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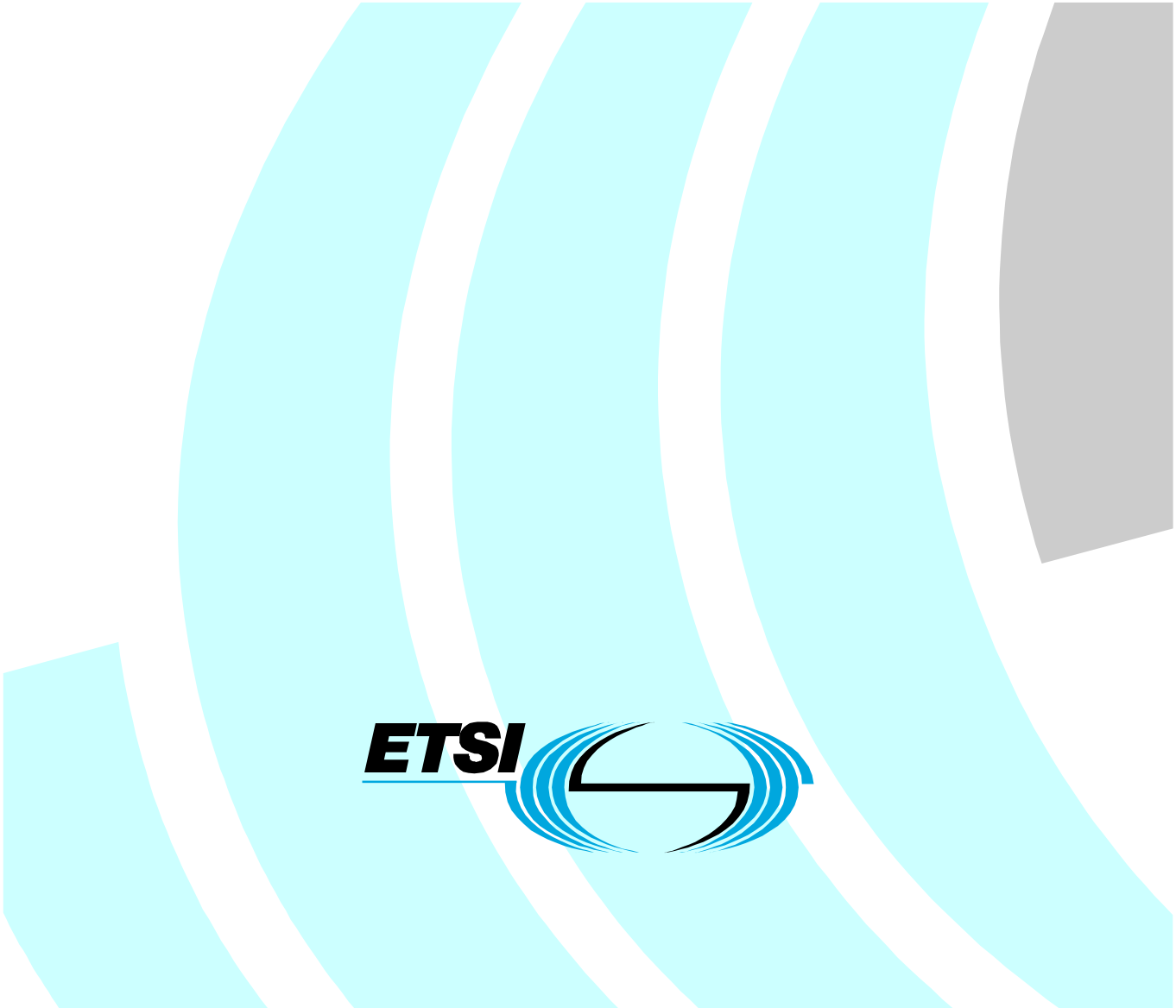
Technical Specification

Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("*TV-Anytime* Phase 1"); Part 1: Phase 1 Benchmark Features



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Foreword

This Technical Specification (TS) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

The present document is part 1 of a multi-part deliverable covering Broadcast and On-line Services: Search, select and rightful use of content on personal storage systems ("*TV-Anytime* Phase 1"), as identified below:

Part 1: "Phase 1 Benchmark Features";

Part 2: "System description";

Part 3: "Metadata";

Part 4: "Content referencing";

Part 5: Not currently applicable in *TV-Anytime* Phase 1;

Part 6: "Delivery of metadata over a bi-directional network";

Part 7: "Bi-directional metadata delivery protection".

Introduction

This document is based on a submission by the *TV-Anytime* forum (http://www.tv-anytime.org).

"*TV-Anytime* Phase 1" (TVA-1) is the first full and synchronized set of specifications established by the *TV-Anytime* Forum. TV-A-1 features enable the search, selection, acquisition and rightful use of content on local and/or remote personal storage systems from both broadcast and online services.

The features are supported and enabled by the specifications for Metadata, Content Referencing, and Bi-directional Metadata Delivery Protection, TS 102 822-3 sub-parts 1 [2] and 2 [3], TS 102 822-4 [4], TS 102 822-6 sub-parts 1 [5] and 2 [6] and TS 102 822-7 [7] respectively.All Phase 1 Features listed in TV035r6 are enabled by the normative *TV-Anytime* tools specifications. This list of Phase 1 Features is to be used as guidance to manufacturers, service providers and content providers regarding the implementation of the Phase 1 *TV-Anytime* specifications.

There will be further TV-Anytime*TV-Anytime* phases published and Business Models for Post-Phase 1 are currently being defined to include Private and public domains, portable recordable media, super distribution (legal sharing of content between consumers), peripheral device support and mobile devices, amongst others.

1 Scope

The present document lists and defines the *TV-Anytime* Phase 1 an evolutionary range of features that are identified in the *TV-Anytime* document "R-1: The *TV-Anytime* Environment" (TV035r6) which describes PDR (Personal Digital Recorder) usage models that the *TV-Anytime* standards facilitate. It is recommended that the reader familiarize him/herself with TV035r6 prior to reading the present document.

These features are supported by the specifications for Metadata, Content Referencing, and Bi-directional Metadata Delivery Protection, TS 102 822-3 sub-parts 1 [2] and 2 [3], TS 102 822-4 [4], TS 102 822-6 sub-parts 1 [5] and 2 [6] and TS 102 822-7 [7] respectively.

