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PSAT Training

Part 02B

Organization - Models

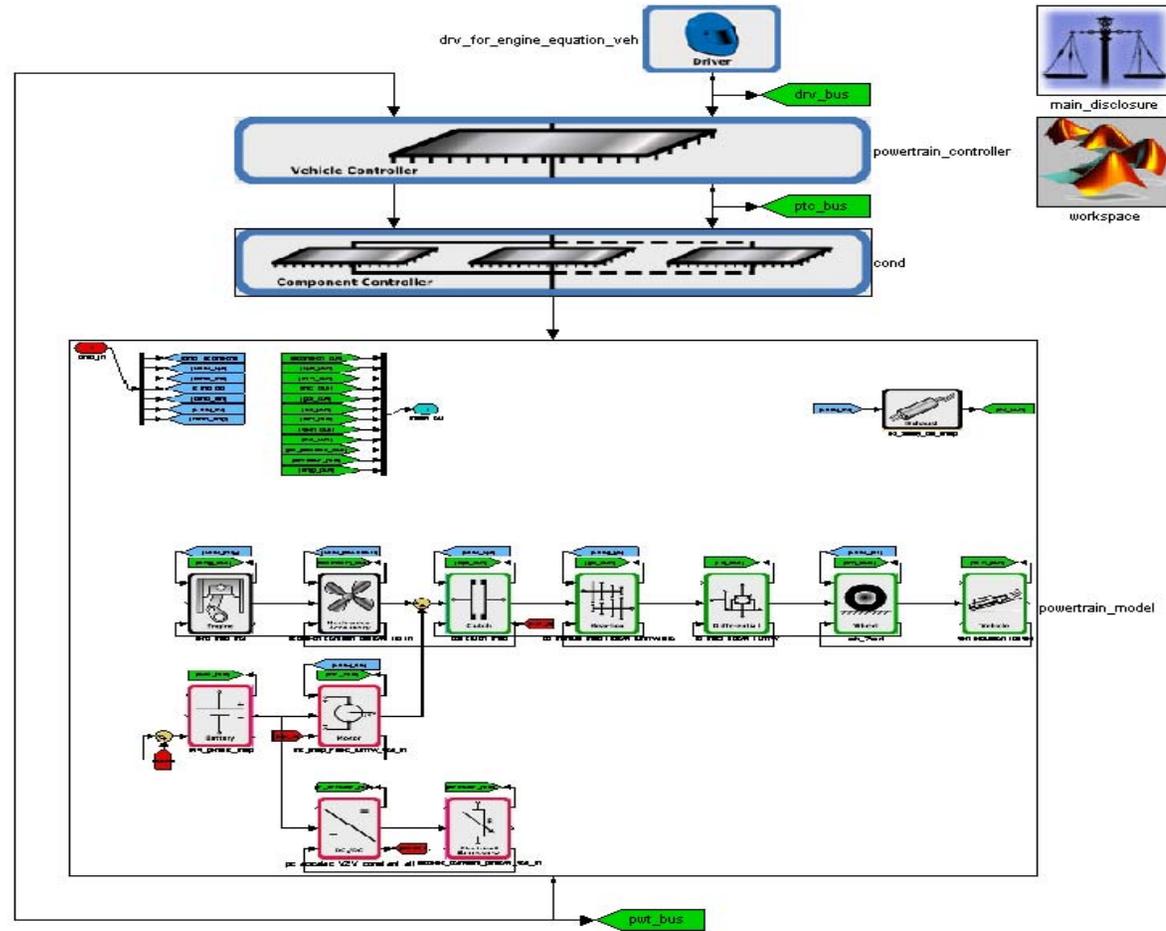
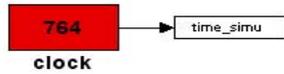
Aymeric Rousseau
Argonne National Laboratory



