

# Coordination of Time Dependent Simulation Parameters Using the Application Builder in COMSOL Multiphysics®

Design an App to cut the *Time* it takes to specify a *Time-dependent* simulation.

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## Introduction

- Time-dependent simulations are most interesting when external factors also change.
- **BUT....**
  - Need to re-evaluate before/after each external change
  - Need to coordinate external changes with re-evaluation (*inconvenient!*)
- Can use the Application Builder to solve this:
  - Build a User Interface (UI)
  - Develop code to automatically change conditions and line up times

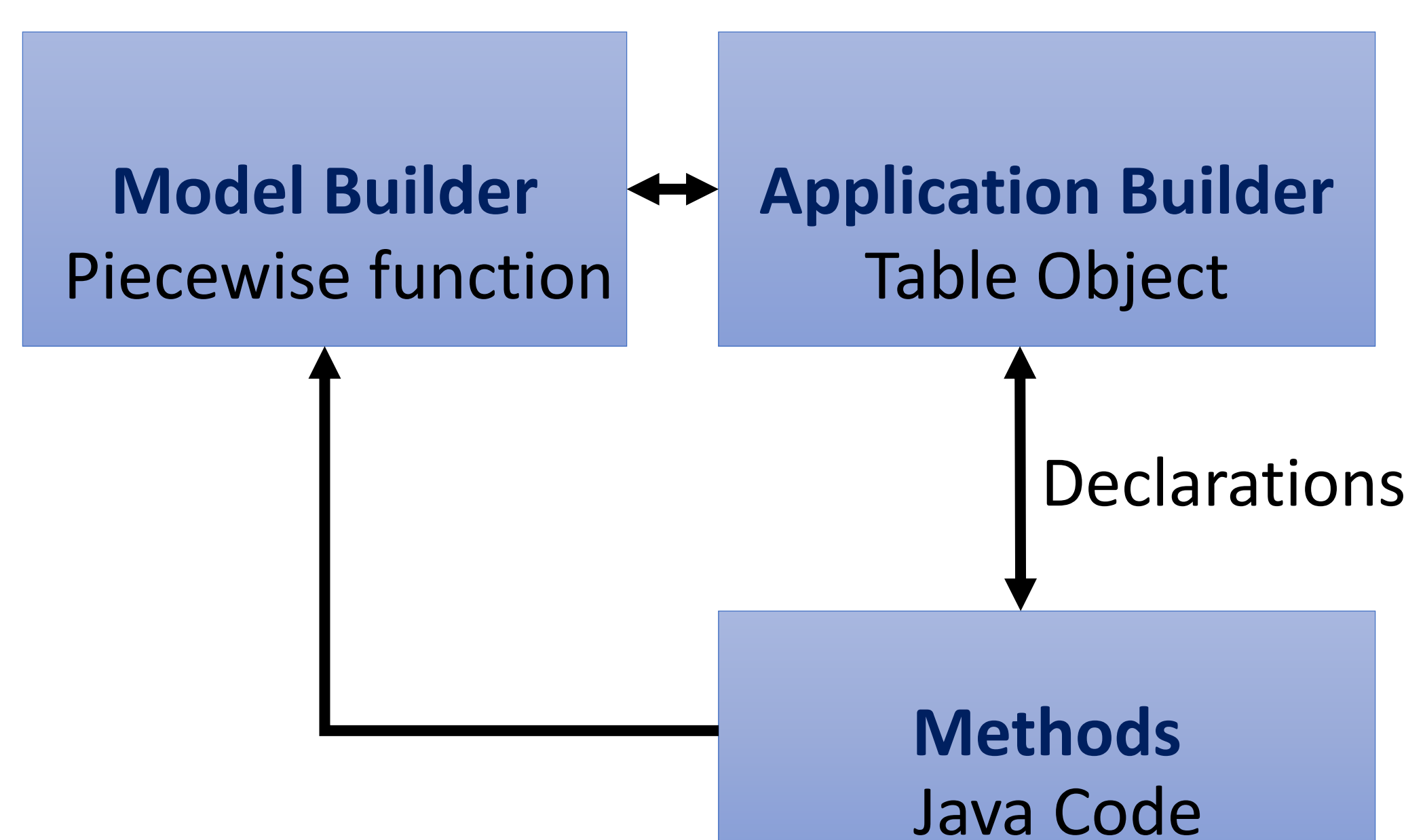


FIGURE 1: Flowchart illustrating how data structures are linked in various COMSOL Multiphysics® environments.