These specifications enable search, select, acquire and rightful use of content on local and/or remote personal storage systems from both broadcast and online services.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] ETSI TS 102 822-2: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 2: System description".

[2] ETSI TS 102 822-3-1: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 3: Metadata; Sub-part 1: Metadata schemas".

[3] ETSI TS 102 822-3-2: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 3: Metadata; Sub-part 2: System aspects in a uni-directional environment".

[4] ETSI TS 102 822-4: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 4: Content Referencing".

[5] ETSI TS 102 822-6-1: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 6: Delivery of metadata over a bi-directional network; Sub-part 1: Service and transport".

[6] ETSI TS 102 822-6-2: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 6: Delivery of metadata over a bi-directional network; Sub-part 2: Service discovery".

[7] ETSI TS 102 822-7: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime Phase 1"); Part 7: Bi-directional metadata delivery protection".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

agent: software application that performs a function as a proxy for a consumer, such as searching based on a personal profile

NOTE: See clause 5.

bi-directional: two way flow of content and/or information

bookmarking (personal indexing): consumer-generated index point along side the content

capture: transfer to a personal storage device of A/V streams, data files such as web content, applications, etc. regardless of delivery methods or who controls the process

content: anything the end user would like to access and that can be stored on a PDR such as A/V material, Internet information or software applications

content creator: producer of content

content owner: entity that owns the copyright to content

content provider: entity that acts as the agent for and is the prime distributor of content

consumer-centric: viewing the system from the perspective of the consumer

consumer domain: consumer's ability to control the distribution of personal content over persistently-protected local and remote networks which may be private or service provider maintained

consumer profile: data that represents the interests and preferences of the consumer

delivery chain: system that provides the distribution of content and information from providers to consumers

electronic content guide: means of presenting available content to the consumer, allowing selection of desired content

NOTE: See clause 5.

end-user: consumer or owner of a TV-Anytime*TV-Anytime* device for whom the content and services are intended

highlights: segments of content played back in a logical sequence, e.g. all of the scores in a sporting event

home network: range of components networked together within the boundaries of the consumer's physical home

home server: networked storage device within the consumer's local home environment

location resolution: process of estabilishing the address (location and time) of a specific content instance from its cridCRID

network provider: entity responsible for content distribution infrastructure

optional (features): features that need not be implemented

NOTE: Where optional features are implemented, the requirements of the relevant clause of the present document apply.

pay TV: any service in which consumers can elect to access specific content for a fee, such as pay-per-view, content rental, etc.

profile: key set of *TV-Anytime* features that are directly enabled by the Phase 1 *TV-Anytime* specifications

"pull" content: content that is delivered only after a consumer requests it

"push" content: content that is delivered to consumer(s) without their intervention or request, i.e. broadcast.

resolving entity: body that provides location resolution

return path: part of a bi-directional distribution system over which data flows from the consumer to the service provider

segmentation: logical division of content into different parts (e.g. scenes.). These may be individually captured sections or simple indexes on longer format content

service provider: aggregator and supplier of content which may include gateway and management roles

service provider's closed network: virtual network over different physical networks that is established and managed by the service provider

NOTE: See clause 5.

smart card: IC card that contains data such as personal profiles, access keys, etc.

superdistribution: process by which consumers redistribute content to third parties

targeting: process which allows providers to deliver relevant content to specific individuals or groups of individuals

NOTE: See clause 5.

trickle cast: download of content to a consumer device (PDR) over time, when possible via the return path connection between the consumer device and the content/service provider

***TV-Anytime* devices:** components that comply with *TV-Anytime* specifications and requirements

***TV- Anytime* participants:** any individual, company or organization involved in specifying, designing, building, delivering to or using a *TV- Anytime* compliant device e.g. content creators and providers, service providers, advertisers and network operators

***TV-Anytime* Phase 1:** specifications included in the present document

uni-directional: system that allows one-way flow of content and information

user profile: set of attributes that define a users preferences

value chain: group of entities that interact to deliver content and services to users

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

A/V	Audio and Visual material
AVD	Audio video and/or data
BL	Broadcast Level
CA	Conditional Access
CFC	Call for Contributions
CRID	Content Reference Identifier
ECG	Electronic Content Guide
EPG	Electronic Programme Guide
IC	Integrated Circuit
I/O	Input/Output
IPR	Intellectual Property Rights
MPDR	Mobile PDR
NDR	Network Digital Recorder (see clause 5)
PDA	Personal Data Assistant
PDR	Personal Digital Recorder (see clause 5)
PVR	Personal Video Recorder
STB	Set-Top Box
TV	Television
TVA	*TV-Anytime*

TVA-1	*TV-Anytime* Phase 1
TVAF	*TV-Anytime* Forum
URL	Universal Resource Locator
VOD	Video on Demand

4 *TV-Anytime* Participants - Rights Considerations

4.1 Consumer Privacy and Provider Rights

The *TV-Anytime* specifications define new environments that arise from consumer-centric scenarios of services offered by traditional and new types of providers. The specifications respect and embrace the basic rights of all participants. These include preserving the basic right of a end-user to privacy and acknowledging the legitimate rights of all participants such as content creators and providers, service providers, advertisers and network operators.

As personal profile information is the sole property of the end-user - using this information as currency for content offerings by sharing it with external bodies remains the sole prerogative of the end-user. The keys for dissemination of private information with other parties always respect the amount of privacy intrusion the consumer is willing to allow.

The specifications fully supports the environment in which all interactions involving privacy issues conduced by content and service providers and personalization engines/agents/software/services preserve this right for privacy.

It is the end-users' decision as to the amount of privacy invasion and profiling capabilities done by these participants, and will be allocated by the end-user to a vendor or service provider at his discretion.

Providers that accept the end-user's choice to allocate to them the responsibility (partial or in full) to profile him/her, through a contract with a service/technology/content provider, will adhere to strict privacy regulations. This will effectively eliminate breaches of security of the collected private information in order to avoid any use of it that was not explicitly permitted by the end-user.

4.2 The intended use of the *TV-Anytime* CRID - Content Provider Rights

CRIDs are unique content reference identifiers and are effectively signposts to content that can be "found and/or retrieved" at a later date. They are a key part of the *TV-Anytime* system. There are many different scenarios in which CRIDs are created and utilized, involving content creators, content owners, service providers, the set top box and third parties. All of these can be "resolving entities" which means that if there are not defined business relationships between those stakeholders then there may be incorrect and unauthorized mapping to content. This could result in a poorer consumer experience. The flexibility of the TVA CRID specification also enables business models for third-party suppliers of CRID and resolution data that when implemented properly can provide a richer consumer experience.

