Looking for a common ground for data analysis, to support all researchers with a powerful tool which allows maximum freedom and yet maintains optimal readability on behalf of the others, traceability of the results quickly becomes a mandatory requirement. To fulfill this new set of classes have been developed into MATLAB®: each LTPDA object class possess a defined group of properties, such as the object’s name, the creation time, the provenance (who created it, on which platform,...) and the history. This variable field will contain all the changes the data went through, because every function in the toolbox it’s programmed to add its own details (the name, the version, the parameters, the type of operation executed) to this growing history. To understand how the data was created thus it will be sufficient to open and read its history field, passing through the different functions which contributed to its creation.

To make easier to open a LTPDA object window definition and so on.

The narrow time margins for operations, with the satellite visible to the ground station antennae for ~8 hours each day, imposed the need to develop a solution to make not only reproducible but easily readable every analysis performed by everyone in the community. This resulted in the design of a front-end graphic user interface (GUI), able to handle an underlying MATLAB® toolbox of analysis functions. The GUI provides easy access to all properties and settings associated to the use of the software, such as:

- Definition of the inputs.
- Functions' parameters.
- Nested loops execution.
- Analysis properties and execution control.

While the GUI is natively programmed in MATLAB® coding language, the analysis diagram is to be sketched into a Simulink® window: the entire set of LTPDA functions is thus converted into a proper library blockset, each block corresponding to a single function, so that to draw and plan an analysis is sufficient to retrieve blocks from the library and to connect them into a model. The Simulink® environment offers powerful control and flexibility, for example enabling the user to create subsystems, to assign names to the signals, to use goto/from blocks and so on. The GUI is entirely interfaced with Simulink®, so for example whenever the user double click upon a block the GUI will show up the parameters panel, containing the proper parameters for the function recalled by the block.

Since the entire structure of the LTPDA toolbox is based upon the defined classes, the ground segment architecture has to be updated accordingly. The raw telemetry received from the satellite and pre-processed by the Mission Operation Center (MOC) is thus immediately processed by an automated robot which converts these data streams into the proper classes. Essentially, for data coming from space, scientific data are converted in AO.

These are stored into the Archive at the Science and Technological Operation Center (STOC), which is responsible for the primary LISA Pathfinder data analysis. Data Analysis consoles have a two way communication with the archive because the data results themselves are stored back into the same server. The data received from space and converted into AOs are immediately passed also to a Quick Look tool, providing a rapid and sharp outlook of the experiment status; this quick look analysis will contribute to the short-term payload planning, for example in case of failures or problems to be tackled soon. Long and medium-term payload planning, together with the short-term one, will decide upon changes in the planned run procedures or in the telemetry parameters to be sent to the spacecraft.

The data and the results of the analyses carried out in the STOC are made available also to external users by the Internet: these consoles have a two way communication with the archive because the data results themselves are stored back into the same server. The data received from space and converted into AOs are immediately passed also to a Quick Look tool, providing a rapid and sharp outlook of the experiment status; this quick look analysis will contribute to the short-term payload planning, for example in case of failures or problems to be tackled soon. Long and medium-term payload planning, together with the short-term one, will decide upon changes in the planned run procedures or in the telemetry parameters to be sent to the spacecraft.

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