
Simulator Module

LYNX

Introduction

The simulator is used to study, in a non-RT context, the effect of one or more outages on the network.

The simulator includes a tool that is used to generate event sequences (scripts), which can then be played in continuous or step-by-step mode.

In an educational context, the trainer will perform training scripts on a console, and observe the response from the student who operates, for example, on an operator station in simulation mode.

In a training context, the operator can simulate events that do not occur frequently and repeat operations that are associated with their management.

The simulator functions are the same as the functions that are installed on the operator station (SCADA, management help, and Study mode).

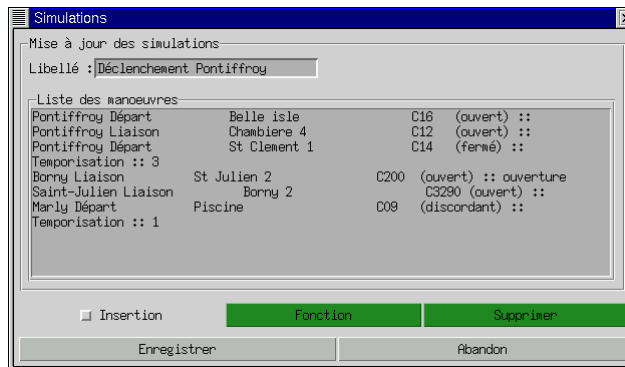
The system initial state is defined by loading a network snapshot (RT situation, normal operation scheme, previously archived state, etc.).

The management simulator allows the facility operators to get familiar with the management system. It is available and operational for basic features (HMI, load flow, simple scenario simulation). The management simulator is also used to train management agents.

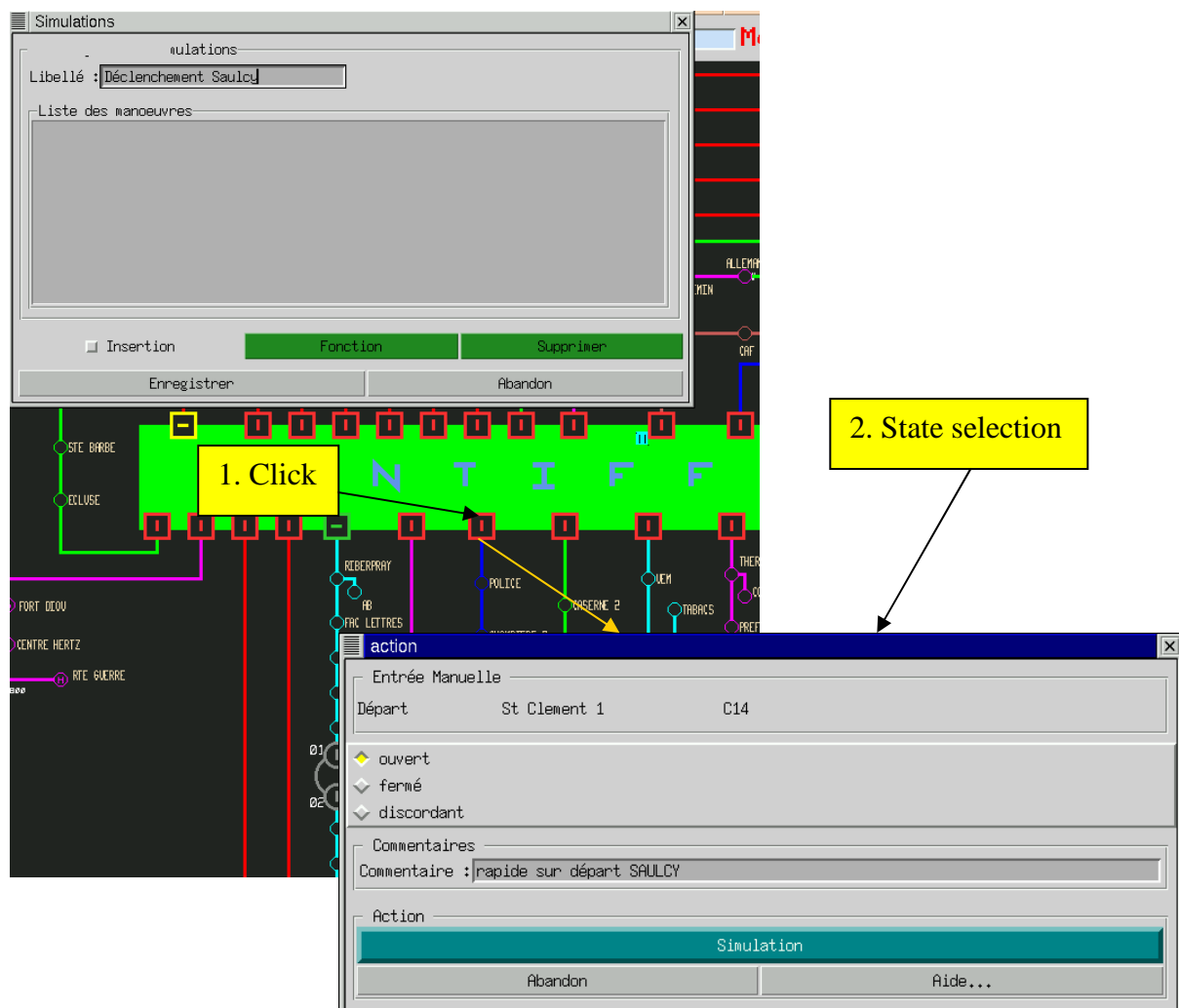
With the investment made on networks to enhance the power supply quality, a management agent has only few chances to be in a disturbed operation situation. The simulator allows to maintain the skill level of operators to ensure the network management quality.

