

7.3. Private Data

[This section and the sections concerning the use of logical channel numbers (LCN) draw heavily on the specification of the E-Book – but with substantial variations and extensions.

]

Where any private descriptors are present in a broadcast, a private data specifier descriptor shall be used (cf. EN 300 468) to identify the definer of the private descriptor.

For the Logical Channel Descriptor, the private data specifier value used in the E-Book, as registered in ETSI TR 101 162, shall be used; it is the one registered for EACEM (EICTA today).

The following table lists this value and the private SI items that are defined within its scope.

Organisation/ specification	PDSID	Private SI information	Value	Type
		Eacem stream identifier descriptor	0x86	Descriptor tag
EACEM	0x00000028	Logical channel descriptor	0x83	Descriptor tag
		Preferred name list descriptor	0x84	Descriptor tag
		Preferred name identifier descriptor	0x85	Descriptor tag

Table 1: Private SI recognised in the E-Book

7.3.1. Logical Channel Descriptor

The logical channel descriptor provides a default channel number label for services. This information is quasi-static. The logical channel descriptor may be inserted once in the second descriptor loop of the NIT. **The logical channel number should be unique within the same network_id** (except when its value is zero) **but may be re-used for regional variants of a service**, normally under different network_ids. Hence the number is not unique within the original network. The logical channel number does not take into account the service type.

Syntax	No. of bits	Type
logical_channel_descriptor{		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
for (i=0; i<N; i++){		
service_id	16	uimsbf
visible_service_flag	1	bslbf
reserved	5	bslbf
logical_channel_number	10	uimsbf
}		
}		

Table 2: Syntax of the logical channel descriptor

7.3.1.1. Descriptor_tag

This shall be assigned to be 0x83.

This is a 16 -bit field which serves as a label to identify this service from any other service within the network. The service_id is the same as the program_number in the corresponding program_map_section. Services shall be included irrespective of their running status.

7.3.1.2. Reserved

All “reserved” bits shall be set to ‘1’.

7.3.1.3. Visible_service_flag

When set to ‘1’, this 1-bit field indicates that the service is normally visible and selectable (subject to the service type being suitable, etc.) via the receiver service list. When set to ‘0’ this indicates that the receiver is not expected to offer the service to the user in normal navigation modes. However, the receiver should provide a mechanism to access these services (for example, by direct entry of the logical channel number).

See also Receiver rules.

7.3.1.4. Logical_channel_number

This is a 10 -bit field which indicates the broadcaster preference for ordering services. Its use is defined in the following table:

logical_channel_number	Description
0	Service not suitable for selection by the user a)
1- 999	logical_channel_number
1000 –1023	rfu – not usable

a) For example, the value zero may be used for data services only intended for selection from interactive applications or for firmware download services, etc.

Table 3: Logical channel number

See also Receiver rules.

7.3.2. The Logical Channel Numbers (LCN)

The role of the LCN is to enable user presentation of service numbers in a convenient and familiar form.

To avoid conflicting allocation of LCNs:

- The logical_channel_number should be unique across all the networks that cover the same geographical region.
- The same logical channel number should be reused only in non-adjacent regions,

- Regional variants of a service may nevertheless use the same logical channel number.

Receivers need to have a mechanism for handling conflicting LCN allocations (see below).

NOTA BENE

It is up to manufacturer to implement LC descriptor acquisition and use in their receivers. It is recommended to support logical channel numbers, as this helps communication between the content provider and the consumer. As an example, they provide a concise method for one service to describe viewing options on another service. In addition, they provide a convenient method for providing references from other media – such as printed event listings.

7.3.3. Network operator rules

Network operators and content providers operating within Italy have elected to choose a service numbering scheme between them, in collaboration with the appropriate coordinating authorities.

This specification defines the logical channel number concept for conveying such service numbering information to receivers. Network operators should obey the following specification rules in order for receivers to be able to properly operate.

Logical channel numbers allocated should be usable directly as service numbers in a receiver.

Services with the same triplet (original_network_id/transport_stream_id/service_id) shall have the same logical_channel_number. Within the scope of one network (as defined by the network_id), logical channel numbers shall be allocated uniquely (except for Successor Services).

When defining regional variants of a service, the same logical_channel_number may be used (for example in neighbouring networks). This facilitates defining a consistent and compact national/regional/local channel numbering scheme, as well as indicating to the receiver that services with the same logical_channel_number are similar (regional variants).

7.3.3.1. Multiples LCNs for a single service

Network operators and/or service providers may allocate up to four LCNs to a single service. This allows the service to be identified and associated with other services according to different criteria, such as local service, with pay elements, belonging to a specific bouquet and being of specific thematic content.

