



GE VERNOVA

Carl Barker | June 2023

Creating a real-time simulation model of a HVDC pole end using the GTSOC

Why use a GTSOC?

Growing market demand for support in research and development projects aiming to develop tomorrow's power system

Some of these programmes are seeking to include real-time simulations

Cost, delivery and space constraint on physical Control & Protection replica – redundant asset at the end of the programme?

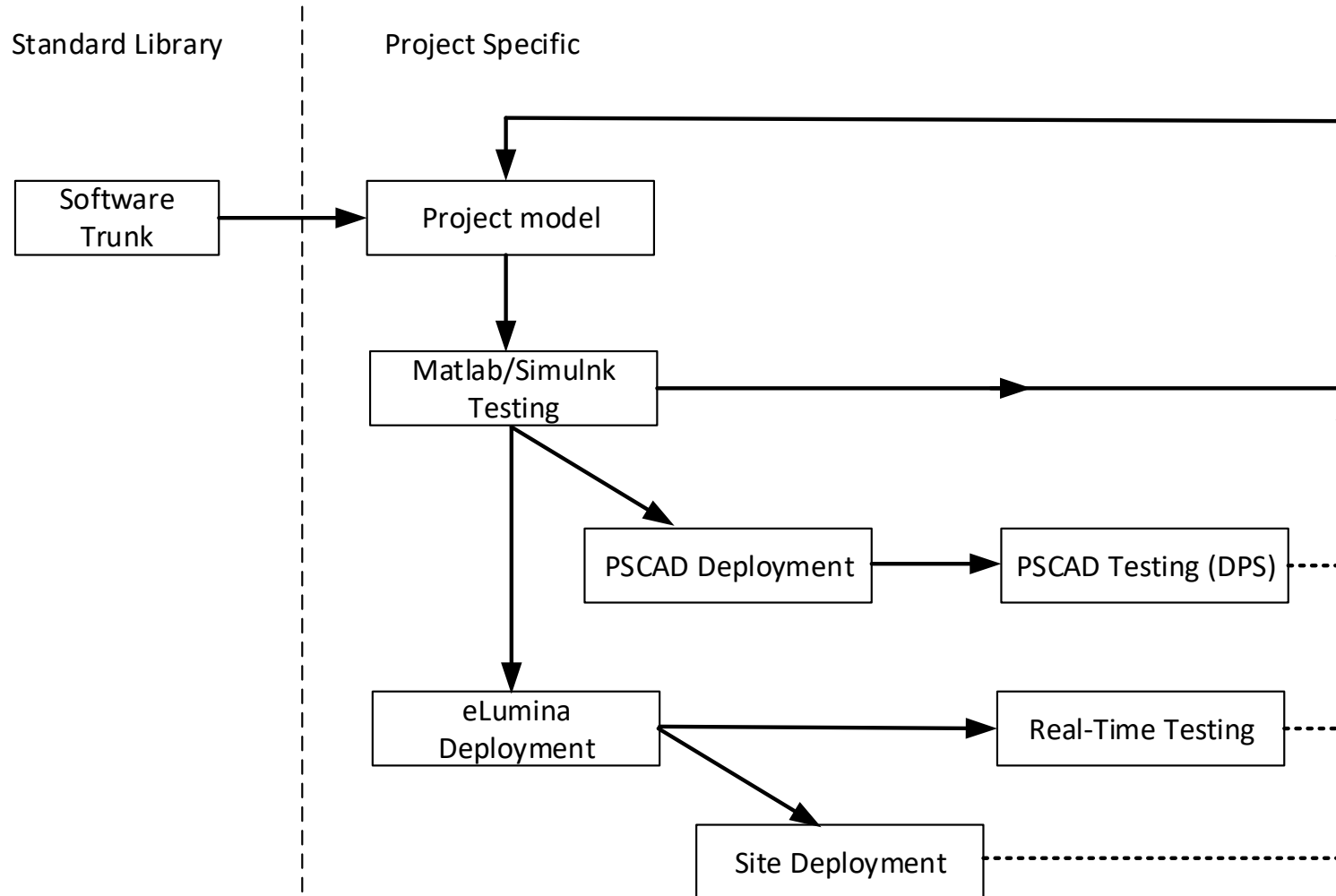
Why use a GTSOC?