Outline

- Vehicle Model
- Component Model
- Powertrain Controller Model

1 – Vehicle Model



2 – *Component Model*

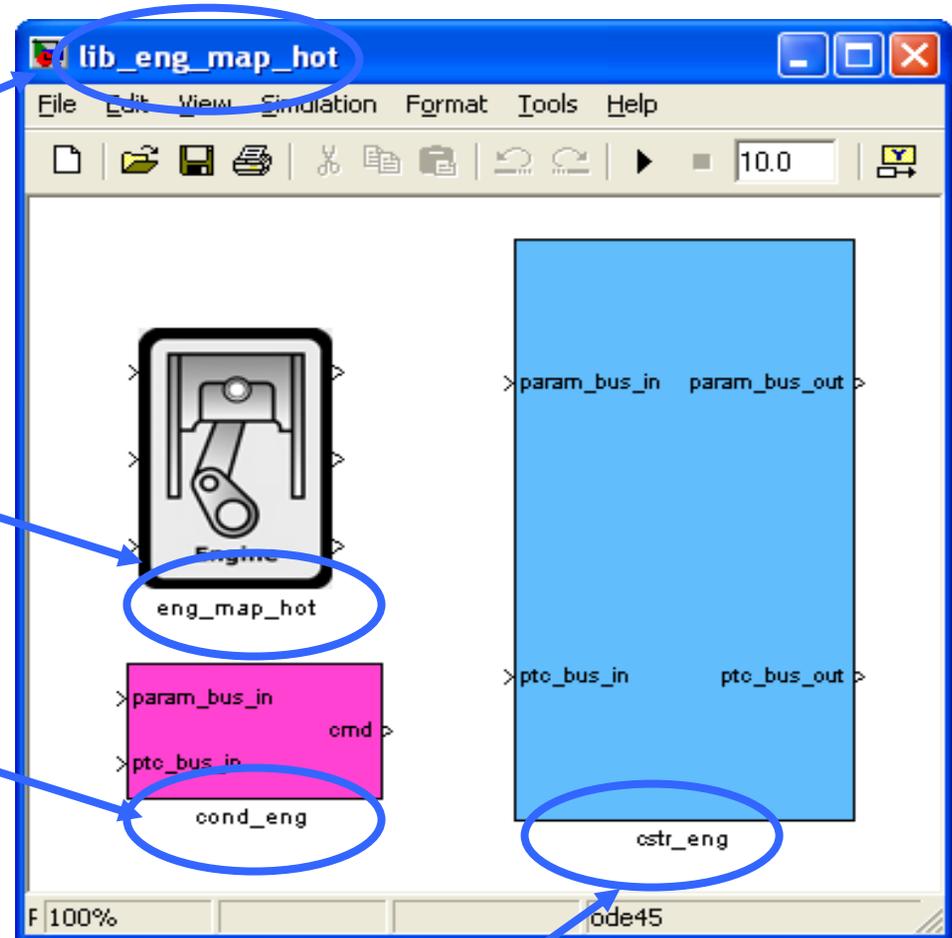
- Simulink block
- Conditioning block
- Constraint block

