

RTDS New Developments

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- ▶ RTDS Technologies Inc.



2026 MADRID USER'S GROUP MEETING
MADRID, SPAIN



AGENDA

- Company Update
- Hardware Developments
- Software Developments
- Model Development

4+ YEARS WITH AMETEK

- RTDS has maintained its core essence with minimal change to our relationships with customers, reps, etc.
- Have been able to leverage AMETEK global resources
 - RMA storage hubs in France, India
 - Assistance with shipping
 - Able to get replacements in customers hands quicker
 - Operations/quality resources assist with sourcing and qualifying new suppliers (eg. IO card manufacturing in Mexico)

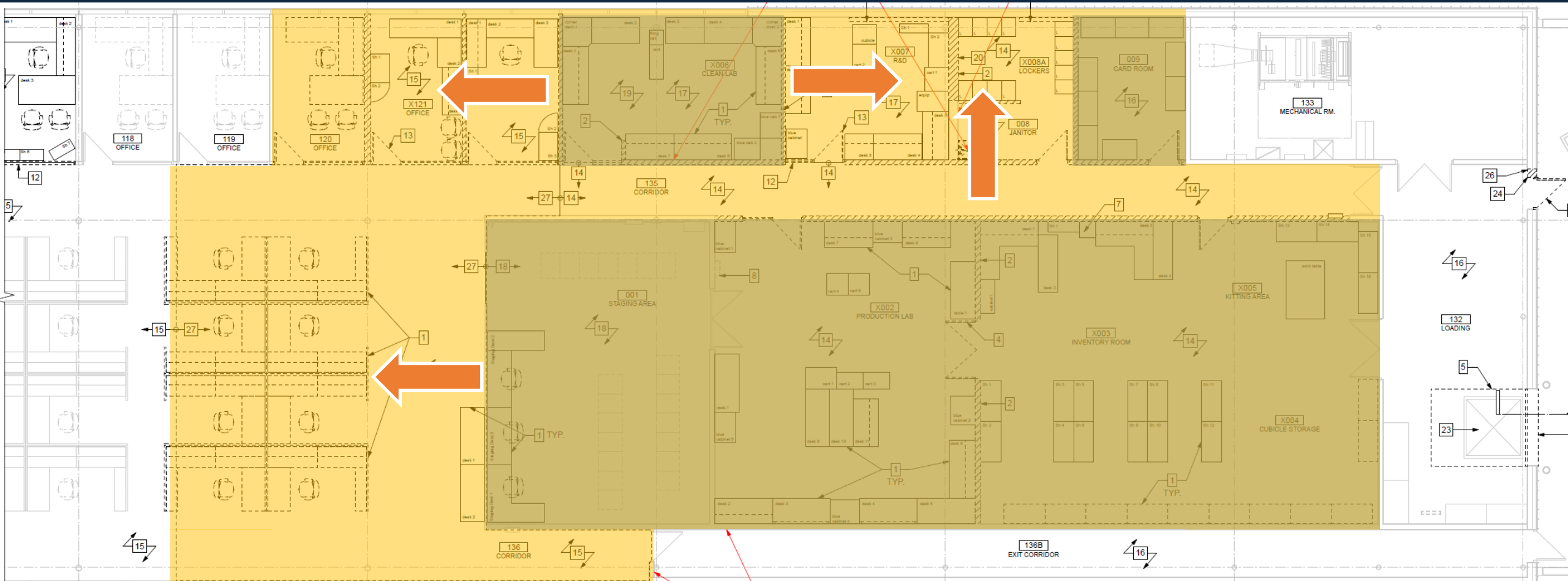
PERSONNEL

- 96 employees
 - 90 permanent, 4 interns, 1 Executive Advisor
- Operations: 22
- R&D: 42
- Applications: 3
- Support: 12
- Sales/Marketing: 8
- Admin/Finance/IT/HR: 9
- Continuing to hire (will be over 100 by end of year)
 - Adding to support/application/R&D/production
 - Will be looking to add personnel to sales in USA/Europe to support regional business

BUILDING UPDATE

- Production has temporarily taken over the training room
- Production expansion underway
- Additional 50% footprint
- Additional 12 cubicles added, 16 more to come

RTDS Production Expansion



From ??? Sqft to ??? Sqft (??% increase)

F25

- Shipped:
 - 267 NovaCor 2.0 chassis!
 - 1,501 total core licenses!
 - 130 cubicles!
 - 422 GTSOC
 - 167 GTNET
 - 1,557 GTAO/AI/DI/DO



RTDS SALES

- >730 customers in 61 countries
- 2022: Best year ever
- 2023: Best year ever
- 2024: Best year ever
- 2025: Best year ever
- 2026: Looking the same.....



HOT TOPICS

- Replicas (HVDC, IBR)
 - RTE Announcement, KSA, Chile
- Data Centers/Hyperscalers/EPCs
 - Amazon, Google, Meta, Microsoft, etc.
- Power Electronics (DAB/SST)
- GTSOC Black Box Models
- Large Scale Simulation
 - TU Delft, National HVDC Center

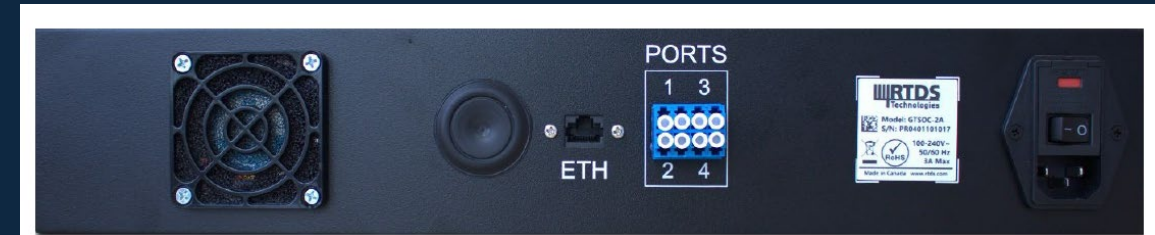
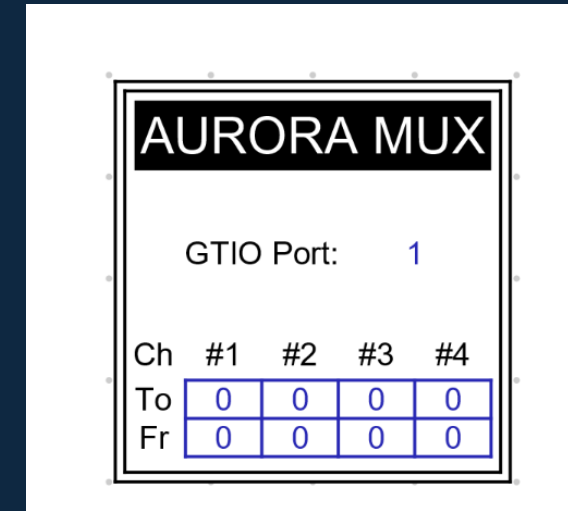
NOVACOR CUBICLE V2

- Same rack space (32U)
- Deeper to accommodate IO cards behind NovaCor (up to 18)
- Up to 6 x NovaCor on 240V, 5 x NovaCor on 120V
- Side panels removable as one piece
- Front skirt included
- Lift rings available on top



