sat-nms LM Link Management

Overview

The **sat-nms** LM link management is a software module available for the **sat-nms** NMS network management software. It is very flexible and therefore suitable for most link management applications. The main features of the link management are:

- Supports bi-directional links occupying two channels (modem data link applications).

- Supports one way (A -> B) transmissions and broadcasts (A -> B, C, D...) as well (video distribution applications).

- Built in resource control: keeps track of the usage of communication channels and station equipment. Keeps the operator from using the same resource twice at the same time.

- Links / transmissions may be scheduled (automation) or started immediately on demand (manual). Links may be scheduled to be active intermittently (e.g. once a day).

- Automatic channel assignment from customer defined channel pools.
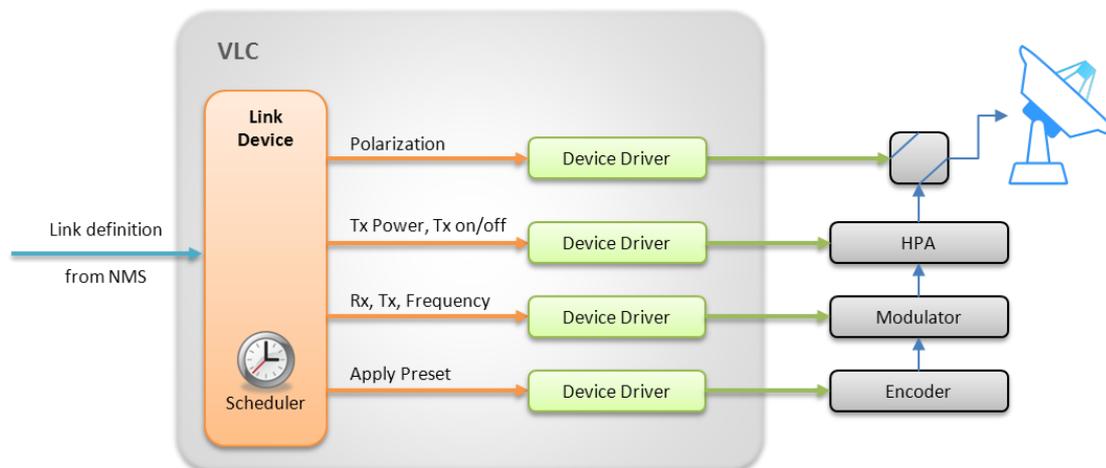
Basic Concepts

The **sat-nms** LM link management is built on on three basic concepts:

- Link abstraction: The **sat-nms** LM link management treats links, their end points and their channel usage in a high abstraction level. This makes the software easily to configure for various applications. The way the software handles link end points even enables the software to control heterogenous networks, using completely different equipment setups at different groups of VLCs.

- Central resource control: A database located in the NMS server keeps track about which resources (earth station equipment, satellite channels, terristrical fiber channels etc.) are used for transmissions at which time. The resource control assists the operator on setting up new links as it checks the resource usage before a operation really takes place.

- Distributed scheduling: The scheduler which really switches on the carrier for a transmission is implemented in the **sat-nms** VLC – normally located at a remote site like a branch office or an mobile SNG vehicle. This means, the information, when a link has to be switched on air, is sent to the **sat-nms** VLC when the operator configures this link. Then the **sat-nms** VLC works on it's own and starts the transmission at the planned date. This ensures that the link starts to transmit on schedule, even if there is a shortage of control communication channels (telephone lines) at this time.

Virtual Link Devices

With the *sat-nms* LM link management, a communication link is between two end points, one for transmit one for receive. The software does not directly control the equipment at link end point VLCs. In fact the NMS software controls a logical or virtual 'Link' device at the source or destination point of the link.

The Link device introduces a level of abstraction above the equipment configuration controlled by this VLC. With this abstract level of control, the NMS needs not to know if the transmit power shall be set by a transceiver, upconverter or satellite modem. From the NMS' point of view, the link device lets each equipment configuration used to perform a link look the same.

There are three different flavors of the 'Link' device, they are used depending on the general type of link end point the 'Link' device stands for:

- link end points which either receive or transmit a signal (unidirectional links). Typical application: transmit or receive facilities of a video distribution system.

- link end points which receive and transmit at the same time. (bidirectional links). Typical application: data or Internet link stations.