Component Model In Simulink

Name of the Library

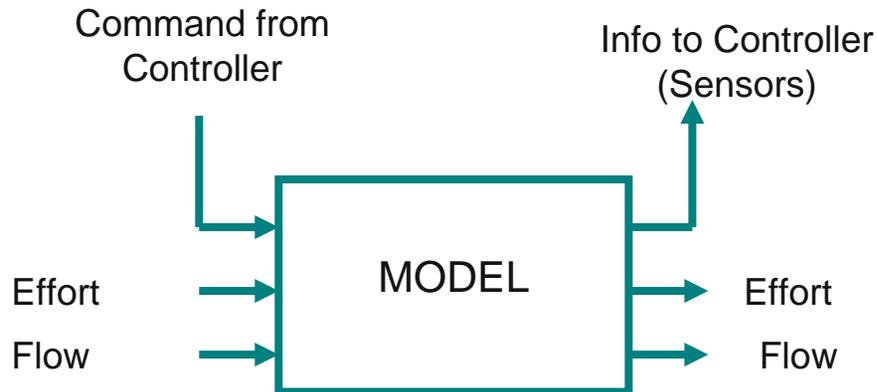
Simulink Model Version

Signal Conditioning Block

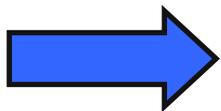


Constraints Block

PSAT Component Model Format Is Generic

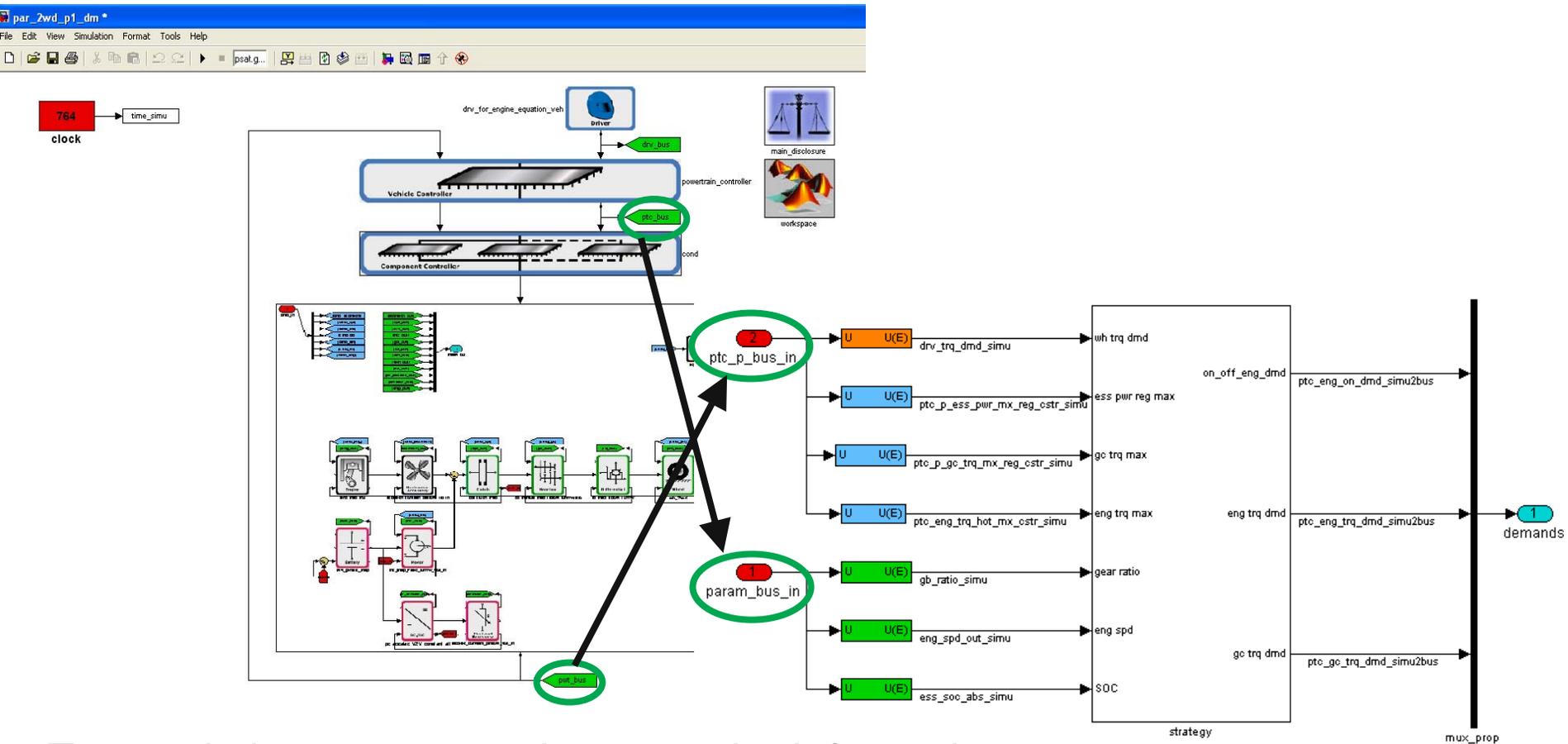


| | | |
|--------|---------|---------|
| | Effort | Flow |
| Engine | Torque | Speed |
| Motor | Voltage | Current |



All the component models have the same number of inputs (3) and outputs (3)

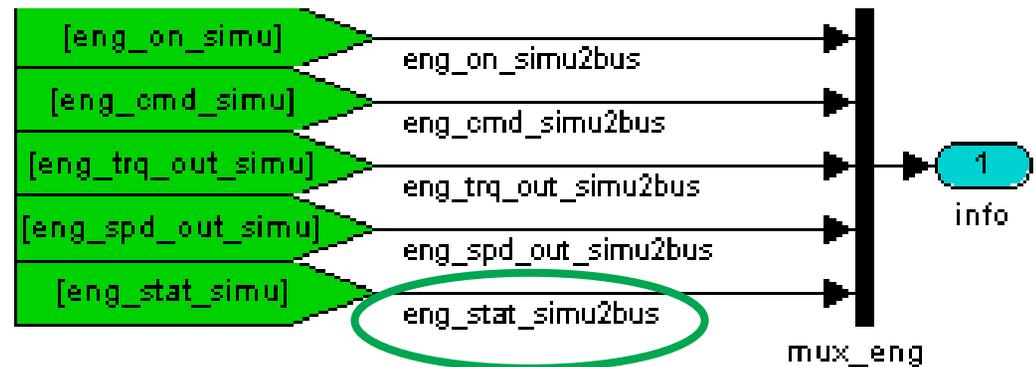
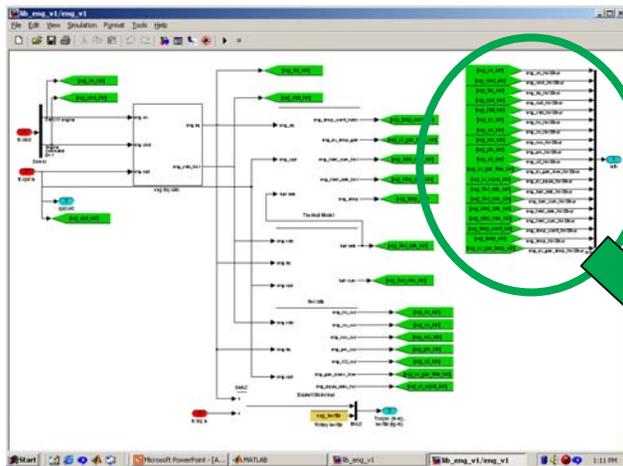
Two Main Buses



Two main buses are used to carry the information:

- 1 – Control parameters – ptc_p_bus_in
- 2 – Component sensors – param_bus_in

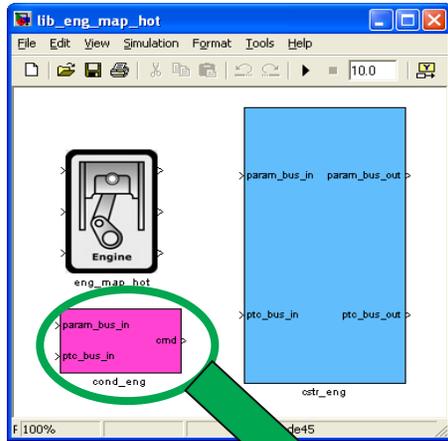
Mux Lines Names are Used for Bus Creation



