

ICSC 2019

Core Competence Enhanced by MBD



IDAJ CAE Solution Conference

GT-DRIVE+架构师建模

IDAJ中国
技术部 GT 刘建雄

● 原计划

演示如何快速建立整车动力性/经济型模型，并得到对应的结果

演示不同新能源车辆架构模型定义

如何加载并定制化计算任务

演示定制化输出计算结果

与优化软件联合制输出

● 实际安排

什么是GT-drive+?

- 介绍GT-drive+
- 演示整车快速建模、计算，及修改

什么是架构师?

- 架构师工作及流程介绍

成为架构师

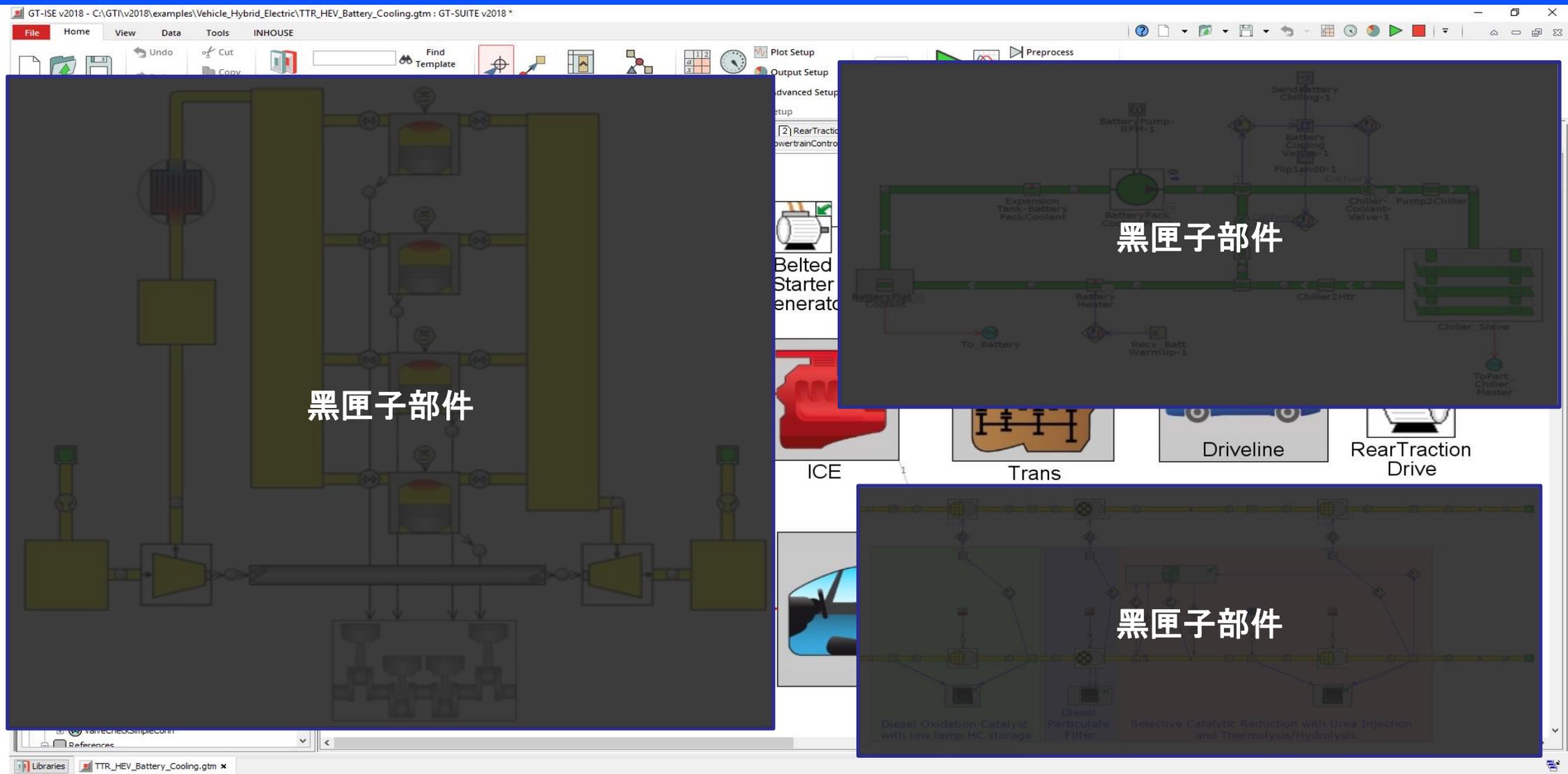
- 介绍GT中变量的定义，引入.gtc文件的创建
- 介绍系统级变量的定义和使用
- 介绍并演示整车架构的创建、及如何嵌入GT-drive+
- 介绍如何在同一模型实现多任务的计算
- 介绍如何定制输出计算结果

GT&MF联合仿真介绍

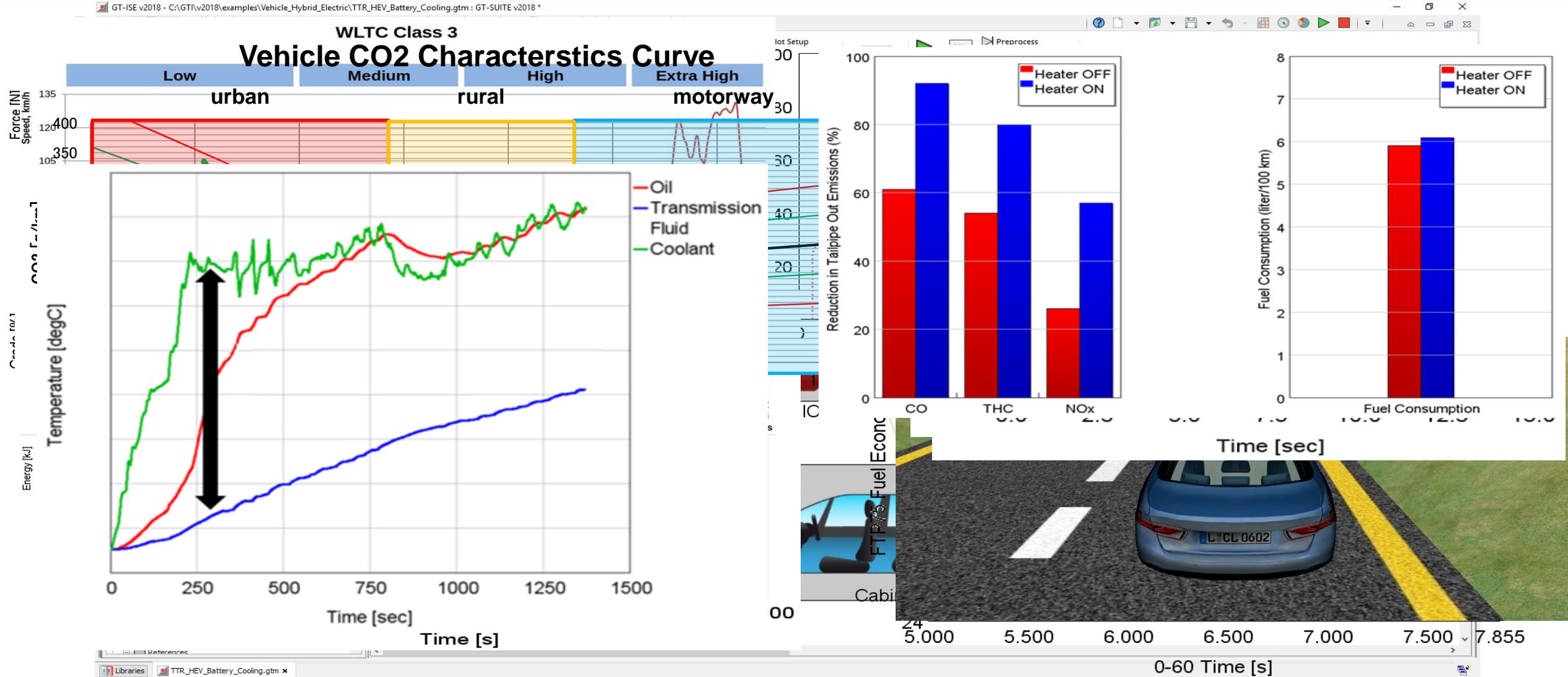
目录

- 什么是GT-DRIVE+ ?
- 什么是架构师 ?
- 成为架构师
- GT&modeFRONTIER联合仿真介绍

什么是GT-DRIVE+ ?



什么是GT-DRIVE+ ?



什么是GT-DRIVE+ ?

