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DIGITAL PAY-TV SYSTEMS

Confidential

SCHEDULE BUILDER
SCB 3.3.x
Overview
ISSUE 1.2.0

IMS

EMC

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Conventions used in this guide

Pull-quotes

Pull-quotes are used in this document to clearly draw your attention to some part of the text. See below for the pull-quotes used in this document. The name of the pull-quote or symbol is on the left (For clarity, these appear in the margins, clear of the main body text) and its purpose is detailed to the right.

CAUTION	Provides information to avoid undesirable effects or indicates that an operation or action could give unexpected results or is irreversible or an unrecoverable event (e.g., data loss etc…).
Important	Information that must not be ignored when carrying out some task or tasks.
Note	Further information, advice or exceptions etc…
NOTICE	Information that Nagravision S.A. respectfully requires its customers and/or partners to observe.
	Technical stuff that only need be read by technical staff.
	Provides information by way of a 'TIP' to carry out a task more effectively or efficiently.
	**Indicates advice, which if not observed may result in injury and/or equipment damage.**
NVoD	Description reserved to the SCB for NVoD license

Convention for Windows

Item	Description
Menu commands	In **bold** type: e.g., Select **Save.**
Field names, radio buttons and check boxes	In **bold** type: e.g., Select the **Needs publishing** check box.
Items selected in a list box	Items selected are shown inverted
Unselected items appear normal	Items unselected are shown without any treatment.

Acknowledgements

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Acronyms and abbreviations

Term	Definition	Description
►	Follows a command on a window menu window to indicate a submenu.	
BLOB	Black out Builder	Channels and events can be blackouted.
BTV	Business TV	—
c.f.,	*confer*, compare	—
CA *System*	Conditional Access *System*	A generic term for a system used in pay television.
DIM	Data Importer	The DIM imports events provided by one or several external source(s) into the IMS database.
DVB	Digital Video Broadcasting	DVB is a family of international standards for all program delivery media: satellite, cable, terrestrial, microwave, MDS, CATV, and SMATV.
e.g.,	*exempli gratia, for example*	—
EPG	Electronic program guide	User-activated TV display showing present and following events on every channel.
GUI	Graphical User Interface	A visual way of interacting with a computer using items such as windows, icons, and menus.
i.e.,	*id est*, that is	—
IMS	Information Management System	DB and set of applications in charge of gathering program and conditional access information.
MPEG-2	Moving Pictures Experts Group	MPEG-2 is an evolving ISO/ITU standard for compressing full-motion broadcast-quality video.
MSC	Media Server Controller	—
NB.	Nota bene	Means 'Note'.
No.	Number	e.g., No. 27.
NVoD	Near Video On Demand	System based on a set of services that broadcast the same events at a fixed time interval. This allows the subscriber to see the event "near of his demand".
PID	Packet Identifier	Unique integer value used to identify the packets belonging to one elementary stream inside a transport stream (which carries many elementary streams).
PMT	Program Map Table	PSI table, MPEG-2 normalized. Identifies and indicates the locations of the streams that make up each service, and the location of PCR fields for a service. Not generated by Nagravision.
PPV	Pay per view	Payment system allowing the purchase of access to individual programs (= events, services or group of events and services) selected in advance.
SCB	SChedule Builder	SCB is an application—described in this guide.
SCN	SChedule Navigator	The Schedule Navigator is an application designed to monitor or examine part of the schedule of a set of channels.
SI	Service information	DVB defined extensions to the MPEG-2 PSI tables which provide service content and scheduling information. See NIT, SDT, EIT, TDT, TOT, RST, ST, BAT.

Term	Definition	Description
TopD	Topology Discovery	TopD is an application that provides tools to assist an engineer in the set up, maintenance and synchronization of the network topology descriptions.

Table 1 Acronyms and abbreviations

1. Introduction

This document provides an overview to the Nagravision Schedule Builder(SCB) application (Software Version 3.3.x or later). SCB is an application that runs under a Windows NT 4.0 environment, SCB is used in conjunction with DIM, TopD and EPG Generator, which are part of a Conditional Access System (CAS) for pay television.

The Schedule Builder (SCB) is an application designed to modify or create the schedule of a set of channels. There are **three versions** available according the user specific need:

- Schedule Editor: events can be edited (modify time, etc.) but no insertion are possible
- Schedule Builder: this is the standard version
- Schedule Builder for NVoD: the full version also allows defining NVoD bloc

1.1 Audience

This guide is directed at persons with comprehension of:

1. System set up requirements
2. The Nagravision CAS
3. Pay television systems and its terminology
4. Windows NT and its terminology

CAUTION The use of this application is not recommended if you do not have the audience prerequisites!

1.2 How to use this guide

To use SCB you do not need to read this guide from cover to cover—because some information is only reference material, therefore depending on your needs make your choice from the following list:

- *Strongly recommended*— Elementary principles, see § 2 p 3
- User interface, see § 3 p 10
- SCB Start up, see § 4 p 11
- Tools overview, see § 5 p 12.

Note

- This guide assumes that Schedule Builder has been installed.
- Some details of SCB windows are not described because the GUI is self-explanatory.
- Some figures are not necessarily up to date with the application but are shown here as a rough guide only.

1.3 Related documents

[1] ImsTopOvw document
[2] ImsSciUse document
[3] ImsScnUse document
[4] Release notes (This document is available directly from the Start menu by selecting Start ▶ Programs ▶ Nagravision ▶ SCB and then Release Notes)
[5] Help > Help topics: - How to guide, - Commands & key bindings.

2. Elementary principles

This chapter introduces the reader to the purpose of SCB, its general concepts, processes and relative position within the system.

2.1 SCB in a Pay-TV system architecture

The following figure shows a block diagram of a general Pay-TV system with the elements related to SCB.

