

1. SCOPE

This Operational Practice recommends a method of automatically pointing a digital television (DTV) receiver to another service within a transport stream, replacing the current service, which is about to cease running. Such circumstances may be encountered when the transport stream multiplex is periodically reconfigured.

A method of achieving this is prescribed by the use of the Linkage descriptor in the Service Description Table sections, according to the syntax and semantics of ETSI standard EN 300 468 [1] and the guidelines described in ETSI recommendation TR 101 211 [2]. This prescribed use of the Linkage descriptor also complies with the Australian Digital Transmission standard, AS 4599-2007 [3].

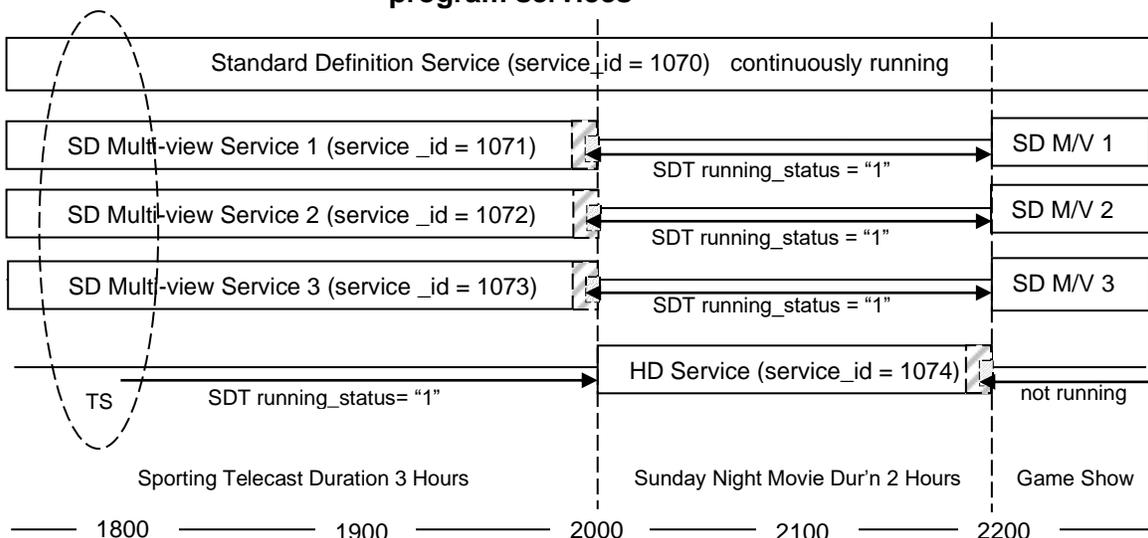
2. APPLICATION

A transport stream may contain a number of services, each of which is identified by a unique service_id number. The number of services contained within a multiplex may vary from time to time, depending on the number and type of program services offered by a broadcaster.

Whenever the transport stream multiplex, is reconfigured to accommodate these changes, some services may be discontinued and other services added.

An example of such a change, within the Australian DTV system, is illustrated below in Figure 1.

Figure 1: A DTV Transport Stream multiplex, which consists of:
 - a Standard Definition service and,
 - one or more Standard Definition multi-view or multi-program services

