	<u>Games applications</u>	
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.	

7. Common Requirements of Applications and Services

Section 7 defines a set of functions which apply to all applications which may be deployed on a DAVIC system.

Section 7.1 describes functions of navigation and interaction. These functions provide capabilities to find and select content and to control playback and presentation of this content. Section 7.2 describes common functions for **service and content management**. The next section, 7.3, describes functions concerning the IPR and **security functions** a DAVIC system must provide. The last section, 7.4,

describes the general aspects on the DAVIC environment. These include functions concerning interoperability, portability and latency.

7.1 Navigation and Interaction

7.1.1 Navigation

7.1.1.1 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 utilise structured meta-data describing the content from the providers.

7.1.1.2 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, customisation, 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 programme 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. programme) for:
 - immediate consumption
 - future consumption
 - review of list of advance-booked elements
 - cancellation of advance-booked elements

Specific navigation requirements which 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 surfing](#) 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.

7.1.2 Interactive Play Control

7.1.2.1 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.

7.1.2.2 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.

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..

7.1.2.3 Constraints

- The response time associated with the Interactive Play Control has to be fast (comparable with VCR).

7.1.3 Multimedia Interactive Presentation

7.1.3.1 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 synchronised way. The synchronisation 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).

7.1.3.2 Functions

- Synchronised 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.

7.1.3.3 Constraints

- Synchronisation of the media presentation must meet the specified requirements;
 - in complex cases, the various media which have to be synchronised may be stored separately and possibly delivered through different links (e.g. Karaoke-On-Demand).
- Ability to offer the media elements (video, audio,) 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.

7.1.4 User interface

7.1.4.1 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, graphics) and interaction structures which compose the User Interface.

7.1.4.2 Functions

- User customisation 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.

7.1.4.3 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.
- 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 is.
- 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 the STU is. 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.

7.2 Service and Content Management

7.2.1 Billing / Charging / Trading

This section (Billing/Charging/Trading) of DAVIC Specifications, Part 1, gives an overview of the different tasks to be considered.

In Part 11, of DAVIC Specifications, [Usage Data](#), this area is covered in detail!

7.2.1.1 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](#) (who may use the network to load their servers, e.g.).

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 behaviour (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 intends to standardise methods (incl. 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 standardised 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.

7.2.1.2 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
- 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

7.2.1.3 Constraints

Intellectual Property Rights (IPR) constraints must be regarded.

7.2.2 Content Loading

7.2.2.1 Introduction

In the DAVIC reference model 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 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:

- programme title
- programme description
- still picture
- promotional a/v segments; and
- final programme 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 which 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 example of such information would be the terms of sale to the [Service Provider](#) - price, number of showings etc., and embargo restrictions.