Generally, for the case of third-party resolving, some data is passed from the CRID issuing authority through the resolving party to the viewer. For example:

> *A provider of an EPG service, who has an indirect relationship with the content providers on the EPG, can issue CRIDs that they do not resolve themselves. A third party (which could be the original content provider) can then offer a service to the EPG provider to resolve those to content locations.*

In order for the intentions of the issuing authority to be honoured there will have to be a business and/or legal relationship between the issuing authority and the resolve. In the simple case the issuing authority will author the resolution information that is carried or published by the third party. In this case the relationship involves the correct and timely carriage of the data.

In a more complex case the issuing authority may only describe the content they are referring to (e.g. by metadata identifying the content) and expect the third party to author and provide the resolution data. In this case the relationship must define the scope of the content referenced by the CRID and the locations returned for the CRID.

The most conceptually straightforward use of the CRID is the case in which an authority issues a CRID with the express intention of providing the corresponding resolution data. The delivery of this data to the consumer may or may not be under the direct control of the CRID authority.

A common use of the CRID will fall into this category in which the integrity of the decomposition of the CRID to a number of specified locators is of paramount importance to the success of the business strategy.

In order to accommodate a wider range of *TV-Anytime* business models, it is recognized that a CRID issued by an authority may be resolved using resolution data authored and/or provided by another party.

In order that all cases can coexist, care must be taken to be clear under what conditions a CRID is issued such that, where appropriate, only authorized parties will offer resolution of this CRID.

In the case of third-party resolution of a CRID, there may still be conditions imposed upon the resolution service, which limit the scope of resolution consistent with the published metadata. These conditions must be made clear by the CRID authority to the resolution provider as part of the business arrangements. For more details on CRIDs see TS 102 822-4 [4].

5 *TV-Anytime* system elements and functional models

5.1 The Personal Digital Recorder

The Personal Digital Recorder (PDR) is central to the *TV-Anytime* specifications. It is a consumer device that includes high-capacity storage. The high-capacity storage of digital content has recently become available to consumers as a result of disk storage technology advancing and the cost for such storage decreasing. Storage of A/V content and data on devices accessible by individual consumers opens the possibility of a whole new range and quality of content, applications and services. The consumer can now record content and watch it independent of broadcast schedules; thereby taking advantage of more sophisticated and personalized content and services via a device that gathers input from all sources connected to it. The consumer can also communicate with broadcasters/service providers from PDRs that have a bi-directional connection (either intermittent or always-on) allowing them to, for example, request specific content or make their personal interests known to service providers.

The Network Digital Recorder (NDR) is a remote storage device(s), which can include virtual storage, outside the home. It emulates physical device(s) and is accessed via a persistently-protected network, such as a service provider's closed path via the Internet. Since the NDR is part of the persistently-protected consumer domain, content can be securely transferred between remote NDR and local PDR device(s.)

The NDR can be used as a remote PDR which functions like an in-home PDR (personal storage on a remote device.) The protocol and command set used by the Network Digital Recorder are considered inside the scope of *TV-Anytime*; however, implementation of services are considered outside the scope of *TV-Anytime*. Content copying agreements may vary in different countries as specified within the protocol.

5.3 Service-Provider's Closed Network

A service-provider's network is a closed network that provides only authorized access to devices and resources as supported and configured by the service provider. The closed network ensures that all content that is accessed over the network is persistently protected.

5.4 Three *TV-Anytime* Functional Models

For the purposes of understanding and implementing *TV-Anytime* capabilities, three functional models are defined and are referred to throughout the *TV-Anytime* specifications. As noted below, the models begin with Model 1, which provides for unidirectional delivery of content with no return path, and increase in capability to Model 3, which includes a full-capability return path. For more details regarding *TV-Anytime* functional Models 1, 2, and 3, refer to *TV-Anytime* Requirements Series R-1, "The *TV-Anytime* Environment".

The three *TV-Anytime* functional models are:

- Model 1 - Broadcast Model (via unidirectional delivery)
- Model 2 - Intermittent Return Path Model (limited, occasional return path)
- Model 3 - Bi-directional Broadband Model ("always on" network connectivity)

TVA-1 is targeted mostly at Model 1 broadcast, but TS 102 822-6-1 [5] details the mandatory and optional elements of a return path. If the return path specifications are implemented the mandatory elements are "query and response" mechanisms. The implementer has an optional element, "service discovery" which also must conform to the TS 102 822-6-2 [6] and be implemented in the manner documented in the specification. Service discovery allows those devices with intermittent or bi-directional capability to find further metadata or other return path services. TVA-1 does not specify data returned from the TVA device that would enable verification or return of usage data back to providers. For TVA-1 the return of data back from TVA devices is left to implementation.

5.5 Electronic Content Guide

An essential element in the *TV-Anytime* system is the Electronic Content Guide (ECG). The ECG allows the consumer to browse, navigate and select different types of content. They allow consumers to make value judgments about what they want to view or capture. Some ECGs can provide in-depth reviews, personalized recommendations and detail about a whole range of content both local and remote.

ECGs may exist locally in a physical PDR or remotely on a network such as the Internet. There may be more than one ECG available to a consumer. Some may be resident; some specific to a particular service provider and others may be delivered by a content provider or third party.

5.6 Agents

As the amount of content and number of sources of content available to consumers increases, it becomes valuable to the consumer to have an intelligent "agent" that can evaluate and filter the available content on the consumer's behalf. These agents are software applications, which "learn" the preferences of consumers and automatically identify/capture content that is of interest to individual consumers. Agents continuously track the consumer's preferences and adjust over time to become more and more finely tuned to the preferences of each consumer, and to adapt as consumer's preferences evolve. Agents can be located at many places within the *TV-Anytime* architecture, including the PDR, the NDR, or the service provider's system.