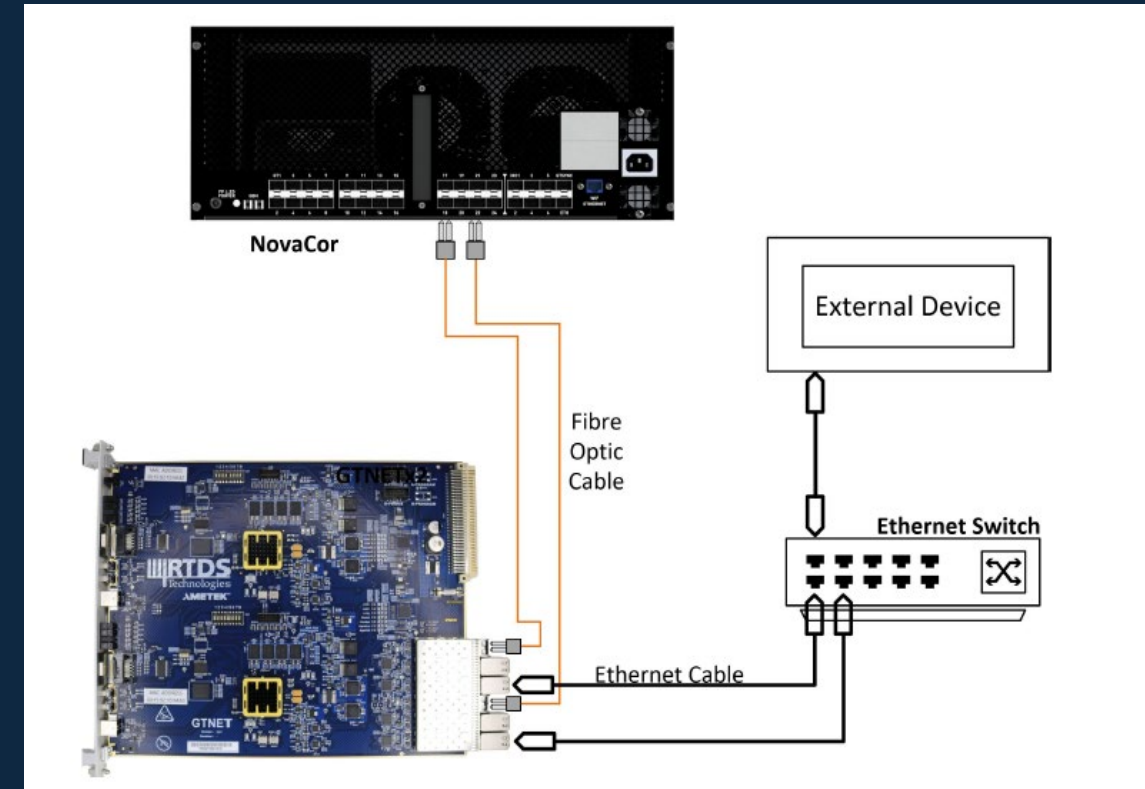
GTSOC V2 – AURORA MUX

- Provides additional Aurora ports for a NovaCor chassis
- 1 to 4 setup, (4 to 16)
- 64 inputs/outputs per stream
- 4 streams included with hardware
- 2Gbit and 3.125 Gbit line rates supported
- Each additional set of 4 streams can be licensed
 - Same cost as NovaCor Aurora license
- Aurora Mux first application to support 8GB IO link

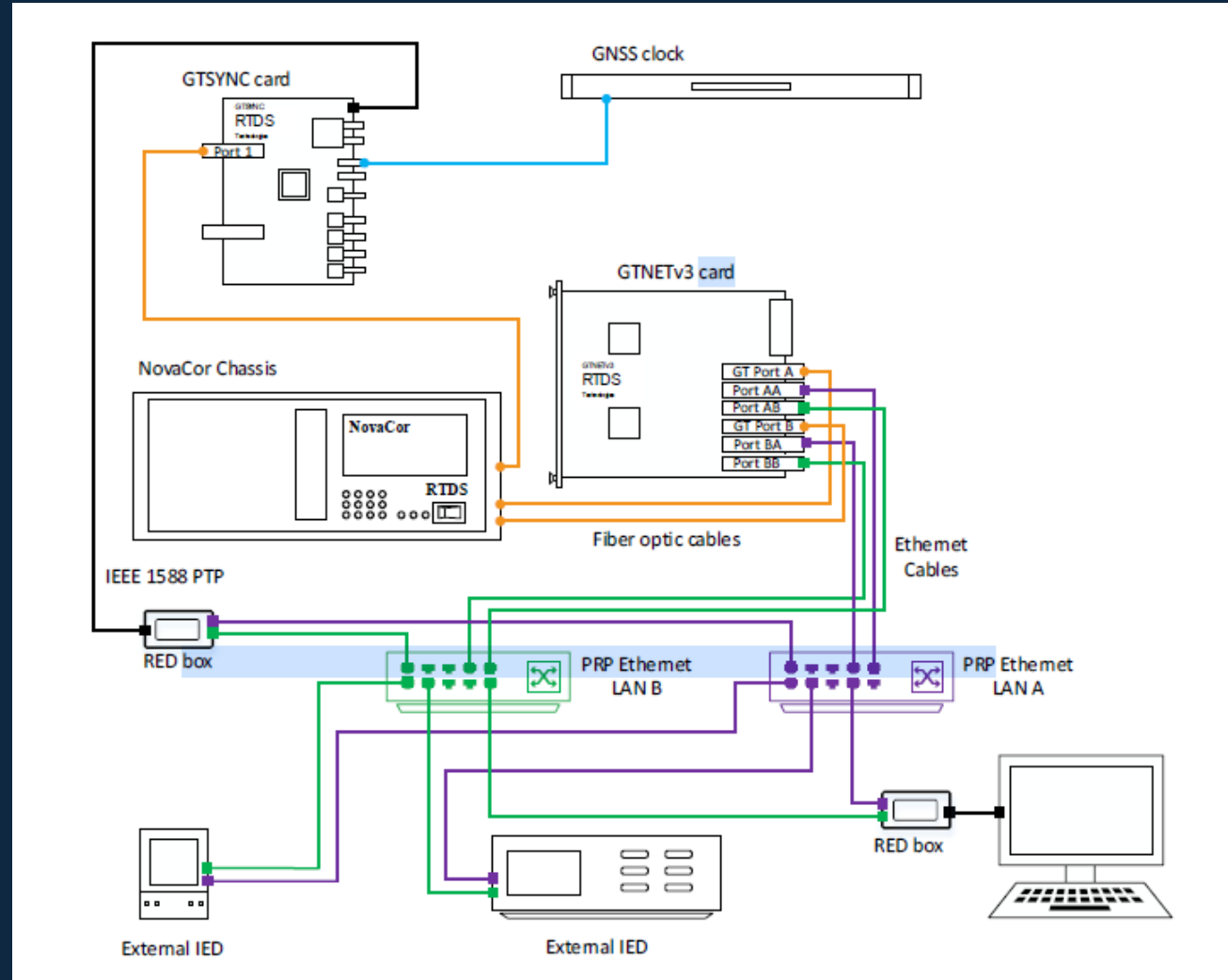


GTNET V3

- GTNET V3 is now shipping and is a replacement for GTNETx2
- Has two ethernet ports per Module.
- All the functionality of GTNETx2 is supported
- Same price and form factor as GTNETx2
- New functionality includes PRP support on 2 modules simultaneously