**Name of the line =>
“name_parameter”2bus**

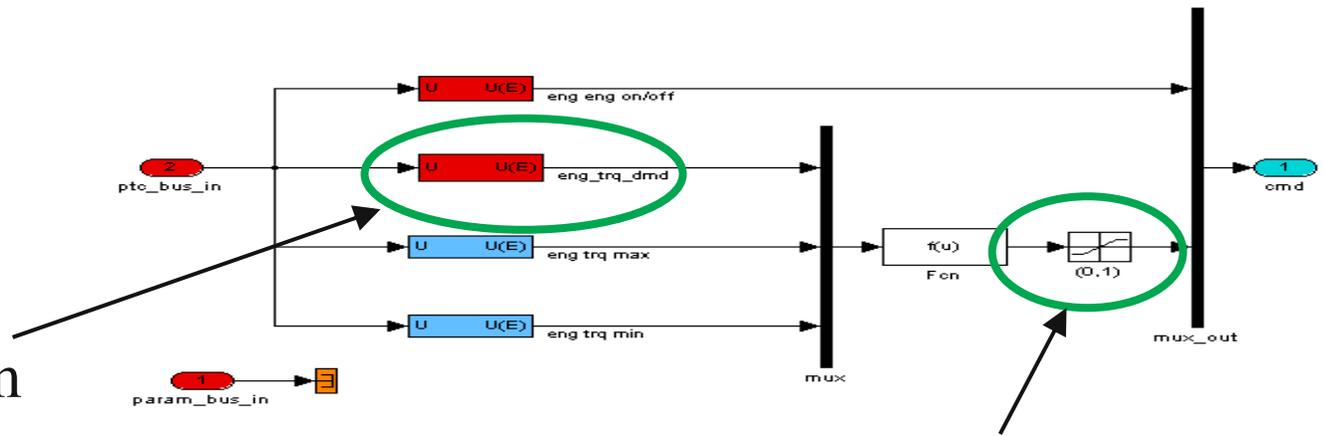
The position of each parameter in the bus is known by reading its name on the component bus (e.g., mux_eng)

Conditioning Block



Conditioning block is used to generate inputs needed by the component model from the PTC commands