GT-DRIVE+ 是GT-Suite新一代整车建模方式

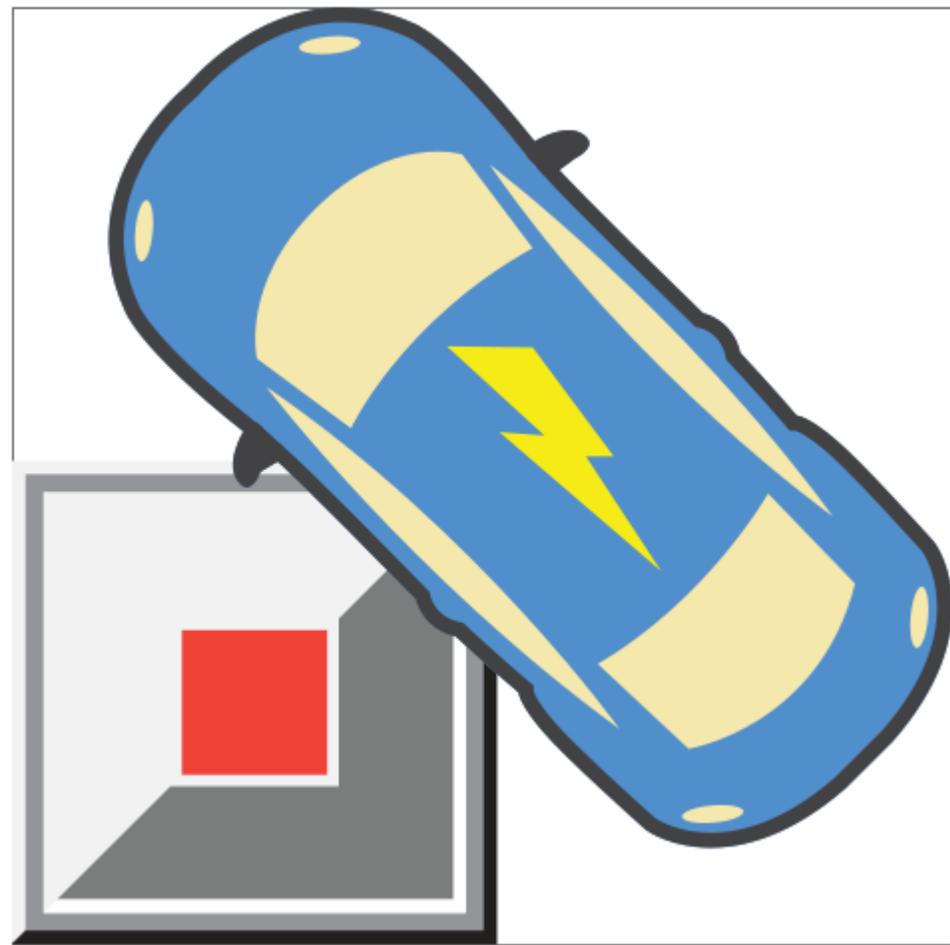
其独特的设计使用户能够快速搭建不同类型的汽车模型

- ✓ 传统车辆
- ✓ 新能源汽车 (HEV, PHEV, BEV, FCEV)

满足不同开发阶段、不同开发部门的仿真需求

- ✓ 动力性、经济型
- ✓ 热管理、能量管理
- ✓ 控制优化

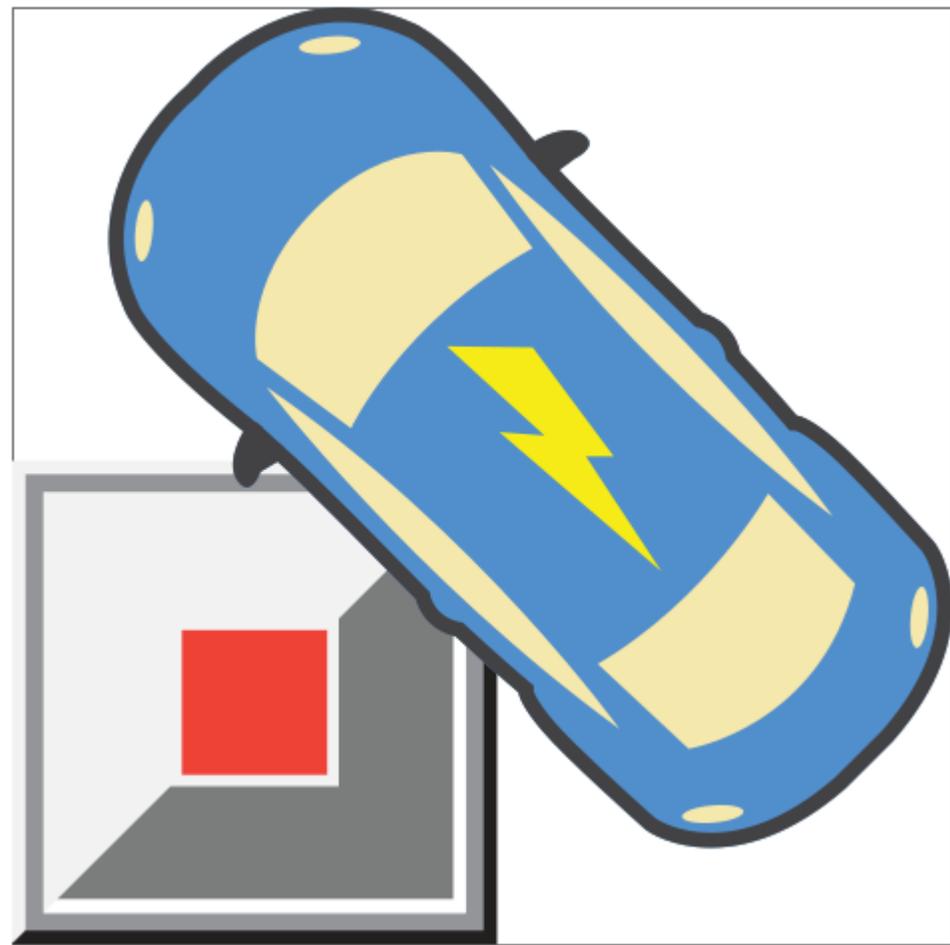
重点关注操作界面的友好性、标准化和自动化的建模流程



什么是GT-DRIVE+ ?

GT-DRIVE+解决了车辆仿真中的关键挑战，包括：

- ✓ 建模过程繁琐
- ✓ 多系统耦合调试困难
- ✓ 整车构架多样
- ✓ 计算需求类型多样
- ✓ 信号、参数定义不统一
- ✓ 子系统、整车构架通用性不强



- Save
- Save As
- Open
- Close
- Change License
- Recent
- Send And Import
- Info
- Resources
- Examples
- Tutorials
- Manuals
- Help
- Print
- Advanced
- Options
- Exit

Create New...

Model Compound Library

Subassembly xLINK GT-DRIVE+

GT-SUITE Applications

GEM3D COOL3D VTDESIGN

GT-SpaceClaim GT-POST CONVERGE Lite (3D-CFD)

GT-SUITE Utilities

Convert to FRM Calculate Fluid Properties Configure Default Units

GT Excel Sheet

User Shortcuts

Click here to add a shortcut



The Leading CAE Platform for Multi-Physics System Simulations

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GT-SUITE  **CONFERENCE 2017**

The Largest System Simulation Event

Register Today!

Don't Miss!

Tech Tip

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- 什么是架构师 ?
- 成为架构师
- GT&modeFRONTIER联合仿真介绍