5.7 Targeting

There are three ways to target content to viewers in correlation with the three *TV-Anytime* models as described below:

- Model 1 - Broadcast: Local agents on the PDR filter personal relevant content for the consumer based on the locally stored consumer profiles and/or preferences.
- Model 2 - Intermittent Return Path: As in Model 1, but here the service provider can receive verification that the targeted content reached its intended audience. Also, the return path allows providers to aggregate the audiences consuming habits and provide more effective niche programming as well as optimize targeted ads or promotions.
- Model 3 - Bi-directional Broadband: As in both models above, but here individuals can be "pushed" relevant content in real-time and the target content could exist more easily in the network. Therefore, unlike Models 1 and 2, the targeted content does not have to be previously downloaded to local (i.e. PDR) storage. It can be "pushed" to the consumer from the service provider's storage in real-time as appropriate based on the content that the consumer is viewing.

If the return path specifications are implemented the targeting elements enabled in the present document are limited to model 1 above, where local filtering or local profile building can take place but no information about usage can be sent back to the providers. Of course a proprietary addition to TVA-1 could include a "submit" mechanism to return usage or other data, within the territorial privacy limitations.

6 *TV-Anytime* Phase 1 features enabled by the specifications

6.1 Introduction - Profiles, mandatory and optional features

This clause describes key *TV-Anytime* features that are directly enabled by the *TV-Anytime* Phase 1 specifications.

The list of Phase 1 features in tables 1 and 2, and the subsequent descriptions of each feature, provide information regarding the capabilities that can be implemented using TVA-1 specifications. These features enable search, selection, acquisition and rightful use of content on local and/or remote personal storage systems from both broadcast and online services.

For TVA-1, four profiles have been defined - three in Model 1 (Broadcast) and one in Model 2 (Intermittent return path). Within each profile, features that are not marked 'optional' shall be implemented. Features marked 'optional' may be implemented. If optional features are implemented, the relevant requirements of the *TV-Anytime* specification shall be met.

The first three profiles are for the Broadcast model. An increase in profile number indicates a progressive increase in functionality of the TVA-1 system, the complexity of the system, and the number of services provided. The last profile (Intermittent Return Path Model) requires some type of "back channel," which is not necessarily always on.

The column on the left side of the table indicates the progressive increase in functionality of the TVA-1 system. These profiles are labelled as Broadcast Level (BL) 1, 2, 3 and Intermittent Return Path, and map to the three models.

The *TV-Anytime* specification for all four profiles includes this part on Benchmark Features (TS 102 822-1), as well as the System Description specification (see TS 102 822-2 [1]), the Content Referencing specification (see TS 102 822-4 [4]), and the Metadata specification (see TS 102 822-3 sub-parts 1 [2] and 2 [3]). The *TV-Anytime* specification's Broadcast Level 1-4 does not include a Rights Management and Protection specification. Therefore, any rights management capabilities required in conjunction with features enabled by the *TV-Anytime* specification BL1-4 will be provided by a private or proprietary method.

TV-Anytime Phase 1 specification profiles are hierarchical, implying that BL2, 3 and Return Path (both Intermittent and Always-on) build on the foundation established with specification BL1. Release BL2 adds additional capabilities to BL1, and BL3 (which is the complete and final Phase 1 specification release) adds further capabilities to BL2. These profiles indicate what extra business models are enabled by the increase in functionality provided by each profile step in Models 1 and 2.

There is another Model to be considered, which is the broadband, bi-directional case. It is deemed that there are no extra Phase 1 features enabled by an always-on, bi-directional connection, apart from implementation, network benefits such as real time reporting of usage/targeting, or content stored in the network. Content can be captured to remote "personal" storage areas via the service provider's closed network (NDR model).

Table 1*: TV-Anytime* Phase 1 Profile Levels and Features

Model	Profile Level	Clauses	Feature (directly enabled by the specification TVA-1)	Cookbook scenarios in TS 102 822-2
1	**Broadcast Level 1**	6.1.1	Capture and playback of audio, video and data (see Note 1)	**6.2**
		6.1.2	Use of ECG to find and capture broadcast content	**6.4, 6.9**
		6.1.3	Updated fragments of EPG listings can be delivered to "broadcast" analogue or PDRs	**-**
1	**Broadcast Level 2**	6.1.4	Personal indexing on captured content	**-**
		6.1.5	Playback of content in highlight or indexed mode	**6.3, 6.7**
		6.1.6	Support of user preferences and profiles	**6.6, 6.11**
1	**Broadcast Level 3**	6.1.7	Cross linking of content to related content	**6.10**
		6.1.8	Capture and playback segments of programmes	**6.7**
		6.1.9	Dynamic insertion of segments during playback	**-**
		6.1.10	Content can be updated/replaced/appended by newer in-coming versions	**6.7**
2	**Return Path Level**	6.1.11	Verification of usage of content on PDR (see note 2)	**-**
		6.1.12	Ability to collect user profile data (see note 2)	**6.11**

NOTE 1: The TVA-RMP specification moving forward into TVA-2 will specify audio and video content protection, while metadata protection is specified as part of TVA-1.

NOTE 2: A wide range of information regarding viewer usage of content is enabled in TVA-1. The method of accessing the information by the service provider though is not specified in this release. This will be an implementation issue.

6.1.1 Capture and playback of audio, video and data

PDR shall record content to storage and plays it back from storage.

6.1.2 Use of ECG to find and capture broadcast content

Shall record the content that the consumer selects from the ECG. The ECG allows the consumer to browse, navigate and select different types of content to view or capture. Possible search criteria on programmes or programme segments should include characteristics such as title, a particular channel or provider, date, media type, ratings, actor/director, genre, critic's choice, format, language, keywords, etc. Once a programme is selected via the ECG an option shall be to record every episode of the programme series..

6.1.3 Updated fragments of listings can be delivered to "broadcast" analogue or PDRs

Where data is not available in the broadcast stream personal recorders (PVRs) should be able to utilize a low-bandwidth back channel to maintain current programme listings and update fragments of the EPG services. Digital recorders may be able to update elements of the EPG this way but also maintain current programme listings and update fragments with the data likely to be carried as part of the transport stream.

6.1.4 Personal indexing on captured content

Consumers should be able to bookmark captured content and later playback this "indexed" content by skipping through the previously logged index points. Also index points from other consumers can be transferred and played on the device.

