RTDS Training course of IEPG

DAY [?]: Small Time Step Modelling

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1.0 Preamble

Electro-Magnetic Transient Program (EMTP) Type software typically use a typical time-step of 50μs for simulation of phenomena ranging from 0 to 3kHz.To model high frequency power electronic circuits such as those found in Static Synchronous Converter (STATCOM),Wind farms,PV solar systems, Fuel cell and High Voltage DC systems, a smaller time-step is needed. The RTDS Simulator utilises processor hardware and optimised calculations to achieve a simulation time-step of 1 and 3 μs. This tutorial provides details of underlying theory behind small time step modelling and also provides a hand-on approach with a simple PWM circuit.

2.0 Lab Objectives

The tutorial aims to equip students with the basic knowledge to enable them do the following:

a. Describe the theory behind small time step modelling in RSCAD
b. Draft and simulate a simple PWM converter circuit

3.0 Prerequisites

Before attending this lab session, students should:

- Read the document titled “Introduction to Small Time Step Theory and Components” –pages 6 to 11.

4.0 Attached documents:

- Introduction to Small Time Step Theory and Components (pdf)
- Small Time-Step Simple PWM Tutorial (pdf)

The lab tutorial is in two parts, each focussing on one course objective outlined under “Lab Objectives”. The first part is to be done ahead of the lab session. The second part is a hands-on workshop to create and simulate a circuit using small time step components.

5.0 Creating a draft in small time step

The process for building a distribution case is the same as that for creating a standard DRAFT case in RSCAD.Start by launching draft mode and proceed as outlined in the tutorial document labelled “Small Time-Step Simple PWM Tutorial”.

5.1 Launch Draft mode

Launch RSCAD’s Draft module by clicking on “Draft” button as shown below in fig 1.

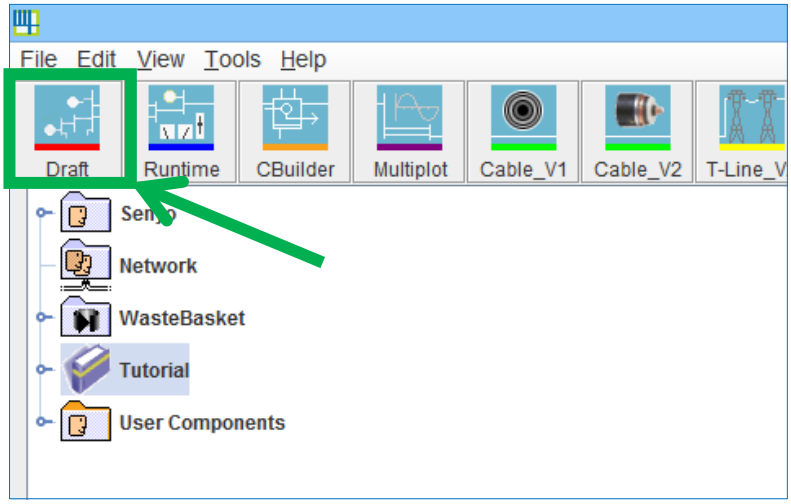

Figure 1: Draft button

Assignment:

1. Complete the instructions in the tutorial document and run the simulation

5.2 Locating Components

The key components for this tutorial can be located as follows:

1. Locate the “Small_dt” tab in the RSCAD library.

2. Select the components as shown in figure 2.

3. Components can be copied into the draft by placing the mouse pointer over the component and pressing “C”on the keyboard.

4. The parameters for each component can be modified by double clicking on the component in the draft to open a window similar to ones shown in Fig 3 and 4.