- static links does not implement any equipment control nor does it contain a local scheduler. It simply collects the fault states of some device and assigns the resulting state to the link. Typical Application: for large networks where no scheduling is needed

Satellite Channels

The software provides a channel database which contains all channels available for transmissions specified by up- and dowlink frequency and polarisation and datarate.

Satellite Channel List (192.168.2.223)				
EUT7A-4M1	↑ 14353.000 MHz H	↓ 11053.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-4M2	↑ 14357.000 MHz H	↓ 11057.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-4M3	↑ 14361.000 MHz H	↓ 11061.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-4M4	↑ 14365.000 MHz H	↓ 11065.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-4M5	↑ 14369.000 MHz H	↓ 11069.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-4M6	↑ 14373.000 MHz H	↓ 11073.000 MHz V	↔ 4.000 MHz	4-MHz-Channels
EUT7A-8M1	↑ 14355.000 MHz H	↓ 11055.000 MHz V	↔ 8.000 MHz	8-MHz-Channels
EUT7A-8M2	↑ 14363.000 MHz H	↓ 11063.000 MHz V	↔ 8.000 MHz	8-MHz-Channels
EUT7A-8M3	↑ 14371.000 MHz H	↓ 11071.000 MHz V	↔ 8.000 MHz	8-MHz-Channels

Resource checking on channels is done by comparing the true frequency band occupied by the channel. This way subchannels may easily be defined in the database and always are recognized correctly during the resource checks. E.g. a 16 MBit channel also may be used as two 8 MBit channels, the wide channel is 'in use' as soon as one of the narrow channels is occupied.
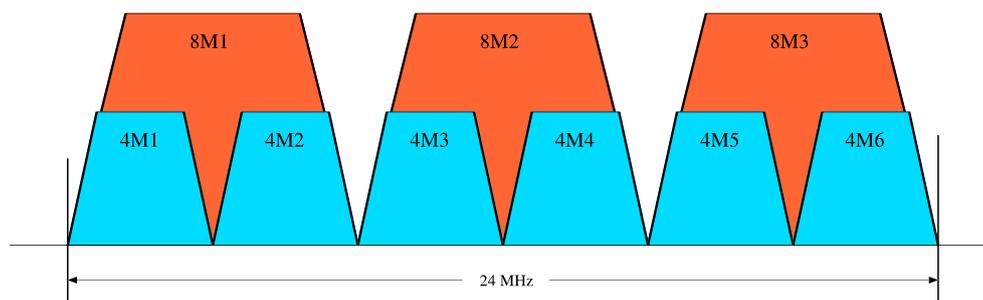
Channel pool

Each channel uniquely is assigned to a channel pool. The membership in a certain channel pool characterizes the channel as being suitable for a certain type of transmission. When a link is setup with automatic channel selection, the software picks a channel from the pool which the type of this link requests.

Beside this, channel pools are used to control the operators' access to the channels in this pool.

Link types

Links may transport different types of data, requiring different parameter settings for the equipment used to implement this link. A Link Type is a set of device presets which get applied to the equipment just before the link is set up.

Beside this, a link type also is bound to a certain channel pool. The link management uses a channel from this pool, if it is advised to setup a link of this type with automatic channel selection.