Torque demand from PTC



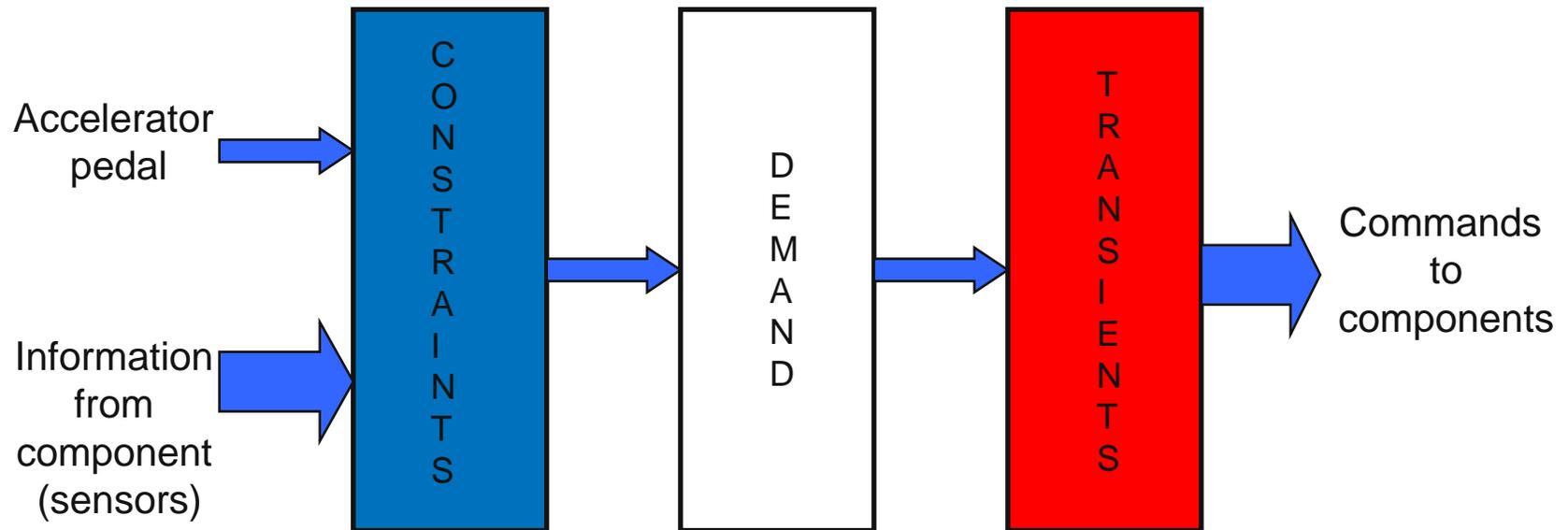
PWM to engine model

3 – *Powertrain Controller Model*

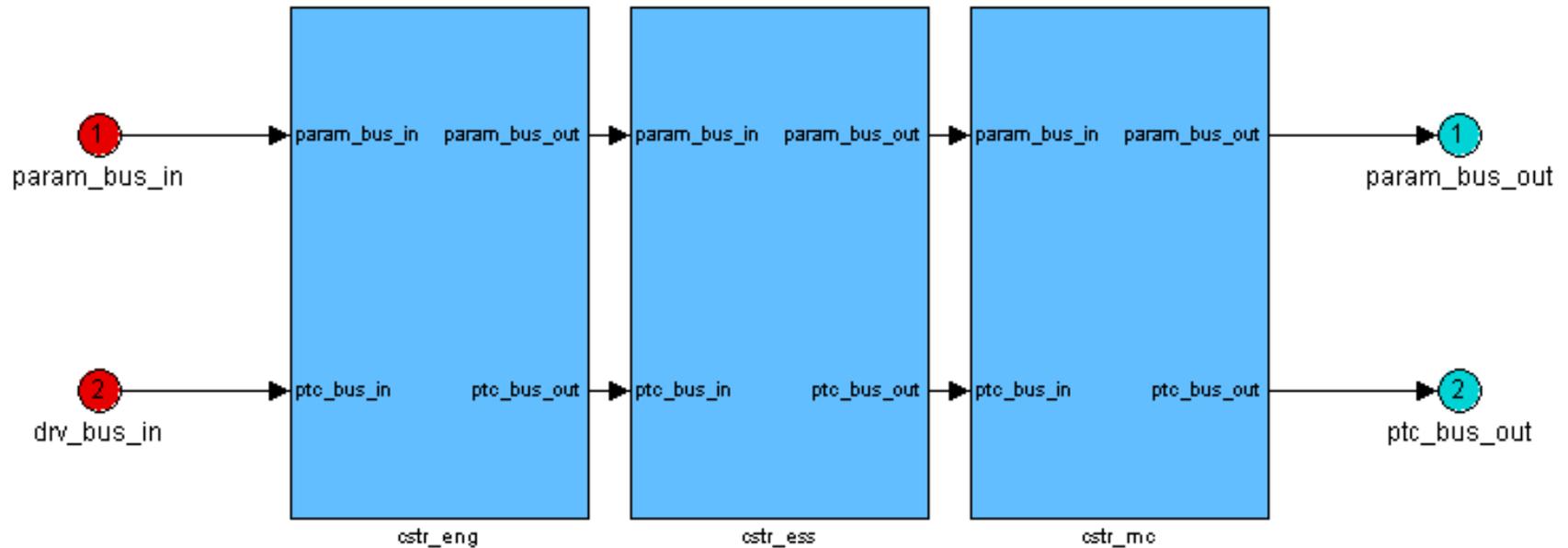
- Map the network drive
- Launch PSAT

Generic Power Controller Organization

A generic organization common to all powertrains

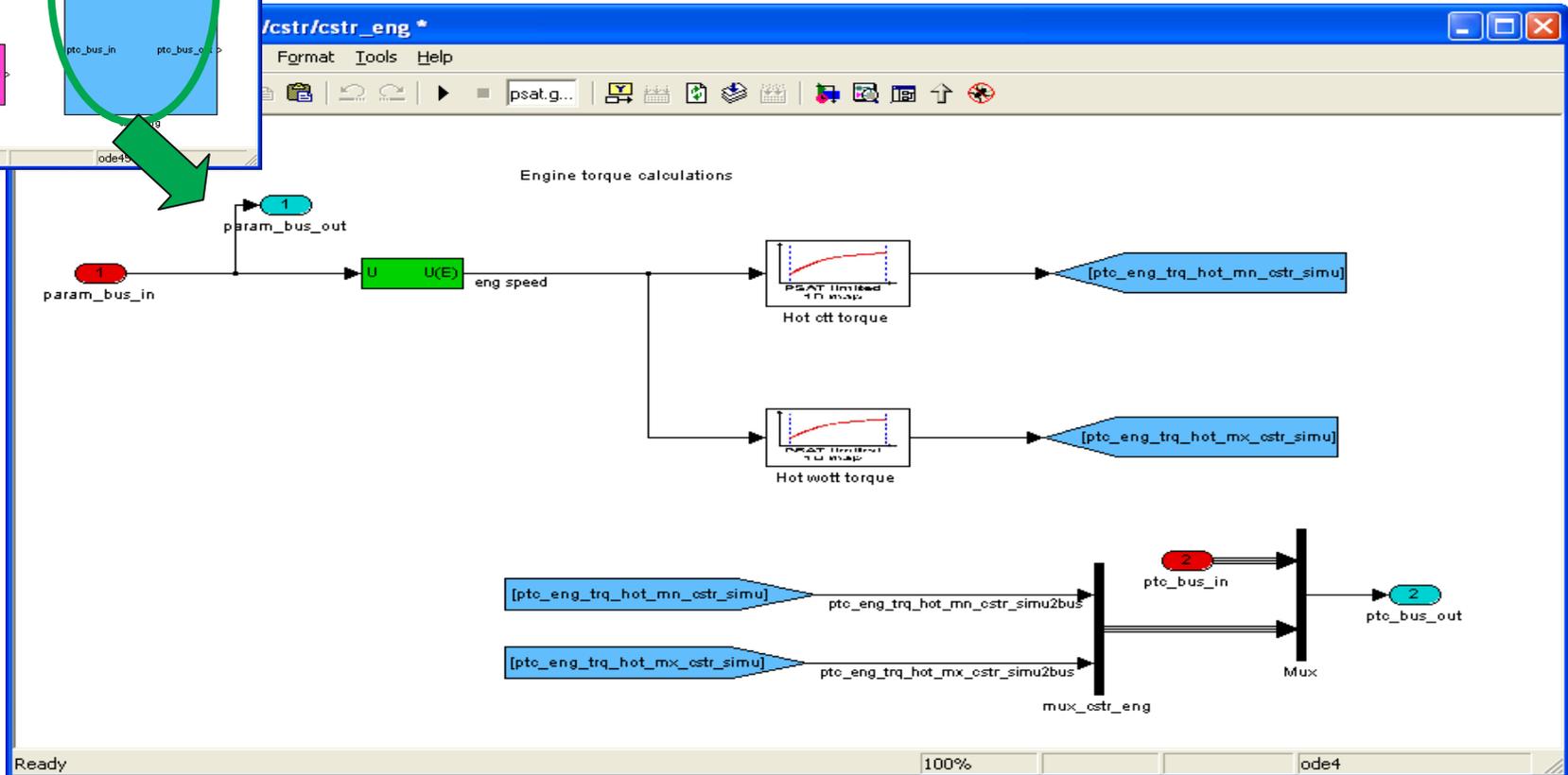
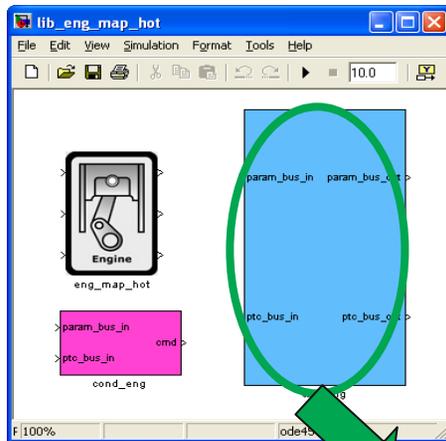