Flexible laboratory approach to reuse equipment across multiple projects

Emulate other equipment (wind, solar, etc.) where suitable models are available – realistic real-time simulation

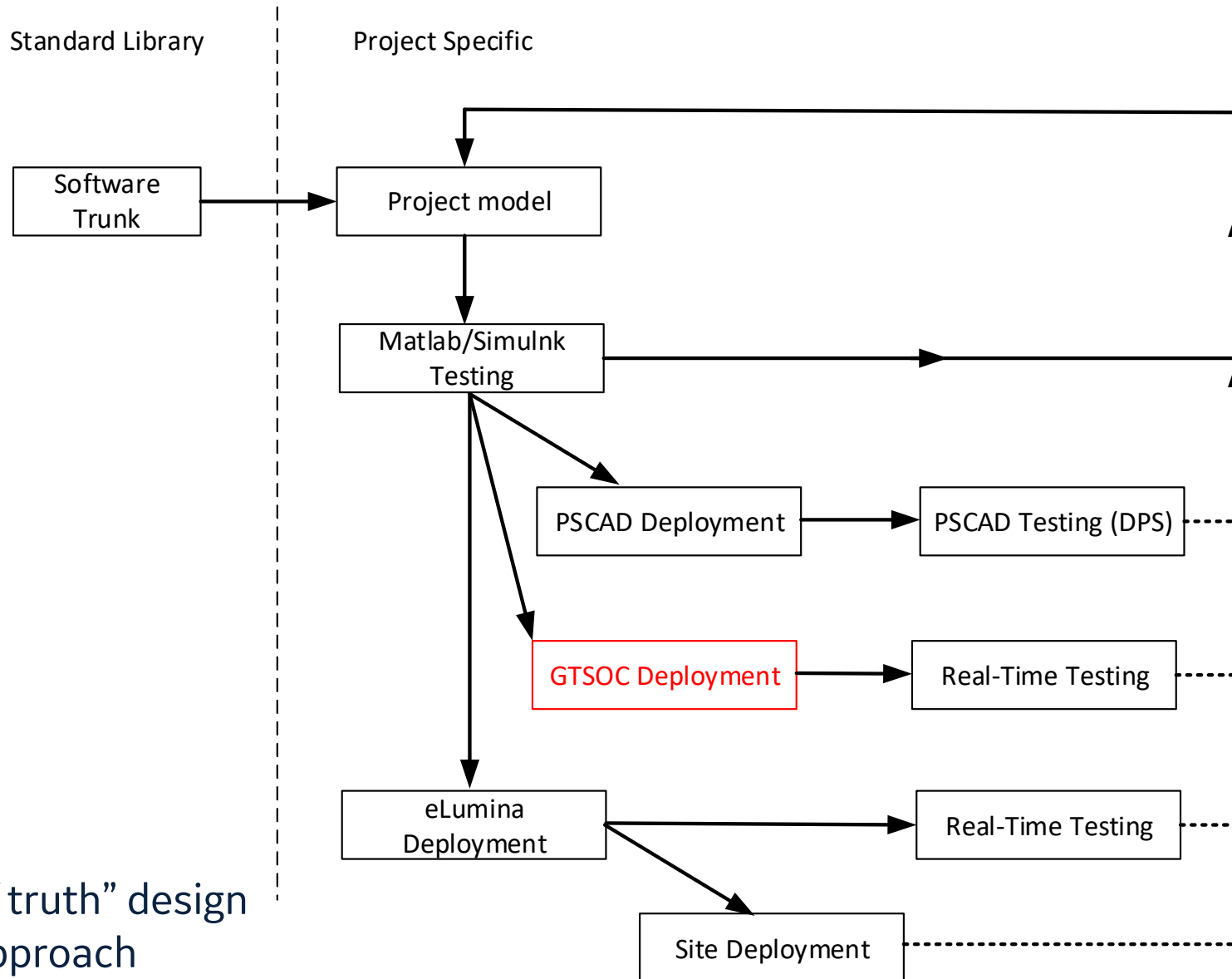
Flexibility to model “other” terminals in multi-terminal HVDC projects when performing HIL testing for a part of the HVDC grid

