

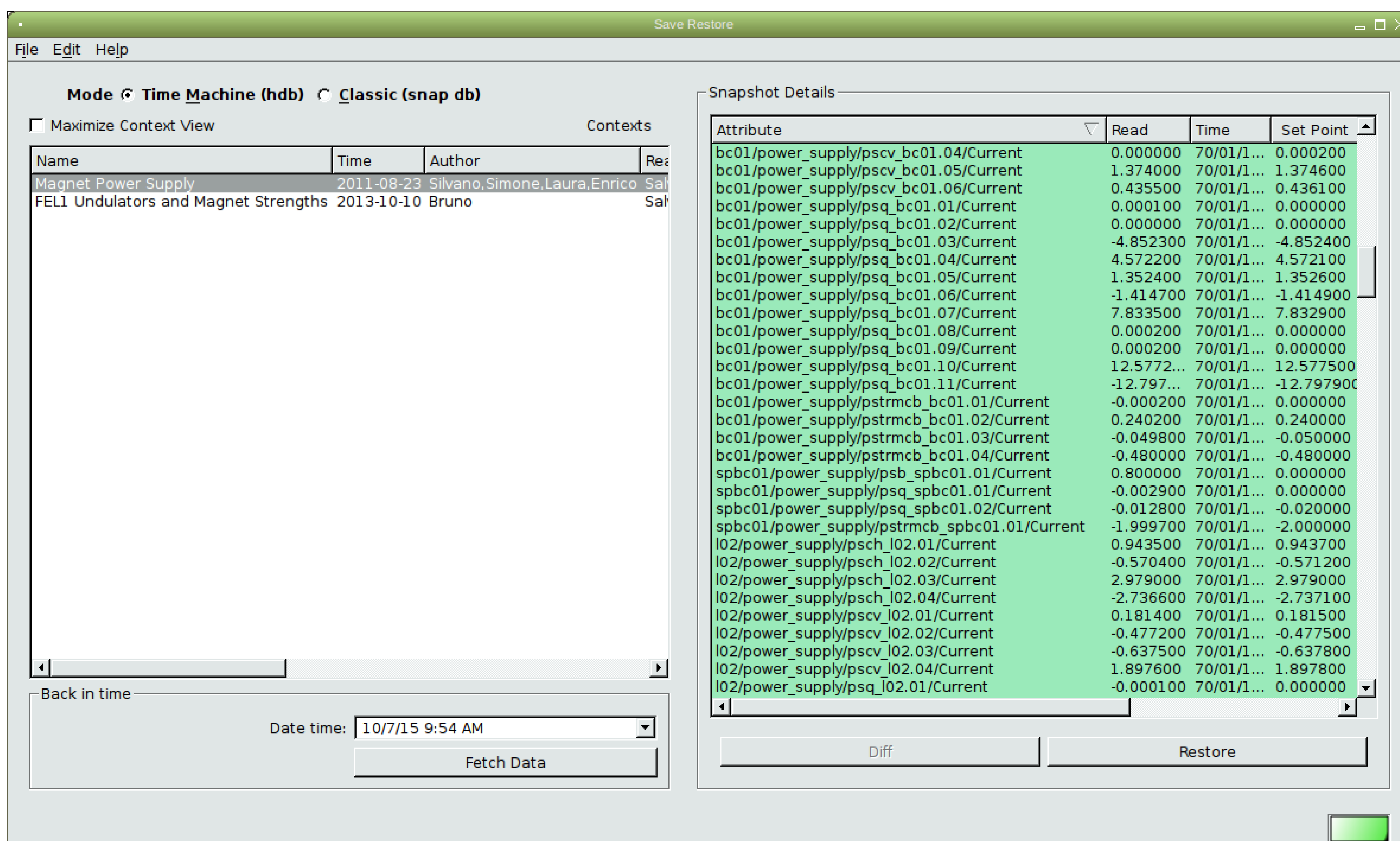


# TIME TRAVEL MADE POSSIBLE AT FERMI BY THE TIME-MACHINE APPLICATION

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The TANGO archiving system HDB++ continuously stores data over time into the historical database. The new time-machine application, a specialization of the extensively used save/restore framework, allows bringing back sets of control system variables to their values at a precise date and time in the past. Given the desired time stamp  $t_0$  and a set of TANGO attributes, the values recorded at the most recent date and time preceding or equalling  $t_0$  are fetched from the historical database. The user can examine the list of variables with their values before performing a full or partial restoration of the set. The time-machine seamlessly integrates with the well known save/restore application, sharing many of its characteristics and functionalities, such as the matrix-based subset selection, the live difference view and the simple and effective user interface.

Relying on an event-based TANGO historical database archiver, named HDB++, the Time Machine is able to restore a set of attributes to their values at any date and time in the past. The HDB++ constantly saves TANGO attributes into the database. Taking advantage of the event-based archiver and the coupled extraction library, it is always possible to retrieve the value of a quantity at an arbitrary point in the past. Historical database snapshots can thus be created on the fly at a given date and time.



## STEPS OF THE RESTORE PROCESS

- ✗ selection of the desired context;
- ✗ fetch data from the historical database, specifying a date and time in the past (see the figure above, bottom left box) and clicking on the *Fetch Data* button;
- ✗ select the attributes to restore and restore them.

The database fetch and the restore processes run on a separate thread so that the graphical interface remains responsive.

