Multi-rate control on Simulink with ACG SDK

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This document provides instructions on how to implement Multi-rate control on Simulink with ACG SDK. It allows running part of the control at a slower rate, without impacting the real-time control running at the base rate. This is typically useful for implementing a finite state machine or running a tracking algorithm.

An example of use is presented in [Maximum Power Point Tracking (MPPT) (TN117)](). This feature has been integrated with **ACG SDK version 3.5.0.0**, which is available from [https://imperix.com/downloads]().

Enable MultiTasking

- Make sure the imperix CONFIG block mode is set as *code generation*
- Go in the **Model Configuration Parameters** -> **Solver** -> **Solver details**
- Check **Treat each discrete rate as a separate task** (for older MATLAB version: for the option **Tasking mode for periodic sample times** select *MultiTasking*)
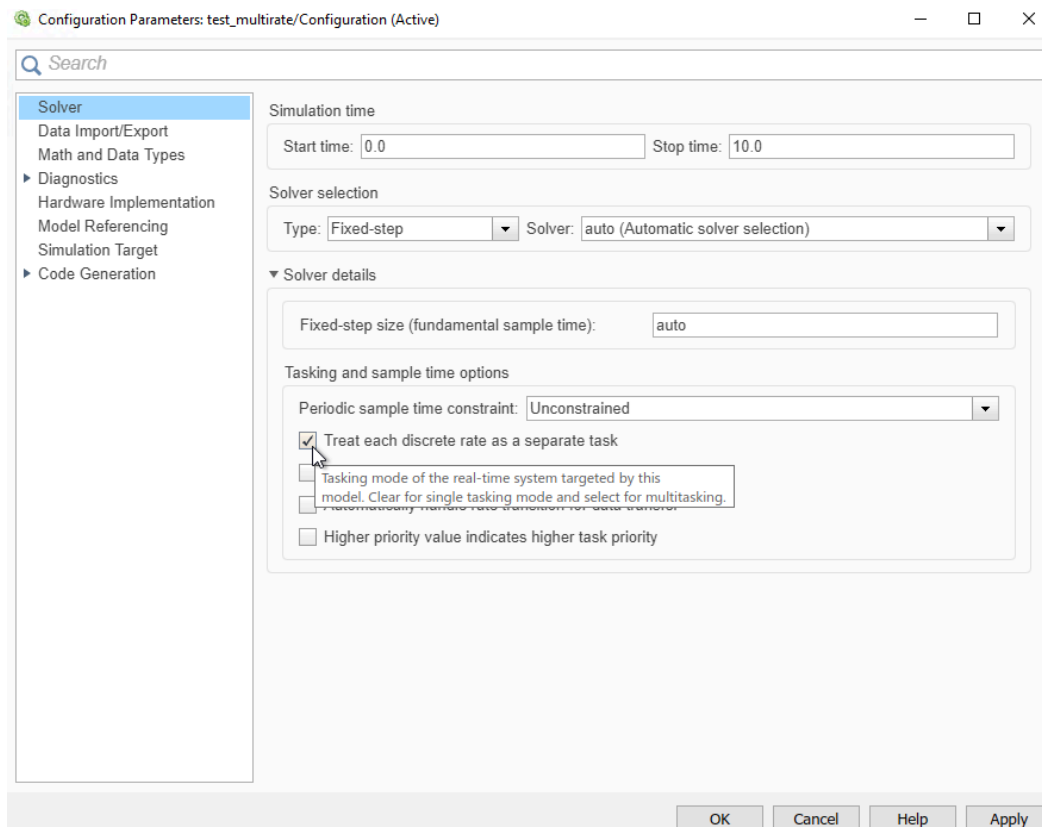
Enable multi-tasking in the model configuration parameters

Using MultiTasking

The base rate frequency is set using the CONFIG block and defines the interrupt frequency. The resulting sample time is available through the global variable CTRLPERIOD.