The management simulator can be used to test new or existing features of the system. It also allows to replay an incident later. Triggering scenarios allows to measure system performance and functionality, together with its behaviour, when commissioning new units.

Generating Simplified Simulations

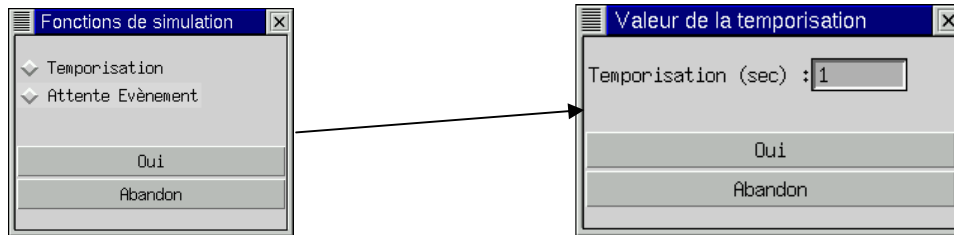


A script is made of a sequence of operations that are obtained by selecting the object graphically (in pictures or lists), and by selecting the state to apply.



Functions can be inserted in simulation sequences:

- Time-outs: Waiting time between two steps in the sequence.
- Event Wait: Waiting for an event of a given type before continuing the sequence.



Running a sequence is performed step-by-step or continuously.

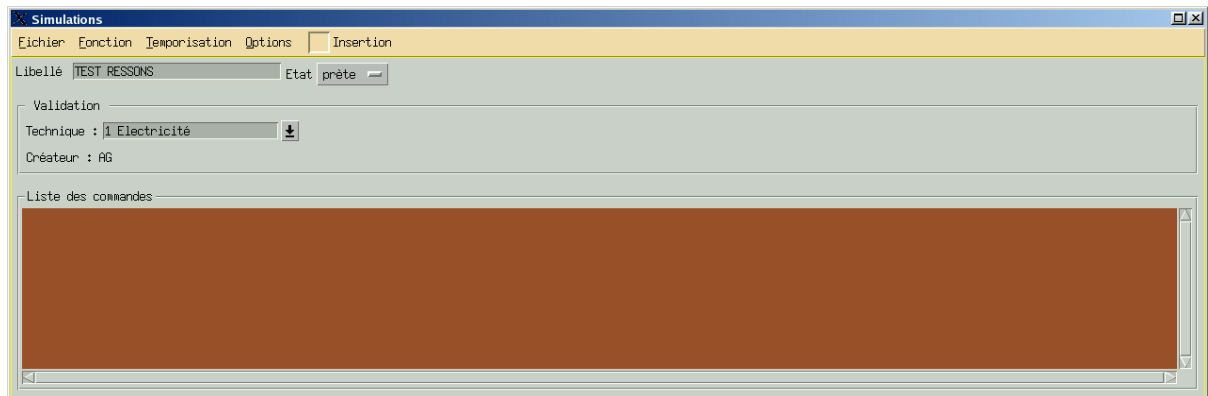


Note: Scenarios can be retrieved from the log book.