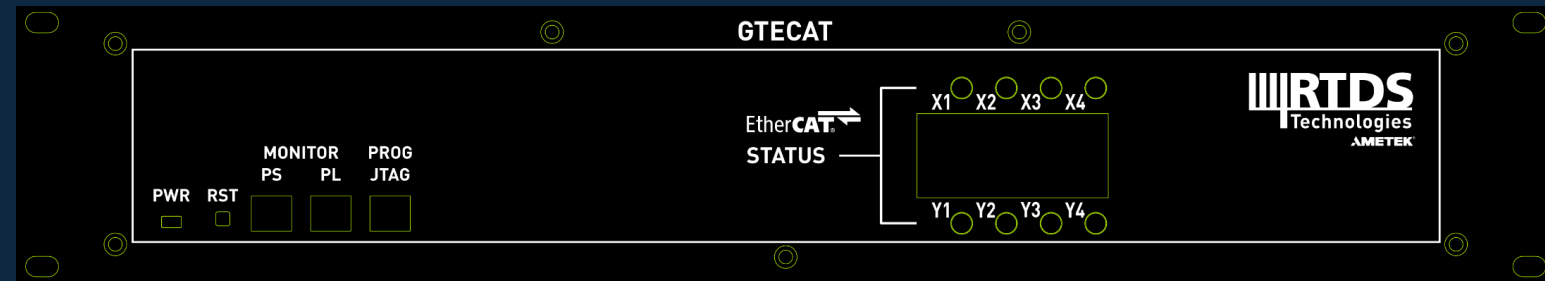


GTNET V3



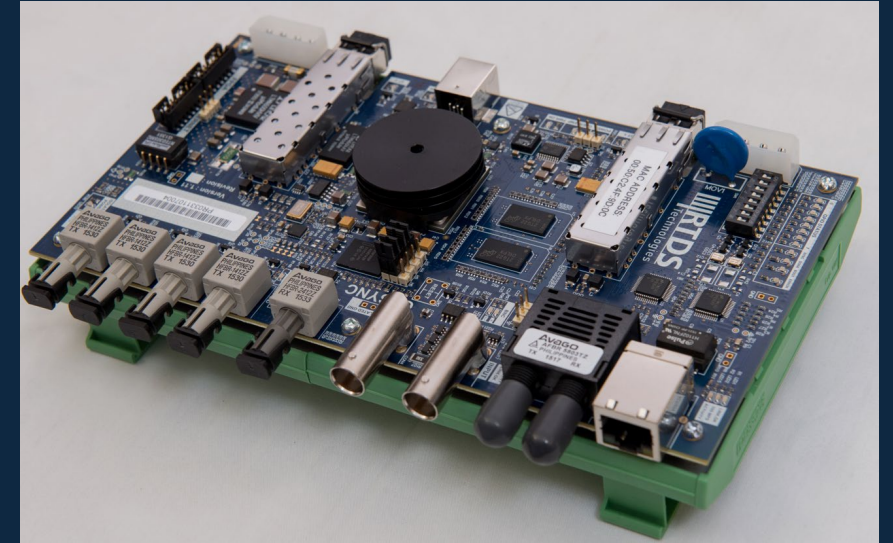
GTECAT

- EtherCAT communication according to IEC standard IEC 61158
- Can only act as slave (sub device)
- Supports up to 8 slaves
- Can be connected in ring, line or star topology



GTSYNC V2

- Replaces GTSYNCV2
- Fully enclosed unit
- 19" rack mountable
- Will support PRP with a future update
 - GTSYNCV1 did not support PRP.
- Now Shipping



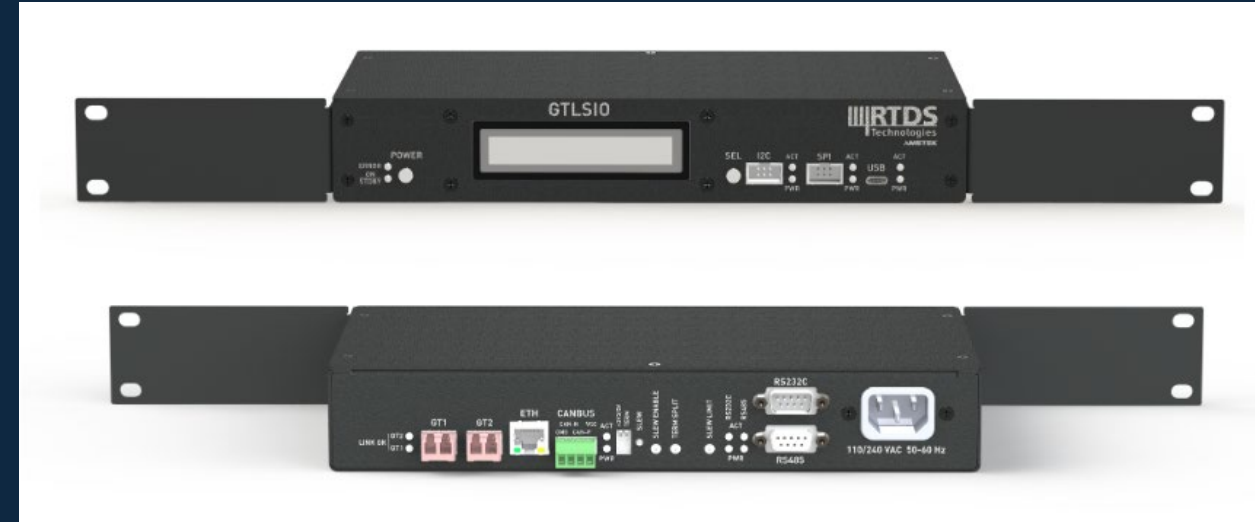
GTSYNC v1



GTSYNC v2

ONGOING DEVELOPMENTS

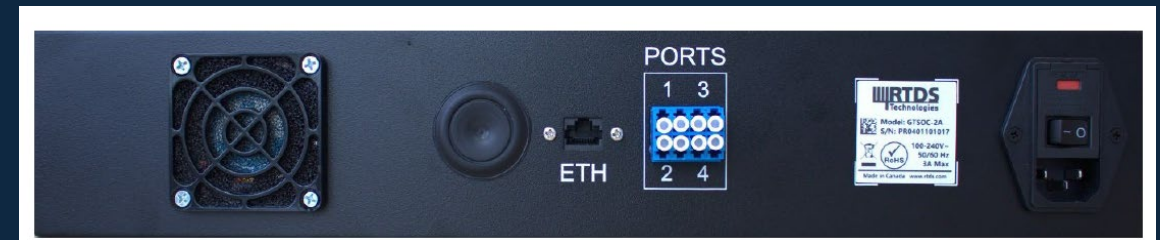
- A serial communication I/O card is available (GTSIO)
 - Card will support
 - CAN 2.0 --> CanOpen
 - RS232-C
 - RS485
 - USB 2.0
 - I2C
 - SPI
 - Ethernet (UDP) protocols
 - 19" rack mounted
 - Connects to NovaCor chassis via fibre cable
 - CanOpen application is the first available protocol



ONGOING DEVELOPMENTS

GTSOCV2 - GT MUX

- Some customers are getting close to using up the GT IO ports (IO cards, GTSOC, GTNET)
- GT MUX will provides additional GT IO ports for the NovaCor chassis using the 8GB IO link
- Run on GTSOCV2 platform
- 1 to 4 setup, (4 to 16) – Similar to Aurora mux
- Daisy chain capabilities still being determined
- Available Q1 2027



RUNTIME FX

- Continue to make enchantments to meet customer feedback and requirements.
 - RUNTIME groups (FX 2.5)
 - Snap to Grid RUNTIME (FX 2.5)
 - Container minimize (FX 2.5)
 - Component properties utility pane (FX 2.5)
 - RUNTIME table representation (FX 2.6)

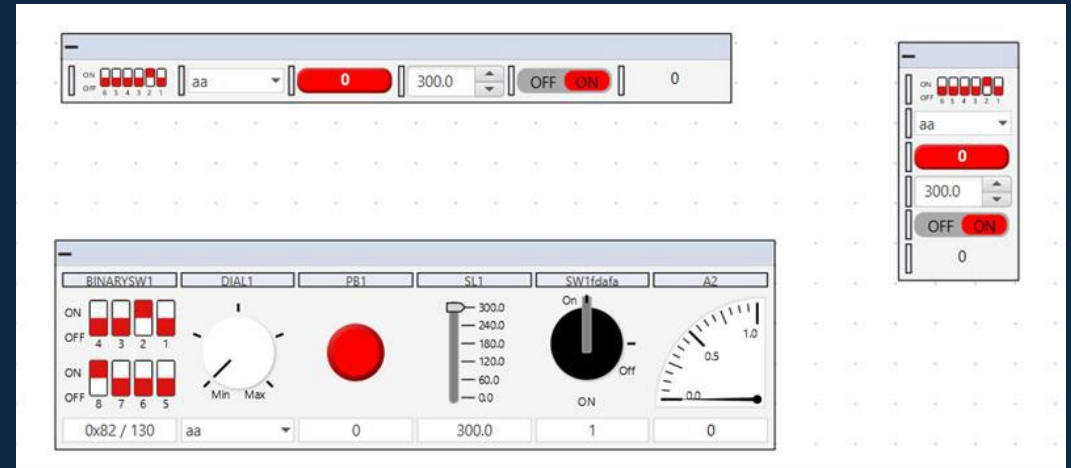


Table representation of RUNTIME objects

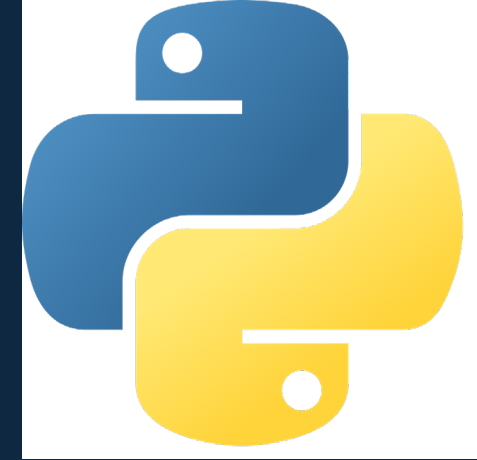
PYTHON SCRIPTING

Already Available

- Running Simulations
- Modifying Simulation Cases, building DRAFT model
- Gathering Results
- Post processing

Development

- Building Runtime Objects
- Record/measure without creating RUNTIME object
- Long term goal is to have most tasks automated with Scripting (Freq. Scan, ICT, Modbus/DNP editor ...)