什么是架构师？

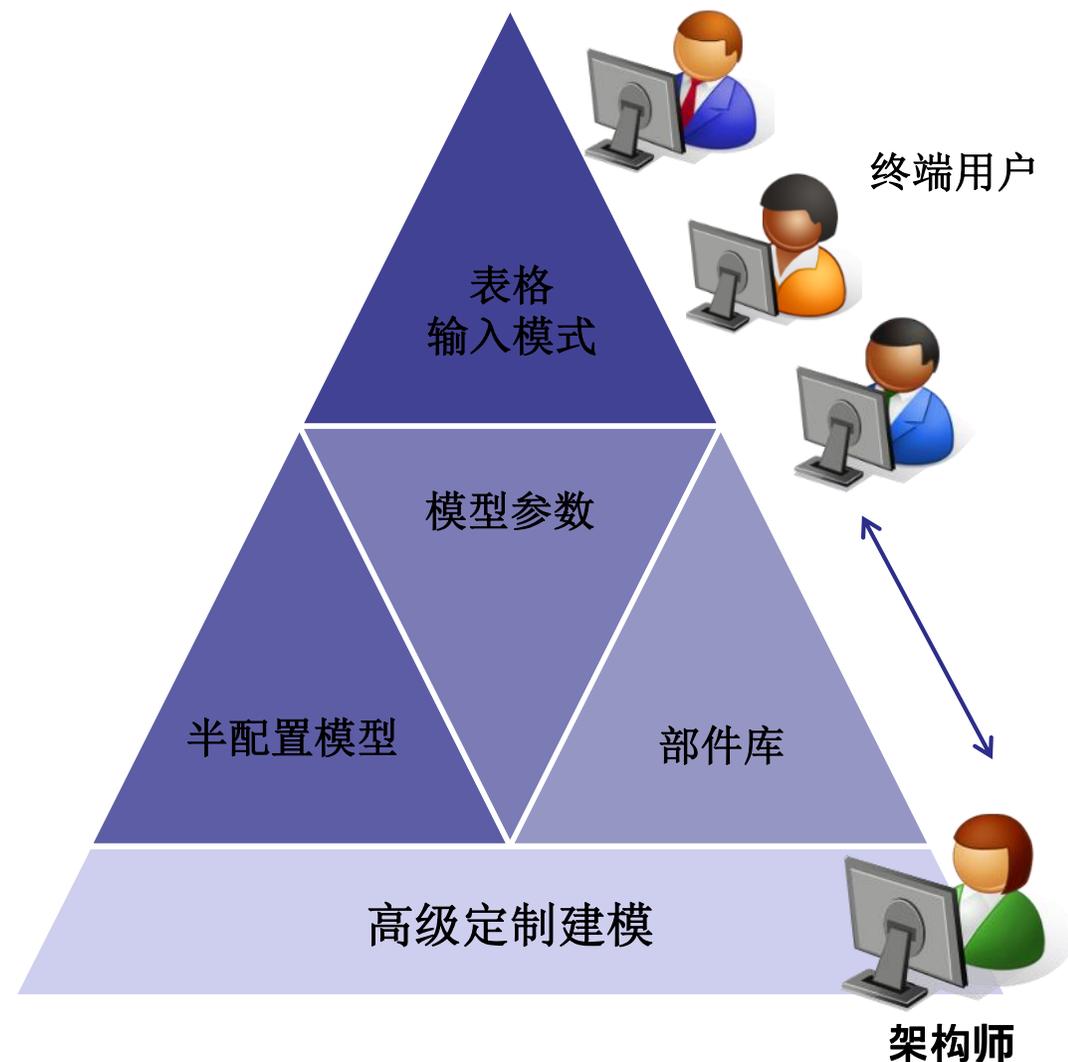
两种工作模式

终端用户：

- 快速建模
- 参数输入
- 计算分析

架构师：

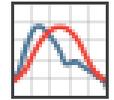
- 制定部件及子系统级模块
- 制定输入、计算及输出模板
- 制定整车架构



什么是架构师？

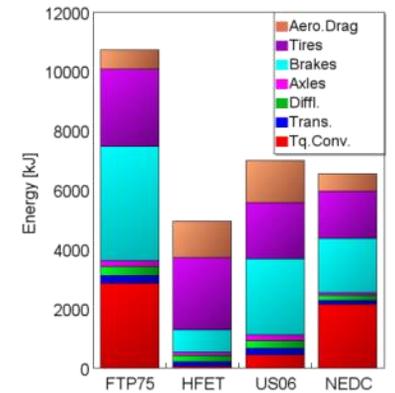
架构师工作内容：



3D ("Configuration" and "Tests") Table of RLTS

RLT Index (Full)	RLT Short Name	Template for RLT Short Name	Constraint RLT	Constraint RLT Value	Label
0					
1	user01:BATTERY	ign	test	FTP_Energy_Management	FTP Battery Consumption
2	user01:BATTERY	ign	test	HFET_Energy_Management	HFET Battery Consumption
3	user01:BATTERY	ign	test	NEDC_Energy_Management	NEDC Battery Consumption
4	user01:BATTERY	ign	test	WLTC_Energy_Management	WLTC Battery Consumption
5	time01:VEHICLE	ign	test	Acceleration_0-60mph	0-60 mph Time
6	time01:VEHICLE	ign	test	Acceleration_0-100mph	0-100 mph Time
7	time01:VEHICLE	ign	test	Standing_1/4_Mile	Standing 1/4 Mile Time
8	speed01:VEHICLE	ign	test	Standing_1/4_Mile	Standing 1/4 Mile Top Speed
9	time01:VEHICLE	ign	test	Standing_1m	Standing 1m Time
10	speed01:VEHICLE	ign	test	Standing_1m	Standing 1m Top Speed



制定模块库

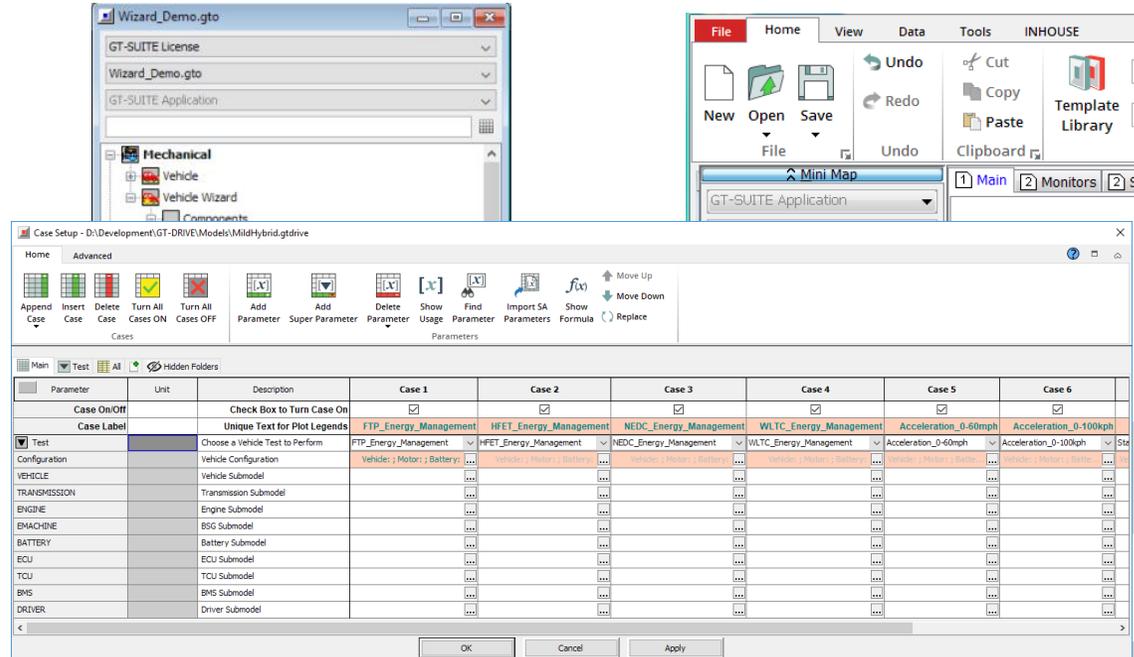
制定构架

输入、计算

分析模板

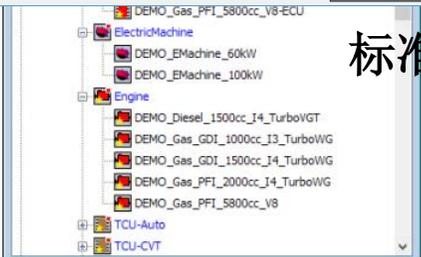
什么是架构师？

将系统仿真专业化、流程化、标准化：



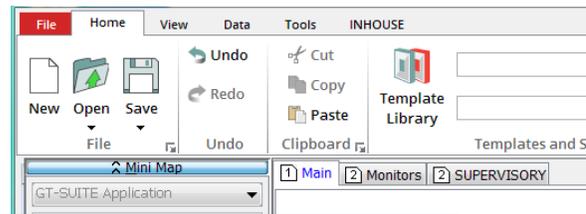
The image shows two windows from the GT-SUITE software. The top window is the 'Wizard_Demo.gto' configuration window, showing a tree view of components like 'Mechanical', 'Vehicle', and 'Vehicle Wizard'. The bottom window is the 'Case Setup' dialog, showing a table of parameters for different cases (Case 1 to Case 6) across various units like 'Test', 'Configuration', 'VEHICLE', 'TRANSMISSION', 'ENGINE', 'EMACHINE', 'BATTERY', 'ECU', 'TCU', and 'DRIVER'.