Field automatisms are not automatically generated; everything should be defined in the scenario.

Generating Complete Simulations

When creating a scenario, the following window will appear:



The following information is required:

The name (label) to identify it later.

The state:

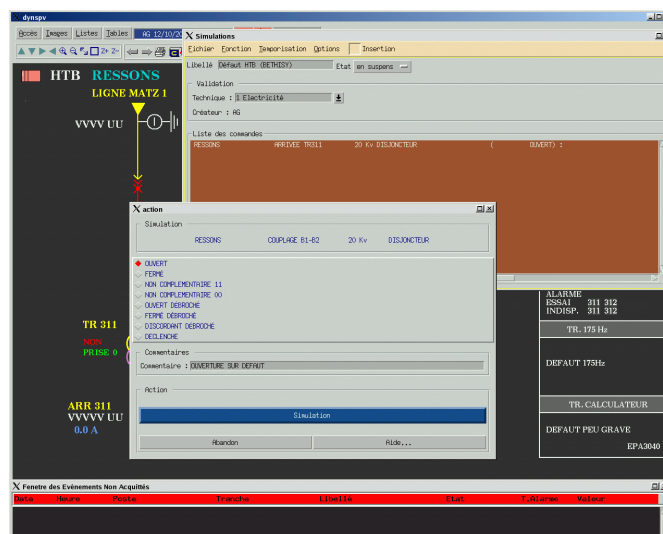
- Ready: Operational
- Outstanding: Stopped when running, can be resumed from the stop point
- Archived or Building in progress: Editable, but can not be run

Edit Options

When editing, simply click the object to display a window with all possible events relating to the object (e.g. trigger, invalidity, fault, etc.).

The example below shows the possible states for the circuit breaker.

A comment can be added to the event.

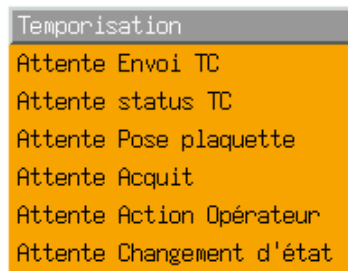


Functions



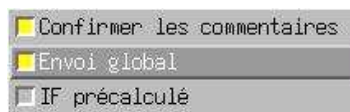
Time-outs and Waiting for Events

The trainer can insert time-outs, or stop points relating to an action by the trainee.



For example, wait for the trainee to send a remote order before triggering a fault on the network, or wait for 10 seconds before continuing a sequence.

Options



Confirm Comments: At runtime, when a comment is found, it should be validated by the trainer.

Global Sending: At runtime, gives the global send option. If this option is off, only the step-by-step send will be offered to the trainer.

Precomputed IF: If this option is checked, conditional sequences will be calculated when loading the scenario, and will not be visible to the trainer. If this option is off, the condition will be evaluated when it is run.

The following additional functions are available:

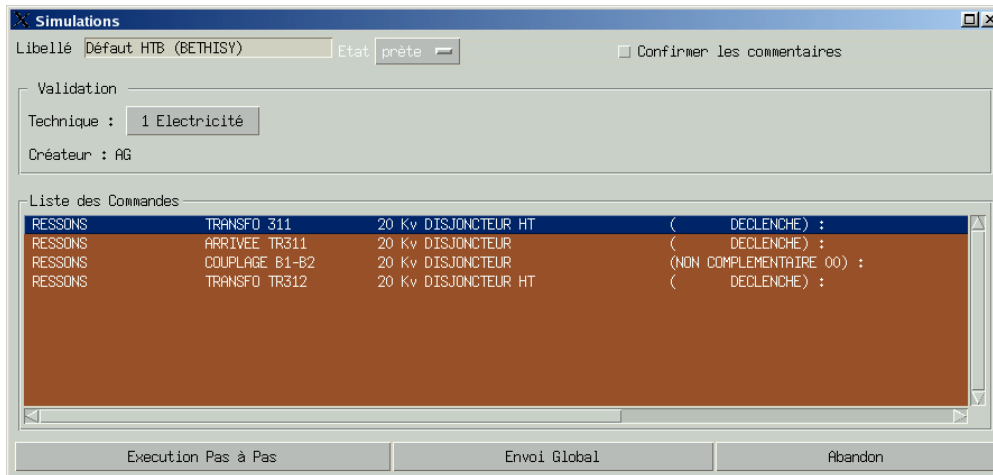
The Insert (Insertion) button can be used to insert an event/comment in the middle of a sequence that has already been defined.