6.1.5 Playback of content in highlight or indexed mode

Consumers should be able to playback content by skipping between index points. For example, a long format sports or magazine show can be viewed in "highlight mode" (playback "automatically" skipping between index points without user intervention.) Various highlight mode packages may be captured alongside the material at time of capture by the service/content provider:

- Basic Indexing - Jumping through provider-created index markers at meaningful points, chapter headers, key moments, magazine "sections," main items, scene change detection, etc.
- Highlight Modes - Viewing a long-format sporting event, for example, in "highlight mode." This may be in addition to the content provider's set of index points.
- Access to service or third-party-provided index sets for use on pre-captured material.
- Various highlight mode packages captured alongside the material at record time. The option to have a long programme played back in "auto-highlight" mode (e.g., just the goals scored) means that the viewer may have this option available as a pre-play facility if it is provided.

6.1.6 Support of *consumer* preferences and profiles

Users in the household should be able to have some control over their device by setting viewing preferences for themselves or other users. For example, a parent can set playback or capture preferences that protect children from unsuitable material. A user can also carry their personal preferences to other devices.

The consumer should also be able to locate and filter content by using agents (i.e., a technology that performs a task on behalf of any or all stakeholders). Local or remote filtering agents can be manually set-up by the consumer in terms of programme, genre, rating or other viewing-preferences and/or automatically adapt to the consumer by creating the user preferences based on viewing habits (profiles). *TV-Anytime* has defined technical methodology for the client TVA device to query and response remote servers, discover services remotely but not to submit specified data. TVA-1 technical specifications **strongly recommend** that implementers limit the TVA-defined profiling data set that can be used for local profiling (i.e., data that intelligent agent uses to create a profile of the consumer) to a defined set that has been created via manual input and/or intelligent agents based on usage of services and content.

TVA-1 does not specify technologies to return "any" usage data to "any" potential return path providers connected to the PDR because **no authenticated return channel RMP has been specified yet.** Of course the *TV-Anytime* Forum respects and embraces the basic rights of all viewers and providers. These include preserving the basic right of a end-user to privacy and acknowledging the legitimate rights of all participants such as content creators and providers, service providers, advertisers and network operators.

Local user profiling should be by default a viewer opt-in function. The ability for providers to "knowingly" match content to viewers enhances both the viewer experience and providers involvement and relationship with their audience.

If implementers decide to adopt TVA user profiling then they should consider utilizing a recommended set of elements from the classification dictionary (see TS 102 822-3 for more detailed information). These include:

- Intended audience
- Content, origination & intention
- Atmosphere
- Director, provider, key character, key talent and writer

The key reason for doing this involves the ability for content providers to attach a limited data set around programme content knowing that a similar **limited** data set exists on uni-directional PDRs, thereby providing a more accurate match. In addition, the static and dynamic elements of the profile need to be fully interoperable (dynamic will constantly update static). Finally, having a limited and interoperable data set will provide the ability for profiles to be more portable and used across a range of different physical devices.

6.1.7 Cross linking of content to related content

Programmes can have cross-links to related content - for example, while watching trailers the user can initiate capture for the complete programme, or while watching a movie the user can be notified and directed towards related material, e.g. "making of." The consumer may be provided with options to capture, playback (if pre-recorded) or receive a notification regarding when and where the content is available. This covers many types of relationships, including one-to-one (a promo to the full programme) and one-to-many (such as recommended programmes or content).

6.1.8 Capture and playback of segments of programmes

Programme material that is appropriately meta-tagged in segments can be captured as isolated elements of the main programme. Once that segment is stored an example of the playback capabilities is cross-linking similar segments from different sources - e.g. jumping among similar news segments from several content providers.

6.1.9 Dynamic insertion of segments during playback

Providers can insert an additional segment within any programme being played back from a PDR, e.g. an advertisement. A viewer or agent could set segment preferences for example that will specify a range of preferred short-form content to be inserted from the PDR during natural or regular breaks in real-time or live transmission.

6.1.10 Content can be updated/replaced/appended by newer in-coming versions

It is possible to automatically replace or append to segments or complete programmes when requested by providers or consumers. For example, a consumer preference for the "latest news" then leads to a replacement of the recorded news shows, whenever a new news report is made available. Providers can overlay a sequence within a programme with an alternative segment, e.g. a promo, updated news item.

6.1.11 Verification of usage of content on PDR

Service providers can track the actual usage of content on individual PDRs pursuant to regional regulation. See the *TV-Anytime* privacy statement at the beginning of the present document (see clause 4.2).

6.1.12 Ability to collect user profile data

Based on regional regulation content or service providers can gather consumer profile data. This feature is needed for targeting service scenarios on the basis of certain characteristics of the audience, such as preferences, demographics, etc. See the *TV-Anytime* privacy statement at the beginning of the present document (see clause 4.2).

6.2 Phase 1 optional Features

The features in the following table are not directly enabled by the TVA-1 specification, but are highlighted as important enough features that further enable some of the key Business Models described below. They should be considered as optional features that may be implemented or not at the discretion of service/content providers and manufacturers in addition to the mandatory features of TVA-1.

Table 2: *TV-Anytime* Phase 1 optional Features

Clauses	Broadcast Model
6.2.1	Support for a variety of broadcast content types
6.2.2	Compliance to all broadcast content delivery mechanisms
6.2.3	Remote storage management
	Intermittent Return Path
6.2.4	Content can be found and captured via return path
6.2.5	Consumers can have portable profiles
6.2.6	Remote storage management with interactions
6.2.9	Verification of delivery on content to PDR
6.2.10	Verification of updating on content on PDR
	Bi-directional Broadband Model (The following features require secure transfer and persistently protected storage)
6.2.7	Content can be individually found and captured, on demand to the local PDR
6.2.8	Content can be captured to remote 'personal' storage areas via the service provider's closed network (NDR model).
6.2.11	Capture and playback of local and remotely stored, requested content (PDR and NDR hybrid model)
6.2.12	*Consumer* controlled, secure transfer of content from local to remote "personal" store via the service provider's closed network.

6.2.1 Support for a variety of broadcast content types

Support for the common broadcast content types (e.g. MPEG, JPEG, XML, BML, MHEG5.) The PDR receives and synchronizes a hybrid mixture of looped, streamed content and pre-recorded segments, providing a seamless, linear experience to the consumer.

6.2.2 Compliance to all broadcast content delivery mechanisms

Analogue personal recorders (PVRs) and PDRs have the ability to capture authorized content delivered through all broadcast mediums (e.g. terrestrial, cable, satellite, or other closed-network broadcast delivery schemes).

6.2.3 Remote storage management

Remote entity e.g.: service provider/s requests, reserves and utilizes space on the PDR. A service provider/s could place and delete content or manipulate existing content. There is no verification back to the service provider/s that these processes have taken place.