## THE MATRIX SELECTION

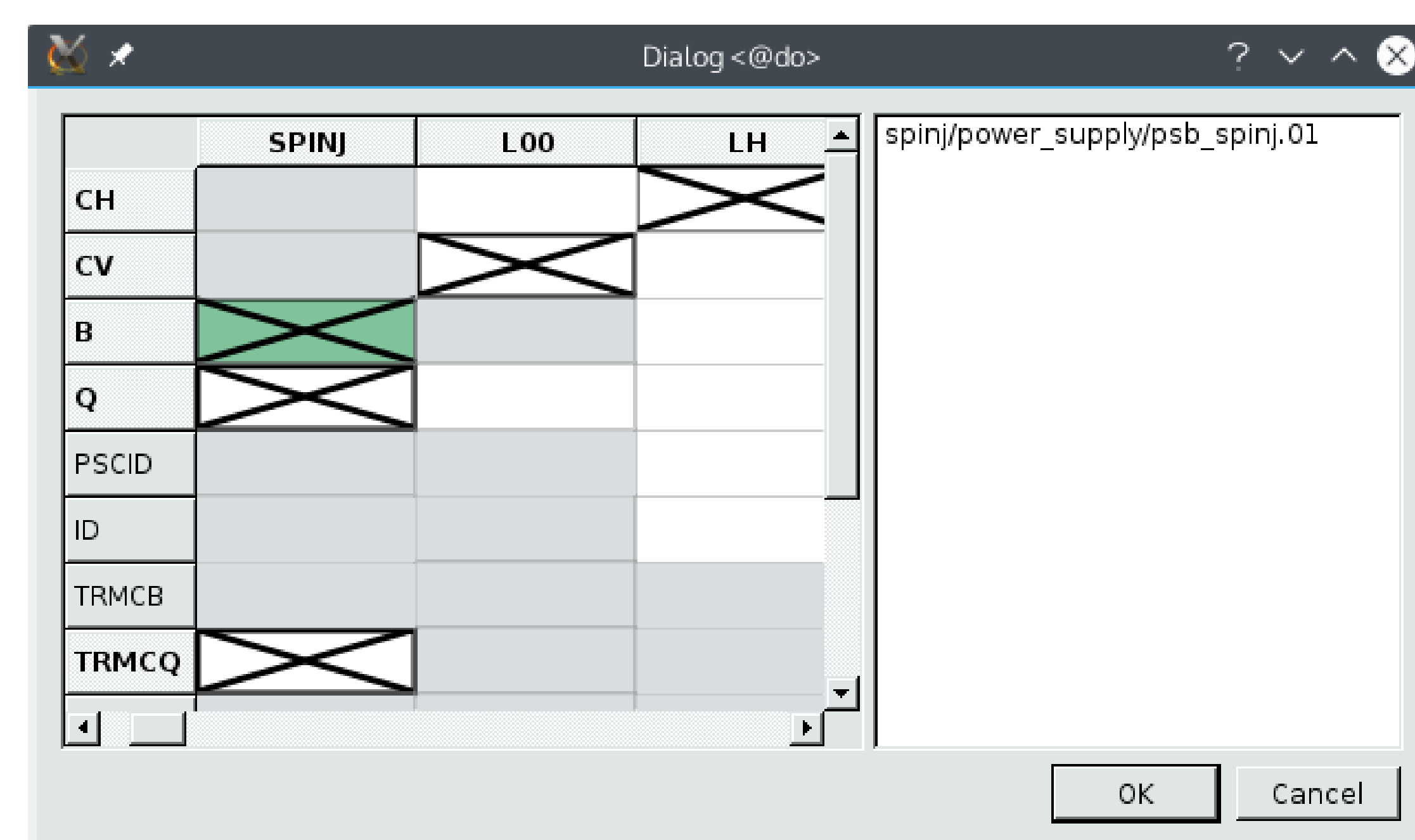
Alongside the classic item selection mode in the attribute selection list, a matrix selection is available. The selection groups and the kinds of distinct devices are defined into the database itself and reflect the sections in which the machine is organized. The actual matrix structure is based on the plant structure and the operational needs of FERMI. Toggling an element of the matrix produces the selection (de-selection) of the items of the congruent type belonging to the corresponding section of the machine.

## THE HISTORICAL DATABASE LIBRARY

The HdbExtractor++ framework allows fetching data from a historical database in a simple object oriented fashion. The library currently supports the HDB (the original version of the TANGO archiver) and HDB++ MySQL database schemas. Scalar and vector data can be fetched from the database, given a start and stop date and time.

## THE GRAPHICAL USER INTERFACE

The Time Machine graphical user interface is written in Qt and is made up of the classical save/restore and the new time machine modes. The top left view is a list of the available contexts. The right view displays the TANGO attribute names and properties. The information is updated with the read and write values of each quantity as soon as historical data is fetched from the database. Before restoring a set of attributes, you must select them (green items in the figure on the left).



## A NEW PERSPECTIVE ON SAVE/RESTORE

The combination of the classical snapshot-based save/restore procedure with the new historical database extraction opens new possibilities to the re-creation of a state of a complex machine, bringing it back to a previous condition. In particular, the time machine has been introduced into the FERMI control room to repair a situation after an accident or an unforeseen occurrence, such as a device failure, a thunderstorm and so forth, restoring the system to a known healthy working state at a given time in the past.