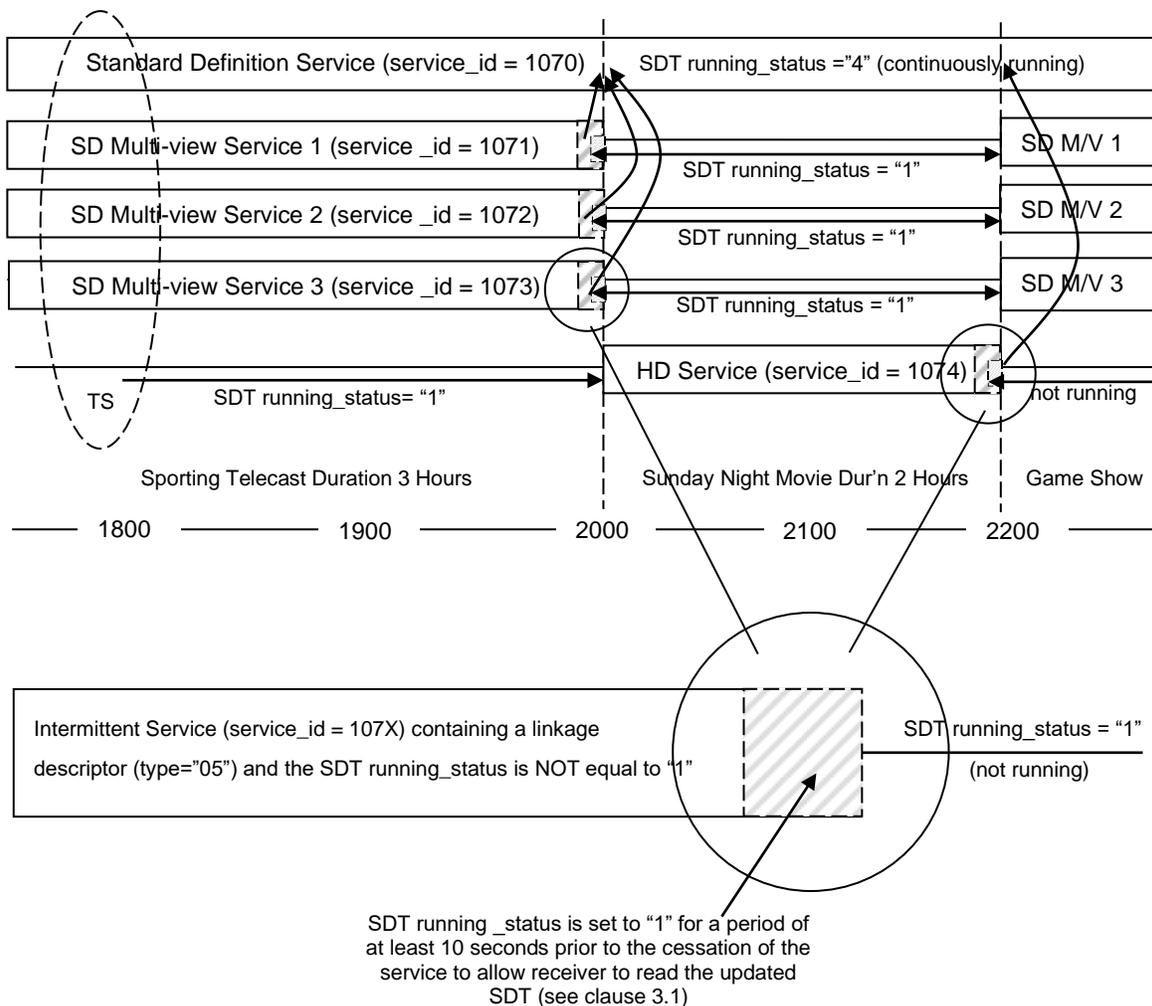


May change to:

- a Standard Definition service and,
- a High Definition Service

To prevent discontinuity to viewers and the possibility of undefined behavior in some DTV receivers, it is desirable that an orderly scheme exists to automatically deflect DTV receivers away from services, which are about to cease and point them to a service that will continue to exist beyond the transition.

Figure 2: Service Replacement Service - the diagram below illustrates the operation of the service replacement service.



The DVB SI system provides a mechanism for the identification of a "service_replacement" service. When the Linkage Descriptor is used within the Service Description Table sections, a value of linkage_type (= "05") indicates that a "service_replacement" service exists.

A service, which is known to be intermittent, should have the linkage descriptor included in the descriptor loop of the Service Description Table sections, for the duration of the service. During the time the service is active, the SDT `running_status` field should be set to "4" indicating that the service is running (refer to Clause 4.2.6 of AS 4599 [3]).

When a service (containing the linkage descriptor) is about to discontinue, the `running_status` field in the Service Description Table section should be changed to "1" indicating that the service is "not running" (refer to Clause 4.2.6 of AS 4599 [3]).

The combination of the presence of the linkage descriptor (for `linkage_type` = "05") and the SDT `running_status` field is set to "1", indicates to the receiver that it should change to the "*service_replacement*" service, nominated by the linkage descriptor through the unique combination of `original_network_id`, `transport_stream_id` and `service_id`.

If the running status field of the Service Description Table section of the logically selected service is NOT set to "1", then the "*service_replacement*" service indicated by the linkage descriptor shall be ignored.

The logical channel number (refer to Free TV Australia OP41 [4]) shall remain that of the logically selected service, NOT its actual replacement. This ensures that by navigating in a single direction the user will eventually visit all available services.