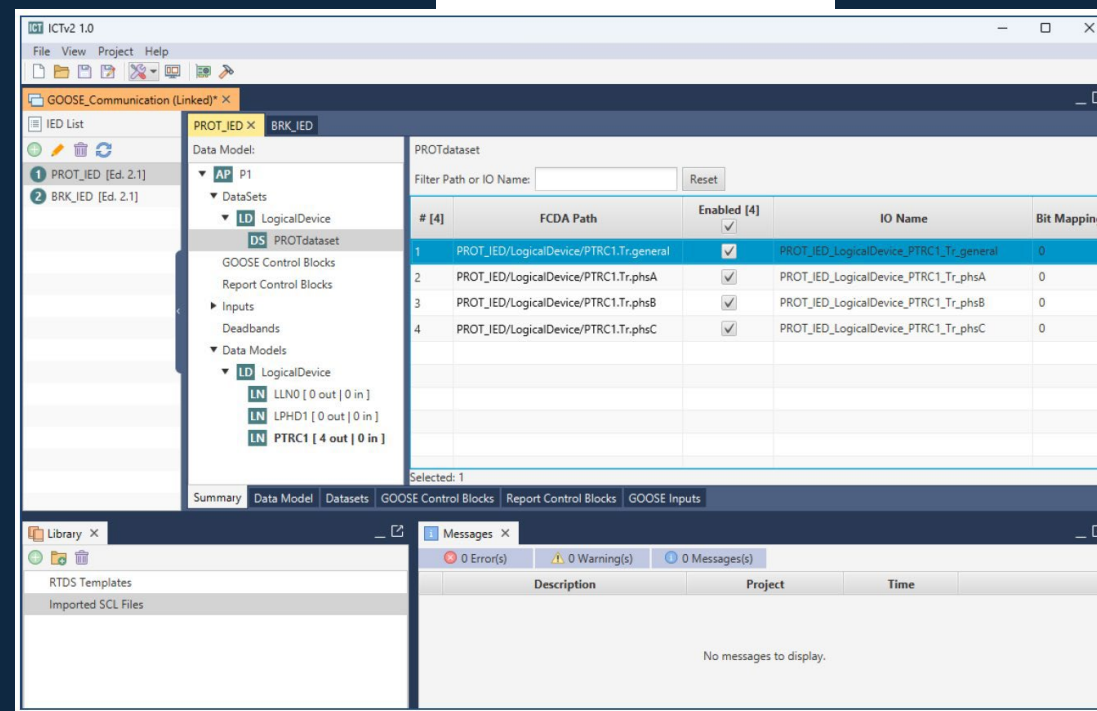
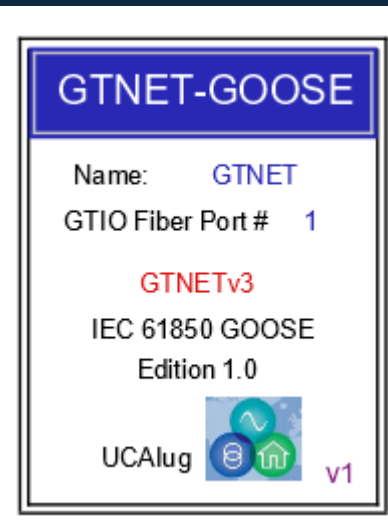


matplotlib



IED CONFIGURATION TOOL V2

- **RSCAD FX 2.7:**
 - ICTv2 tool is included
 - GTNET-GOOSE component
 - Step-by-step tutorial case
- **Recent Webinar (May)**
- **Ongoing Development**
 - Configuration of GTNET-SV with ICTv2.
 - Importing external or third party SCL files.
 - Goal is for all RSCAD FX IEC 61850 components configured through ICTv2



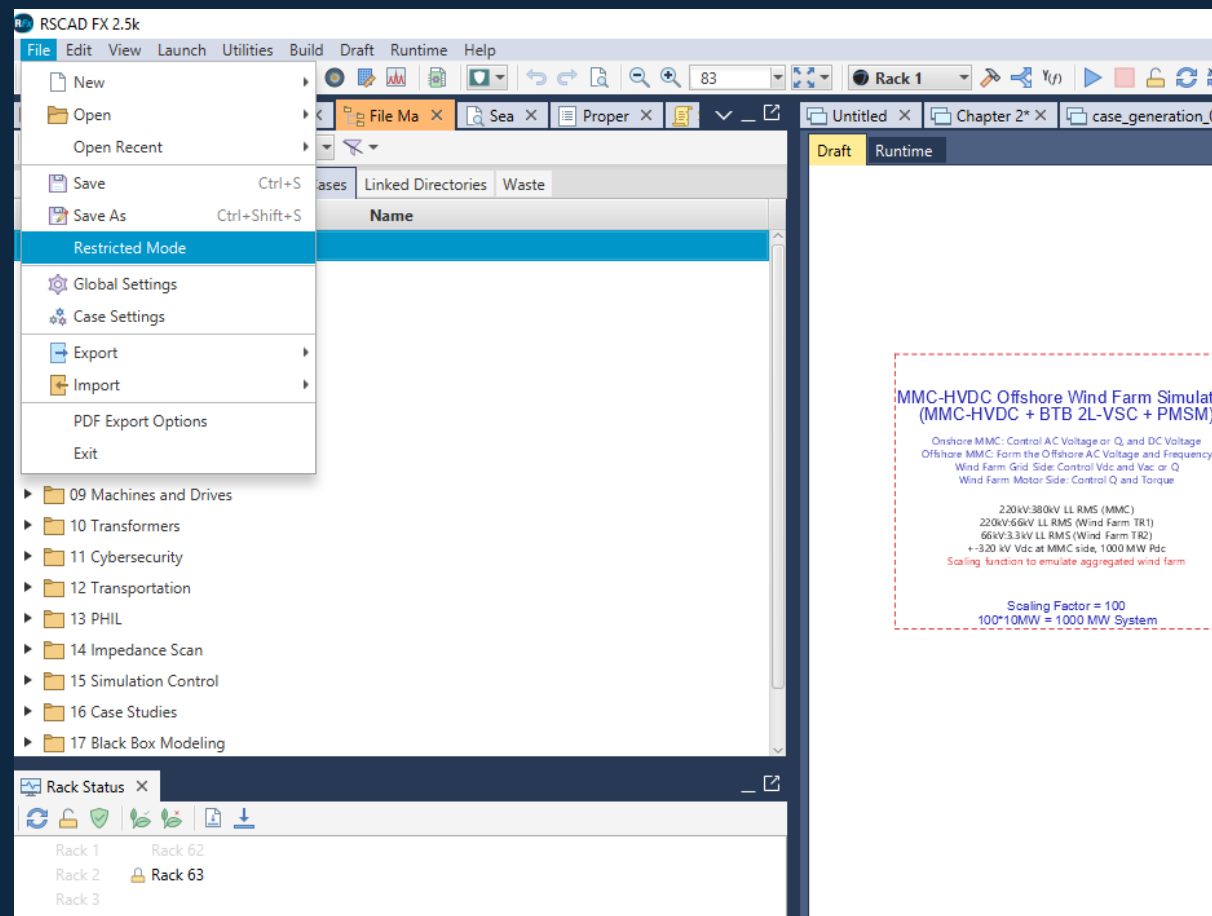
IEC CONFIGURATION TOOL V2

Objectives

- **Speed up IED configuration**, reducing engineering time and effort
- **Enable realistic utility-grade modeling** with support for vendor-specific IEC 61850 Logical Nodes and Data Objects
- **Improve interoperability and reuse** by supporting multiple SCL files within a single project
- **Reduce errors and improve consistency** through automated I/O naming
- **Increase productivity** with efficient bulk editing of I/O names
- **Minimize rework** with easy IED model comparison and fast configuration reloads
- **Enhance reliability and performance** through optimized CID file generation
- **Simplify project management and long-term support** by embedding ICT project files directly in the RSCAD RTFX file
- Deliver all enhancements without requiring firmware changes