标准化模型

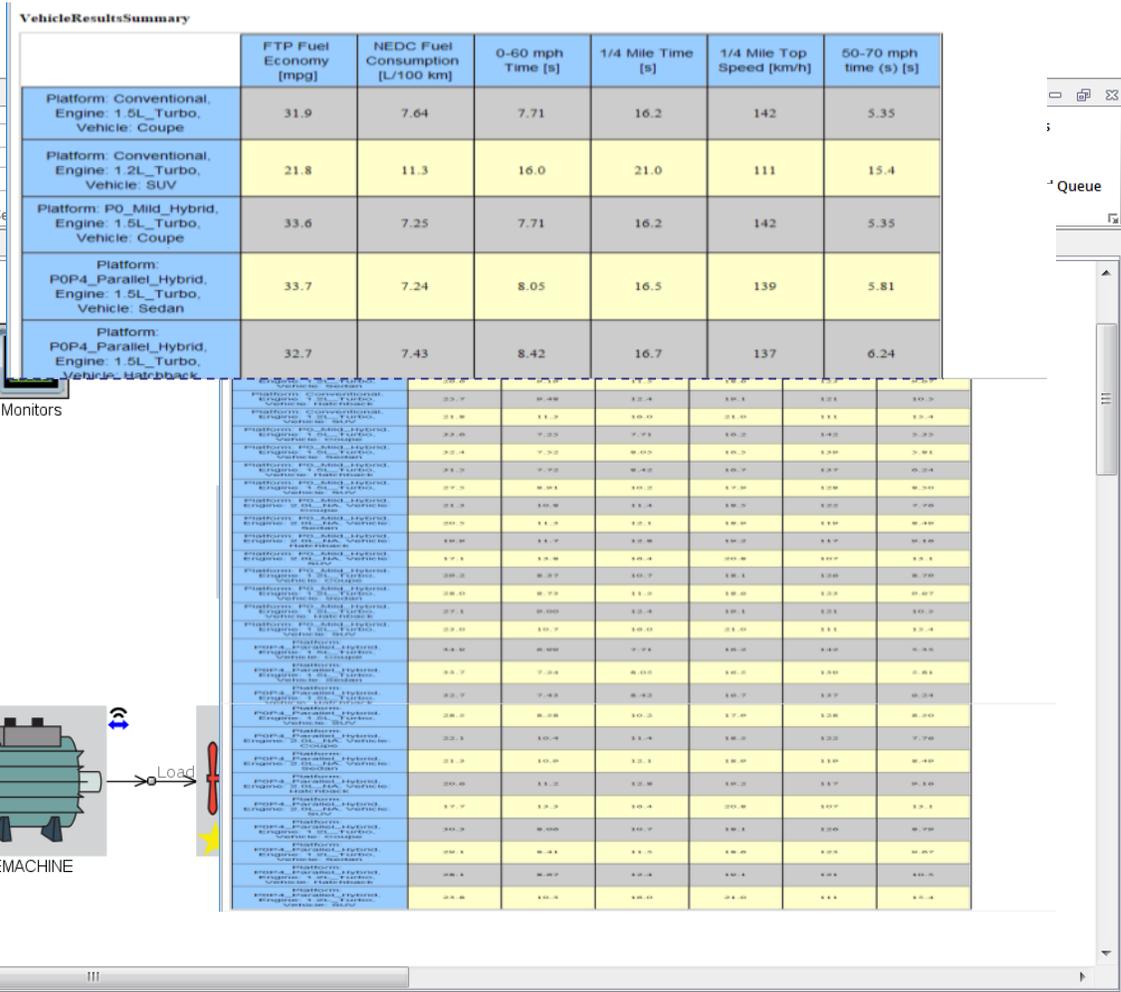


A screenshot of a component library in GT-SUITE, showing a tree view of standardized parts such as 'ElectricMachine', 'EMachine_60kW', 'EMachine_100kW', 'Engine', 'DEMO_Diesel_1500cc_I4_TurboGT', 'DEMO_Gas_GDI_1000cc_I3_TurboWG', 'DEMO_Gas_GDI_1500cc_I4_TurboWG', 'DEMO_Gas_PFI_2000cc_I4_TurboWG', 'DEMO_Gas_PFI_5800cc_V8', 'TCU-Auto', and 'TCU-CVT'.

标准化部件



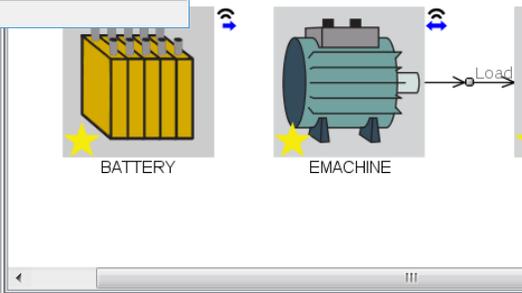
A screenshot of the 'INHOUSE' menu in GT-SUITE, showing options like 'New', 'Open', 'Save', 'Undo', 'Redo', 'Cut', 'Copy', 'Paste', 'Template Library', and 'Mini Map'.



The image shows a 'VehicleResultsSummary' table and a 'Monitors' window. The table compares performance metrics for different vehicle configurations. The 'Monitors' window shows a detailed list of simulation parameters and their values.

	FTP Fuel Economy [mpg]	NEDC Fuel Consumption [L/100 km]	0-60 mph Time [s]	1/4 Mile Time [s]	1/4 Mile Top Speed [km/h]	50-70 mph time [s] [s]
Platform: Conventional, Engine: 1.5L_Turbo, Vehicle: Coupe	31.9	7.64	7.71	16.2	142	5.35
Platform: Conventional, Engine: 1.2L_Turbo, Vehicle: SUV	21.8	11.3	16.0	21.0	111	15.4
Platform: PO_Mid_Hybrid, Engine: 1.5L_Turbo, Vehicle: Coupe	33.6	7.25	7.71	16.2	142	5.35
Platform: POP4_Parallel_Hybrid, Engine: 1.5L_Turbo, Vehicle: Sedan	33.7	7.24	8.05	16.5	139	5.81
Platform: POP4_Parallel_Hybrid, Engine: 1.5L_Turbo, Vehicle: SUV	32.7	7.43	8.42	16.7	137	6.24

标准化整车配置



目录

- 什么是GT-DRIVE+ ?
- 什么是架构师 ?
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成为架构师

变量

A.定制模块

B.定制架构

C.定制计算

D.定制输出

E.修改脚本

1. 参数变量: soc、转速、车速、仿真时间。。
2. 对象变量: 路谱、曲线、map、材料、介质。。
3. 状态变量: 驾驶模式、控制模式、分析模式。。

⚠ DriverMode ⚠ Model Properties ✓ Controller Settings ✓ Launch Control ✓ Gear Shi 		
Attribute	Unit	Object Value
Controller Version		v2019b1
Driver Mode		
Driver Mode		Speed Targ... <input type="button" value="v"/>
Targeting Options		
Target Speed (speed & mixed mode only)	km/h <input type="button" value="v"/>	Acceleration_Tar
Performance Monitors		
Display Performance Monitor (speed and accel mode ...)		Mixed_Mode [CTRLMODE]

⚠ Main ⚠ Performance Maps ⚠ Advanced ✓ GT-POST Output 		
Attribute	Unit	Object Value
Battery Capacity	A-h <input type="button" value="v"/>	
Initial State of Charge	See ... <input type="button" value="v"/>	[Initial_SOC] <input type="button" value="v"/>

✓ Main ✓ Advanced ✓ Actuator Position ✓ GT-POST Output 		
Attribute	Unit	Object Value
Machine Shaft Moment of Inertia	kg·m ² <input type="button" value="v"/>	0.02 <input type="button" value="v"/>
Efficiency/Power Losses		
<input checked="" type="radio"/> Electromechanical Conversion Efficiency		E_Machine_55kW_Efficiency <input type="button" value="v"/>
<input type="radio"/> Power Loss	kW <input type="button" value="v"/>	
<input checked="" type="radio"/> Inverter Efficiency		1 <input type="button" value="v"/>
<input type="radio"/> Inverter Power Loss	kW <input type="button" value="v"/>	
Friction Torque Curve	N·m <input type="button" value="v"/>	ign <input type="button" value="v"/>
Machine Torque Limits		
<input type="radio"/> Define Min/Max Torque Curves		
<input checked="" type="radio"/> Maximum Brake Torque		E_Machine_55kW_MaxTq <input type="button" value="v"/>
<input type="radio"/> Minimum Brake Torque		E_Machine_55kW_MinTq <input type="button" value="v"/>