Link Scheduler

The Link Scheduler   is the user interface for the operator to create, change or remove links (transmissions). It visualizes which resources are available a which time.
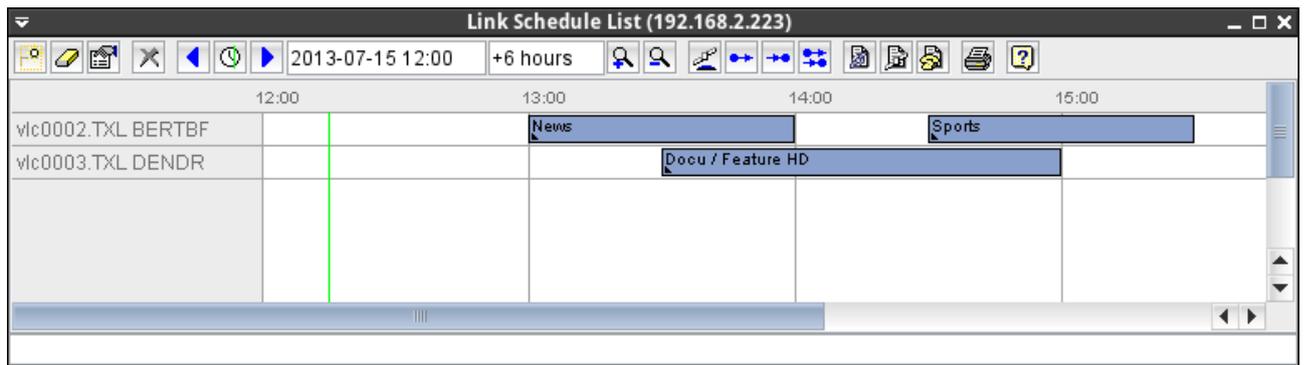
The scheduler window provides four different views, which show the occupancy of different kinds of resources: channels, link sources, link destinations and finally a view showing sources and destinations in one diagram.
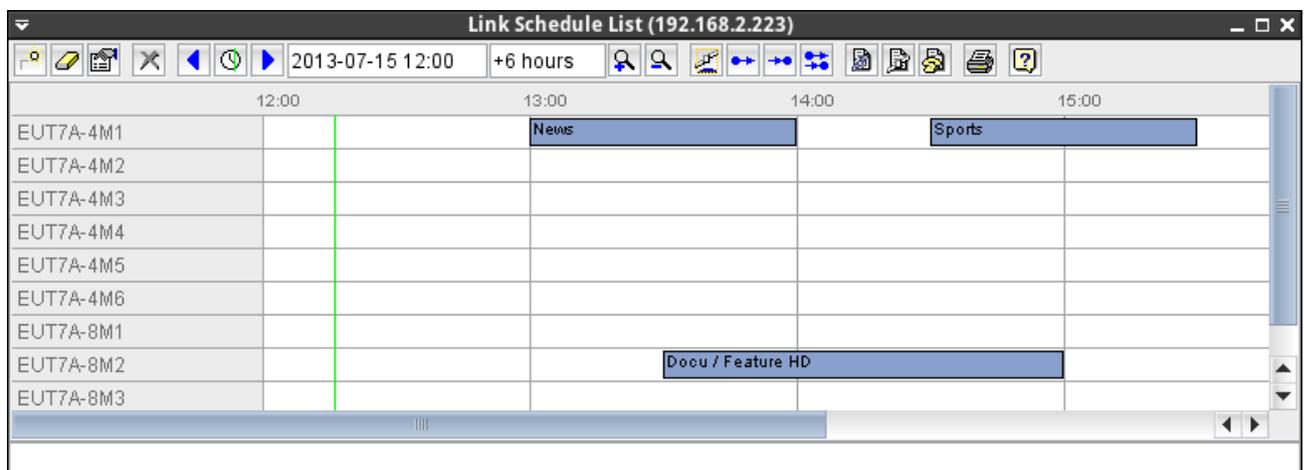
The actual state of the links shown is displayed as the color of the link bar:

	The blue bar symbolizes an active link. If the green vertical line which represents 'now' crosses the link bar, the link is transmitting.
	This link is a rx-only one. It is programmed as a 'slave' to another link, automatically adapts the timing and channel selection from it's master.
	This is a deactivated (disabled) link. Deactivated links never transmit, they do not occupy channels or end points. Hence deactivated links may overlap with other (activated or deactivated) links.
	A change has been commanded for this link, but the VLCs did not yet acknowledge this change.
	The link is faulty. A device needed for this link may be in fault state or the link could not be programmed at one of the VLCs.
	You tried to program a link which conflicts to this yellow marked link. The yellow mark disappears as soon as you close the alert box which informed you about the the resource conflict.

Link properties

Depending on the type of link you want to create, different properties are available for configuration. This includes for example:

- Link Name describes the program contents transmitted by this link.

- unidirectional or bidirecttion link type

- End points of the links

- Communication Channels, it is also possible to let the software automatically assign a matching channel for the transmission.

- Start and End time of the transmission and if required a repeat rate

Link Queue

The Link Queue window displays which link programming commands actually are on the way to some VLCs. The NMS sends the programming commands to the VLCs following a certain priority scheme. The Link Queue window shows the programming command which will be sent next at the top of the list.

⚡	NMS actually tries to connect (dial) to the destination VLC.
⚡	After the connection to the VLC has been established, the flash symbol changes to green. The NMS now waits for an acknowledgement of the link programming command.
⚡	If the destination VLC actually is unreachable (e.g. line busy), the link command is marked with a red flash.