The CPU-FPGA communication is tightly coupled to the interrupt. As such, FPGA driver blocks (CLK, ADC, PWM, GPI, GPO,…) can only be called at the base rate frequency.

To enable colors to display sample time do **Right-click on the model** → **Sample Time Display** → **Colors**
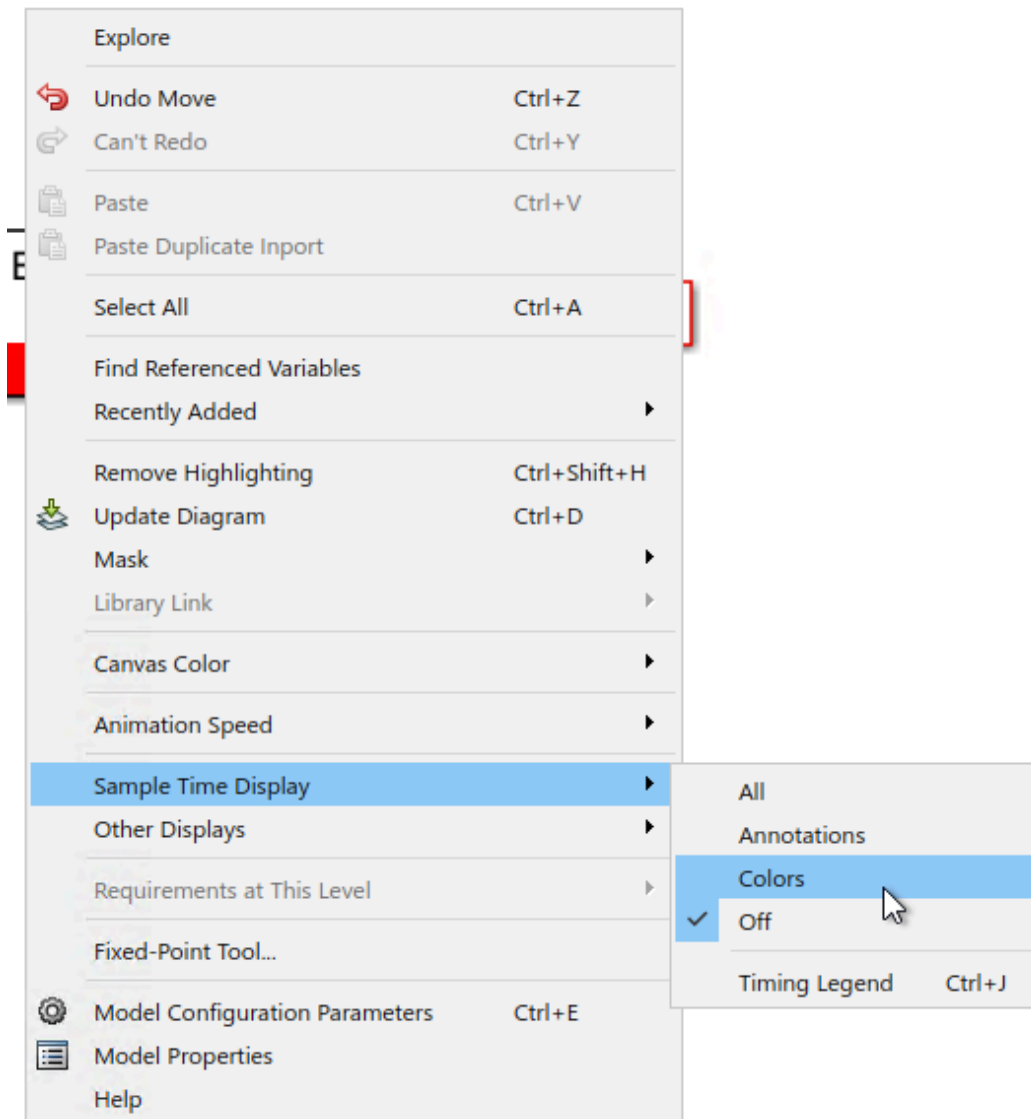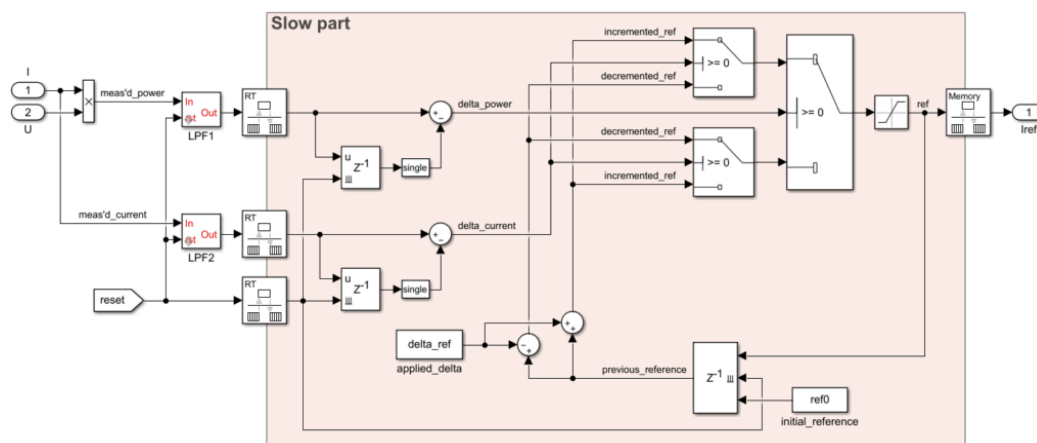
Display sample times as colors