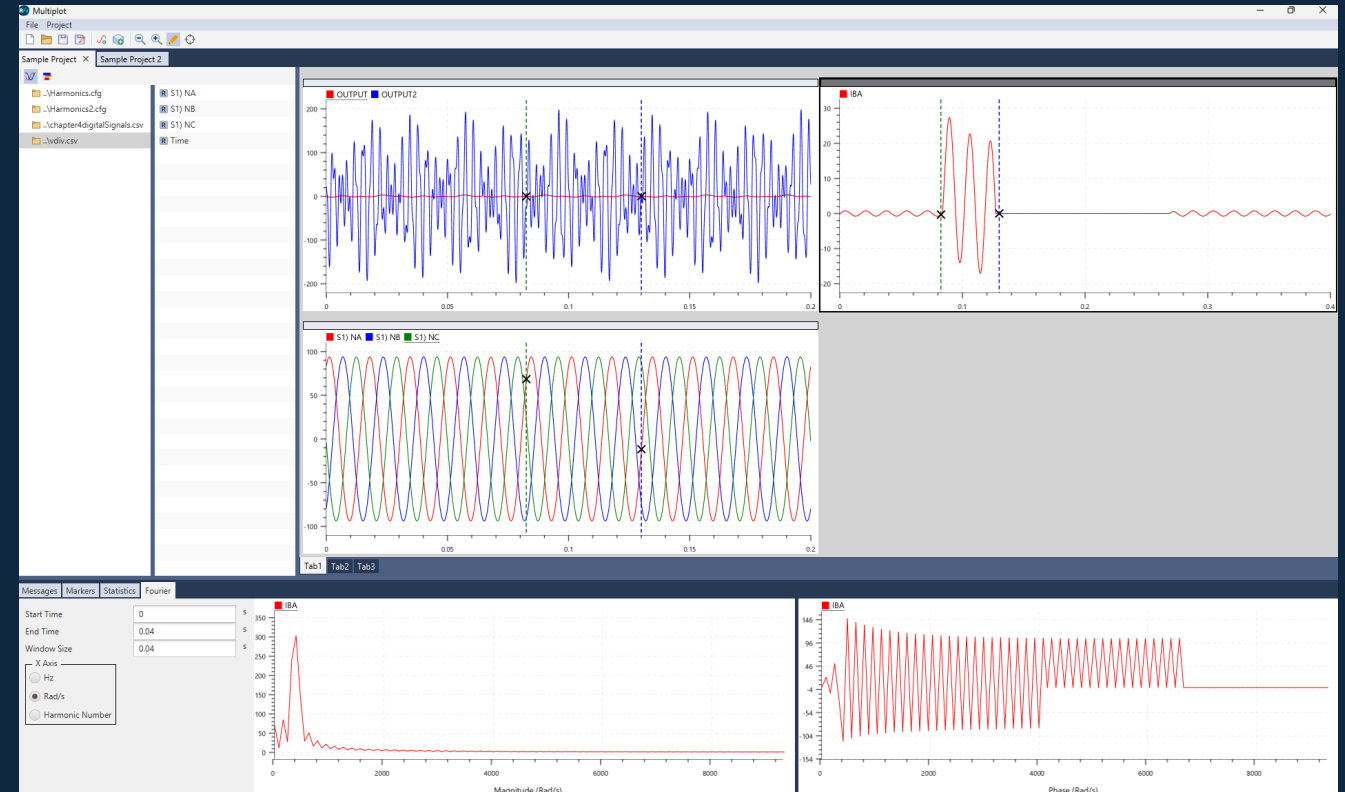
RSCAD FX ENHANCEMENTS – RESTRICTED MODE

- In Restricted Mode, DRAFT cannot be modified by the user
- Prevents changes from been made by users not authorized to modify the case
- Password protected
- RUNTIME can be modified as usual
 - But not saved
- Available since RSCAD FX 2.5



MULTILOT

- New, revamped Multiplot tool for post-processing, visualization, and analysis
- Some statistical and harmonic analysis functions are included



NON SEQUENTIAL RACK RUN

The screenshot shows the 'Case Settings' dialog box with the 'Hardware Assignment' tab selected. The left sidebar contains a tree view with 'Draft' (Simulation Options, Description, Hardware Assignment) and 'Runtime' (Monitoring, Manage Snapshots, File Options). The main area is titled 'Hardware Assignment' and contains two radio buttons: 'Sequential Rack Ordering' (unselected) and 'Non-Sequential Rack Ordering' (selected). Below this is a 'Rack Ordering' section with two slots. The first slot is labeled 'SS #1' and has a dropdown menu set to 'Rack 1'. The second slot is labeled 'SS #2' and has a dropdown menu set to 'Rack 3', which is highlighted with a blue border. A 'Close' button is located at the bottom right of the dialog.

Case Settings

▼ Draft

- Simulation Options
- Description
- Hardware Assignment

▼ Runtime

- Monitoring
- Manage Snapshots
- File Options

Hardware Assignment

☐ Sequential Rack Ordering ☒ Non-Sequential Rack Ordering

Rack Ordering

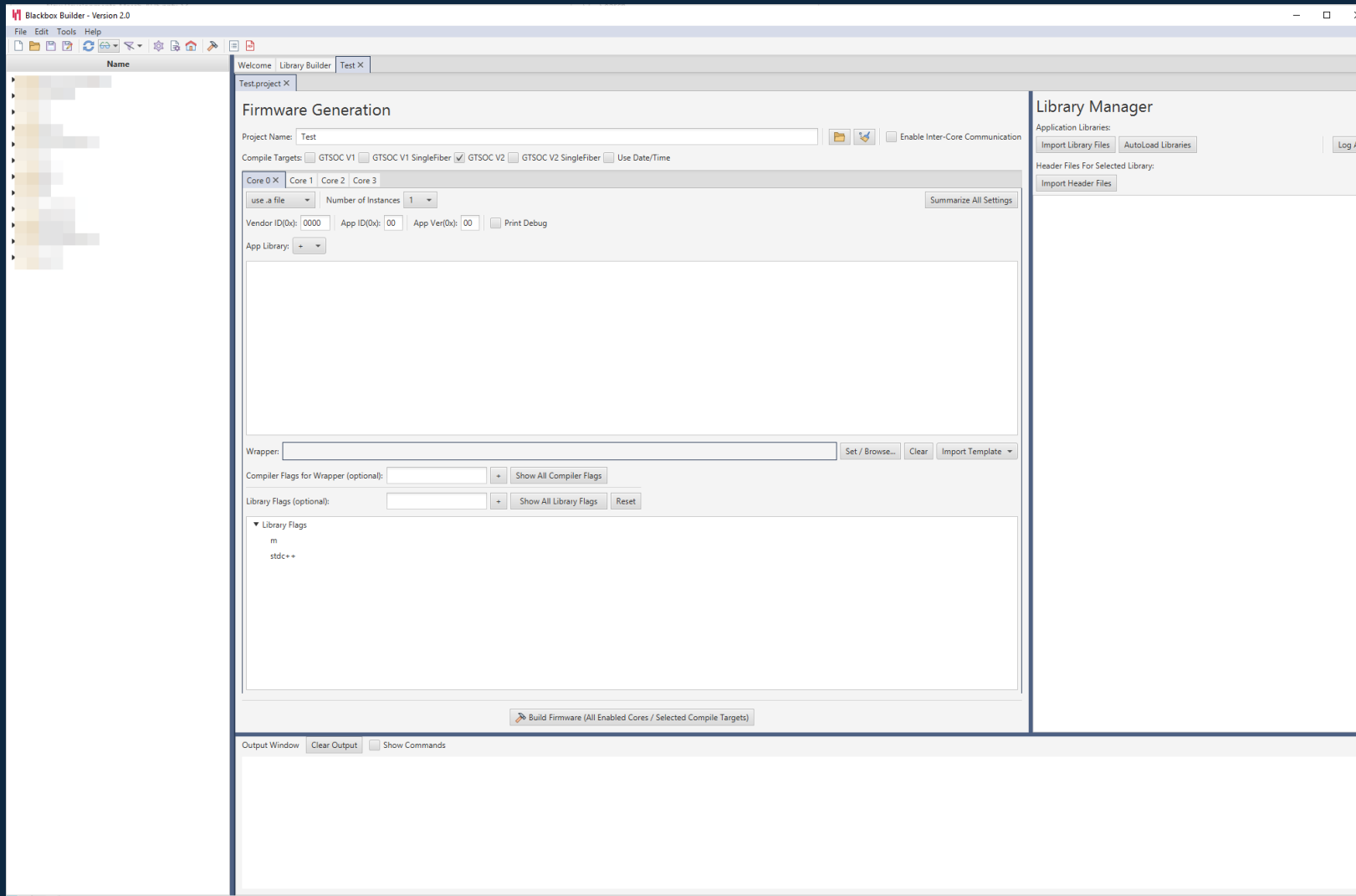
SS #1 ● Rack 1 ▼ SS #2 20 Rack 3 ▼

Close

Requires:

- GBH V2
- IRC V2

BLACKBOX BUILDER 2.0

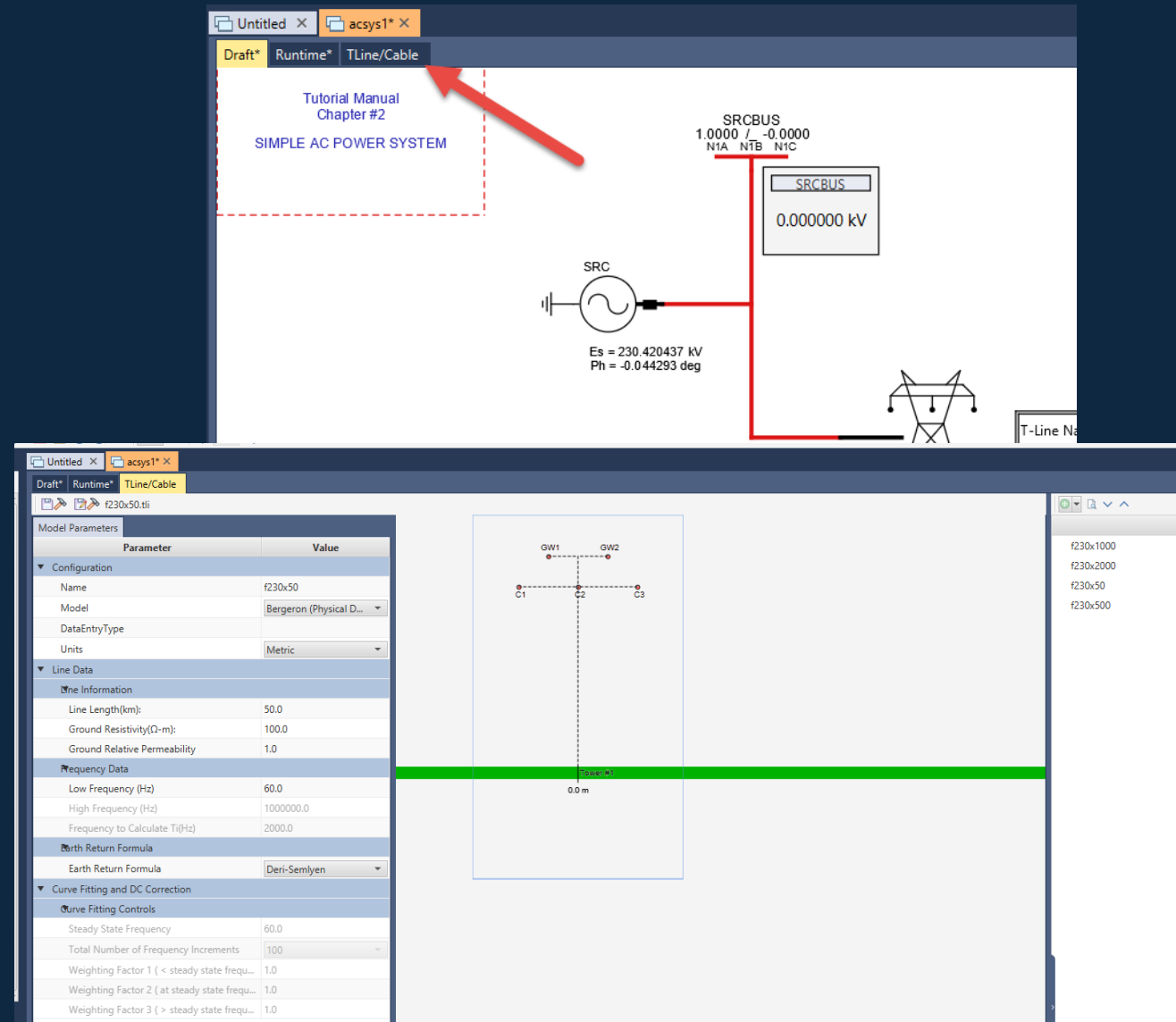


- Tool to generate Blackbox vendor control models on GTSOC
- Lighter Version
 - No longer requires Vitis
 - Significantly reduces disk space requirements
- Generates protected Library (.a file)
- Create GTSOC firmware
- Not integrated to RSCAD FX.
- Available to share with users

ONGOING DEVELOPMENT

T-line and Cable Rewrite

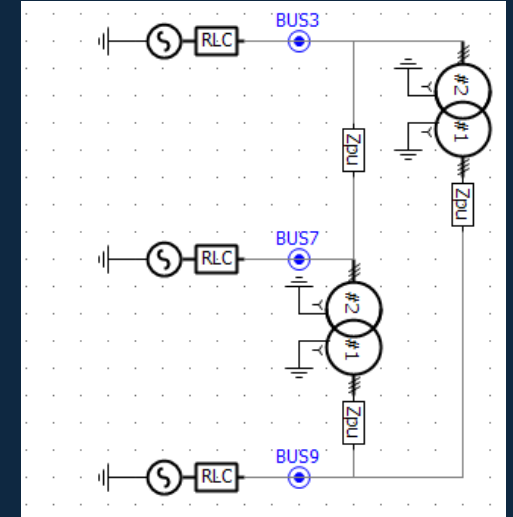
- Integrate the Tline/Cable files into the DRAFT case
- Keeps case folders cleaner and more organized
- Import/Export feature available to use files for other cases



ONGOING DEVELOPMENT

NETEQ

- Generate static network equivalent of PSS/E network data.
- Integrated into PSSE/RSCAD conversion tool
- Similar to the network equivalent feature as part of the PSCAD's PRSIM.
- Preserve power flow and short circuit level at the boundary bus
- No dynamic behavior represented in equivalent model



Input (text file):

Raw data file
Study bus details



NETEQ
(C++, exe)



Output (text file):
Details of NETEQ

ONGOING DEVELOPMENT

Conversion Tool Rewrite

-By the end of year

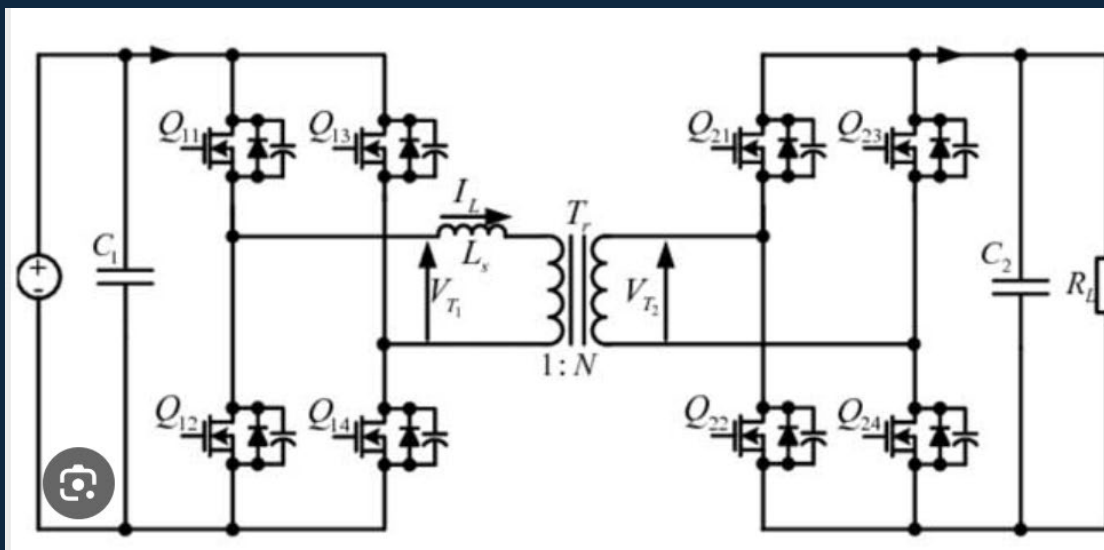
- Backend development to update the conversion of PSS/e files into RSCADFX case and vice versa
- Translate input data to standardized RSCAD FX native format using python based translation scripts.
- Easier adoptions to different versions of PSSE (historical and future), easier maintenance
- Enable users to choose the study area, and provide options to substitute rest of the network to equivalencies (TSA or NETEQ)
- Key aspect is separation of data translation and layout generation.