✓ DriverMode ✓ Model Properties ✓ Controller Settings ✓ Launch Control ✓ Gear Shi 		
Attribute	Unit	Object Value
Controller Version		v2019b1
Driver Mode		
Driver Mode		Speed_Targe... <input type="button" value="v"/>
Targeting Options		
Target Speed (speed & mixed mode only)		NEDC <input type="button" value="v"/>
Performance Monitors		
Display Performance Monitor (speed and accel mode ...)		<input checked="" type="checkbox"/>

变量

A.定制模块

B.定制架构

C.定制计算

D.定制输出

E.修改脚本

4. 超级变量：自定义变量集合

5. 模块变量：电机、电池、发动机、变速箱。。。

6. 系统变量：发动机系统、电机系统、控制系统。。。

Parameter	Unit	Description	Case 1
Case On/Off		Check Box to Turn Case On	<input checked="" type="checkbox"/>
Case Label		Unique Text for Plot Legends	FTP_Energy_Management
Test		Choose a Vehicle ...	FTP_Energy_Management
Operating...		HEVOperatingMode	HFET_Energy_Management
Configuration		Vehicle Configura...	NEDC_Energy_Management
BMS			WLTC_Energy_Management
ECU			Acceleration_0-60mph
TCU			Acceleration_0-100kph
BATTERY			Standing_1/4_Mile
EMACHINE_FRONT			Standing_km
EMACHINE_REAR			Tip-In_50-70mph

Compound Template (.gtc)

Parameter	Unit	Description	Case 1
Case On/Off		Check Box to Turn Case On	<input checked="" type="checkbox"/>
Case Label		Unique Text for Plot Legends	FTP_Energy_Management
Test		Choose a Vehicle ...	FTP_Energy_Ma...
Configuration		Vehicle Configura...	Vehicle: Compa...
VEHICLE		Vehicle Submodel	Compact_Car...
TRANSMISSION		Transmission Subm...	DirectDrive...
EMACHINE		Electric Machine ...	EMachine_55kW...
BATTERY		Battery Submodel	Li-Ion_387V_52Ah...
BMS		BMS Submodel	BMS_HighVoltage...
DRIVER		Driver Submodel	BEV-Driver...

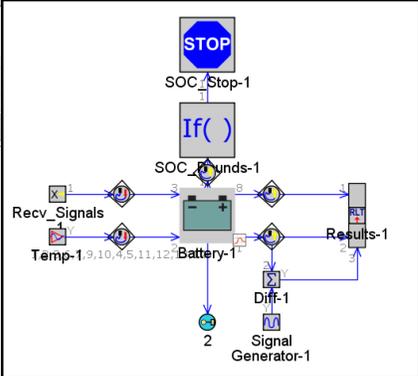
Value Selector

Objects and Templates

Select An Existing Object

In GTDRIVE file VehicleData.gtc

- BatteryPack
 - Li-Ion_387V_52Ah
 - Li_Ion_226V_21.5Ah
 - Li_Ion_226V_21.5Ah_Aged
 - Li_Ion_247V_5Ah
 - Li_Ion_247V_5Ah_Aged
 - LiMn204_130V_4.4Ah
 - LiMn204_130V_4.4Ah_Aged
 - LiMn204_285V_5.5Ah
 - LiMn204_285V_5.5Ah_Aged



Attribute	Unit	Object Value
Battery Definition		
<input type="radio"/> Battery Pack Data		
<input type="radio"/> Single Cell Data		
Initialization		
Initial State of Charge	frac...	...
Battery Load		
Load Type		Power Request
Power Request	W	...

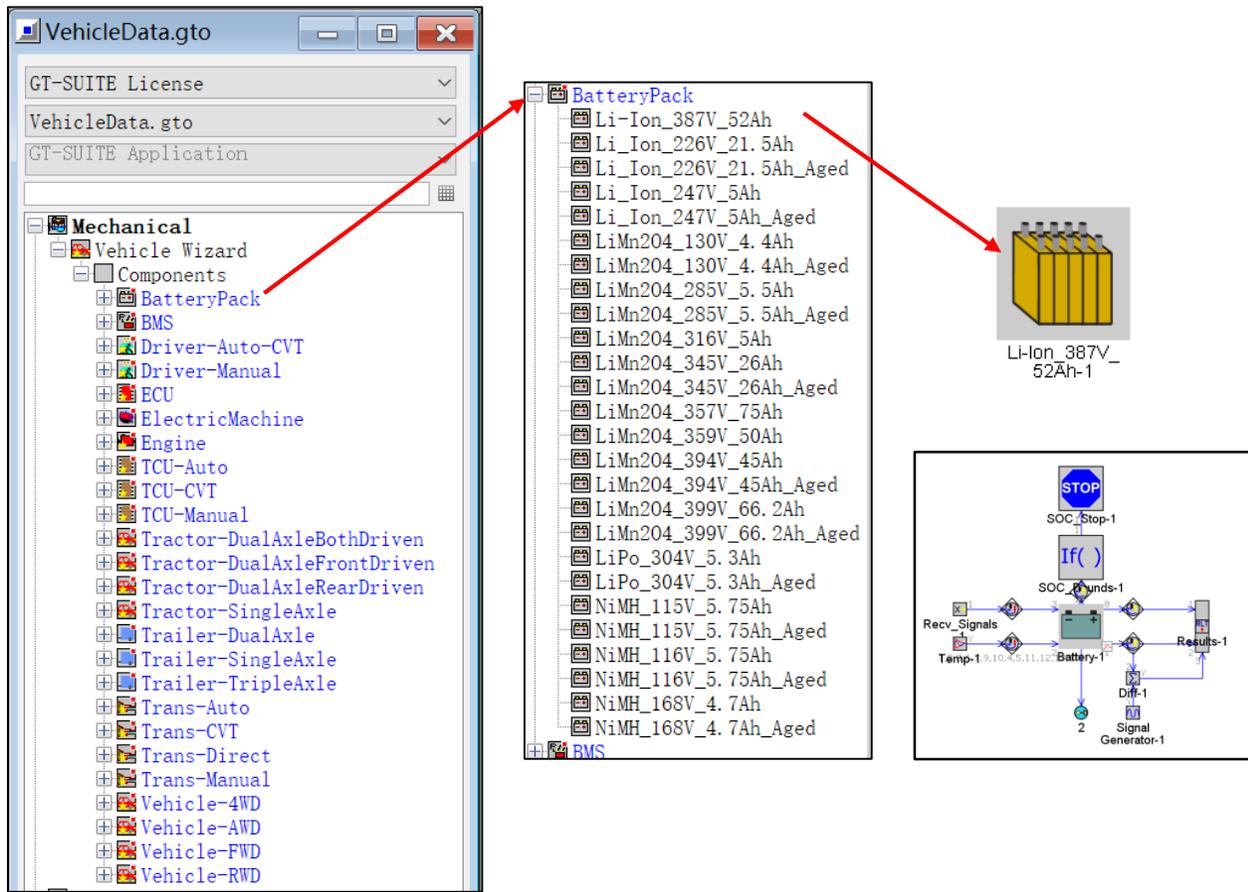
成为架构师

- 变量
- A.定制模块
- B.定制架构
- C.定制计算
- D.定制输出
- E.修改脚本

制定的模板 (Compound Template) 将以 .gtc 格式存储并支持工程师随时直接调用。

哪些可以制定成模块:

- ✓ 部件 (电机、电池、压缩机等)
- ✓ 3D模块 (进排气管、消声器、动力舱、乘员舱等)
- ✓ 子系统模型 (空调系统、水冷系统、PTC回路等)
- ✓ 控制系统 (BMS、TCU、ECU、VCU等)
- ✓ 计算
- ✓ 统计、输出模板



The image shows a screenshot of the GT-SUITE software interface. On the left, a project tree under 'Mechanical' shows a 'BatteryPack' folder. A red arrow points from this folder to a central window displaying a list of battery types, including 'Li-Ion_387V_52Ah', 'Li-Ion_226V_21.5Ah', and various 'LiMn204' and 'NiMH' models. Another red arrow points from the 'Li-Ion_387V_52Ah' entry to a 3D model of a battery pack. Below the battery list is a control logic diagram featuring a 'STOP' block, 'SOC_Stop-1', 'If()' blocks, and various signal and temperature inputs.