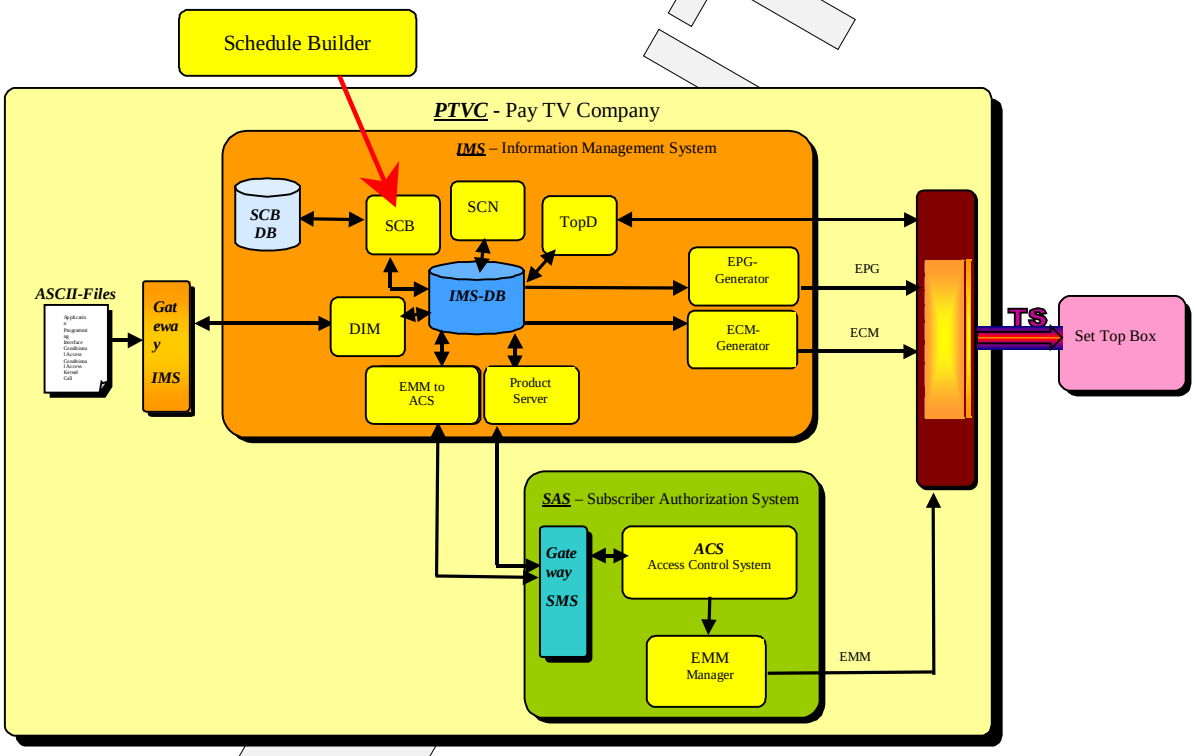

Fig. 2-1 - SCB in a Pay-TV system architecture

2.2 Definition

2.2.1 Licence

There are three possible licenses for SCB, with increasing number of features enabled. The license level can be checked by selecting 'Help -> About…'. Here are the different levels:

- **Schedule Editor**: A schedule can be imported and its events modified or deleted, but it is not possible to create new events. That also means that the Event Generator is not available.
- **Schedule Builder**: Same features as above, with the addition of creating new events by hand (see the Help topics Key bindings) or automatically (see §5.6 Event Generator).

- **Schedule Builder for NVoD**: Same features as above, plus the ability to manage assets and create NVoD bloc definitions.

2.2.2 Blackout

To satisfy either service provider agreements or legal requirements access to some events should be denied or only made available in particular areas.
The NagraVision CA system offers this feature through a system of blackout types, normally related to the type of events (football, boxing...), and subtypes, related to areas where this type of event should be blacked-out.
You can edit zones/patterns in BLOB and then blackout an event or a channel using the Schedule Builder.

2.2.3 Channel (Service)

A channel is the material (audio, video) broadcast to customers (MTV could be considered as a channel).

A channel is always mapped to one service but a service can be associated to several channels, for instance one channel in the morning and another one in the afternoon.

2.2.4 Container

This is a physical medium containing assets used for their distribution. Containers can be created and edited in basic editor. A container can be assigned to a freshly created asset.

2.2.5 Data broadcast

The Data broadcast descriptor is a DVB descriptor that provides information about a data stream that is broadcast on a separate PID.
An editor and a finder are available for data broadcasts.

2.2.6 DVB descriptor

A DVB descriptor provides:

- information about a data stream that is broadcast on a separate PID,
- a link to an elementary stream in the PMT,
- a multi-lingual text description about the data stream,
- an anchor to a precise location in the data stream, thus permitting to have more than one data object in the stream.

2.2.7 Event

An event is a broadcast with a defined starting and finishing time. It can be a PPV product (E.g. a single football game). A channel is usually a series of events.

2.2.8 Portfolio

Displaying all the channels contained in the IMS database could be unwieldy, but selecting only part of the channels can be more convenient. A set of channels can be grouped together to form a portfolio. A channel can also belong to more than one portfolio.

2.2.9 Private descriptors

Additional SI descriptors not defined by DVB standards (e.g. privately specified by the operator, or equipment provider).
They allow edition, publication and importation of private descriptors of events and can be assigned to events or channels.

2.2.10 Schedule

A schedule is defined by all the events related to a portfolio (i.e. a set of channels) and matching a user defined slide of time.

A schedule can be created either with a portfolio or with a simple list of channels. Such a schedule is created either by opening the selection in a finder or by adding channels to a default empty schedule.

Note All opened schedules when the application is quit are restored when the application is re-launched (simple channels list as well as portfolios).

NVoD

2.2.11 Event Ref (formerly named “production”)

This kind of event is especially useful with SCB for NVoD since it contains all the common attributes shared by the events used in a NVoD bloc definition. An event ref is marked as "template" and should not be deleted from the DB.
Event Ref can be created in the Basic Editor. Its micro-schedule is edited by dropping assets in the micro-schedule table.

2.2.12 Template Event Ref

See § 2.2.11 Event Ref (formerly named “production”). In finder, Event Ref is referenced as Template Event Ref.

NVoD

2.2.13 Asset

An asset is a file containing the MPEG-2 (or other) encoding of a movie or other production. A video server reads asset files and streams them on its output ports.
Assets can be created in the Basic Editor.

2.2.14 Main clip

Information used by video servers to fill up the As run file in order to validate that the event was correctly played. There can be one or more main clip(s) per micro-schedule.

NVoD

2.2.15 Micro-schedule

A micro-schedule describes a series of assets being played consecutively. E.g., a micro-schedule may include:

- a pre-show
- the first half of the movie
- commercials
- the second half of the movie
- a post-show.

When this micro-schedule is associated with an event in the IMS database, the scheduler takes care of making the video server play the assets in the correct order at the event start time.
Possibility to define micro-schedules with several main clips.
A micro-schedule editor allows displaying, validating the duration of, and publishing micro-schedule events.

NVoD

2.2.16 NVoD schedule

A NVoD schedule contains a series of NVoD bloc definitions. It doesn't contain actual events, these will be created in the IMS database when the schedule is published.