A popup menu is available by clicking on a line. This menu is used to edit, copy, or delete the line. A copied line can be pasted anywhere else in the sequence.

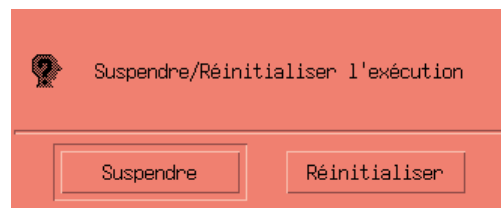
Running a Scenario

Running (Select [Sélection] option) a scenario is done sequentially or as a global send (if this option is enabled).



Notes:

If a scenario is aborted, the following dialog box will appear for the trainer:



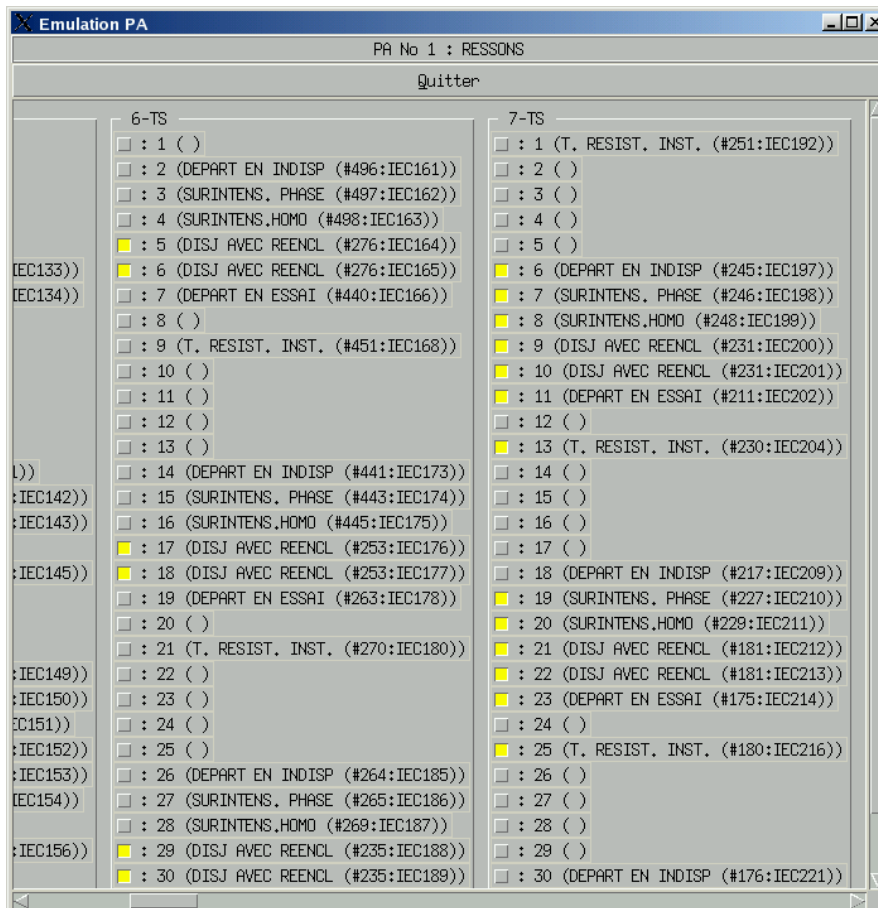
If the trainer chooses to save the scenario state, he will be able to resume the execution of this scenario later from the stop point. The scenario will then have the state “pending”.

Simulation Flow

Fully settable user lists can be used to display the various current disturbances (unavailable objects, etc.).

Load modelling is defined below; the operator can define his own template.

The trainer has a tool set that he can use to generate critical events. In addition to the previously described tools, an RTU simulator is used to send information that is the same as the one received from the RTU.



The RTU simulator allows to force states (valid/invalid), and to change values for AI or counters. The system behaviour will then be exactly the same as the one triggered when receiving an analogue message from the RTU.

Replay a Session or an Incident

The simulation session, and any incident, can be reviewed later using the black box recorder, which can be used to replay an event sequence.