Each Component has its Own Constraint Block

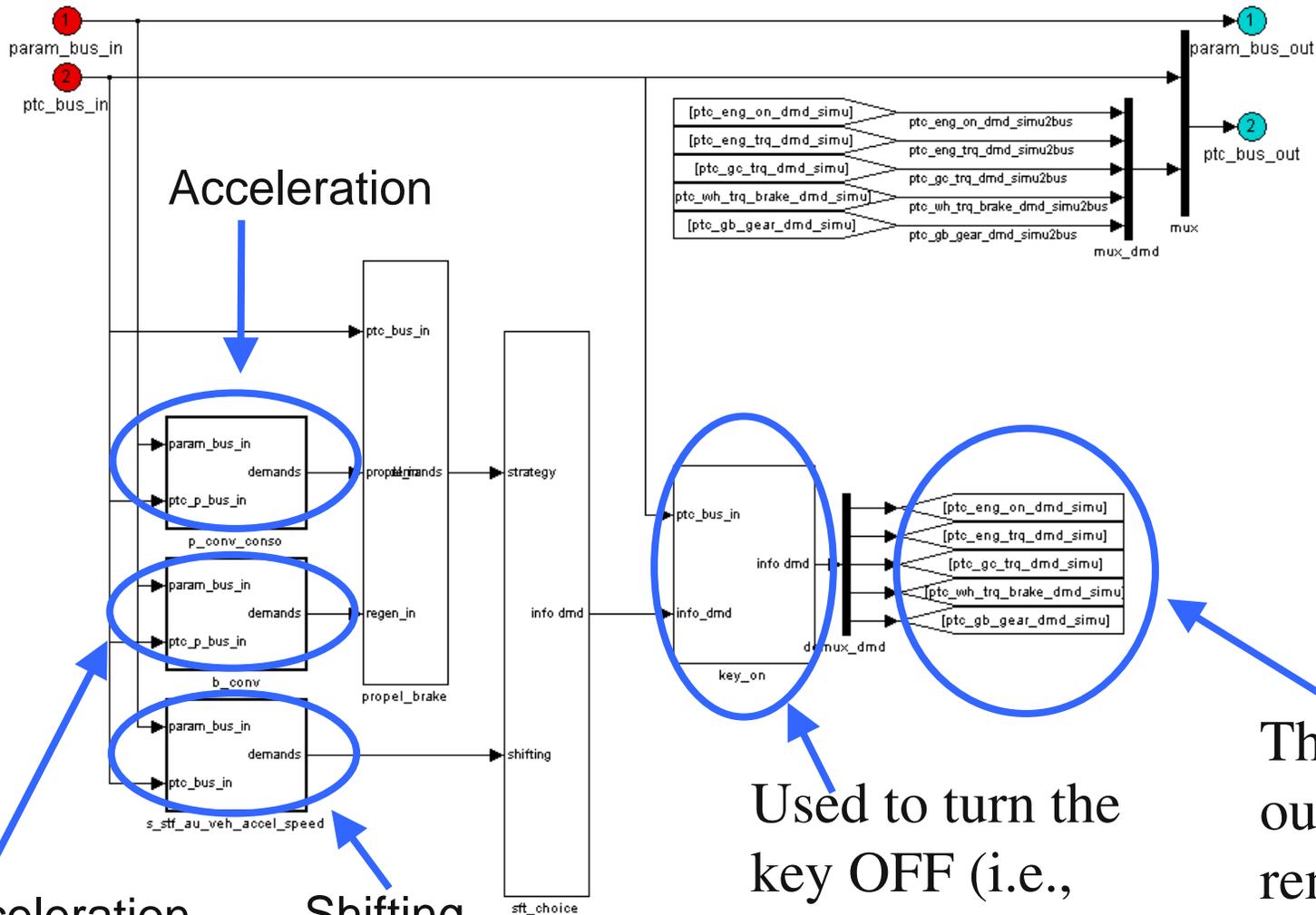


Constraint Block – What Can I do?