变量

A.定制模块

B.定制架构

C.定制计算

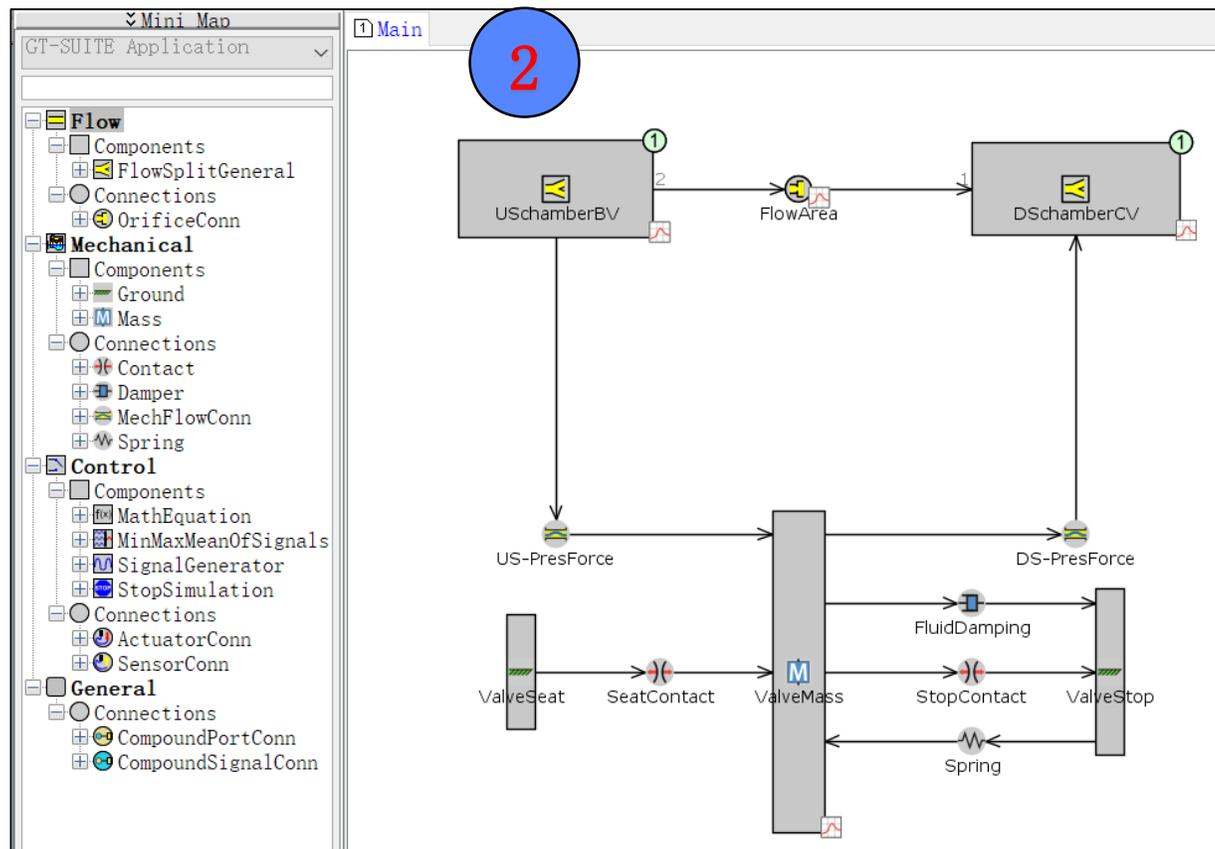
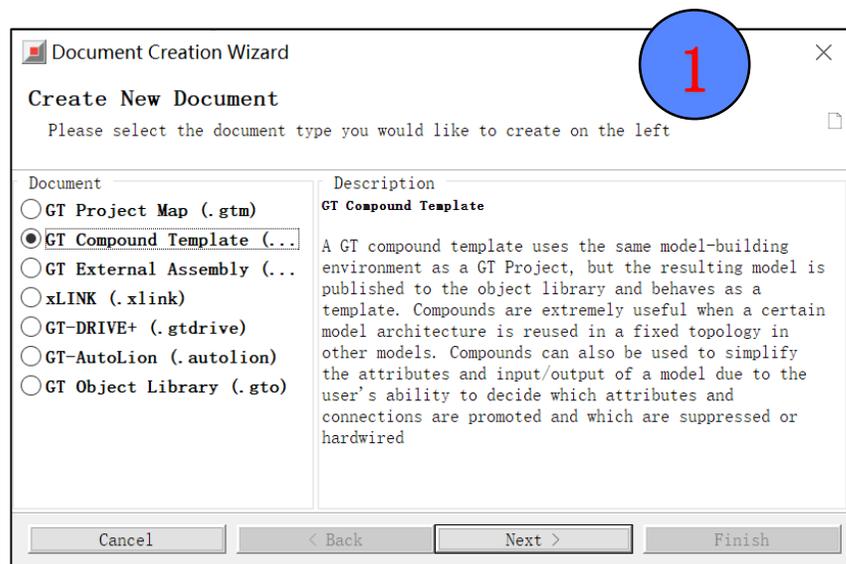
D.定制输出

E.修改脚本

a). 新建Compound Template

1. New→GT Compound Template;

2. 按需求搭建相应的基础模型



变量

A.定制模块

B.定制架构

C.定制计算

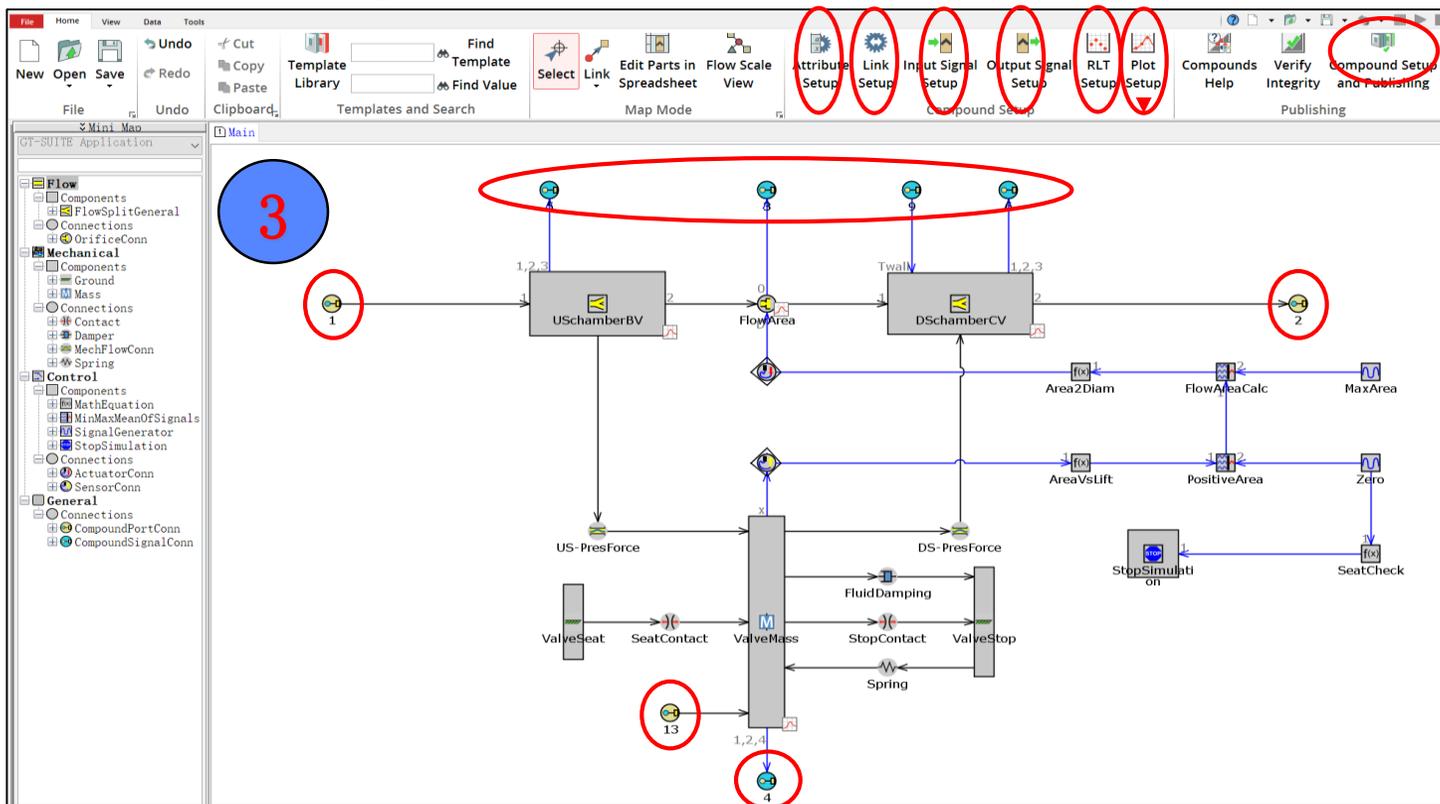
D.定制输出

E.修改脚本

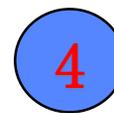
a). 新建Compound Template

3. 设置相应的控制、输入、输出模板及信号;