NVoD

2.2.17 NVoD bloc definitions

A NVoD bloc definition is the abstract description of the time-shifted showings of a series of a micro-schedule see Fig. 2-2. The NVoD bloc is defined by the start and end date, the description of the event reference, the number of channels (services) to use and the time shift between the showings.
When published, the NVoD bloc generates a series of events (called title event) starting at predefined times. The voids in between (if any) are filled with filler events.

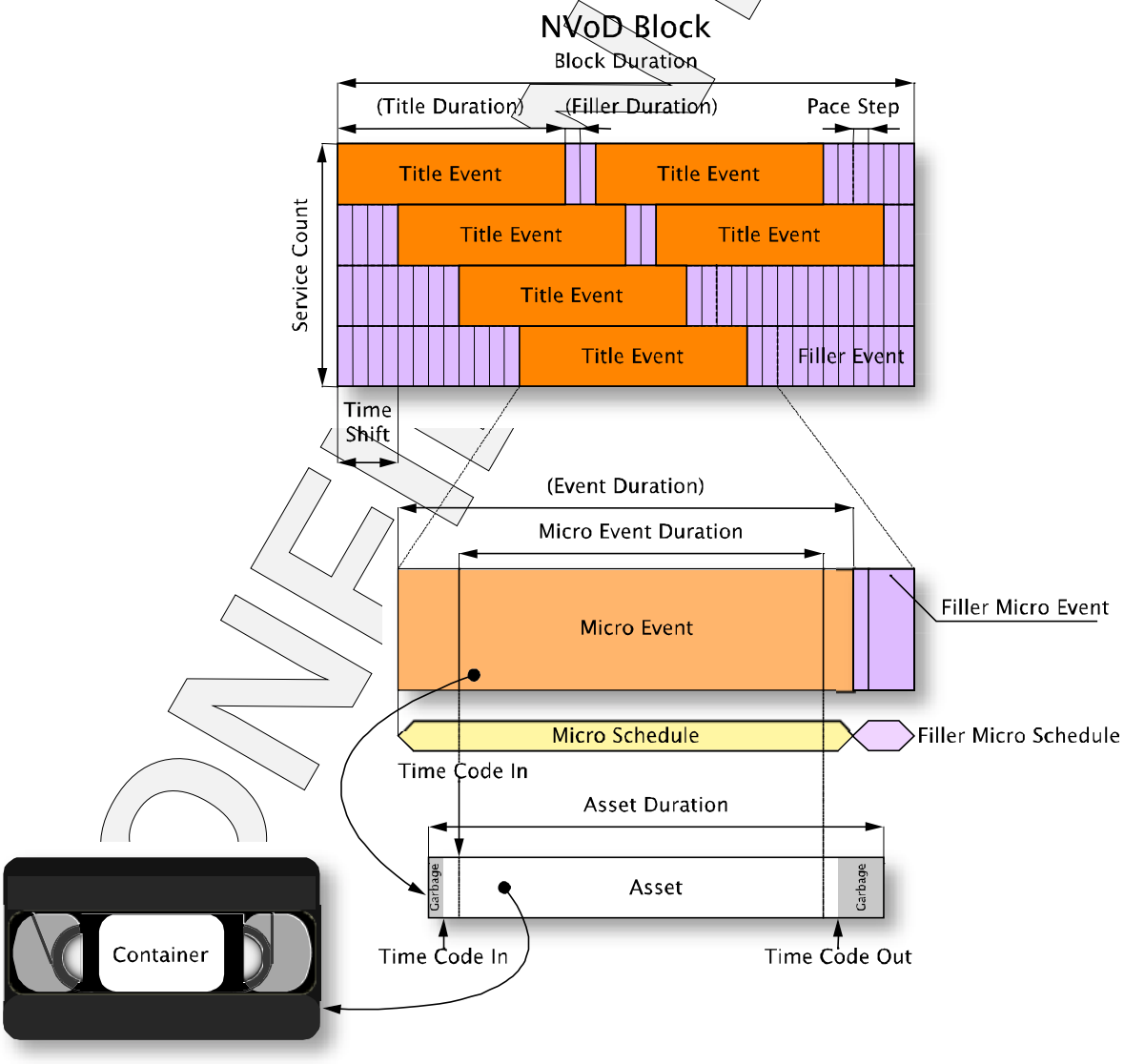

Fig. 2-2: NVOD Block definitions

NVoD

2.2.18 Title event

The title event is the event reference shown to the subscriber by the set-top box in the EPG for the NVoD bloc definition. It is usually the description of the main asset making up the micro-schedule.

NVoD

2.2.19 Filler event

A filler event is used to fill in the voids between consecutive NVoD showings (title events) so that the schedule contains no hole. E.g., if the title event is 1'10:34 long, and every showing must start at a multiple of 15 minutes, then a filler event 4:26 long must be inserted between each of them.
A filler event can have a micro-schedule (which may contain promotional material to show to the subscriber while it is waiting for its show) or not, because some set-top boxes don't allow to tune on the channel before the start of the showing it has purchased.
Filler events are optional, customers may consider acceptable to have schedules with holes in them.

2.2.20 Hole

When two successive events on a channel are not continuous, the gap between them is named a hole (also see § 5.8).

2.2.21 Linkage descriptor

The linkage descriptor provides a database structure that permits linking various SI entities to a service. It can be created and edited in the Basic Editor.

2.2.22 Live event / unpublished event

Live events refer to events stored in IMS database, which are ready for being broadcast. All the live events -imported to the current schedule from the IMS database- and all the new events created in SCB are called unpublished events. An operator works on them until he publishes the schedule.

2.2.23 Publish

When the schedule has been changed, the publish (export) command will update the IMS database so that the EPG can be regenerated.

2.2.24 Zone

A zone defines a geographical area that can be used to blackout events. A zone is defined by a list of zip codes. Zones can overlap each other and need not be geographically contiguous. A zone is not limited in the number of zip codes it can hold. Also to be mentioned that an empty zone is merely a zone where no zip code has been defined yet.

2.2.25 Work Area

For security reason, events should not be edited directly in the IMS database. Instead, they will be imported to another database in a work area that is stored independently from the IMS events (i.e. live events). This allows the operator to quietly construct or modify the schedule without being worried of trashing the IMS and therefore invalidating the EPG being broadcast to the subscriber. The editing session can also be long and needs

intermediate saves. The edited schedule can be completely erased without affecting the IMS in case it is wrong, or can be published in one shot once the operator is sure it is correct.