7.3.3.2. Invisible services

It is recommended to allocate high service numbers to services marked as invisible to avoid accidental collision of service numbers with those of visible services when they are being automatically or manually reallocated.

7.3.3.3. Service number zones

The service numbers are divided into two zones:

1- 99: the Preferences Zone
 100-999: the Assignment Zone

Service numbers (LCNs) may be pre-assigned in both zones.

Further more, two specific ranges have been defined:

- the Preferences Overflow,
- the Main Overflow (or “Garbage Collector”).

The Preferences Overflow occupies service numbers 75 to 99.

The Main Overflow occupies service numbers 850 to 999.

7.3.4. Receiver rules

It is a manufacturer option to provide an automatic service numbering facility on the basis of logical channel numbers. However, when the manufacturer supports logical channel numbers for automatic service numbering, he shall comply with the rules set out below.

It shall be possible for the user to select, in the set up menu, the possibility to switch off and on this automatic ordering possibility. By consequence the table in [Chapter 11. Default settings] shall be completed as follows:

Feature	Specification	Status	Note
Automatic Channel Numbering	Default is “active”	Optional	This is a toggle active/inactive

7.3.4.1. General rules

The receiver shall be able to associate up to 4 different service numbers with one service (i.e. with a unique triplet), based on the LC descriptor associated with that service.

When a viewer uses the channel up-down arrows, the receiver shall skip all service numbers which are not allocated or are allocated to “invisible” services.

7.3.4.2. Definitions

7.3.4.2.1 Scan List

This is the full list of services created on the basis of the services found by doing a frequency scan. It shall include the Logical Channel Number(s) requested by each service.

7.3.4.2.2 Service List

This is the ordered list based on the requested LCNs and after the resolution of the eventual conflicts in the requests. The only user intervention allowed to this list is during resolution of conflicts.

7.3.4.2.3 Master User List

Initially, if the user has chosen automatic channel ordering at (re)installation time, equal to the Service List (with maybe the exception of invisible services – see below), this list includes subsequent manual modifications by the user.

This is the default list of services that is used by the user.

7.3.4.2.4 User Favourite List(s)

It is recommended that manufacturers implement some form of “favourite channel” list(s) in which the user has full control over channel adding, deleting, ordering and numbering, including the possibility to leave out services even when they have been allocated a valid service number.

7.3.4.3. Logical channel number zero

Services associated to logical channel number 0 should be disregarded as part of the process below (irrespective of the value of the `visible_service_flag`). These services are not intended to be presented as part of the viewer’s service list. These services are not intended to be selectable by viewers.

7.3.4.4. Invisible services

- Receivers shall support a “default” mode in which they will not show services marked “invisible” in their user service list or selectable in normal P+/P - browsing.
- The receiver shall ignore the presence of “invisible” services when (re-) allocating services to service numbers requested by “invisible” services.
- Receivers shall support a mode (for example as a service mode or as an installation option) in which it will allow direct selection of all services (irrespective of being marked invisible) by the user. This mode may display all services also as part of the Service List in this mode.
- It is a manufacturer option to combine the two modes mentioned above, by allowing direct selection of “invisible” services while not showing them as part of the Master User List.
- Usually, “invisible” services should not be allocated a Logical Channel Number, and thus should be positioned in the Overflow Range.

7.3.4.5. Service List management

7.3.4.5.1 First initialisation

When a receiver is first initialised or reinitialised (e.g. because the user applied for a factory reset), it is expected that a user will be present in front of the receiver. However, it shall also be possible to have a fully automatic procedure. This means that, at any point where a user interaction is requested, there shall be a time-out and an automatic selection procedure.

The receiver shall perform in accordance with the following rules:

- a) It shall give the user the possibility to choose between automatic (LCN-driven) and manual (based on discovery) service numbering (see above).
- b) If automatic service numbering has been selected the receiver shall attempt to allocate in the Service List each service with associated LCN(s) to the service number(s) equal to the LCN(s) requested for that service. This rule implies that if there is only one service with a particular `logical_channel_number` request, it shall be allocated to that service number.

c) In the case of the presence of the same service (identical DVB triplet - ON_id, TS_id & S_id) on two different frequencies, the conflict shall be resolved as described in **[7.6.5.2. Handling of duplicate services]**.

d) In presence of a conflict between different services that request the same logical channel number the receiver shall:

- present the viewer with a menu allowing to select which channel to maintain at the requested position; and
- if the conflict is in the Preferences Zone, allocate the other service to the next unallocated number in the Preferences Overflow. In case there is no unallocated number in that range, the service shall be allocated to the next unallocated number in the Main Overflow.
- if the conflict is in the Assignment Zone, allocate the other service to the next unallocated number in the Main Overflow

e) in case the viewer does not select a service in the menu within the given time out the first service in the list shall be automatically selected. The ordering of conflicting services should not be based on the order of discovery, but should be random.

f) If a service does not have an associated logical_channel_number, it shall be allocated an available number in the Main Overflow.