4. 保存, 发布 (Publishing) 。



发布



设置输入模板

设置连接需求

设置信号输入

设置信号输出

设置RLT输出

设置Plot输出

变量

A.定制模块

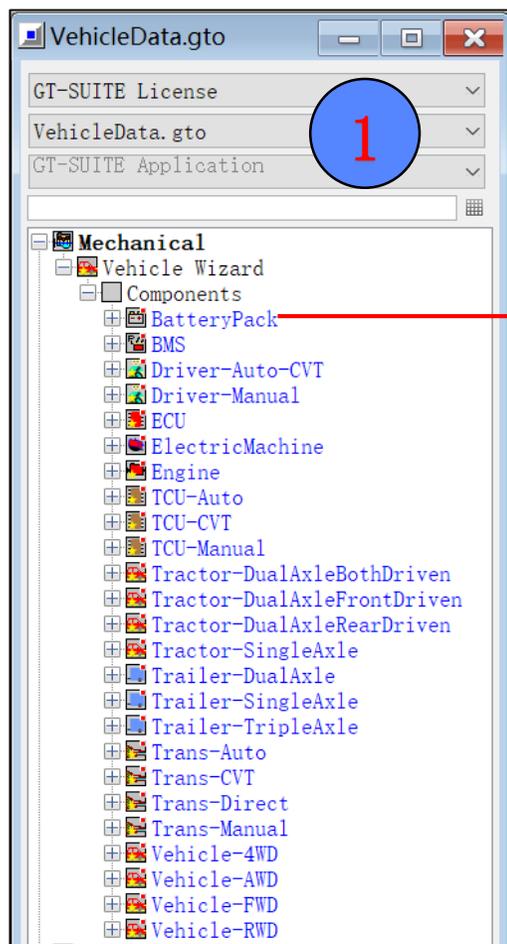
B.定制架构

C.定制计算

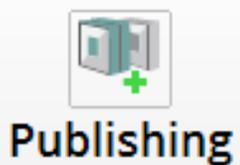
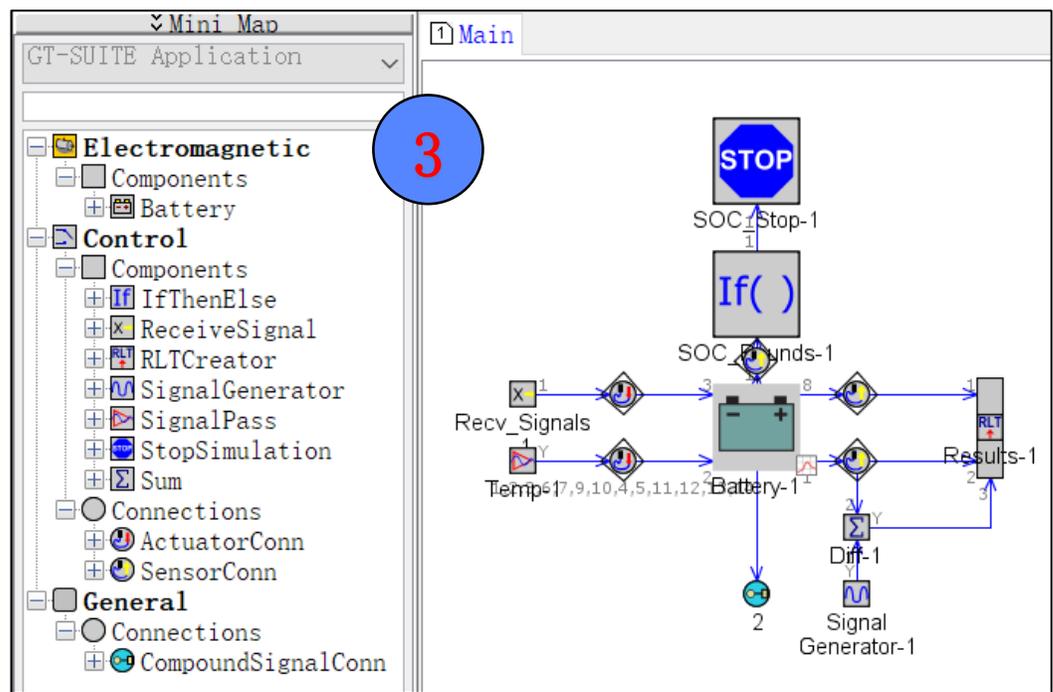
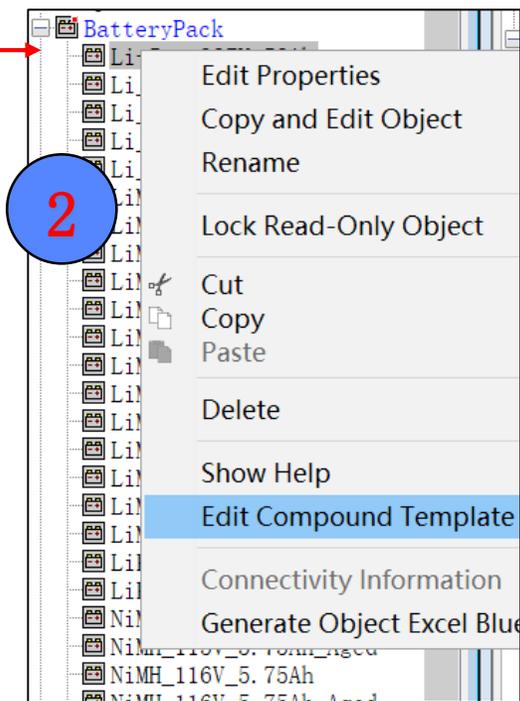
D.定制输出

E.修改脚本

b). 直接在系统自带模块基础上修改



1. 在Libraries里面找到相应的模块（Compound）；
2. 右键选择Edit Compound Template, 打开对应的模块；
3. 修改、设置、另存；



4. 发布（Publishing）。

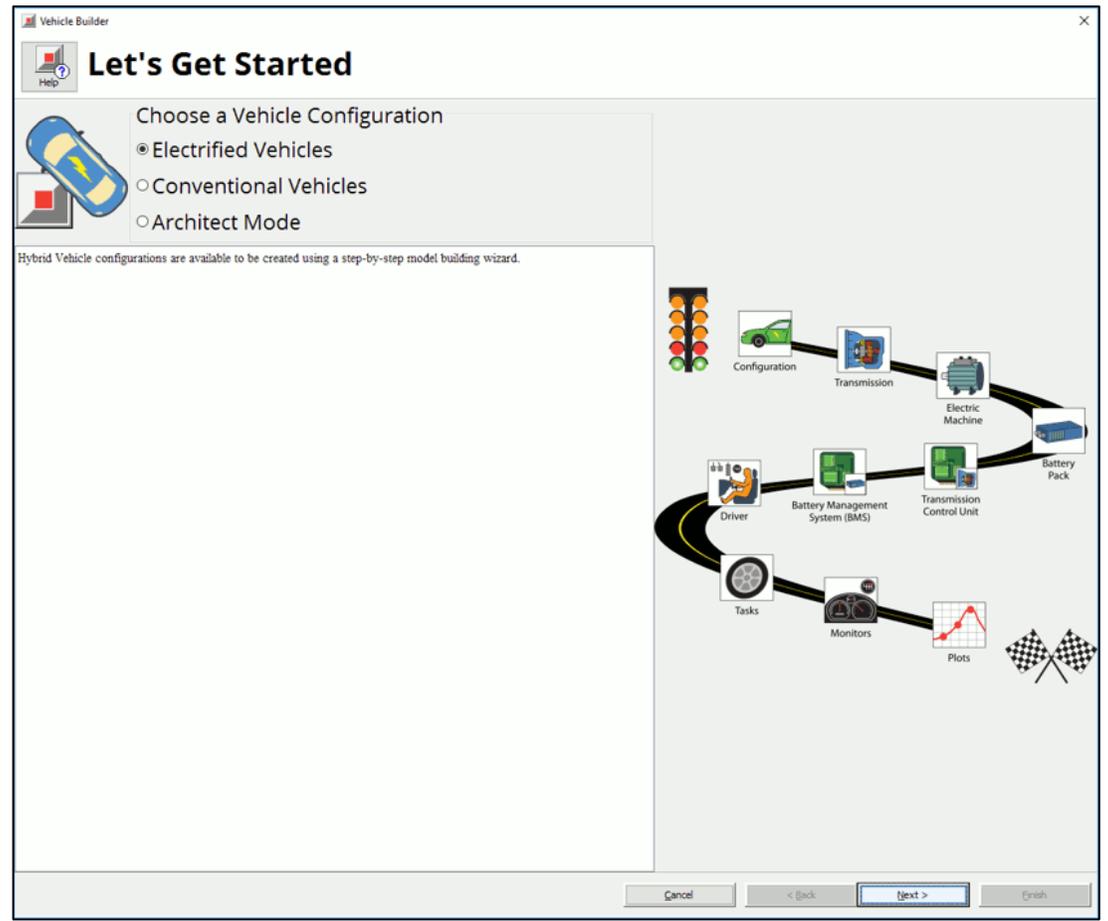
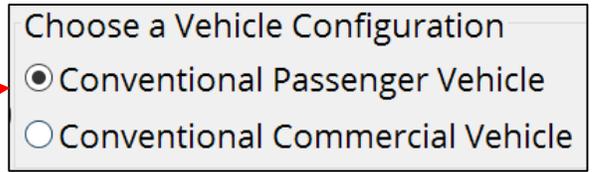
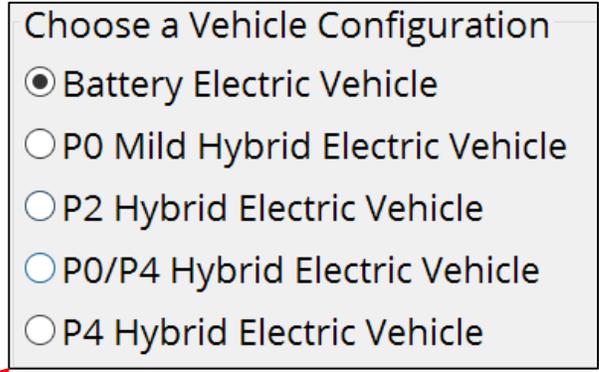
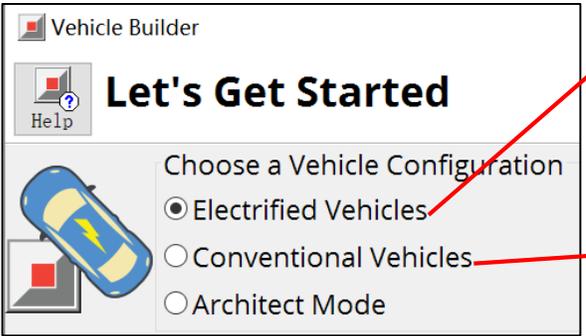
成为架构师