Constraint Block is used to determine the limits of the component (i.e., max engine torque at the current speed)



Demand Block – What do I want to do ?



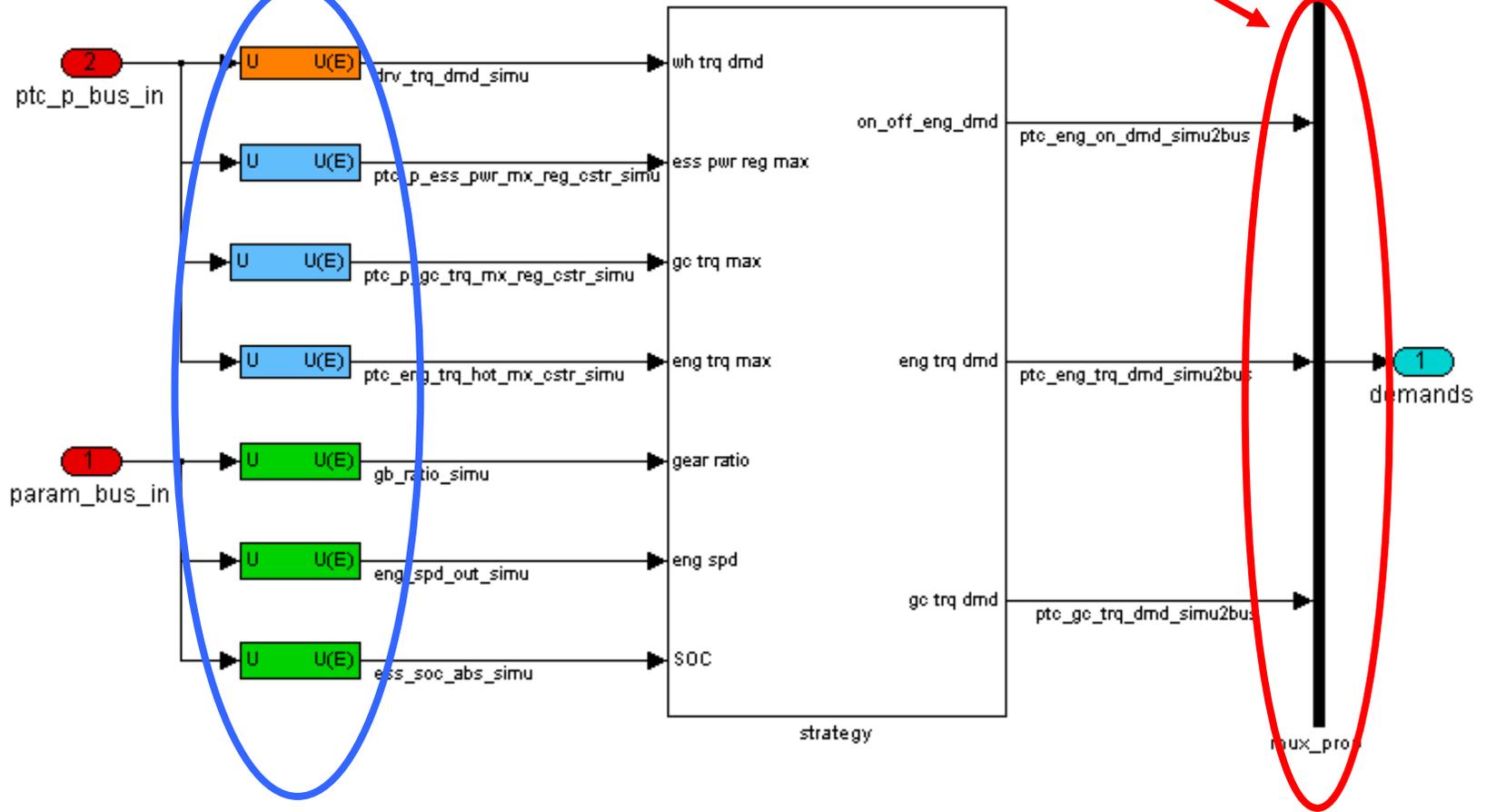
Used to turn the key OFF (i.e., road load match)