2.3 SCB's purpose

The Schedule Builder (SCB) is an application that provides tools through a user friendly interface to assist an operator in:

- creating a new schedule from scratch,
- controlling and modifying a schedule,
- creating channels.

2.3.1 Conceptual overview

Usually, the process of SCB can be described in four steps:

① The schedule is done externally in a flat file and is imported into the IMS database through the DIM.

② The SCB imports the existing events (live events) from the IMS database to the SCB database. The schedule first needs to be copied into a work area (see § 2.2.25 Work Area) so that intermediate changes can be saved.

③ Then the SCB displays the schedule of all the specified channels within a user-defined time interval and the edition can take place in different sessions.

④ Publish: Validation. Before publishing, a validation check can be run. A validation panel then displays some logs resulting from validation checks. See 4.2 Preferences panel.

⑤ Publish: Effective transfer.
Finally, the modified schedule is published as XML format in the IMS database via the DIM so that they are taken into account by the EPG generator. The updated EPG is then broadcast to the subscribers.

Notes

- In case of a new schedule created from scratch, steps 1 and 2 do not exist.
- NVoD blocks are created from scratch only (no importation).
- Supported format is XML.

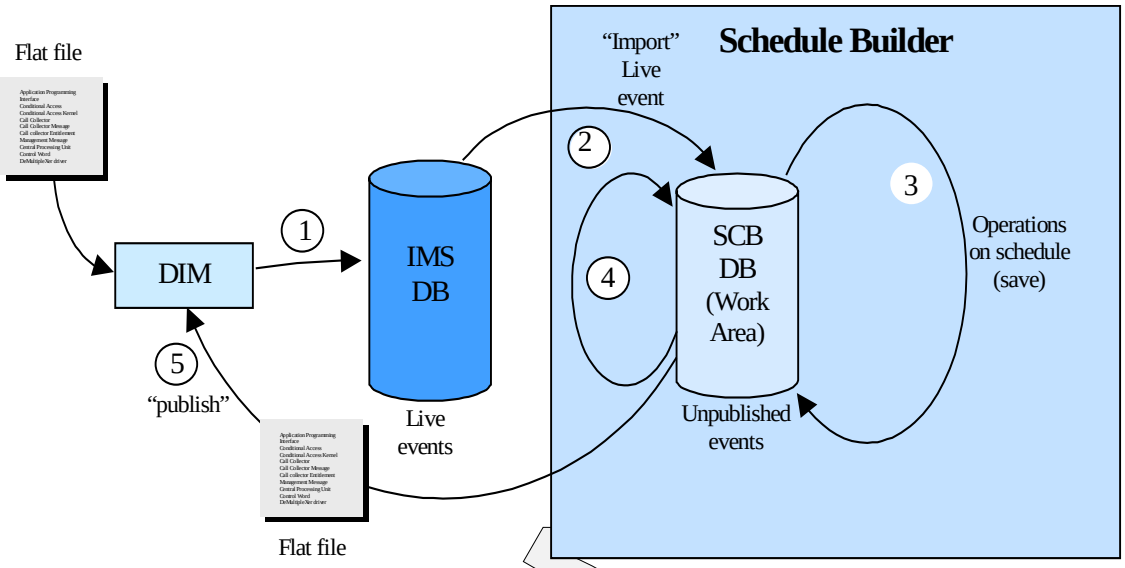

Fig. 2-3 - Conceptual overview

2.3.2 Schedule modification

Sometimes, a schedule of the IMS database needs to be modified for some reason: the description of an event can be erroneous, or a schedule modification happens too late to allow the creator of the schedule to send a corrected import file, and it happens early enough for not using Last Minute Changes (see [3] ImsScnUse document). Modifications take place at the schedule level, a full "window" is defined for modification, i.e., all events on a set of channels over a specific period.

2.3.3 New Schedule

Some customers (more frequently small and BTV customers) may need to completely create their day-to-day schedule from scratch with Nagra's tools.

2.3.4 Channel creation

Channels are created with SCB and connected to MPEG services by TopD. All attributes of channels are editable. The fields include:

- channel number and type
- name, short name, description and their translations in various languages (if applicable).
- access control (unscrambled, free access, NASP SID)
- default values for events contained in the schedule (preview time, dolby audio)
- other customer-specific fields.

Channels are created directly in IMS database, no need to create a working copy of the channel (as done for events).

3. User interface

SCB provides a user with system information through a user friendly GUI. The GUI is designed in such a way to provide operators with the quickest and most effective method of managing schedules.

3.1 Online Help

Important Help topics can be accessed directly from the **Help** menu (**F1** key).
Please consult the "**How To…**" section for practical information.

3.2 Icons, symbols

To assist the user, events are color-coded (see help in SCB)

3.3 Sorting criteria

When data are displayed in a table, each column can be sorted in ascending or descending order. The first column from left is considered as the primary sort key, the second as the second sort key, etc. Therefore, move the column you want the list to be sorted on to the left-hand side using a Drag & Drop operation. An icon (located in upper right corner) specifies which way the sort is performed (ascending, descending or neither).

3.4 Practice recommendation

SCB supports the use of the standard Windows features:

- Cut (Ctrl-X), copy (Ctrl-C) and paste (Ctrl-V)
- Drag & Drop operations. E.g. channels from the finder (channels tab) can be added to a portfolio within its schedule editor window by means of a drag & drop operation
- Events multi-selection: hold the CTRL-key down and click events (the SHIFT-key performs a multi-selection by range)

Note On a multiple events selection, most operations can also be performed like cut-and-paste, move left, move right, …

Note Copy/Paste are not supported in NVoD schedules.

TIP

1. In the schedule window, Alt-click in a hole will create a new event.
2. The shortcut key **CTRL+H** reduces all SCB's windows to one symbol in the task bar.
3. For key shortcuts and further enable actions, see help in SCB.

4. SCB Start up

4.1 Starting a new session

When starting a new session, SCB automatically connects with the IMS database. Then the operator is asked to specify a username and password for profile identification according to different possible logins, like:

- ims_reader (for ReadOnly)
- operator (for Edit)
- ims_nagra for edit and "restricted" operations, e.g. live event edition.

Once the connection and the user profile are specified, it is possible to open a schedule.

4.2 Preferences panel

This window gives access to different settings:

- language
- date formatter
  - time zone: GMT or local time (display correctly daylight saving time transitions)
- application startup (with automatic opening)
- publish validation, see note below.
- grid setup (for NVoD schedules).