6.2.4 Content delivery using the return path

The return path can be used to find and/or deliver content to the device, for example:

- Advertisements can be captured on the device using the return path, delivered via trickle cast.
- A consumer can request listings of available content using a range of criteria.

6.2.5 Consumers" portable user profiles

The consumers' profiles can be portable between different PDRs. These user profiles can contain subscription data, manually edited preferences, agent-assisted data or demographics. Secure portability of user profiles must be maintained.

6.2.6 Remote storage management with interactions

A remote entity (e.g., service provider) requests, reserves and utilizes space on the PDR. A service provider could place and delete content or manipulate existing content. There is verification back to the service provider that these processes have taken place, and additional negotiation of service provider requests may also take place.

6.2.7 Content on-demand to the local PDR

The consumer can initiate the capture of certain content from various network sources to the local PDR (on-demand-scenarios). The content is transferred to the local PDR via broadband network. The transmission will start instantly, which could allow the immediate use of the content (see figure 1).

6.2.8 Content captured to remote "personal" storage areas via the service provider's closed network (NDR model)

Consumer can capture content also to NDRs (Network Digital Recorders). These NDRs could consist of dedicated storage space in the service provider's private network. This space must be protected from any illegal access (see figure 3).

6.2.9 Verification of delivery of content to PDR

Service providers can know whether the content has been successfully delivered to the consumer's PDR. This feature enhances pay-per-view scenarios.

6.2.10 Verification of updating of content on PDR

Service providers can know whether a requested update of the content on the PDR has been successfully fulfilled on the consumer's PDR. For example, this functionality can be used for subscriptions of news-updating services.

6.2.11 Capture and playback of local and remotely stored, requested content (PDR and NDR hybrid model)

A seamless interoperation of PDR and NDR must be provided. The consumer can control the NDR through the user interface of the PDR and browse seamlessly through the contents on the PDR and the NDR. Based on consumer's choice, the PDR could request additional space from the NDR automatically (see figure 4).

6.2.12 Consumer controlled, secure transfer of content from local to remote personal store via the service provider's closed network(s)

The consumer can transfer content from the local PDR to the NDR using a secure connection. For example, the consumer can free storage space on his local PDR by moving contents to the NDR.

7 Conceptual Diagrams

This clause provides six diagrams that represent connectivity concepts for *TV-Anytime* implementations for both Phases 1 and 2 of the specification series. Each of the diagrams can have elements of Phases 1 and 2 of the specifications, but as Phase 2 is primarily concerned with redistribution of content, then Figure 2 and later diagrams have more relevance. TVA-1 as yet has not specified Rights Protection technologies, except protection of metadata (including the CRID) as detailed in TS 102 822-7 [7]. The metadata, content referencing and return path specifications work across all conceptual models, but with limited RMP. The six concept diagrams evolve in complexity and may need additional proprietary elements that enable the suggested implementation.

It is hoped that the reader will be able to ascertain from the TVA-1 specification series what elements of these implementations below are standardized and which are proprietary.

The scope of the diagrams ranges from the simple (e.g., figure 1 shows a standard PDR interfaced to a service provider) to the complex model (e.g., figure 6 includes a NDR and a mobile PDR [mPDR] in addition to the standard in-home PDR). In this latter concept, content can be transferred by the consumer among all three storage devices.

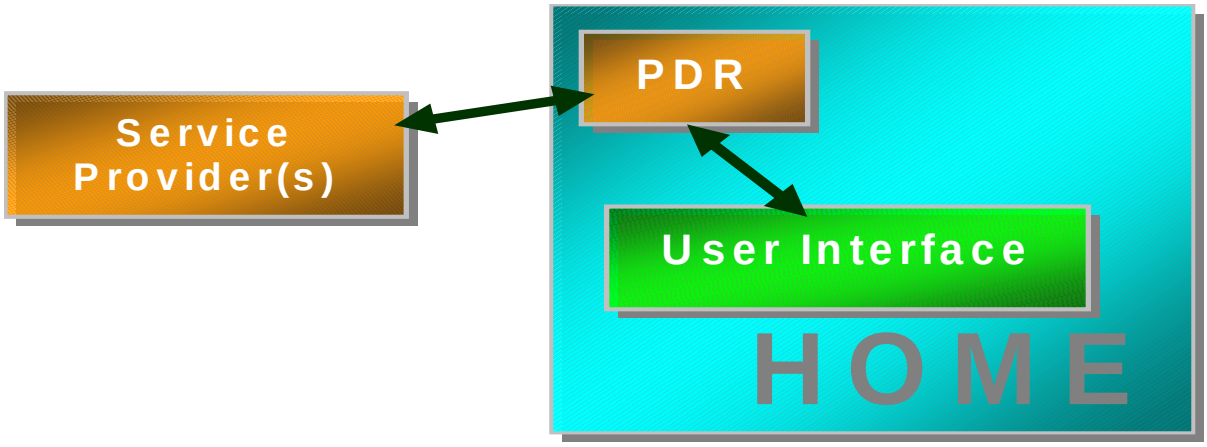

Figure 1: Local *TV-Anytime* Implementation

Local device or devices (STB, Integrated TV, PC, for example) in the consumer's home.

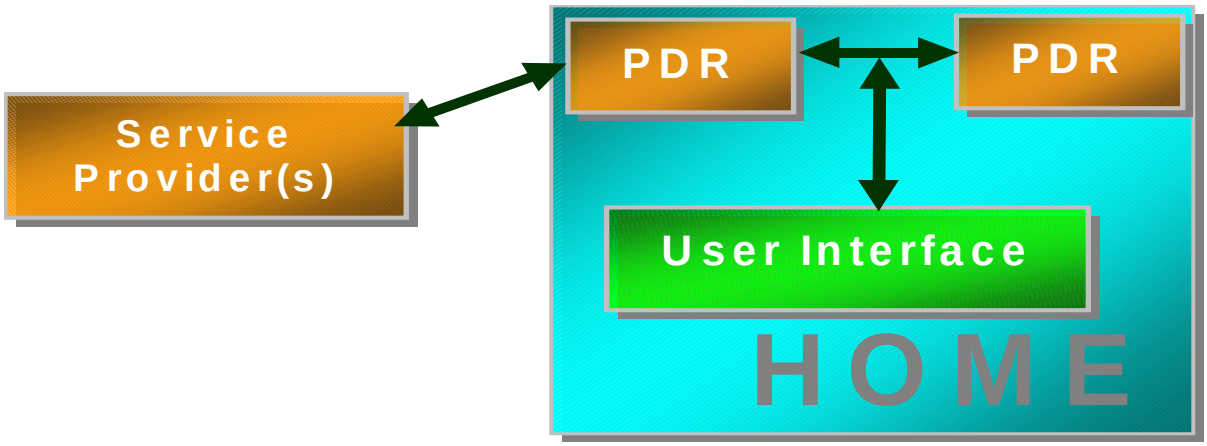

Figure 2: Home network *TV-Anytime* Implementation

Multiple storage devices inside the home. A personal local storage system in the home may also contain multiple PDRs, content archiving components (such as DVD-R) and a wired or wireless home network (including hand-held devices).