To interface logic running at a different rate, add **Rate Transition** blocks. In the block parameters:

- set the **output port sample time** (for instance 0.1 for a 10 Hz frequency)
- check **Ensure data integrity during data transfer** so the generated code will use an intermediate variable (and thus avoid data corruption)
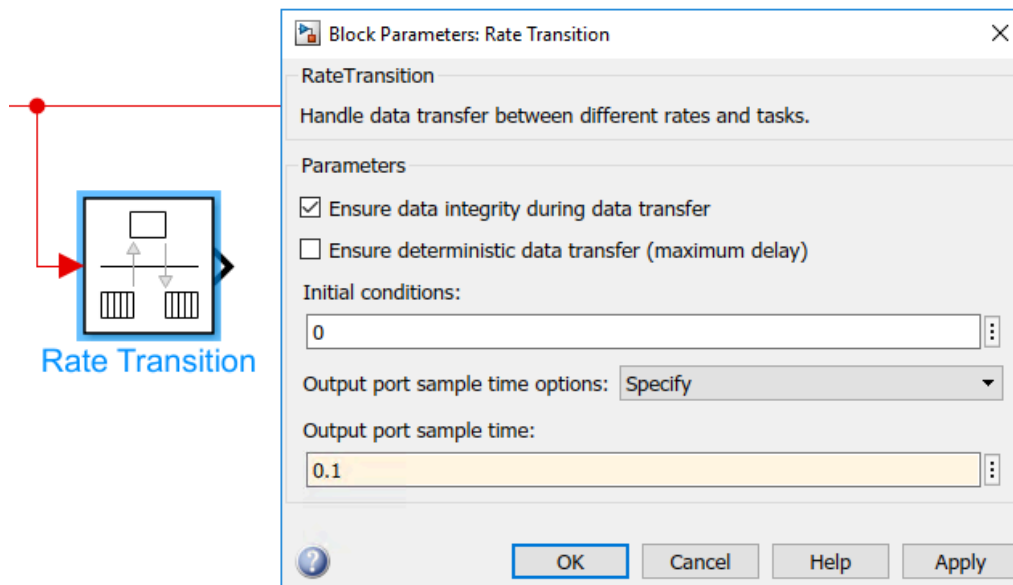
Rate transition block to define a slower task

An example of use is presented in [Maximum Power Point Tracking (MPPT) (TN117)](#). It shows how one part of the control (in red in the figure below) can be executed at a slower rate than the main control code.

Multi-rate MPPT example