HYPERWORKS: Next generation of Real-Time Digital Simulation with EMTP-RV & HYPERSIM

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By:

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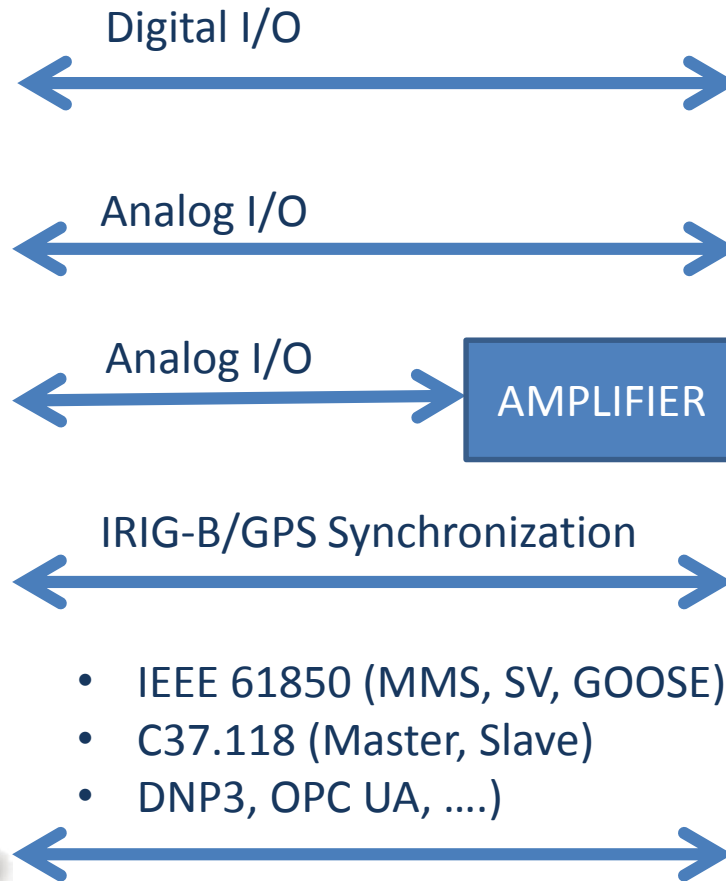Julie Fortin-Morin, Account Manager USA & South America

HYPERSIM definition

Electrical systems are complex networks of power elements such as power generation, transmission, distribution and loads. Other elements are controls systems including regulation,control and protection devices.
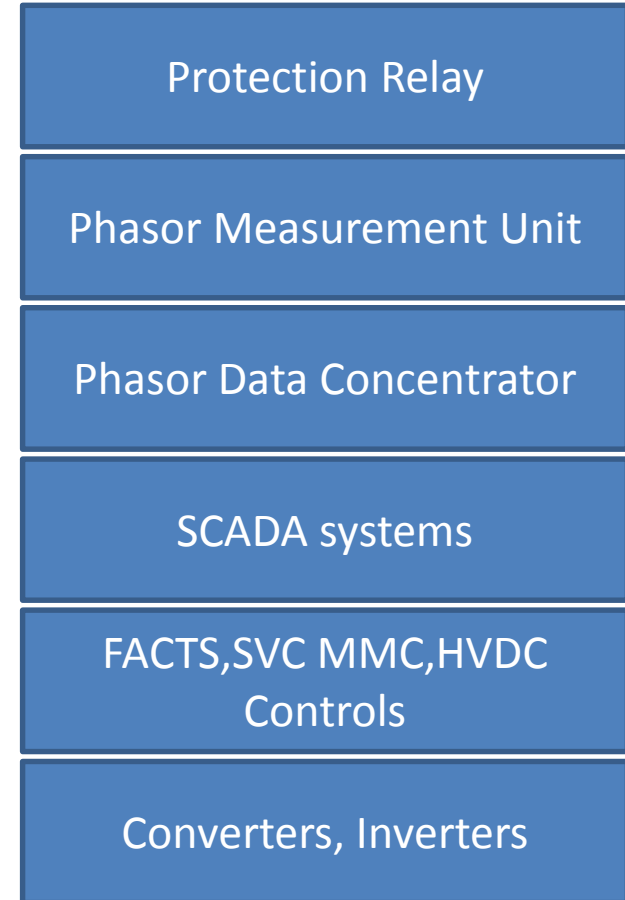
HYPERSIM offers to engineers and designers an extended software and hardware package designed for **Hardware-in-the-loop testing**

HYPERSIM definition

VIRTUAL POWER GRID

REAL COMPONENTS

Digital I/O

Analog I/O

Analog I/O

AMPLIFIER

IRIG-B/GPS Synchronization

- IEEE 61850 (MMS, SV, GOOSE)
- C37.118 (Master, Slave)
- DNP3, OPC UA, ….)