7.2.2.2 Content and Control Flows

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

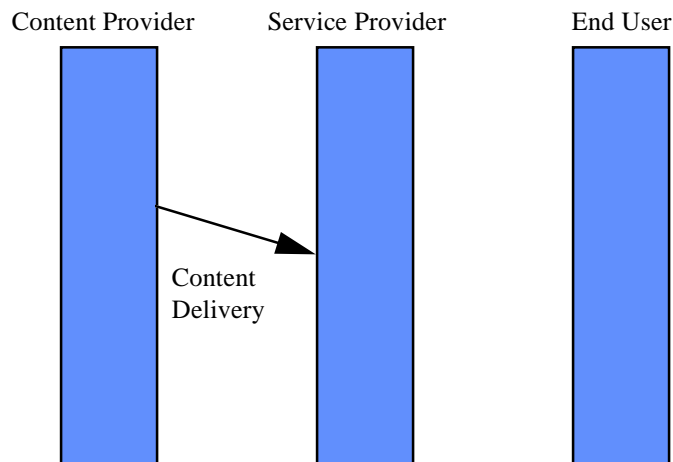


Figure 7.1: Content delivery, Content Provider to Service Provider

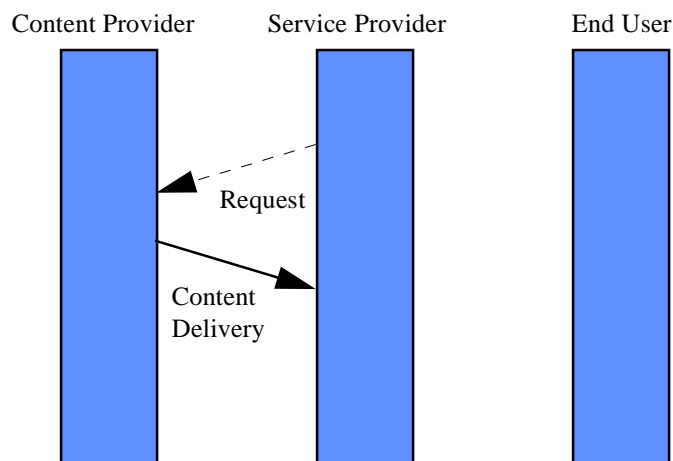


Figure 7.2: Delivery of content on request from Service Provider

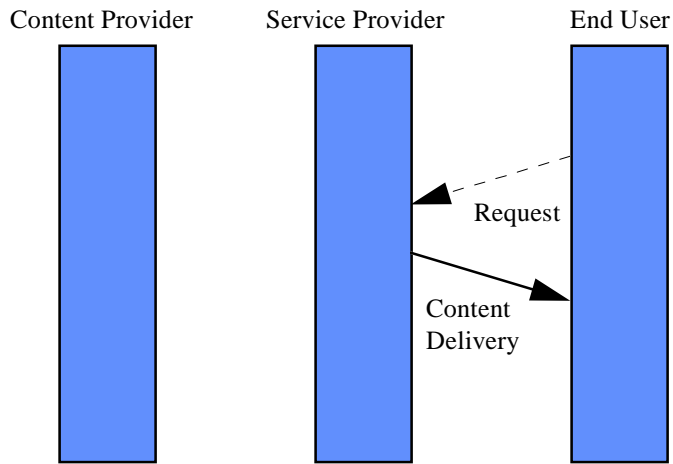


Figure 7.3: Onward delivery of content from Service Provider to User

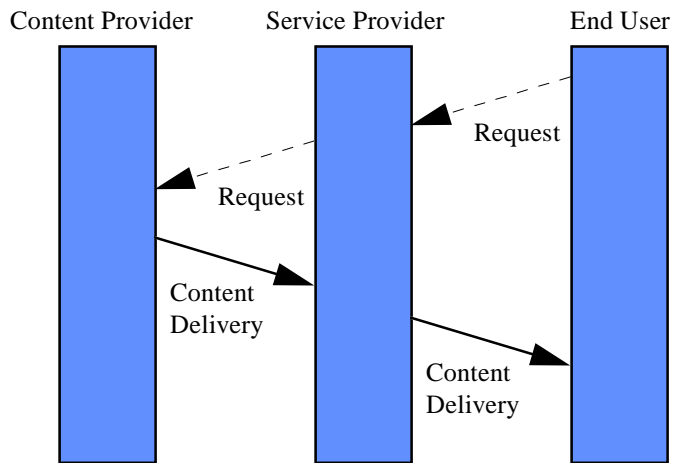


Figure 7.4: Delivery from Content Provider to Service Provider on request by User

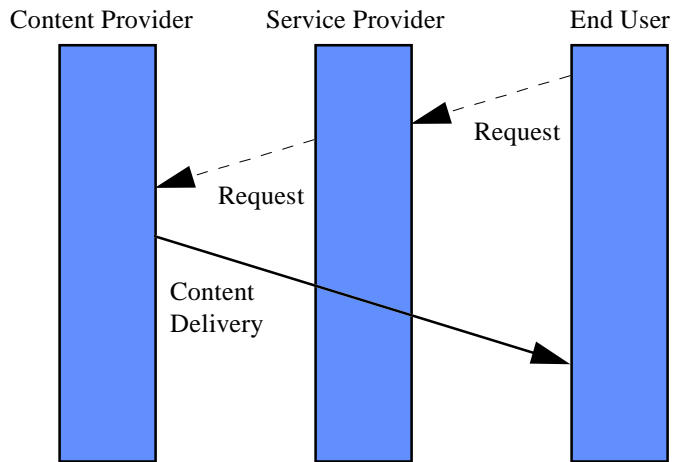


Figure 7.5: Content stream supplied to User from Content Provider via Service Provider

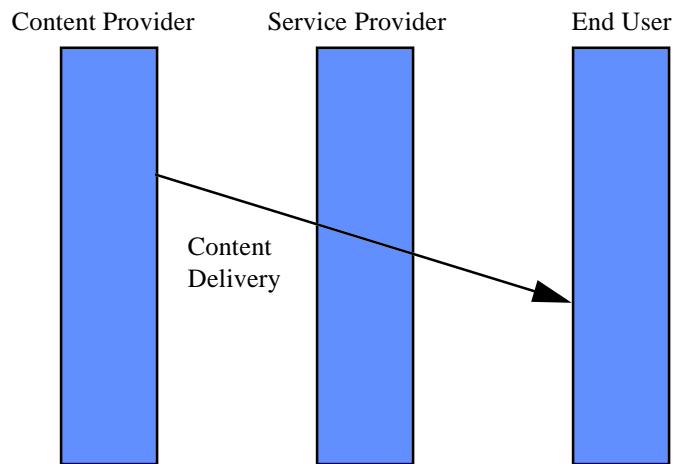


Figure 7.6: Content delivery to User via Service Provider

7.2.2.3 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 world-wide, 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 which comprise a television programme. Firstly, the programme 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 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](#).