Note In “publish validation” tab, severity validation rules can be defined. They must match constraints of DIM validation. The three possible states are:

- Disable: not tested,
- Warning: information is returned since rule is not entirely satisfied but publishing can take place,
- Error: rule is not satisfied, publishing cannot take place.

5. Tools overview

5.1 Introduction

This chapter provides a general description of the tools provided by SCB and an explanation of the purpose of each and operation basics.

5.2 Tools described

The tools described:

5.3 Basic Editor

The **Basic** editor allows the operator to create, edit or delete objects like portfolio, channel, etc, without needing to set them in a schedule view.

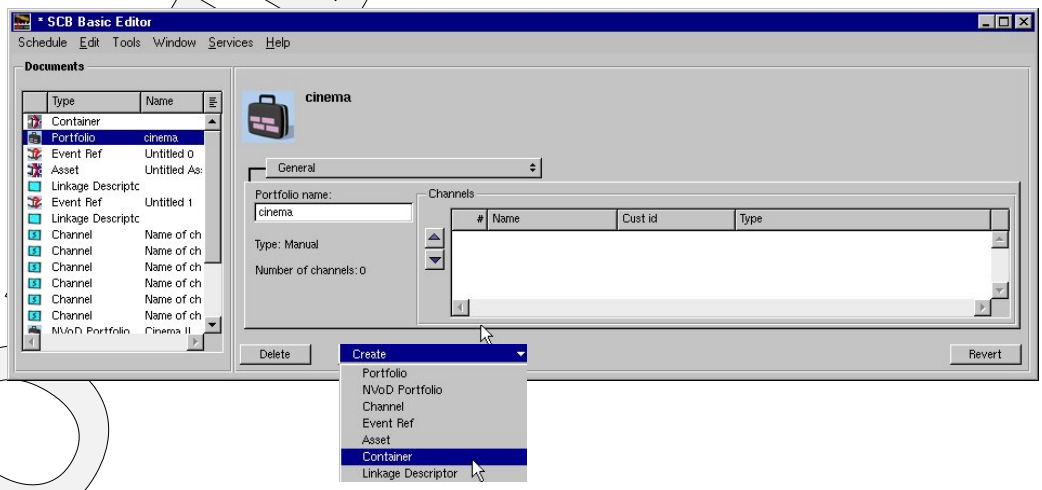

Fig. 5-1 - Basic editor

To edit an object, simply Drag & Drop its icon from the finder to the Documents area in the Basic editor.

Channels and portfolios may be dropped in the channel list of a portfolio that is displayed in the basic editor when a portfolio is selected.
The basic editor may edit assets, event ref and live events (with appropriate privileges for live events). Objects may be dragged&dropped or copied and pasted from the finder or a schedule view to the editor document table.

5.4 Manual schedule editor

The main schedule window presents the work area corresponding to the selected portfolio and the time period. In this window, you can tell at a glance for each event:

- Its begin time and end time
- Its title
- If it is scrambled, unscrambled or free access by its color.

All the channels are listed vertically and the unpublished events can be displayed on a timeline (a timeline of events for each channel) or on a tabular view (see Fig. 5-2 and Fig. 5-3). The timeline scale can be magnified with the **Zoom** command (in/out) or reset to its original scale.

The bottom part of the window (also called Edit Area) is reserved for parameters edition depending on the current selected objects; it can be the timeline settings like in Fig. 5-2, a channel or a event attribute.

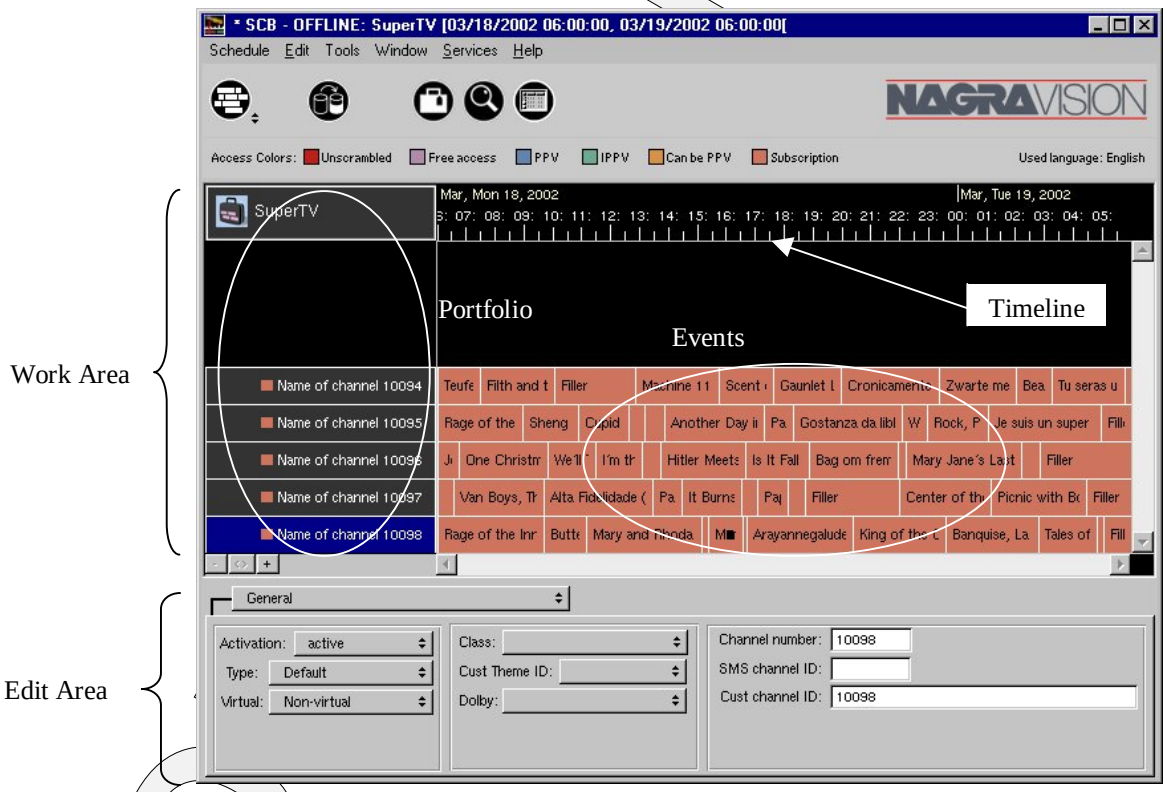

Fig. 5-2 - Schedule editor (timeline view)

Note

The period of each displayed schedule can be modified either:

- by clicking the time ruler (the horizontal ruler above the schedule) and editing the period settings in the detail view below the schedule.
- or by using the schedule period buttons located on the left of the edit eara.