It is strongly recommended that receivers use the Linkage descriptor, when present in the Service Description Table, to locate the "*service_replacement*" service.

The syntax and semantics of the linkage_descriptor are indicated in Table 1:

Table 1: Linkage descriptor

Syntax	No. of bits	Identifier
Linkage_descriptor(){		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
transport_stream_id	16	uimsbf
original_network_id	16	uimsbf
service_id	16	uimsbf
linkage_type	8	uimsbf
if (linkage_type !=0x08){		
for (i=0;i<N;i++){		
private_data_byte	8	bslbf
}		
}		
if (linkage_type ==0x08){		
hand-over_type	4	bslbf
reserved_future_use	3	bslbf
origin_type	1	bslbf
if (hand-over_type ==0x01		
hand-over_type ==0x02		
hand-over_type ==0x03){		
network_id	16	uimsbf
}		
if (origin_type ==0x00){		
initial_service_id	16	uimsbf
}		
for (i=0;i<N;i++){		
private_data_byte	8	bslbf
}		
}		
}		

The Linkage descriptor is assigned the tag value of 0x4A within the DVB Service Information (refer Clause 4.1 Table 4.1 of AS 4599 [3]).

Semantics for the linkage descriptor:

transport_stream_id: This is a 16-bit field which identifies the TS containing the information service indicated.

original_network_id: This 16-bit field gives the label identifying the network_id of the originating delivery system of the information service indicated.

service_id: This is a 16-bit field which uniquely identifies an information service within a TS. The service_id is the same as the program_number in the corresponding program_map_section. If the linkage_type field has the value 0x04, then the service_id field is not relevant, and shall be set to 0x0000.

linkage_type: This is an 8-bit field specifying the type of linkage e.g. to a service_replacement service (refer Table 2).

Table 2: Linkage type coding

Linkage_type	Description
0x00	reserved for future use
0x01	information service
0x02	EPG service
0x03	CA replacement service
0x04	TS containing complete Network/Bouquet SI
0x05	service replacement service
0x06	data broadcast service
0x07	RCS Map (SIS 31)
0x08	mobile hand-over
0x09	system software update service
0x0A to 0x7F	reserved for future use
0x80 to 0xFE	user defined
0xFF	reserved for future use

private_data_byte: This is an 8-bit field, the value of which is privately defined.

hand-over_type: This is a 4-bit field specifying the type of hand-over (refer Table 3).

Table 3: Hand-over type coding

Hand-over_type	Description
0x00	reserved for future use
0x01	DVB hand-over to an identical service in a neighbouring country
0x02	DVB hand-over to a local variation of the same service
0x03	DVB hand-over to an associated service
0x04 to 0x0F	reserved for future use

origin_type: This is a flag specifying in which table the link is originated (refer Table 4).

Table 4: Origin type coding

Origin_type	Description
0x00	NIT
0x01	SDT

Network_id: This is a 16-bit field which identifies the terrestrial network that supports the service indicated.

initial_service_id: This is a 16-bit field which identifies the service for which the hand-over linkage is valid.

3. RECEIVER PERFORMANCE

3.1 Table Repetition Rates.

This Operational Practice is based on broadcasters' assumption that receivers refresh the Service Description Table (SDT) with timing, similar to the transmission requirement given in ETSI TR 101 211 [2] §4.4.2 and ETSI TS 101 154 [5] §4.1.7 - i.e. at intervals not greater than 10 seconds.

3.2 Typical Receiver Behavior

A flowchart is provided overleaf, in Figure 3, to indicate typical receiver behavior when a service_replacement service is encountered involving the Linkage descriptor and the running status field of the Service Description Table for the currently selected service.

4. REFERENCES

[1]	Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems	ETSI EN 300 468 V1.6.1 (2004-11)
[2]	Digital Video Broadcasting (DVB); Guidelines for implementation and usage of Service Information (SI)	ETSI TR 101 211 V1.6.1 (2004-5)
[3]	Australian Standard, Digital television – Terrestrial broadcasting Part 1: Characteristics of digital terrestrial television transmissions	AS4599.1-2007
[4]	Free TV Australia Operational Practice OP-41 Logical Channel Descriptor	Issue 3 2005
[5]	Digital Video Broadcasting (DVB); Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream	ETSI TS 101 154 V1.7.1 (2005-06)

Figure 3: Service Replacement Service – typical receiver behavior.