7.3.4.5.2 Adding new services

When adding services to the Service List as a result of an update scan (whether manual or automatical, in stand-by or in operate mode), the receiver shall first try to allocate each new service to the number(s) indicated in the LC descriptor, if any. In case of conflict (i.e. the number is already occupied by a “non-invisible” service or is requested by several services, excepting Successor Services), the receiver shall proceed in the following manner:

- a) In the absence of a LCN request, the service shall be allocated the next available number in the Main Overflow.
- b) In the case of the presence of the same service (identical DVB triplet - ON_id, TS_id & S_id) on two different frequencies, the conflict shall be resolved as described in **[7.6.5.2. Handling of duplicate services]**, and the unselected service shall be allocated to the Main Overflow.
- c) the receiver, after signalling to the user that new services are available (as in the procedure described in 7.6.5), shall display a pop up menu for each case of conflict, to allow the viewer to select which service to allocate to the requested service number. (If there is already a service at the requested number, that service shall be the first in the list.)
- d) the pop up menu shall have a time out. In case no channel is selected, the first service in the list shall be automatically selected
- e) non selected service(s) shall be allocated the next available number(s)
 - a. in the Preferences Overflow if the conflict is in the Preferences Zone. In case there is no available number in that range, the service shall be allocated an available number in the Main Overflow
 - b. in the Main Overflow in all other cases.

7.3.4.5.3 Removing a service

If, during an automatic or a manual update scan, the receiver decides a service can be removed from the Service List, it will exclude the service and its service number from the Service List and the Master User List; but it shall preserve the information about the removed service in case a Successor Service is found later (see below) to allow such a Successor Service to take the place of the removed service in the service list. The service number shall continue to be considered allocated until full confirmation of the deletion of the service by the network operator or by the viewer.

A service will be considered as removed in case it's no longer present in the NIT actual and the SDT actual.

In any case, a service cannot be considered as removed due to the absence of the RF signal or in case SI Tables are incomplete/missing (e.g. due to the transmission of a PRBS signal).

It should also be noted that the (possibly temporary) inability to receive a service as such cannot be the sole reason for a receiver to delete a service from the Service List: in general, additional user intervention is recommended in such a case.

This retention mechanism also improves the robustness of the receiver against network SI errors or otherwise unintentionally removed services.

7.3.4.5.4 Successor Services

However, the more common case is that a suitable Successor Service will be available at the same time a service is removed

In case such a new service requesting the same Service Number allocation, is available, this shall not give rise to a conflict of service number requests: this new service shall be considered a Successor Service.

As the deletion of the former service from the NIT actual and SDT actual is a positive confirmation of its deletion by the network operator, the Successor Service shall be allocated the service number present in its LCN descriptor.

Earlier registered services, with at the time conflicting requests (processed during earlier scans), shall not be considered as Successor Services.

In case no Successor Service is available (and the service is no longer present in the NIT actual and in the SDT actual), the viewer shall be asked whether to delete the service from the Master User List or not. This is irrespective from the presence (or not) of a LCN descriptor in the deleted service. The default response shall be "Yes", and a time out shall select the default response in case the viewer takes no action.

Of course, a viewer shall always be able to cancel/remove a service from the Master User List.

7.3.4.6. Master User List Management

7.3.4.6.1 Creating the Master User List

Once the Service List is created or rebuilt, the Master User List shall be created/rebuilt, equal to the Service List.

7.3.4.6.2 Modifying the Master User List

The user is free to modify the names in the Master User List, to delete services, and to move services from one number to any another.

If the requested number was unoccupied it will be attributed to the service being moved (the original service number becoming available).

If the requested number is occupied, there shall be a switch of service numbers (whether determined by LCN requests, manually or automatically) between the services.