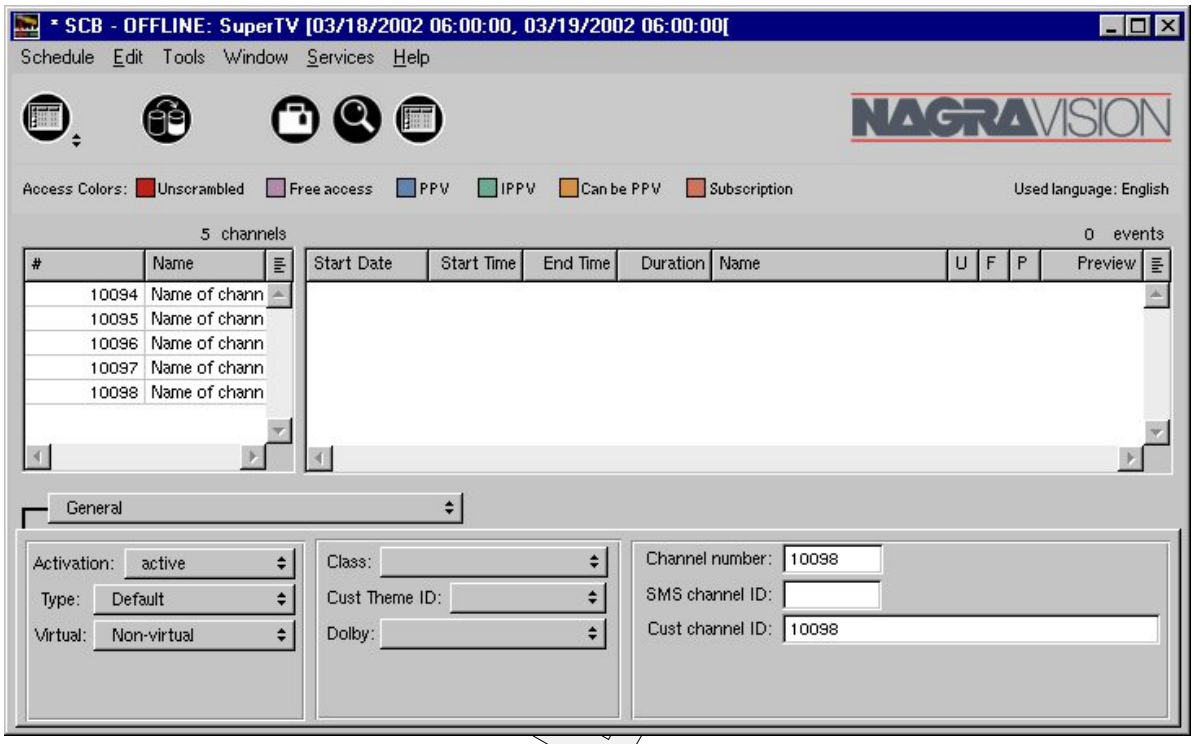

Fig. 5-3 - Schedule editor (tabular view)

Note A schedule can be extracted (import live events) only if the current schedule is not currently edited (a flag "*" in the title bar will appear when the schedule needs to be saved).

The **Schedule** editor allows selection of an event or bunch of events (multi-selection) to:

- re-schedule the events (change the date and time at which events are scheduled)
- delete the events.
- edit the events description in the edit area

Note When user performs a multi-selection, the fields displaying different attribute value indicate '**(..)**'. For such a field, a pull-down menu displays the list of the different values according to the selection and the selected value will be applied to the whole selection. The user can also directly type in a new value that will be applied to all selected objects.

5.5 Finder

The **Finder** is a search tool to assist in the location of element(s) for examination. A search can be made using various criteria and/or keywords.

A hole finder allows to locate holes in schedules.

