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Announcing PSCAD® X4 Release!

The Manitoba HVDC Research Centre, in collaboration with Cedrat S.A., is pleased to announce the release of PSCAD® X4! The software development team has successfully achieved a significant leap forward in the evolution of the PSCAD software architecture. At the same time, all the work concerns to ensure that the user interface environment remains familiar to users by keeping the outward appearance of the software similar to the latest released version; though functionality has been enhanced to deliver the powerful new features made possible by the modern architecture. The result is branded X4, and it is the most powerful version of the PSCAD software to date.

A centralized database

During the past decade, a trend has emerged toward the use of compatible software working off of common sets of data, eliminating the need to manually manipulate or translate results from multiple incompatible tools. It is this philosophy that has driven the changes to the internal architecture of PSCAD. We have elected to consider the simulation as data centred rather than computational engine centred as in the past. PSCAD is now operating fully on a centralized database, meaning that it reads and writes all of the bookkeeping information required to keep the project organized, from a single source. This architectural change is absolutely essential to facilitate communication between different programs, and to design a common information bank for results data. This also greatly simplifies and stabilizes both the usage and the development of the software, which in turn reduces operational difficulties, making PSCAD even more enjoyable to work with.

The new architecture advantages

In addition, the new architecture will make possible a new efficiency in feature implementation and future innovations of PSCAD from this point forward. For example, X4 includes an advanced copy and paste for entire page modules, including pages within pages, graphs, controls, etc. The ability to copy and paste page modules comes with a new responsibility that rests primarily on the shoulders of the user. The PSCAD X4 user must now rethink how a project is designed from the very beginning of the process in order to make the most efficient use of this feature. The multiple instance modules feature is meant to exploit repetitiveness in systems. In other words, identify first what combinations of components are replicated at the lowest level (a string of thyristors for example), and incorporate them into a page module. From here, move upward until you reach the top, all the while exploiting duplication. The main reason for this is that although a page module can be copied and pasted many times, only unique page module definitions need be compiled. So, the more duplication is taken advantage of, the more efficient the compilation of your project will become. In addition to the computational efficiency, there is also improved efficiency in the preparation of simulation cases. Exploiting the duplication in a case reduces the time required to create a case, as well as reducing the opportunity for error in needing to manually prepare each individual copy.

The many new structural and feature changes to PSCAD X4 have enabled abilities that have long been sought after by PSCAD users. X4 is the first step in a new development direction for PSCAD. Moving forward, you will be able to readily import PSCAD version 4.1.x or 4.2.x project files into X4.

Of course, the features discussed above are not the only highlights of PSCAD X4. Here are a few more of the major advancements in this release[1]:

- **Multiple Instance Modules (MIM)**: The new architecture has enabled us to treat page module components the same as regular components. Page modules may be copied and pasted, either as an instance of itself, or uniquely with new definitions and links. In addition, page modules may now possess input parameters, which may be used in concert with graphical connection ports to transfer data onto the page module canvas.
- **EMTDC Memory Management**: A major change was made to the manner in which EMTDC uses memory in large networks with subsystems. EMTDC now dynamically allocates the memory needed for subsystem storage, instead of relying on fixed dimensions. This can mean huge savings in system memory, especially for systems containing many subsystems (i.e. networks separated by transmission lines).
- **FORTRAN 77 Compatibility No Longer Required**: The old free compiler supplied with PSCAD, which is Fortran 77 based, has been replaced by its modern equivalent: The GFortran 95 compiler. This means that users no longer need to maintain model code in Fortran 77 when working in PSCAD X4.
- **New Master Library Models**: Many new models have been added to the master library, in addition to numerous updates and improvements to existing models. Some of the more important new models are:
  - a. New Multiple Run component allows for additional data recording
  - b. Discrete Wavelet Transform (DWT)
  - c. Saturable Reactor
  - d. Spark Gap
  - e. Two New Auto Transformer Models
- **Line Constants Program Improvements**: Line constants program developments include some of the following major enhancements:
  - a. *DC Correction*: Two unique DC correction algorithms have been added, which assure accurate DC parameters for time domain simulations.
  - b. *Unique Ground Wires in Overhead Towers*: If there are two ground wires in a tower, they may now be entered with unique parameters.
  - c. *Specific Conductor Layer Elimination in Cables*: Users may now select which conductors are to be eliminated (not just the outer layer).

The technical support team has played a key role in the success of PSCAD and would be pleased to assist you. We will be conducting a number of web based 'training' sessions to highlight the new features of PSCAD X4. Please contact sales@pscad.com or software@cedrat.com for more information.

1 *For a complete list of new features, please refer to the PSCAD help documents.*