## Methodology

- Step 0: Create UI in App Builder to specify time-dependent factors
- Step 1: Link data structures to UI via Declarations
- Step 2: Specify Time Dependent Solver Settings
- Step 3: Comment Method code
- Step 4: Record code to set up conditions
- Step 5: Record code to set up evaluation times
- Step 6: Modify Method code
- Step 7: Execute UI Application

```

Method Code Structure
1 // Set data from pulse table ==== CUSTOM
2
3 // Modify piecewise function ==== RECORD
4
5 // populate square pulses for each row ==== CUSTOM
6
7 // setup square pulse in piecewise function ==== RECORD
8
9 // find transition time for pulses ==== CUSTOM
10
11 // setup transition time for piecewise function ==== RECORD
12
13 // Find evaluation times ==== CUSTOM
14
15 // set times for evaluation ==== RECORD
  
```

## Results

- We demonstrate how to customize and model irregularly changing boundary conditions across a wide range of time scales.
- Through custom code in Application Builder, users can develop an app to input parameters in a table object which will subsequently update a piecewise function in the model.
- To ensure an optimal simulation, evaluation times are recorded and specified to resolve pulse events across large time scales.
- This automated approach saves time, reduces errors, and can be applied to many different physics.

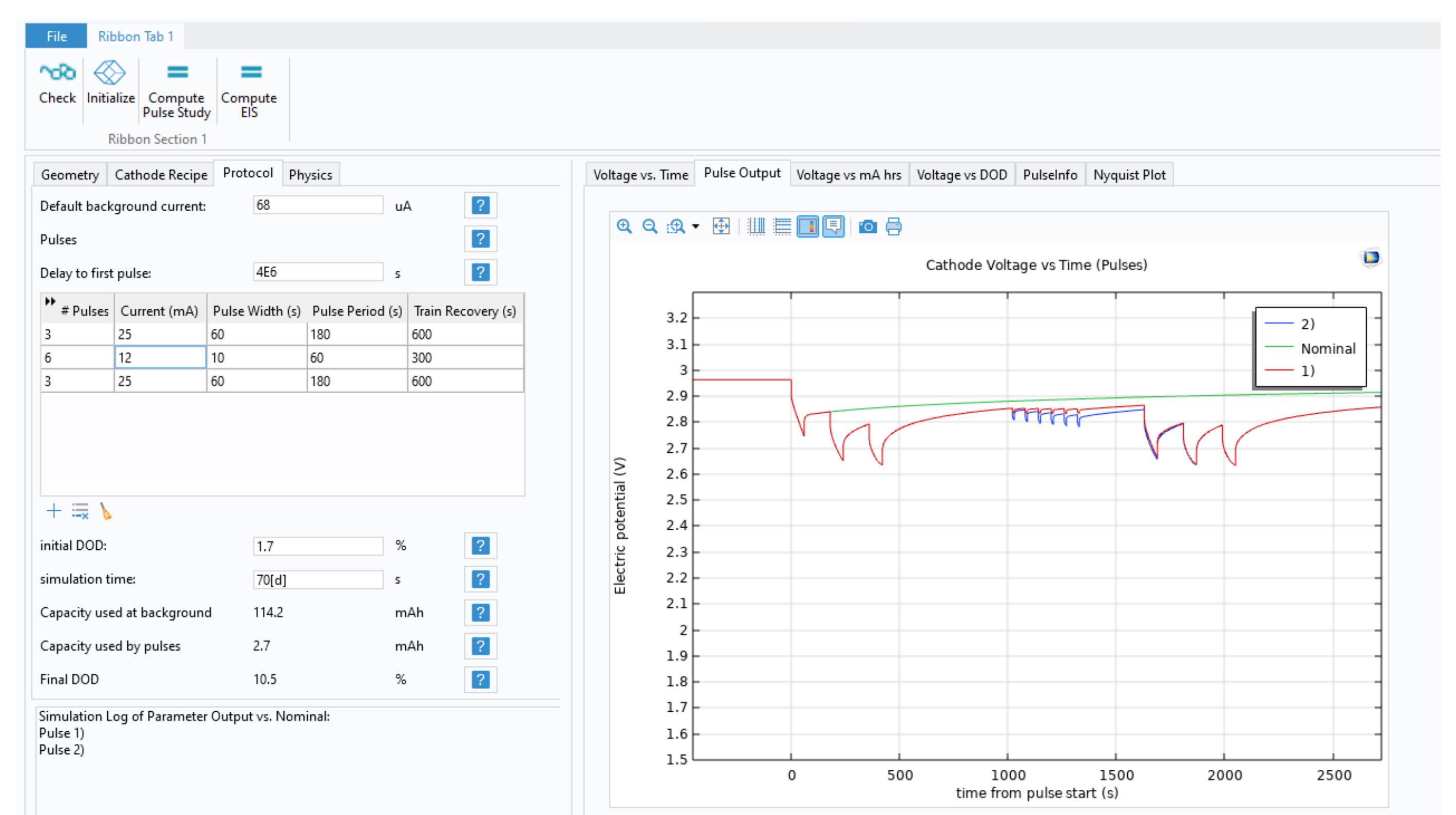


FIGURE 2: Battery application capable of simulating multiple current pulse events using a custom input table.

...To learn more about our App, attend our Talk at 10:30am on Thursday!

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