Easily accommodating software integration on the GTSOC



“Single source of truth” design and validation approach

Easily accommodating software integration on the GTSOC

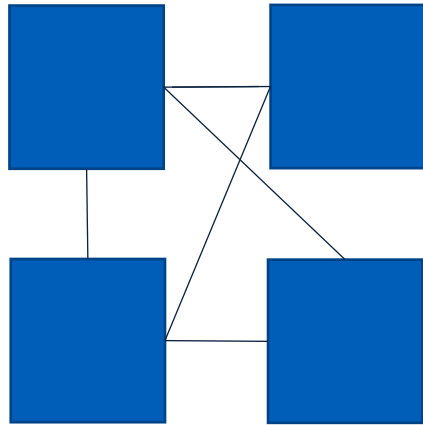


“Single source of truth” design and validation approach

Task Allocation

GTSOC

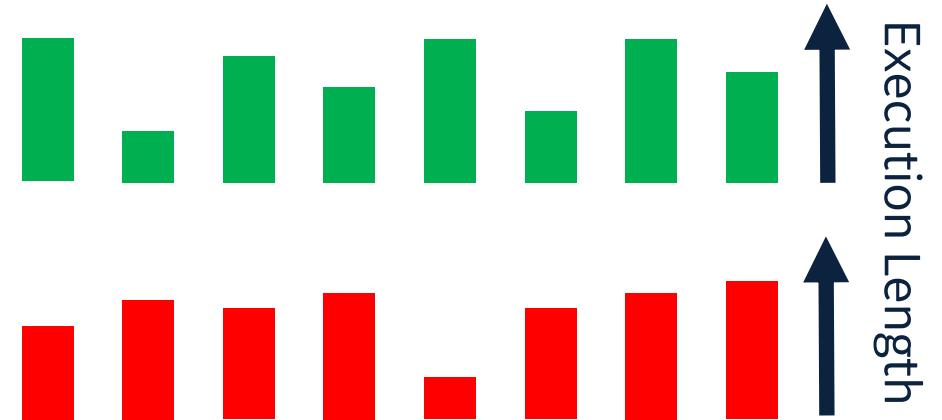
four core ARM processor



GE eLumina C&P

Multiple "tasks" (Simulink™)