Protection Relay

Phasor Measurement Unit

Phasor Data Concentrator

SCADA systems

FACTS,SVC MMC,HVDC Controls

Converters, Inverters

HYPERSIM origin

Hypersim is a simulation package developed for the **last 20 years** in collaboration with:

(Since 2010)

Their Power System Testing and Simulation Laboratories develop and test the validity of the models.

OPAL-RT Technologies has commercialisation license of HYPERSIM **since 3 years**.

HYPERSIM Applications

Integration of renewable energies, integration of SVC & STATCOM from different suppliers, WAMS , protection relays and MMCs

HYPERSIM Applications

ABB SVC Controller Hardware-in-the-loop at IREQ

HYPERSIM Applications

SIEMENS SVC Controller Hardware-in-the-loop at IREQ

HYPERSIM Applications

Research in energy efficient systems, energy conservation, power system protection, advanced motor modeling, and fault analysis.

Industrial facts

Growing Presence in US, European and Asia National research laboratories.

In the last two years, a growing presence in R&D utilities.

Important system presence at power systems manufacturers

Academic facts

Presence in more than 208 Universities in 34 countries on 5 continents :

Presence in more than 50 Universities America.
Presence in more than 50 Universities in Europe.
Presence in more than 90 Universities in Asia.

In 2014, 70 technical publication have been already written with mention of OPAL-RT systems:

Prestigious publications like IEEE Transaction
Most published topics are Smart Grid, Micro Grid, Renewable energy & MMC

Custom Hardware vs COTS*

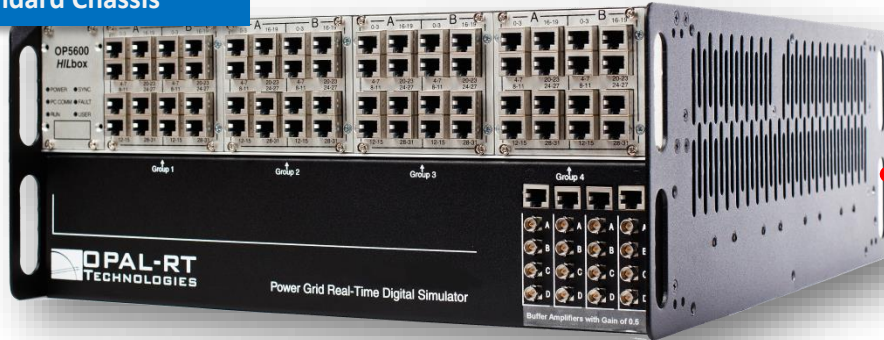*"Do not let the hardware restrict your research or studies"*

Equivalency Chart

Competition	Nodes	HYPERsim	RT Computer	OPAL-RT
1 Rack	150	3 cores	1 (25% use)	1 Rack
2 Racks	300	6 cores	1 (50% use)	1 Rack
4 Racks	600	12 cores	1 (100% use)	1 Rack
8 Racks	1200	24 cores	2	1 Rack
???	>5700	96 Cores	3 (SGI)	1 Rack

OPAL-RT Use Commercial-Off-The-Shelf Computer

Type	CPU	CORES
INTEL XEON 3.4GHz	2	8/12
INTEL XEON	2	16/32

Type	Channels per slot	Maximum per Chassis
Digital OUT	32	256
Digital IN	32	256
Analog IN	16	128
Analog OUT	16	128

Type	Channels per slot	Maximum per Chassis
Digital OUT	16	256
Digital IN	16	256
Analog IN	16	128
Analog OUT	16	128
Digital Tx/Rx Fiber Optic	8/8	128/128