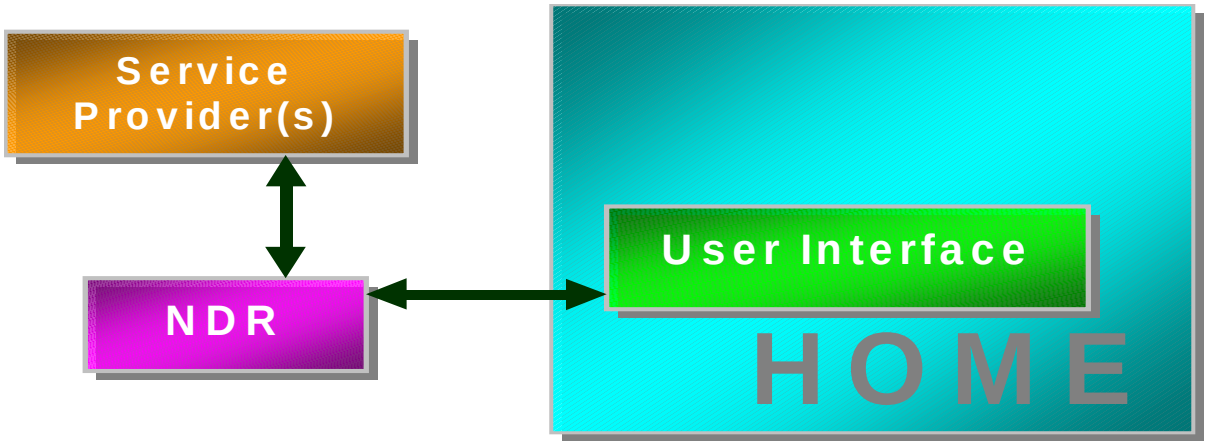

Figure 3: Distributed *TV-Anytime* Implementation

Remote storage using the Network Digital Recorder (NDR) and/or virtual storage device(s) outside the home emulating physical device(s) and accessed via a network such as the Internet or a service provider's dedicated path.

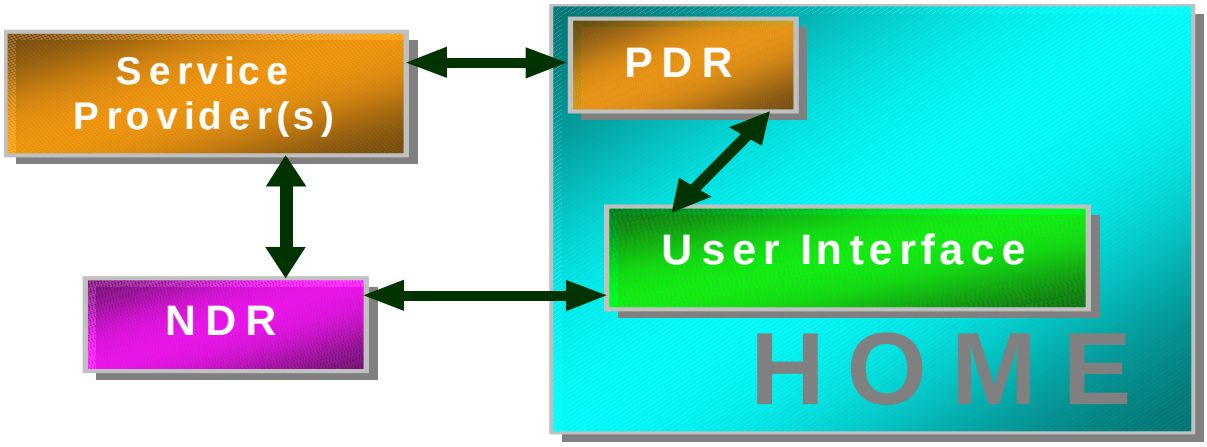

Figure 4: Hybrid *TV-Anytime* Implementation

Hybrid combination of remote and local content storage.

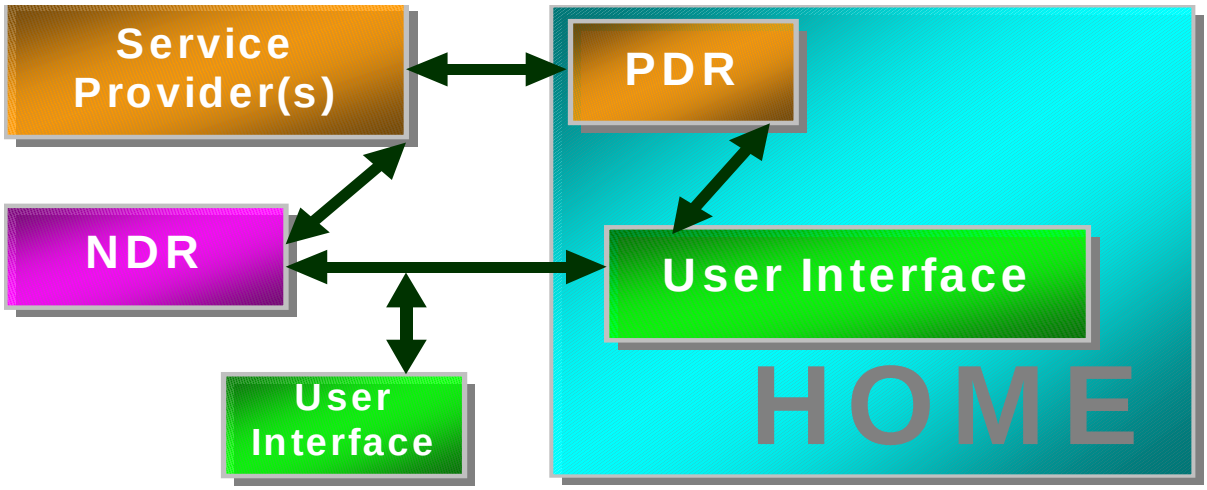

Figure 5: *TV-Anytime* Implementation with External User Interface

As in figure 4, but allowing remote control of and access to PDR content (via PDA, mobile phone, etc.).