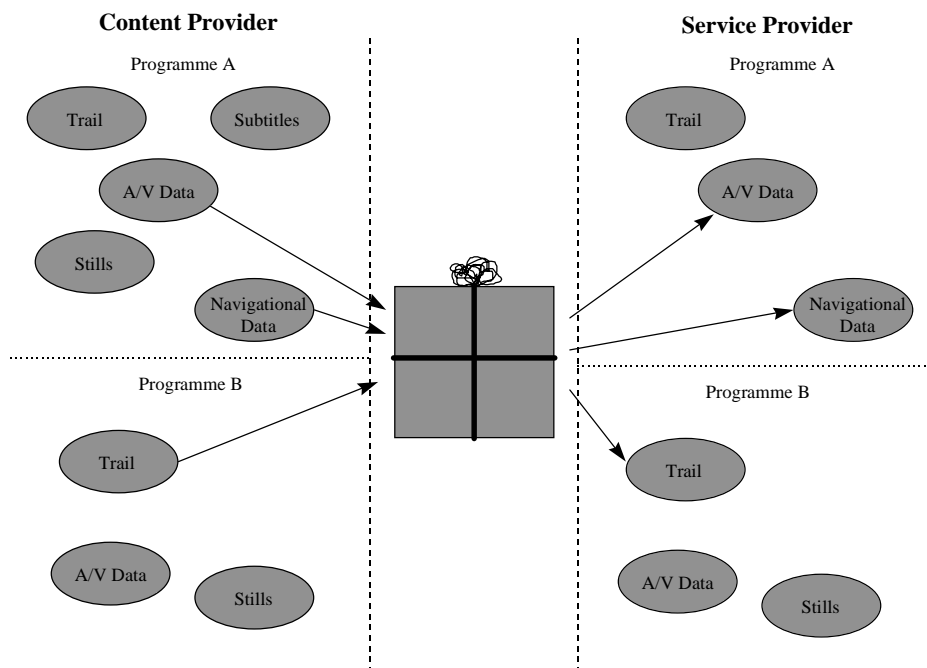


Figure 7.7: Packaging of Content Item Elements

- 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 figs. 5,6.

7.2.2.4 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.

- 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 a 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).

7.2.2.5 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 world-wide for each an every piece of published audio-visual material. This label, which must accompany each and 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 the purpose of 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.

7.2.2.6 Links

In order to characterise the content loading process it is necessary to consider the nature of the links which may be utilised, 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 programme 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:

- 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 realised 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 realise these functions, and will still be required even if a “pulled” system is to be realised using exchangeable media.

7.2.3 Exception Procedures

7.2.3.1 Definition

The functions required to indicate and recover from failure conditions.

7.2.3.2 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 which will need to be regionally broadcasted.
- A piracy detection alert may be required.

7.2.4 Commercial Insertion

7.2.4.1 Definition

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

7.2.4.2 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 programme), and payment system.
- The commercial content may be located on a different server from the content requested by the user.

7.2.5 Session Management

7.2.5.1 Definition

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

7.2.5.2 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 programme
- 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 programmes.
- Account control for billing may be by user, instead of by terminal location

7.2.6 Polling

7.2.6.1 Definition

Collection of information made with the purpose of:

- Producing statistics about Service usage
- Collecting audience responses.

7.2.6.2 Functions

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

7.2.6.3 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 organised and presented.

7.2.7 Multiple Access to content

7.2.7.1 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.

7.2.7.2 Functions

Basic

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

- 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.

7.2.8 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 authorised participants.

7.3 IPR and Security

7.3.1 Introduction and General Requirements for Security

(Part 10 of this document contains details of the Security specifications.)