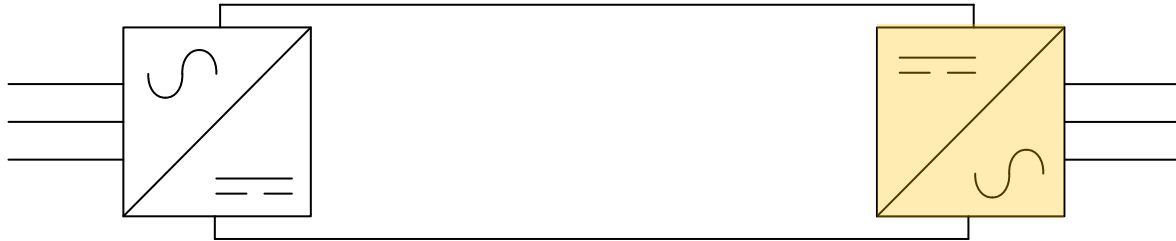
Control



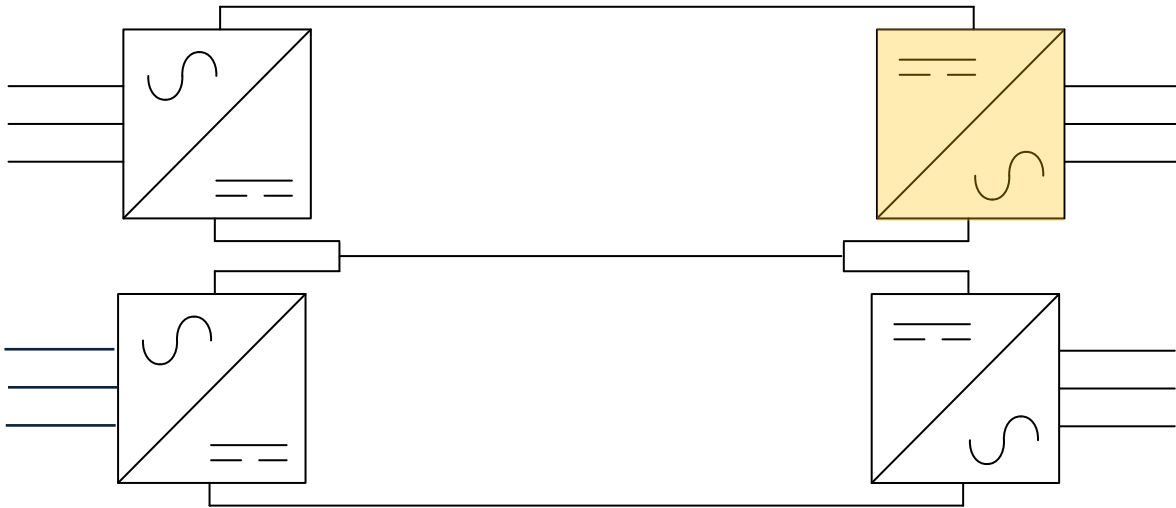
Protection

Making it fit

Symmetrical Monopole



Bipole



One pole-end



Converter Modelling

Full Implementation



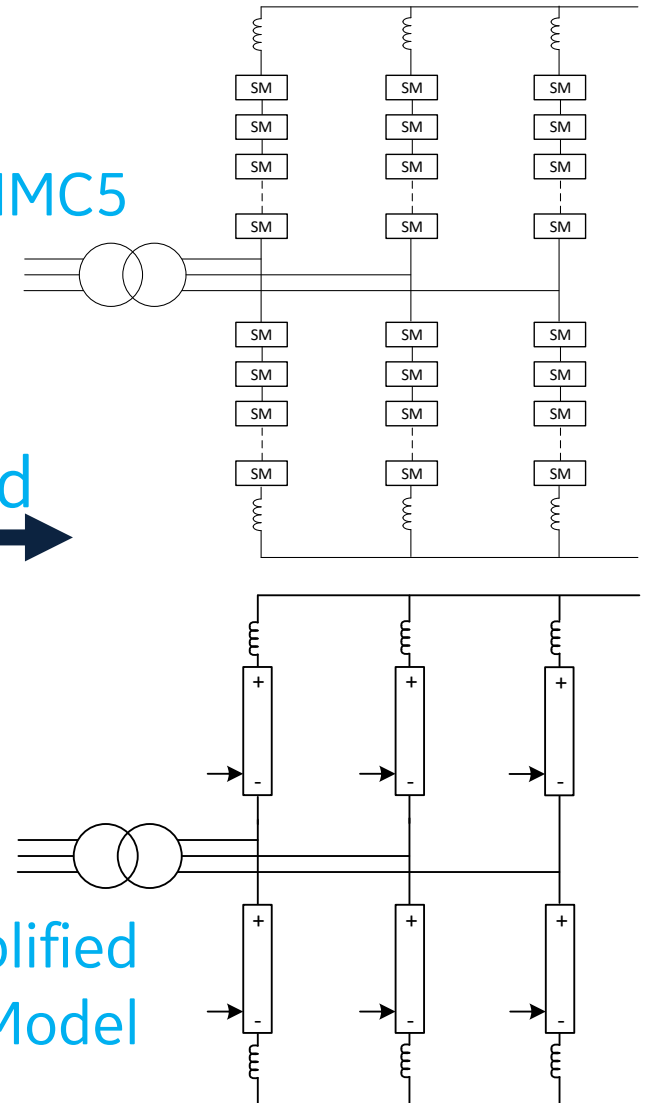
Full Implementation

Simplified Implementation

Valve Demand

MMC5

Simplified Model



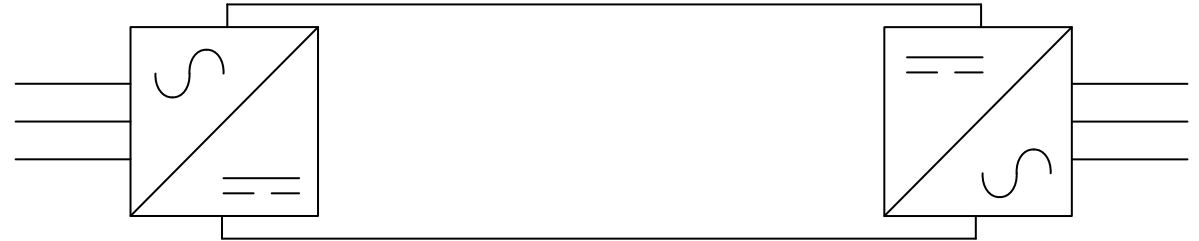
Testing

Real project code