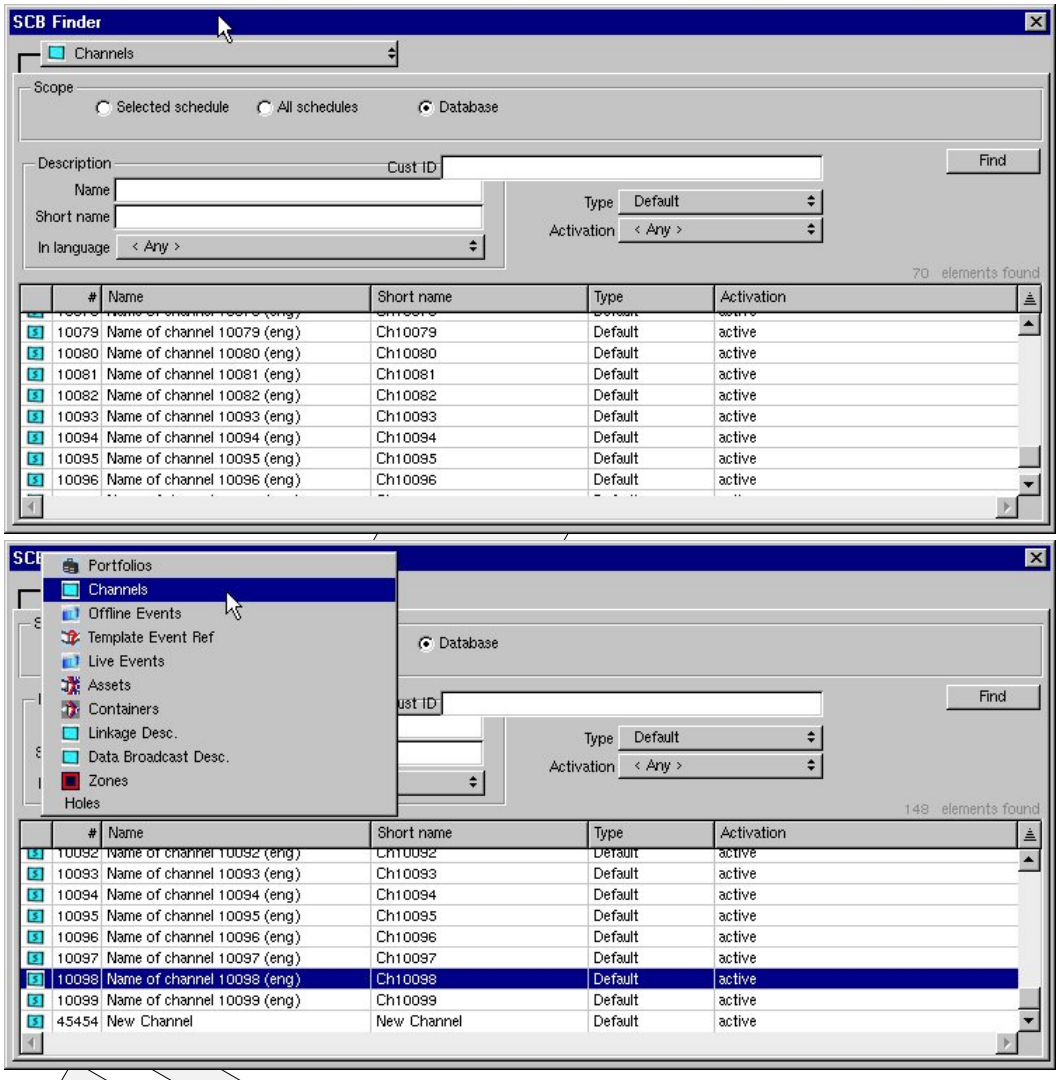

Fig. 5-4 - Finder

Note that when there is an icon, a Drag & Drop operation can be performed on it.

5.6 Event Generator

To create a series of new events with default attributes:

- Select a hole, a channel or a series of channels in the schedule view
- Click the **Event Generator** command in the Tools menu
- Fill information request and generate.

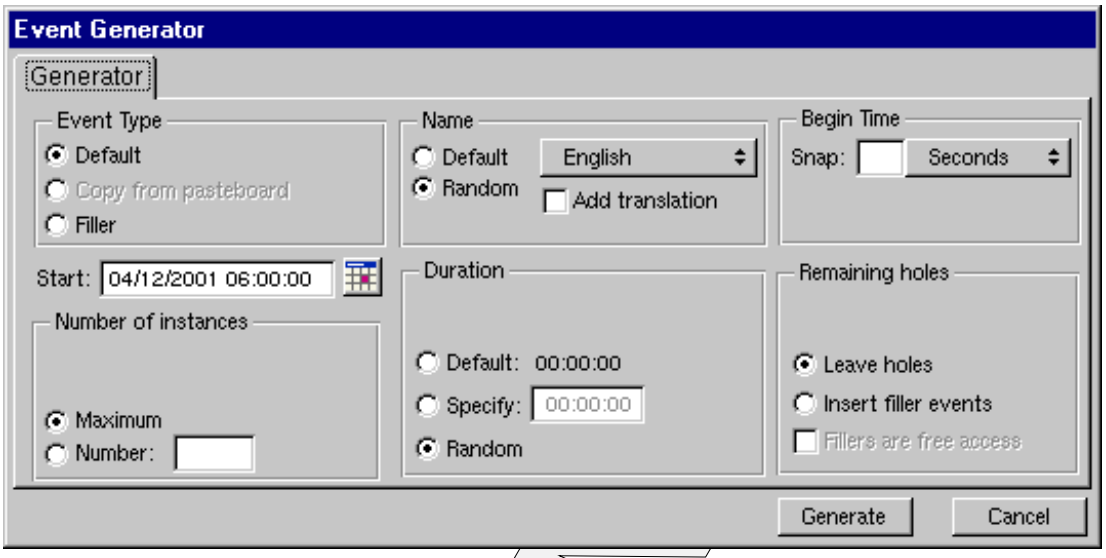

Fig. 5-5 - Event Generator

The **Event Generator** is also used to duplicate an event (or multi-selection of events):

- until date D or until x events have been generated
- every H hours
- every day at time T
- every working day (or a user choice of days) at time T.

5.7 NVoD schedule editor

The main schedule window presents the work area corresponding to the selected portfolio and the time period (see Fig. 5-6). In this window, you don't see directly individual events, you're working with abstract NVoD bloc definitions. These blocs span several channels (usually 2 – 6 channels). The following parameters can be directly edited:

- Its begin time and end time
- The description of the event reference associated (which determines the description displayed on the subscriber's set-top box)
- The list of assets to be played (micro-schedule).