Following are some general requirements that are applied to all the security tools. They are not prioritised:

- 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
- Security will not cause non-delivery of authorised 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)

7.3.2 Viewpoints for Security Requirements

The Security Functionalities matrix has been derived from two sources - Part 1 of DAVIC [1.1](#) (noted as “from Applications”), or from one of the following viewpoints:

- IPR Holder
- Content
- [Service Provider](#)
- Network Provider
- End User
- Equipment Manufacturer
- External BSS
- Financial Transactors
- Rights Collection Agency
- Regulatory Folk

- Legal Monitors

7.3.3 Security Category Definitions

The following are the Security Categories.

	Function	Description
1	Conditional Access	A means of allowing system users to access only those services that are authorised 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 Integrity	The detection of unauthorised 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 authorised participants from unauthorised utilisation 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 unauthorised 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.

7.4 General aspects on environment

7.4.1 Interoperability

7.4.1.1 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.

7.4.1.2 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.

7.4.1.3 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

7.4.2 Platform Independence

7.4.2.1 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.

7.4.2.2 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 or 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.

7.4.3 Latency

7.4.3.1 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.

7.4.3.2 Latency Budget

The requirements for 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 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 recommendations 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.

7.4.3.3 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](#)

7.4.3.4 Comments

- IR recognition and interpretation delay needs to be included in user input.
- Resynchronisation of the analogue TV signal may or may not be a factor, depending on the design of the MPEG decoder.
- The resynchronisation time of a switched MPEG-2 stream, with unsynchronised 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.

8. Descriptions of Example Applications

The 19 DAVIC core applications have been described briefly and then been prioritised. The applications given high priority is specified in detail in the following text. (That is section 8.1 up to and including 8.8). For the other applications only the description is presented (8.9 - 8.19).

The functions needed by these Applications have already been presented in the Table in section 6.

This section 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.

Note: Digital Audio-visual mail functionality is currently badly missing. Non of the currently identified Core Applications necessarily need this functionality, although it is useful in some. However, DAVIC recognises the need for future digital audio-visual systems to be able to receive multimedia data, even when not explicitly solicited. DAVIC will draw up specification for such functionality in the next version of this baseline document.

8.1 Movies on Demand

8.1.1 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 on Demand', 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.

8.1.2 Base Specification

8.1.2.1 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 or not 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).
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).

8.1.2.2 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.

8.1.2.3 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. Categorise content for selection.

8.1.2.4 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.

8.1.3 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.

8.1.4 Extensions

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

8.2 Teleshopping

8.2.1 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 which 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 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

8.2.2 Base Specification

8.2.2.1 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. Authorise payment / purchase of goods
11. Enquire about and alter previous purchase (orders) including requesting exchange / return authorisation
12. Being able to make a hard copy
13. Reserve products/services
14. Select payment method

8.2.2.2 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
5. Keep an intermediate list of acquired items

8.2.2.3 Content Provider Functions

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

8.2.2.4 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).

8.2.3 Characteristics

Teleshopping can be implemented in a wide range of complexity, however, for the purpose of this paper, the more complex implementation will be described.

- 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.

8.2.4 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

8.3 Broadcast

8.3.1 Description

Broadcasting is a 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](#). Programmes can comprise real-time video, audio, text and data streams from which the user can select a programme for immediate access. Beyond that, programmes 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 flow](#) via a narrow back channel. Thus the user can be

enabled to participate in a programme or get control over a programme or parts of it. User inputs to [games](#), polls and elections can possibly alter the content of the broadcasting programme.

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

8.3.2 Base Specification

8.3.2.1 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 programme, e.g. different camera positions or alternative outcomes of a movie
9. To personalise their selection of services, for example through easy connection to preferred services, pre-selection of favourite services and applications, and personal filtering

8.3.2.2 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](#)
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 programme parts

8.3.2.3 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

8.3.2.4 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](#) programmes
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

8.3.3 Characteristics

1. Large uni-directional 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

8.3.4 Extensions

Some addressing mechanism could enable point-to-point links using [broadcast](#) channel ([conditional access](#)).

8.4 Near Video on Demand

8.4.1 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 Programme 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.

8.4.2 Base Specification

8.4.2.1 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 authorisation, [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)

8.4.2.2 Service Provider Functions

The [Service Provider](#) may define values for the following times which 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.
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.

8.4.2.3 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](#))

8.4.2.4 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 authorisation

8.4.3 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

8.5 Delayed Broadcast

8.5.1 Description

[Delayed Broadcast](#) is a specific broadcasting application where the [Service Provider](#) or the end user selects a scheduled [broadcast](#) programme 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-programmes 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.

8.5.2 Base Specification

8.5.2.1 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.