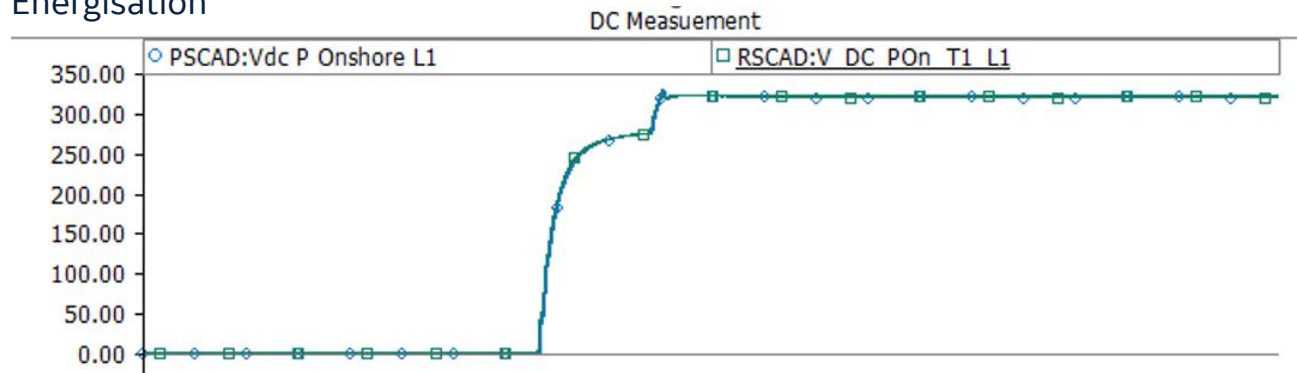
Simplified AC network models

PSCAD DPS study

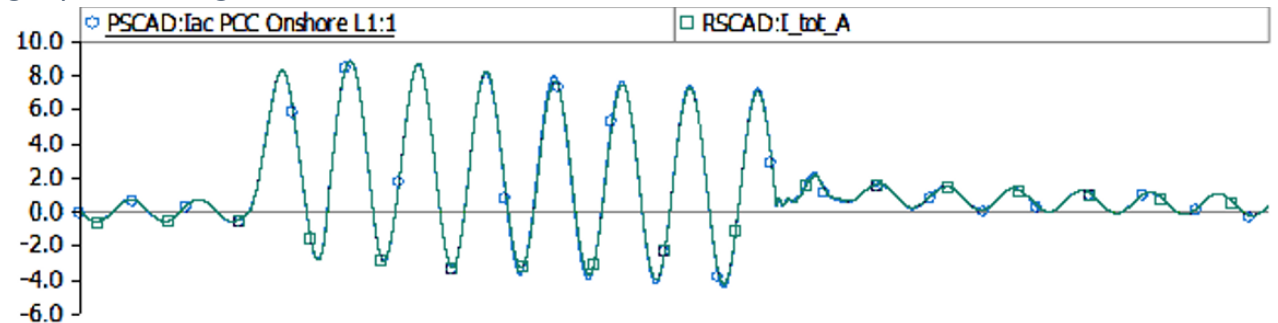
GTSOC real-time study



Energisation



Single phase-to-ground fault



Wrappers configured for “Standard Library”

Parameter file to configure GTSOC

Networked to GE’s office network – access from engineer’s desk



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