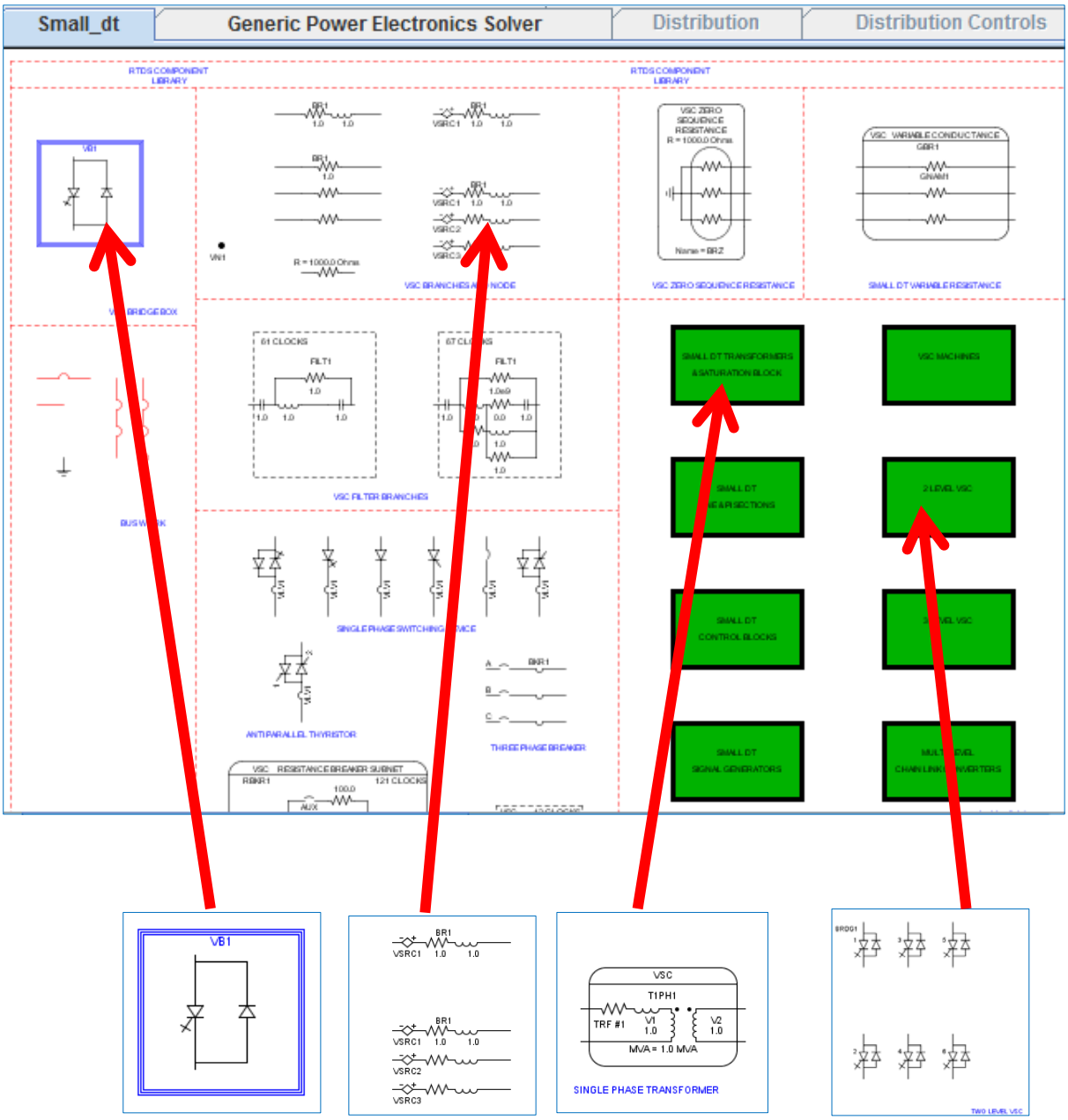

Figure 2: Location of components for PWM tutorial

Tips:

1. The "**nmtrf**"parameter in the single phase transformer should be set to 3 for three phase application. See Fig 3.
2. Change "**bty**" and "**vsrc**" parameter in the VSC branch component to 1 and HIPASS respectively to obtain the input filter type shown in the tutorial.
3. Small time step components should be placed within the VSC bridgebox
4. The "Introduction to Small Time Step Theory and Components"pdf contains detailed information on other small time step components (pages 14 onwards)

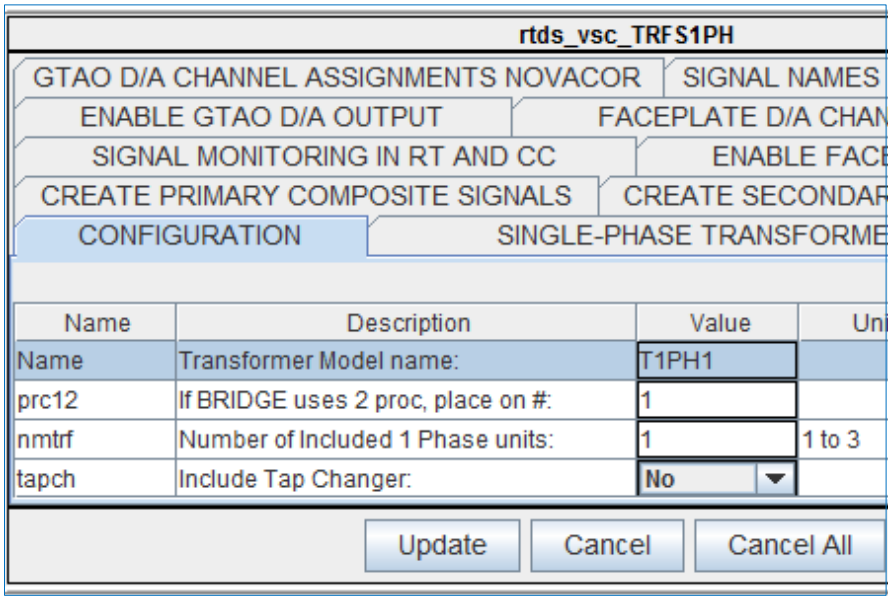

Figure 3: Change “nmtrf” parameter to 3 for three phase application

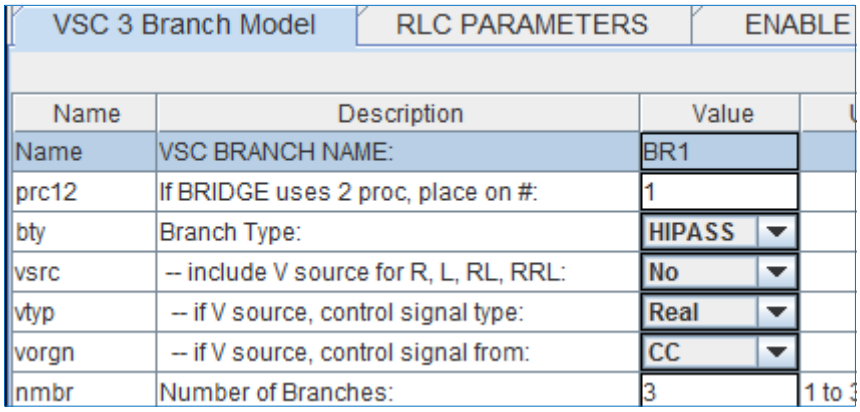

Figure 4: Change “bty” and “vsrc” parameter for the VSC branch component to 1 and HIPASS respectively