7.3.4.6.3 Updating the Master User List

When new services are added to the Service List, they shall also be added to the Master User List, with the same service number as in the Service List, but with the following complementary rules:

- If a service number (as it appears in the Service List) is occupied in Master User List by a user modified service, the service shall be allocated the next available number in the Preferences Overflow if the number is in the Preferences Zone, and in the Main Overflow in all other cases or if there is no available number in the Preferences Overflow
- User deleted services shall be reintroduced in the Master User List only when there has been a modification in the Service List due to the service being available on a new frequency.
- A Successor Service to a deleted service shall be reintroduced in the Master User List, at its Service Position (subject to the first complementary rule).

7.3.4.6.4 Renewing the Master User List

It is strongly recommend that the user shall have the possibility, at any time, to re-create the Master User List by importing the Service List.

7.3.4.7. User Favourite List(s)

Those lists are created and modified at the request of the user. They are not automatically modified by the update of the Service List or of the Master User List.

7.3.4.8. The Preferences Zone

In the Preferences Zone (service numbers 1-99), all services numbers (already occupied by a service or "empty") are available for placing a preferred channel, by the user.

When a service carrying a LC descriptor, requests an already occupied service number, and it is not a Successor Service, the user shall be able to select which service to allocate to the requested number; the other service shall be assigned the first available service number in the Preferences Overflow. If no number is available in that range, it shall be assigned an available service number in the Main Overflow.

7.3.4.9. The Assignment Zone

In the assignment zone, only occupied numbers need to be available to the user to modify the numbering scheme (pre-assigned or done by the receiver).

The receiver shall manage a Main Overflow range, at the high end of the available numbers.

Overflow Range ("Garbage collector"): the service numbers in this range are assigned to services whose type cannot be identified or is patently erroneous, and to services which cannot find an available number in their category's range.

In the absence of a LC descriptor, a receiver shall not try to allocate automatically services to another zone than the Overflow Range, where the services need not be sorted by service type.

In case the receiver implements separate lists for TV, radio and application services, a Main Overflow (with the same numbering range) should be included for each service type.

In case of conflict in the Assignment Zone (a LCN carrying signal requesting an already used number), the user shall be given the possibility to choose which signal to allocate to the specified service number. The other service shall be redirected to the Main Overflow.

7.3.5. Service variation options

7.3.5.1. Successor Services

In case of conflict, the receiver shall first attempt to find suitable Successor Services (i.e. occupying a personalized channel number or having a conflicting allocation with a service that the receiver has not been able to identify positively as removable) according to the following rules:

- a) The receiver shall first try match a new service (Successor Service) to a logical_channel_number and network_id and original_network_id from a service previously removed from the service list.
- b) Any remaining new services shall be allowed to replace services of other networks no longer available (match only on logical_channel_number and original_network_id)

Any new services that remain after Successor Service rules have been applied shall be assigned in accordance with the service number allocation rules mentioned above for resolving conflicts by the viewer, but shall not change already existing service number allocation.

7.3.5.2. Service regionalisation

When a service dynamically become regional (e.g. for regional news) it is recommended that the regional transmissions at all times be identified as separate services (different DVB triplets). In this case the service may have the same LCN descriptor: this allows the user in zones common to two or more regionalized services to select which one to allocate to the requested service number.

7.3.5.3. Network re-configuration

For major network reconfigurations, it is recommended that the user proceed with a re-installation, even at the risk of losing his/her custom numbering, if any.

When the receiver detects a service offer change, which includes the addition and deletion of multiple services and/or networks it shall first remove all services which it can determine positively (see Removing a service) to be removed permanently from the service list, and then add the new services.

Where possible, the receiver shall attempt to find suitable Successor Services (i.e. occupying a personalized channel numbering or having a conflicting allocation with a service that the receiver has not been able to identify positively as removable) according to the following rules:

- a) The receiver shall first try match to a new service (successor service) to a logical_channel_number and network_id and original_network_id from a service previously removed from the service list.
- b) Any remaining new services shall be allowed to replace services of other networks no longer available (match only on logical_channel_number and original_network_id)

Any new services that remain after successor service rules have been applied shall be assigned in accordance with the service number allocation rules as mentioned above, but shall not change already existing service number allocation.

Such services may take any free position in the service list, thereby potentially using the service number of a removed service that might be replaced later and thus blocking such a future successor. Receiver manufacturers should attempt to minimise such events. It is suggested to mark (for example using an alternate colour or an icon) those services with changed status (added, deleted, or changed) in order to indicate the changes to the user.

7.3.5.4. Change of LCN numbering scheme

Any re-arrangement by the broadcasters of LCN numbering of services will be treated as above under network re-configuration. This implies that user changes and non-default allocation of services to service numbers by the receiver should be preserved as much as possible unless a re-installation is done.