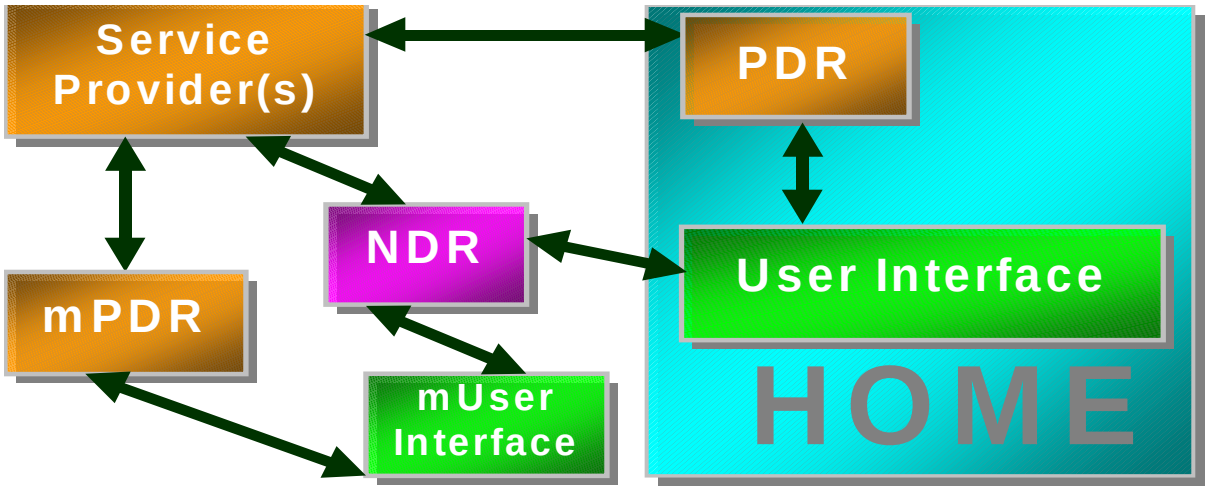

Figure 6: Mobile *TV-Anytime* Implementation

As in figure 5, but with PDR functionality in a mobile device (mPDR), using occasional or persistent network connectivity to content provider(s) and other PDR content.

NOTE: For all of the above models, sources of content can be from multiple networks (DTV broadcasting of any format) or online access to a network such as Internet.

8 Key Business Models Enabled by Phase 1 specifications

The list of business models that follow is intended to be informative only. These were used to develop the functional requirements in Clause 5 and the features enabled by the normative specifications in clause 6 of the present document, and are distilled from a large range of potential business models. The order of the items in the list is meant to suggest the order in which business models are likely to be required and implemented in a TVA-1 system. The following models also focus attention on the user experience, each of which has implications for the *TV-Anytime* Requirements Series.

Note: The column on the left is a simple identifier for each functionality. The column on the right indicates the corresponding business model scenario built from these features in the TS 102 822-2 [1]. The listing is non-exhaustive, and the features are in part or whole enabled by Phase 1 specifications, even with limited return path and RMP elements.

Table 3: Key Phase 1 Business Models

	key business models phase 1	Cookbook scenarios in TS 102 822-2
BM001	A PDR can capture and playback content.	7.2
BM002	The PDR can offer live pause.	-
BM003	A PDR has an on-screen menu of content already captured.	-
BM004	The PDR system provides a schedule so a viewer can choose content to record from it.	7.4
BM005	A PDR can enable new content to be captured and replaced or be added alongside old content on the PDR.	7.7
BM006	The PDR allows users to select for capture, single or multiple episodes of a series or other programme groupings.	7.2
BM007	The PDR allows the management of items "cued" for capture.	-
BM008	The PDR enables retro-record (i.e. capture entire programme or ad starting up to x minutes back into the live stream), or gives option to capture at later date when it is available.	-
BM009	The PDR system supports storage partitioning and management of multiple users and/or service providers.	-
BM010	The storage space on a PDR system can be managed by consumers or providers (e.g. items to be deleted next, permanently stored, etc.).	-
BM011	The PDR system can automatically capture content based on viewer behaviour (profiling).	7.9, 7.6, 7.5
BM012	Viewer profiles can be aggregated and analyzed from individual or groups of PDRs for targeting services.	7.11
BM013	The PDR enables the insertion of pre-captured advertisements or promotions into live/broadcast content based on viewer profiling.	-
BM014	The PDR allows the insertion of pre-captured advertisements or promotions into stored content being played back, based on viewer profiling.	-
BM015	There can be remote control of the PDR system functionality (e.g. capture settings, profile settings, etc.).	-
BM016	The PDR system allows the selection of segments (or separate CRID-referenced parts) of programmes for recording based on information provided by the service or content provider.	7.3, 7.7
BM018	Some content is provided with index points and a playlist enabling "passive" highlight or other playback modes.	7.3, 7.7
BM019	The PDR system allows the navigation and exploration of content segments using provider indexes (e.g. step through, short/long form, etc.).	7.3, 7.7
BM020	The PDR system can create single, personalized programmes from individual "personally linked" segments.	7.3, 7.7
BM021	There is support for multiple users (e.g. separate recorded content menus, profiling, parental control, etc.).	-
BM022	There are flexible usage rules (e.g. limited viewing windows) on the PDR system.	-
BM023	Consumers (on a bi-directional PDR system) can store their "personal" content on Network storage devices.	-
BM024	Consumers can move their personal profiles to different PDRs or PDR systems in other physical locations.	7.11
BM025	3rd parties or service/content providers can provide recommendations, content referencing and resolution of content potentially from many other providers.	7.2, 7.10
BM026	Providers can force download "premium/PPV" content to the PDR system (i.e. Local VOD).	-

Annex A (informative): Bibliography

Documents are available from the *TV-Anytime* web site http://www.tv-anytime.org.

"R-1: The *TV-Anytime* Environment" (TV035r6)

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History

Document history		
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