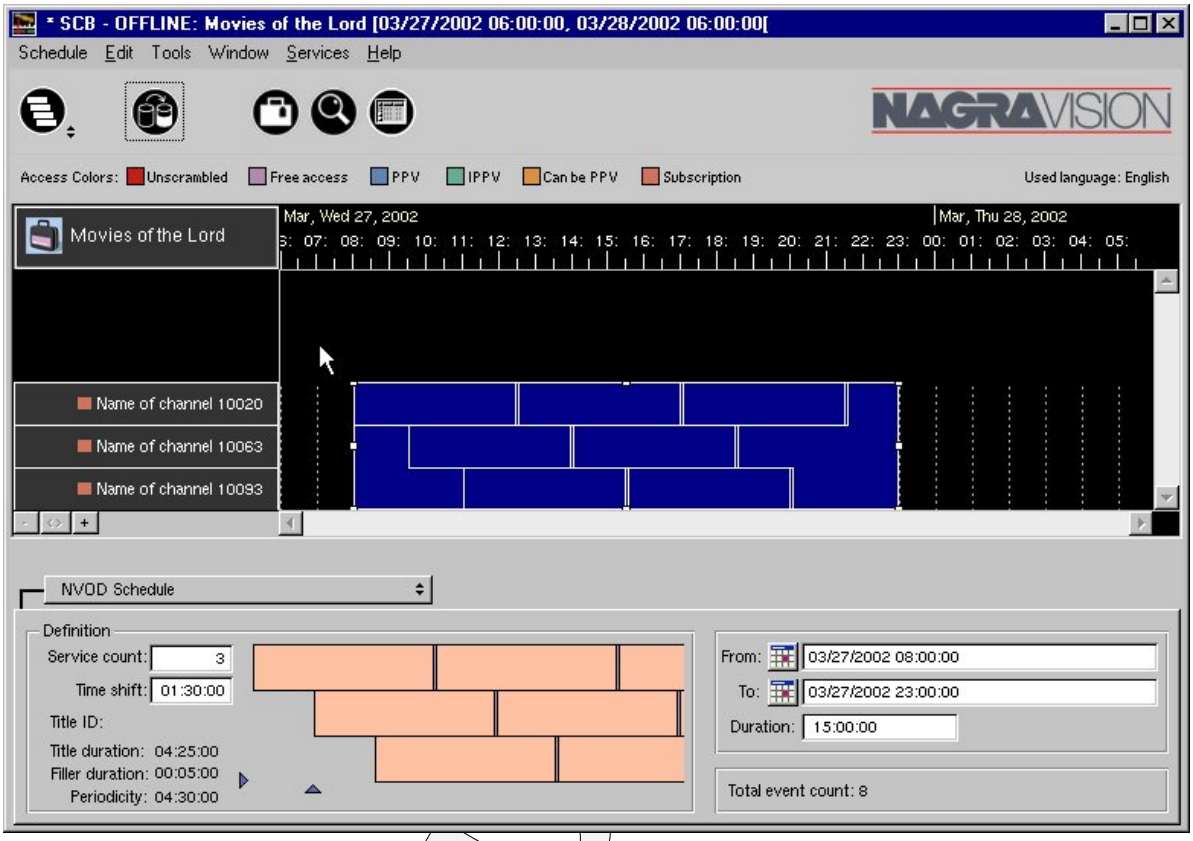

Fig. 5-6 - NVoD Schedule editor

In addition, a specialized control allows to graphically specify the number of channels to use (arrow with vertical move) or the time-shift (arrow with horizontal move): the filler length is updated accordingly.

The total number of events that will be generated by the publishing process is continually updated.

5.7.1 Creation

To create a NVoD bloc, the operator drags a template event reference with its attached micro-schedule from the finder to the NVoD timeline view. The event reference will become the title event. By dragging more events to the view and adjusting its start time, end time and number of services, a complete schedule for several days can be created very rapidly.

A validation process checks that the frame rate of the individual assets matches the channel's frame rate, and that the maximum bit rate doesn't exceed the video server's capacity.

It is then possible to publish the schedule, which will be stored it in the IMS database. The EPG generator is notified to regenerate the EPG for the specified period, and the MSC will automatically start to schedule the assets at the correct time.

If needed, the events generated can then be selected in Product Builder to create various kinds of products for the events.

5.8 Working with Hole

When a channel contains holes between events, the **Finder** can be used to directly access them.

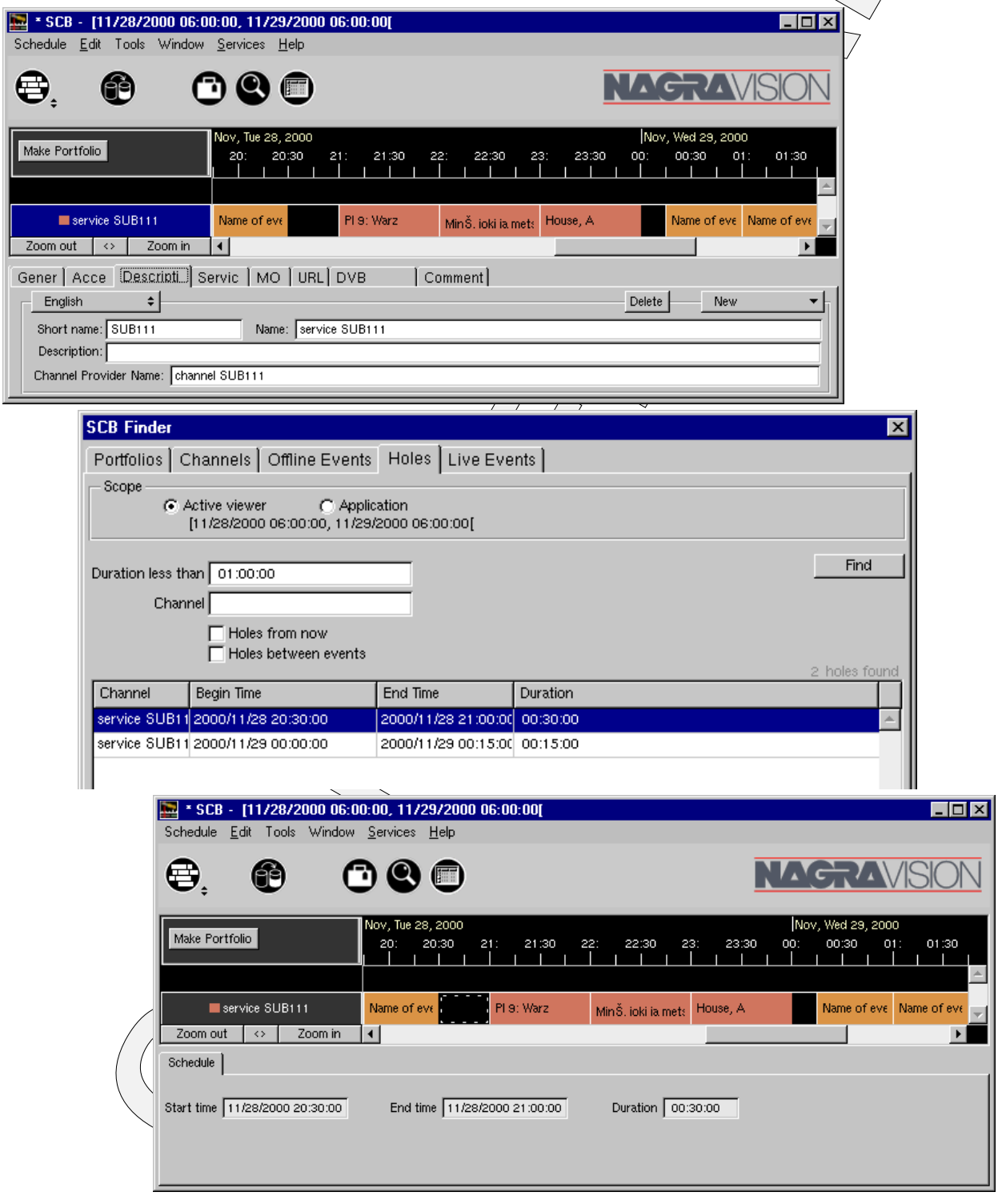

Fig. 5-7 - Working with Hole

6. Troubleshooting & Maintenance (SCB)

6.1 Terms and conditions

Troubleshooting support and application maintenance assistance is bound to the contractual terms and conditions agreed with Nagravision S.A.

6.2 Troubleshooting

Troubleshooting is beyond the scope of this document.

6.3 System maintenance

This application does not require system maintenance—I.e., no daily or periodic system operation is required to maintain the performance of SCB.

6.4 Anomalies with functionality

6.4.1 Reporting anomalies to Nagravision

Before contacting Nagravision, please note down:
Details from the **About panel…**

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