The dmd block output have to remain the same

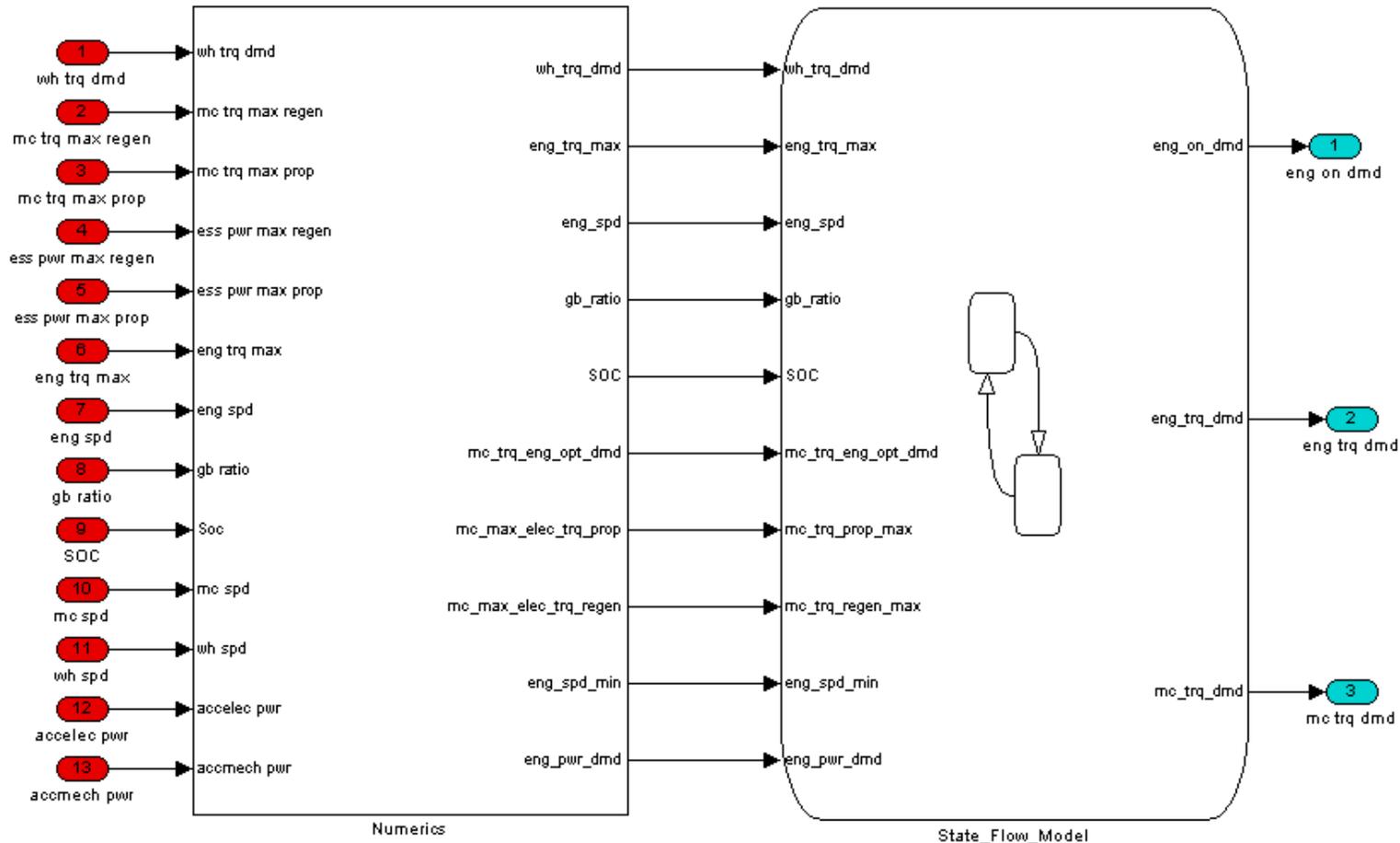
Strategy Block In Simulink

The inputs chosen have to be available from the models or the constraint block

The outputs have to be the same and in the same order than the initial strategy



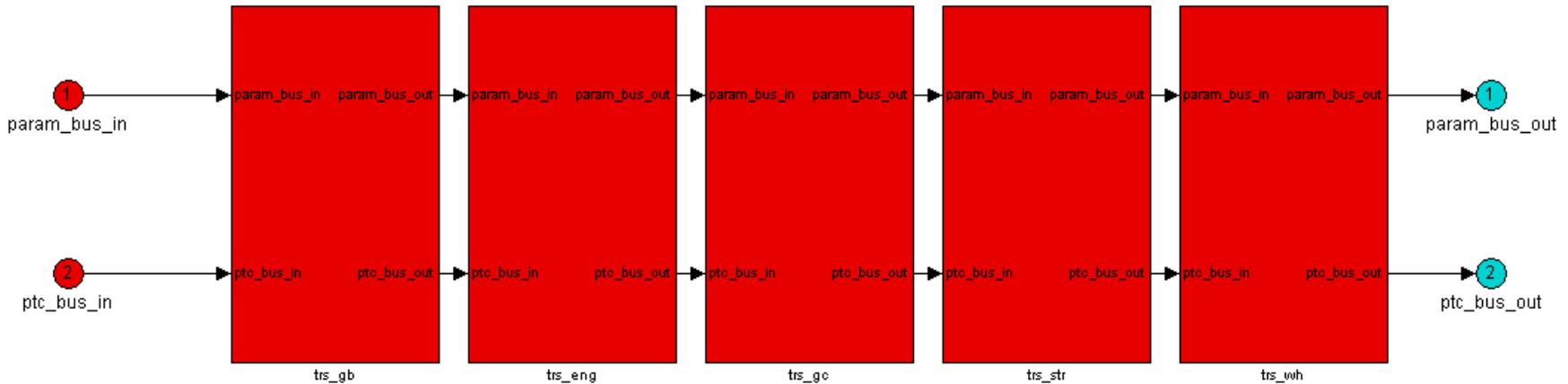
Strategy Block – Combination of Simulink and StateFlow



Calculation and
Look-up tables

Control Logic

Transient Block In Simulink – How do I do it?



Example:

If one needs to shift a gear, what is the impact on the other components?