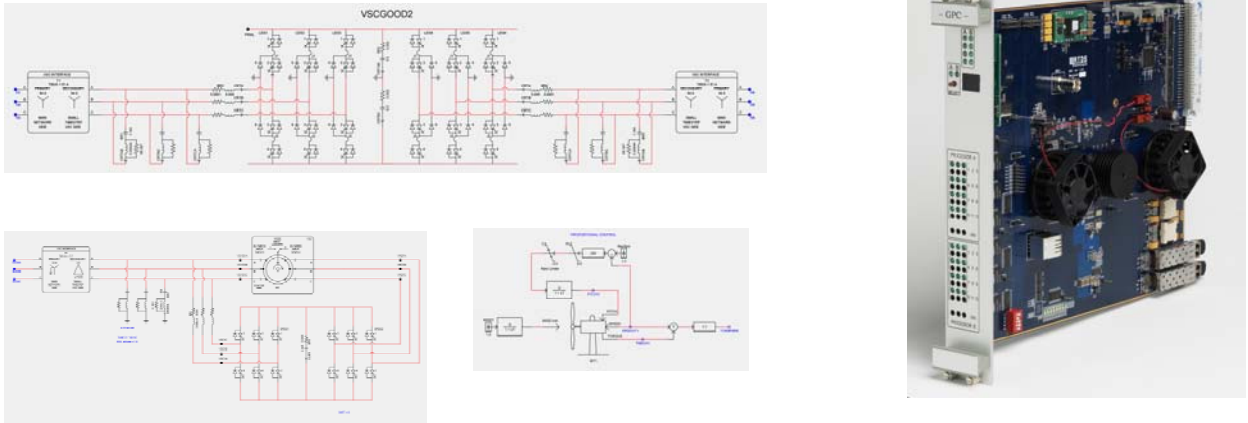Real time digital simulation for the power industry

GPC Power for Multi-Level VSC Simulations

We have recently released the Giga Processor Card (GPC) which includes 2 x IBM PowerPC 750 GX processors each running at 1 GHz. The GPC provides a significant increase in processing power versus the RPC and a huge increase versus the 3PC. The additional power is mainly being used for the simulation of Voltage Source Converters (VSC). The GPC is however code compatible with the RPC so it can also be used for the network solution, generators, lines, controls, etc.

Our new VSC modeling technique is based on simulating the power electronics with a very small timestep; in the range of 1-2 μs. The small timestep model of the VSC is numerically interfaced to the rest of the simulation which typically uses a timestep of 50 μs. The advantage of the dual timestep approach is that great flexibility and detail can be provided for the power electronic circuit, while at the same time providing the largest possible system representation at 50 μs.

The small timestep VSC allows a configurable valve topology. Therefore a new model does not have to be created every time a different valve configuration is investigated. You simply draw the circuit and connect firing pulses which

are generated internally by the RTDS Simulator or from external hardware.

A GPC card can accommodate a small timestep simulation with as many as 30 nodes and 36 switching devices. A GTO/IGBT – back diode pair are considered one switching device. Simulating thirty-six devices is enough to represent a 3-level force-commutated HVDC back-to-back system.

The small timestep approach to VSC modeling is superior to averaging models, used by some simulation packages, for the following reasons:

1) averaging models do not allow firing pulses to be connected and tested

2) averaging models do not represent the harmonic spectrum generated by the VSC

3) new averaging models must be created for every bridge configuration

To allow the testing of VSC firing pulse and other controllers, external and onboard I/O was developed for the GPC. Twenty-four front panel d/a's are provided along with four Giga Transceiver (GT) optical ports. The full range of analogue input (GTAI) and output (GTAO) plus digital input (GTDI) and output (GTDO) can
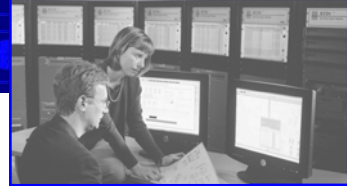
be connected via the GT ports. All of these cards were developed with very low latency performance for small timestep applications, but can also be used in 50 μs simulations.

RSCAD Update

The current version of RSCAD available for download is 1.188. A number of new features have been added over earlier versions and include:

- Modbus Commands – can now be included in Script files to change the settings of a protective relay automatically during a set of tests. The Modbus commands can be sent either via Ethernet or serial port.

- Time Zero for RunTime Plots – can now be given by an external signal. For example when performing protective relay testing, t=0 can be defined as the point when the fault is applied.
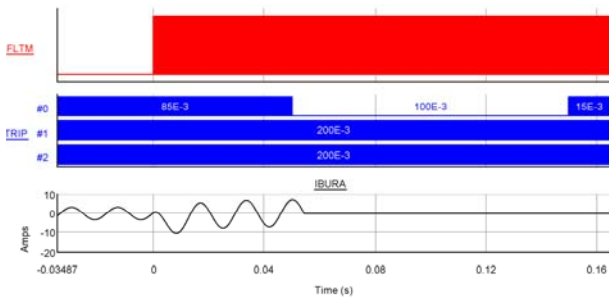
- Enhanced Pre-Processor Functionality – has been added to Draft to allow any variable to be changed automatically from a Script file.

RTDS Simulator to Support IEC 61850

RTDS Technologies has undertaken the development of new hardware and software to provide IEC 61850 communication. The hardware portion of the development is called the GTNET which connects to an optical port on a GPC card. Digital signals are currently being exchanged with external devices using the GSSE format, soon to be followed by IEC GOOSE messaging. The final step of the development will be the implementation of the IEC 61850-9-2 sampled values.

- Edit Common – is a powerful Draft feature which has actually been available for a while. If a number of components are grouped, the Edit -> Common selection will allow a common variable to be changed in all the grouped components at one time. This feature is very useful for example when changing the processor assignment for a group of control components.

- Launching External Processes from Scripts – is now supported so other programs can be controlled during automated operation.

- Save to PDF – was added to both Draft and RunTime. Adobe Acrobat is not required since PDF generation code from the public domain was embedded in RSCAD.

- Vector Display – is now supported in RunTime by supplying the signal amplitude and angle. An excellent feature for viewing calculated impedances or voltage vectors.

Strong Sales = Good Future

The fiscal year 2005 ended as one of our best ever and now, just a few weeks into fiscal year 2006, it looks like an even better year ahead. In the last 12 months, we have completed 15 customer upgrade projects and established 8 new sites, including:

- *NARI Relays – P.R. China*
- *Saudi Electric Company – Saudi Arabia*
- *University of Missouri-Rolla – USA*
- *University of Saskatchewan – Canada*
- *ZIV P+C – Spain*

Our strong sales translate into a good future for the RTDS Simulator as we continue to invest in research and development.

UPCOMING EVENTS

IEEE T&D 2005
Exhibition, October 10-12, 2005 in New Orleans, USA

GCC Power 2005
Exhibition, November 28-30, 2005 in Doha, Qatar

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