8.5.2.2 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 procedures. Signalling downstream when recording failed.
6. Content presentation. Play and send.
7. Ad (commercial) insertion. Could be distributed with geographical differences.

8.5.2.3 Content Provider Functions

1. Content presentation. Digitising, coding and compressing content which is broadcasted with some sort of label attached.
2. Indexing, "Tagging" of the digitised content. I.e. marking up the parts within a TV-programme in a way that the end users navigation system recognise and is able to utilise.

8.5.2.4 Network provider functions

1. Exception procedures. Signalling 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.

8.5.3 Characteristics

1. [Delayed Broadcast](#) could be implemented by means of a central broadcaster which digitises, codes and compress programs and distributes them over a network to local video servers.
2. There is a need for a broad-band downstream channel from the [content provider\(s\)](#) to the local server(s).

3. There is also a need for one broad-band channel from the local video server to the end users equipment.
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 providers](#) registered-and-allowed-user database and the now-and-in-the-future-available-programs database is a distributed database with relevant data residing on the local server.

8.5.4 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)

8.6 Games

8.6.1 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 specialised 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](#), characterised 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.

8.6.2 Base Specification

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

8.6.2.2 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 synchronised.

8.6.2.3 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

8.6.2.4 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 procedures - recovery from network errors

8.6.3 Characteristics

1. ms 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

8.6.4 Extensions

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

8.7 Telework

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

8.7.1 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.

8.7.2 Base Specification

8.7.2.1 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 synchronised)- only with pointer control- with full control (scrolling, sizing, moving) (synchronised)

9. Jointly edit shared application- Send/accept edit request(s) - Synchronise 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 services](#)
14. Receive mail announcements
15. Receive mail
16. Read bulletin board

8.7.2.2 Service Provider Functions

1. Provide directory service
2. Provide 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. Synchronise 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 services](#) and on-line services
13. Mail announcement to end user

8.7.2.3 Content Provider Functions

8.7.2.4 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 services](#) and on-line services

8.7.3 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. Synchronisation of shared application and pointers at low response time (if applied)synchronisation with token holder synchronisation with latest changes.

8.7.4 Extensions

Telework multipoint-to-multipoint

- 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.

8.8 Karaoke on Demand

8.8.1 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 synchronised. 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.

8.8.2 Base specification

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

8.8.2.1 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/synchronisation mechanism that is stricter than for **Movies on Demand**

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)

8.8.2.2 Service Provider functions

See [Movies on Demand](#).

8.8.2.3 Content Provider functions

See [Movies on Demand](#). [Content provider](#) has to allow separate access to the different data streams, notably audio streams.

8.8.2.4 Network provider functions

See [Movies on Demand](#).

8.8.3 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 .

8.8.4 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)

8.9 Internet Access

8.9.1 Description

The scope of this section is to specify full [Internet access](#) by a DAVIC STU. Access is meant to be the following: the STU will have 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 in general; that is to say, the STU does not have to be able to behave as a server to other entities on the Internet.

This section 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.

8.9.2 Base Specification

8.9.2.1 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.
3. Navigate through all information on the WWW using [hypertext](#) links.
4. Search for specific information.
5. Send and receive email.

8.9.2.2 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.)

8.9.2.3 Content Provider Functions

Internet [Content Providers](#) are outside the scope of DAVIC.

8.9.2.4 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.

8.9.3 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).

8.9.4 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](#))

Note! The 19 DAVIC core applications have been described briefly and then been prioritised. The applications given high priority has been specified in detail in this text. (That was in section 8.1 up to and including 8.9). For the other applications only a brief description is presented (8.10 - 8.19).

8.10 News on Demand

8.10.1 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 ‘Personalised News’.

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These two extensions combined give an application that can be called 'Personalised News'.

8.11 TV Listings

8.11.1 Description

Once the TV-listings is 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.

8.12 Distance learning

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

8.12.1 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 functionalities 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.

8.13 Videotelephony

8.13.1 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.

8.14 Home Banking

8.14.1 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 counsellor (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.

8.15 Telemedicine

8.15.1 Description

Similar to the combination of VOD, Multimedia information retrieval application and [videoconferencing](#) application. X-ray images (annotated) may be retrieved by the end user or distributed by the end user to other 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](#).

8.16 Content Production

8.16.1 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.

8.17 Transaction Services

8.17.1 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.

8.18 Videoconferencing

8.18.1 Description

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). [Videoconferencing](#) provides a real time bi-directional exchange of audio, video, and data information between multiple users.

8.19 Virtual CD-ROM

8.19.1 Description

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

(Note: this is a service that supports many applications.)