-Longer term future enchantments (No timetable)

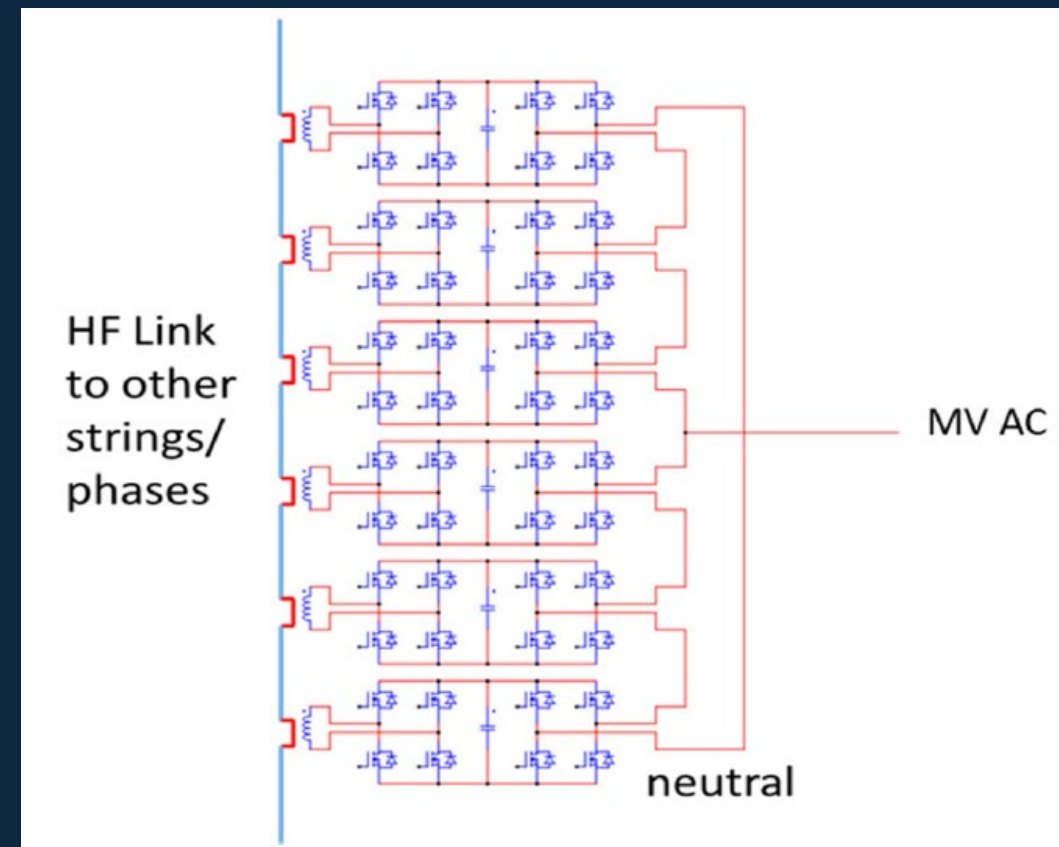
- Supporting additional simulation formats
- Allowing users to expand or modify networks without repeating the full conversion process
- Improving layout and visualization capabilities over time

POWER ELECTRONIC MODELS

- Strong emphasis on generating high frequency power electronic models
 - DAB, resonant converters, SST, etc.
 - Data Center, microgrid, EV charging ... applications



Dual Active Bridge (DAB)



Solid State Transformer (SST)

OVERVIEW OF DAB MODEL DEVELOPMENT

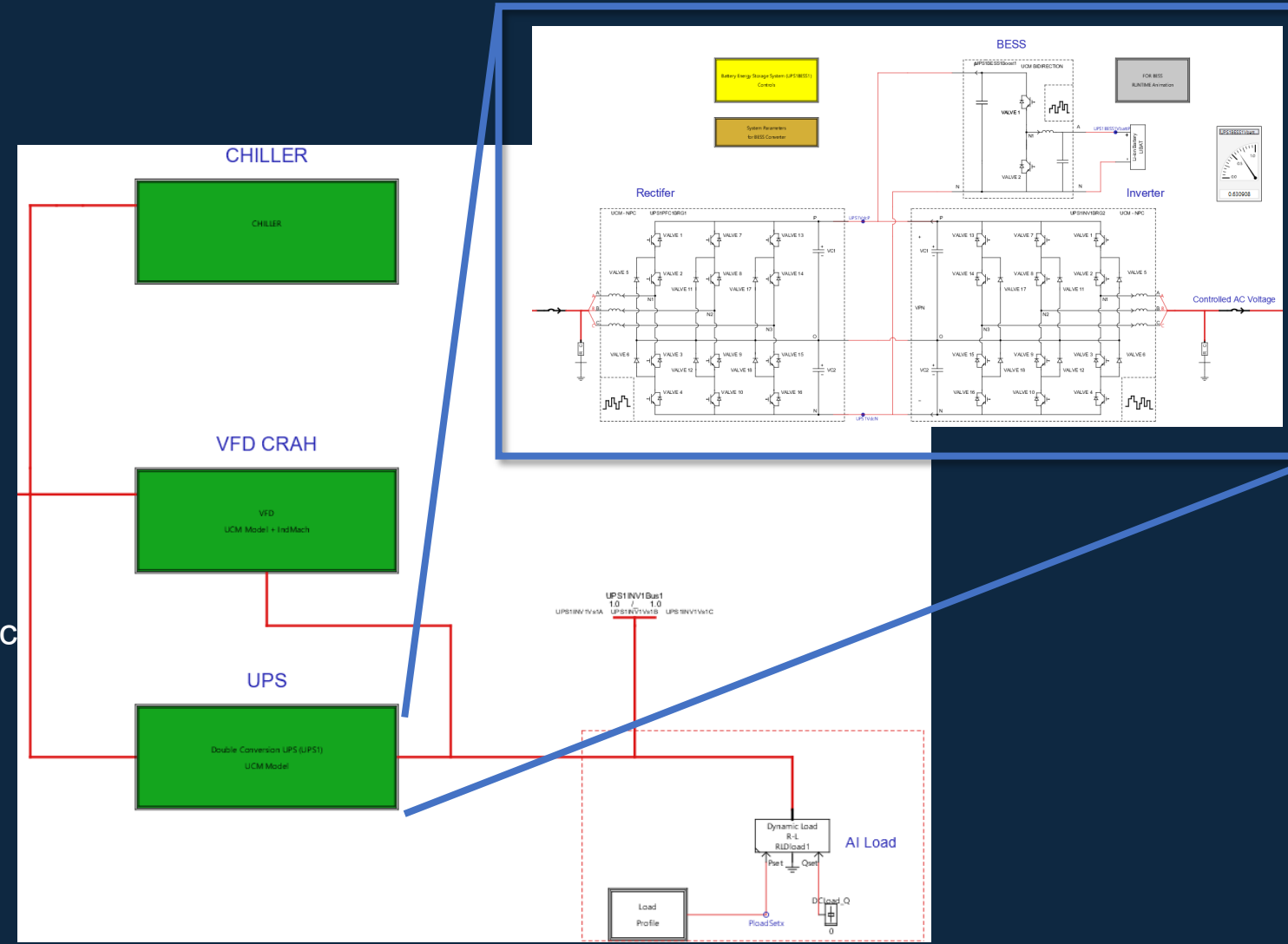
- DAB is the essential building block of SST
- Stand-alone equipment for EV charging applications.
- 4 DAB models are in our development plan
 1. DAB Model on NovaCor by UCM
 2. DAB on FPGA by VHDL
 3. DAB on FPGA – HLS
 4. DAB model on NovaCor with decoupling techniques

