What’s New In Simulink?

R2013a  R2013b

By Fraser Macmillen
Helping Simulink Users

- **Build & Understand** models more easily
  - New Simulink Editor & Physical Modelling
- **Manage** large models more effectively
  - Simulink Projects & New Variant Manager
- **Explore** model behaviour more efficiently
  - Enhanced Simulation Performance
The New Simulink Editor
Example

Add a optional gain on airbrake command in braking controller and log all the signals entering the controller bus.
Bloodhound Controllers Model

This model specifies the embedded controllers for the Bloodhound vehicle:
1. The winglet controller to maintain stability
2. The thrust controller supervising the jet and rocket
3. The brake controller for the airbrakes, parachute and disc brakes

These controllers will be implemented with automatic code generation.
Rich Dialogs for Masks

Embrace Complexity by…

- Organise large numbers of parameters in groups or tabs
- Provide hyperlinks to…
  - MATLAB function/script, help, user guide, design or requirements doc, etc.
- Drag and drop mask building
What about Stateflow Editor?

R2012b: New Editor

- Unified canvas with Simulink: Tabbed windows, Explorer bar
- Smart guides, Drag margins, Transition indicator lines
- Visual breakpoints and data value displays during debug mode

R2013b

- parse chart
- output child-state activity
- enhanced pattern wizard
Parse Stateflow Chart

Detect errors in state machine without generating code for simulation

- Syntax errors reported
- Symbol Wizard to resolve data and events
- Exported graphical functions resolved
Output actions of driver model & log for time-history plots
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Physical Modelling Updates in R2013b

- **Simscape Language**
  - branches, import & connect

- **Simscape**
  - Thermal liquid domain and library
  - Simscape model statistics viewer
  - Laminar-turbulent ZCs removed

- **SimDriveline**
  - Universal Joint block
  - Double-Pinion Planetary Gear block
  - Helicopter transmission demo model

- **SimHydraulics**
  - 3 new component models
  - Nominal fluid density parameter added to pump and motors models

- **SimMechanics**
  - Prescribed motion for joints
  - Actuation force & torque calculated
  - Bevel Gear Constraint block
  - More CAD constraints supported

- **SimElectronics**
  - Voltage-Controlled Oscillator block
  - Servomotor permits parameterized torque-speed curve and iron losses
  - Solar Cell block models arrays

- **SimPowerSystems 3rd Generation**
  - Simscape-based libraries
  - Three-phase electrical ports for single-line diagrams
  - Simscape language examples of Machines and transformers
Simscape
Thermal Liquid Library

- New domain and library
  - Single-phase liquids
  - Fluid properties vary with temperature

```matlab
variables
    p = { 1, 'bar'};  % Pressure
    T = { 293.15, 'K'};  % Temperature
end

variables(Balancing = true)
    mdot = {0, 'kg/s'};  % Mass Flow Rate
    Phi = {0, 'J/s'};  % Thermal Flux
end
```
SimPowerSystems
Third Generation

- Simscape based
  - Directly connect to Simscape blocks, including SimElectronics
  - Fully supported code generation
  - Easier to create custom components
SimMechanics
Prescribed Motion & Actuator Forces

- Compute force/torque required to produce prescribed motion
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MATLAB API to automate tasks

Integrate with Source Control

R2013b
+ Your Company Library v1.3
+ Your Project Libraries
+...

Understand structure of your design

Standardize team environment

Support for peer-review of changes

Build, store & share best-practice

Simulink Projects
Run custom modelling standards checks on all model files
&
Check impact of Controller change
Run tests to verify performance requirements met
Requirements and Traceability

Linking requirements to MATLAB code

Link to specific lines of MATLAB code:

- in MATLAB function blocks
- for requirements verification scripts
Why Variants?

Common Use cases

- Product Variants
- Design Options / Trade-offs
- Model Fidelity Variants
Why a Variant Manager?

- Customer Example:
  - Single model
  - 36 nested variant subsystems
  - 97,320,960 possible combinations
Example

Manage:
Design Variants:  rocket + jet, rocket only
Fidelity Variants:  6dof, 1dof
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Bundled icc64 Compiler on 64-Bit Windows

Supports simulation based on generated code:

- used automatically in the absence of an external compiler

- Supported use cases (Simulink):
  - Stateflow simulation
  - MATLAB Function block simulation
  - Accelerator & Rapid Accelerator modes
Simulink Performance Advisor

- Compare Normal, Accelerator & Rapid-Accelerator Modes
- Assess compiler optimization
- Assess parallel model-reference rebuild

![Comparing simulation modes](image)
Simulink Performance Enhancements

- Improved back-stepping speed
- Signal logging in rapid-accelerator mode
%% SCRIPT: For running initial Bloodhound design studies
%% Fraser Macmillen, MathWorks 2013

%% Set parameters for batch run

machReheat.Value = 0.15;
machRocketArray = [0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55];
numParamSets = numel(machRocketArray);

%% run normal batch in series
Where next…?
Conclusions

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Accelerating the pace of engineering and science