OVERVIEW OF SST MODEL DEVELOPMENT

- Various SST models are developed to simulate different circuit configurations
- The following 3 SST models are under development:
 1. CHB DAB SST Model based on Surrogate Network algorithm
 2. CHB DAB SST model based on Decoupling Algorithm
 3. LLC SST model based on Switching Function Algorithm

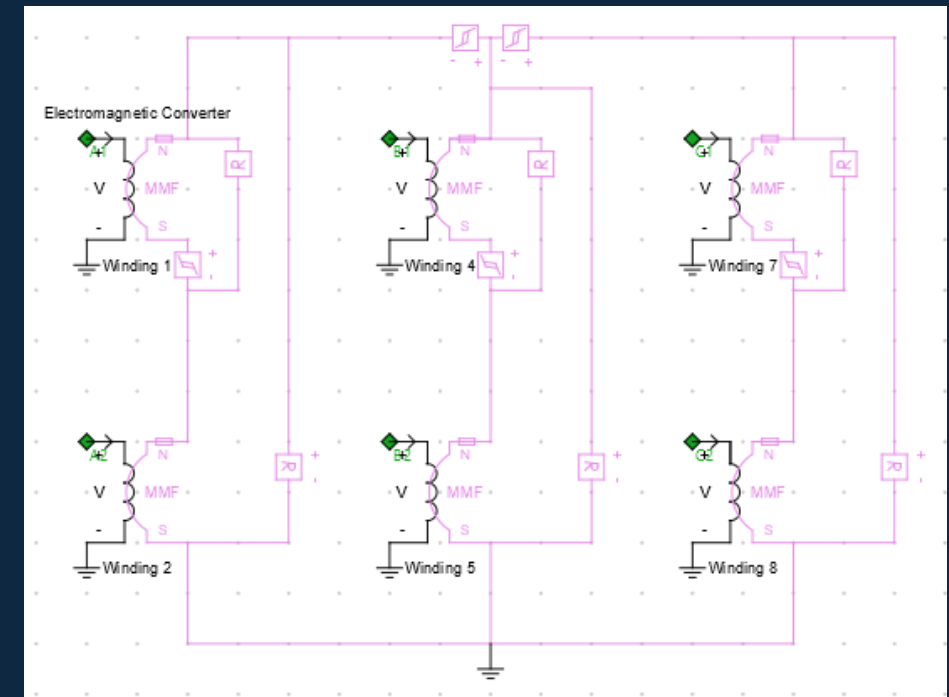
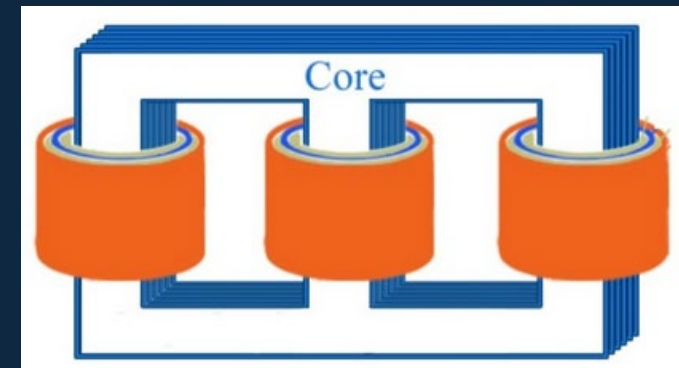
DATA CENTER EXAMPLE

- RTDS example case released in RSCAD FX 2.7
- Considering the following elements
 - Chiller
 - VFD CRAH
 - UPS
 - AI load
 - Co-located BESS
- Use aggregation to represent larger Data center load
- EROCT and PNNL have also generated generic EMT models (PSCAD)
- Will continue to look to develop Data Center models as the architecture evolves



MAGNETIC CIRCUIT SIMULATION

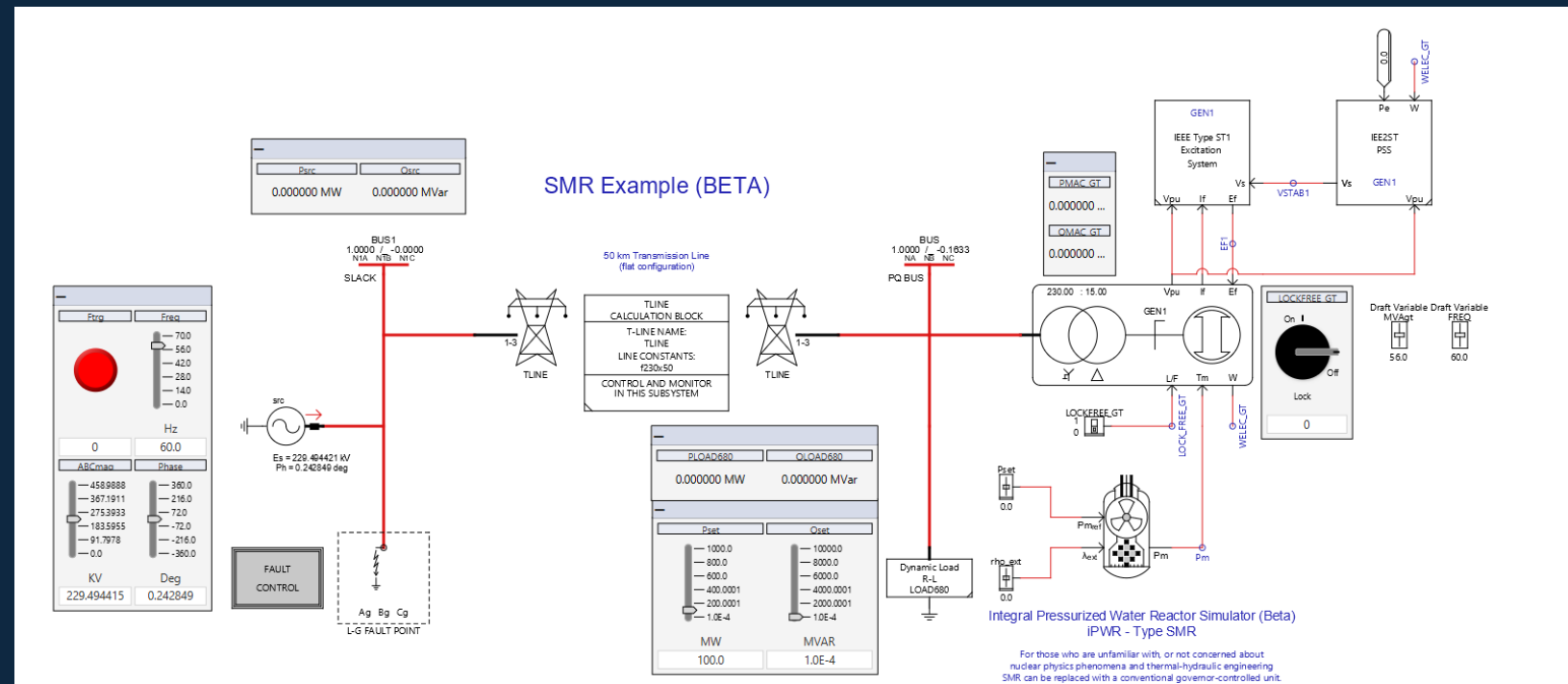
- Transformer components support only common core structures – 3 Phase Banks, 3-Limb, 5-Limb...
- Magnetic Circuit Simulation allows user to build custom magnetic circuit with
 - Electromagnetic Converter (Winding)
 - Linear Reluctance
 - Nonlinear Reluctance
 - Coupled Reluctance
- Magnetic circuit is solved as a whole system using a similar algorithm as UMEC and can run even within sub step environment.
 - Up to 9 winding in one magnetic circuit
 - Up to 9 non-linear element in one magnetic circuit



3-limb 2-winding transformer and its magnetic circuit built in RSCAD.

SMALL MODULAR REACTORS

- Developing components to support SMR application
- Not released yet



FUTURE DEVELOPMENTS

- **GTSOC-SV port configurability (not needed to be sequential)**
- **More GTSOC SV streams: 32** streams without PRP, 16 streams with PRP
- GTIO (v3) redesign
- CIM conversion as part of collaboration work with RTE
- Black box controls from Matlab to GTSOC with one click