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- B.定制架构**
- C.定制计算
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- E.修改脚本

制定的架构将以.gtdrive格式存储，写入Drive+后用户能快速搭建相应架构的模型。

支持哪些架构：

- ✓ 传统车
- ✓ 电动车
- ✓ 混动
- ✓ 燃料电池汽车
- ✓ 动力性+排放+热管理



变量

A. 定制模块

B. 定制架构

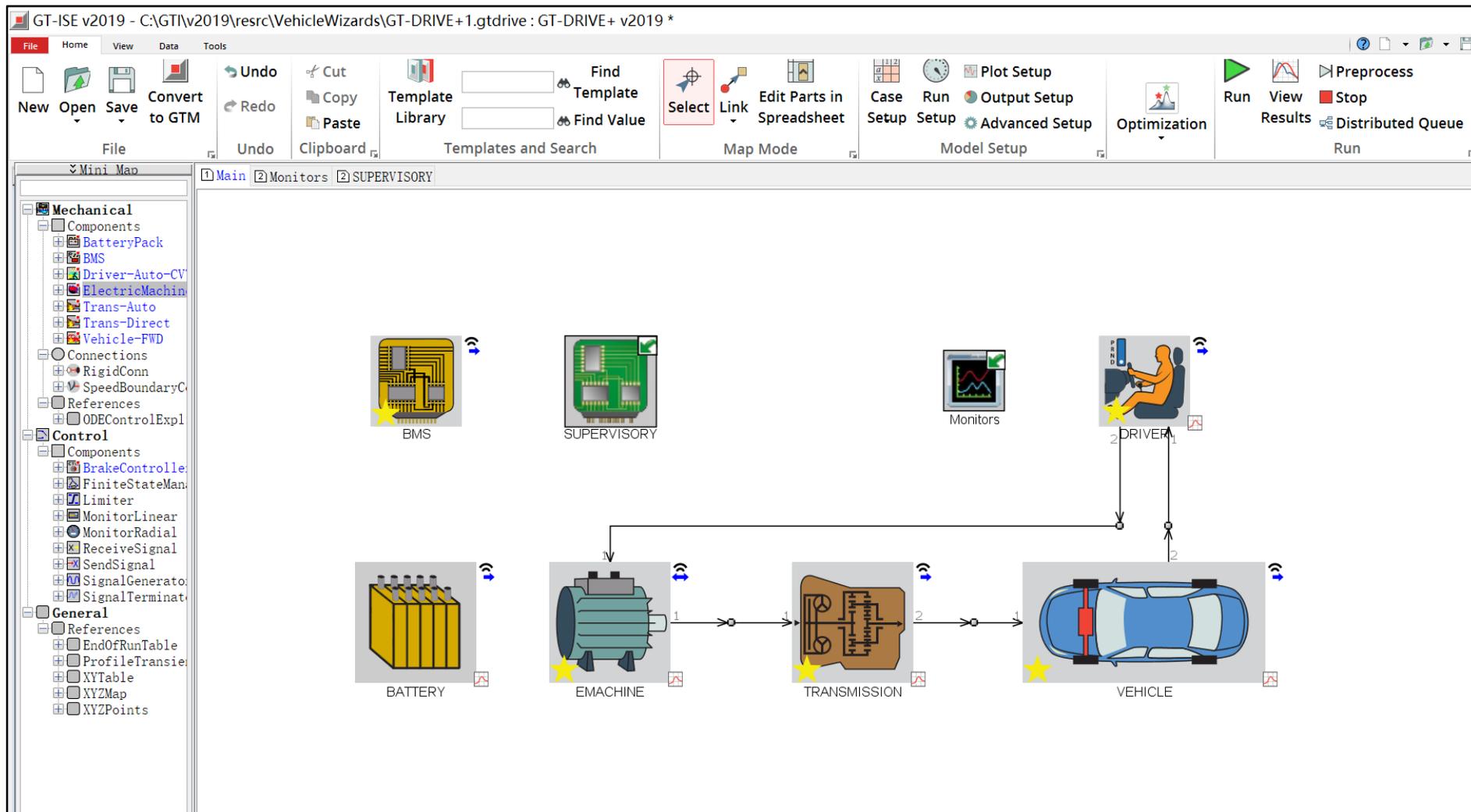
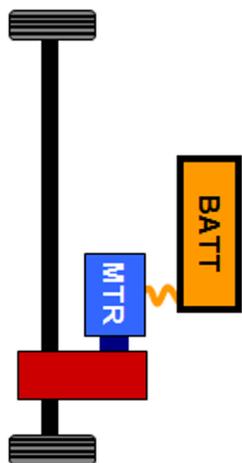
C. 定制计算

D. 定制输出

E. 修改脚本

Choose a Vehicle Configuration

- Battery Electric Vehicle
- P0 Mild Hybrid Electric Vehicle
- P2 Hybrid Electric Vehicle
- P0/P4 Hybrid Electric Vehicle
- P4 Hybrid Electric Vehicle



GT-ISE v2019 - C:\GTI\v2019\resrc\VehicleWizards\GT-DRIVE+1.gtdrive : GT-DRIVE+ v2019 *

File Home View Data Tools

File: New, Open, Save, Convert to GTM, Undo, Redo, Copy, Paste, Template Library, Find Template, Find Value, Select, Link, Edit Parts in Spreadsheet, Map Mode, Case Setup, Run Setup, Output Setup, Advanced Setup, Optimization, Run, View Results, Stop, Preprocess, Distributed Queue, Run

Mini Map: Main, Monitors, SUPERVISORY

Mechanical: Components (BatteryPack, BMS, Driver-Auto-CV, ElectricMachin, Trans-Auto, Trans-Direct, Vehicle-FWD), Connections (RigidConn, SpeedBoundaryC), References (ODEControlExpl)

Control: Components (BrakeControlle, FiniteStateMan, Limiter, MonitorLinear, MonitorRadial, ReceiveSignal, SendSignal, SignalGenerato, SignalTerminat), General (References: EndOfRunTable, ProfileTransie, XYTable, XYZMap, XYZPoints)

Diagram Labels: BMS, SUPERVISORY, Monitors, DRIVER, BATTERY, EMACHINE, TRANSMISSION, VEHICLE

成为架构师

变量

A.定制模块

B.定制架构

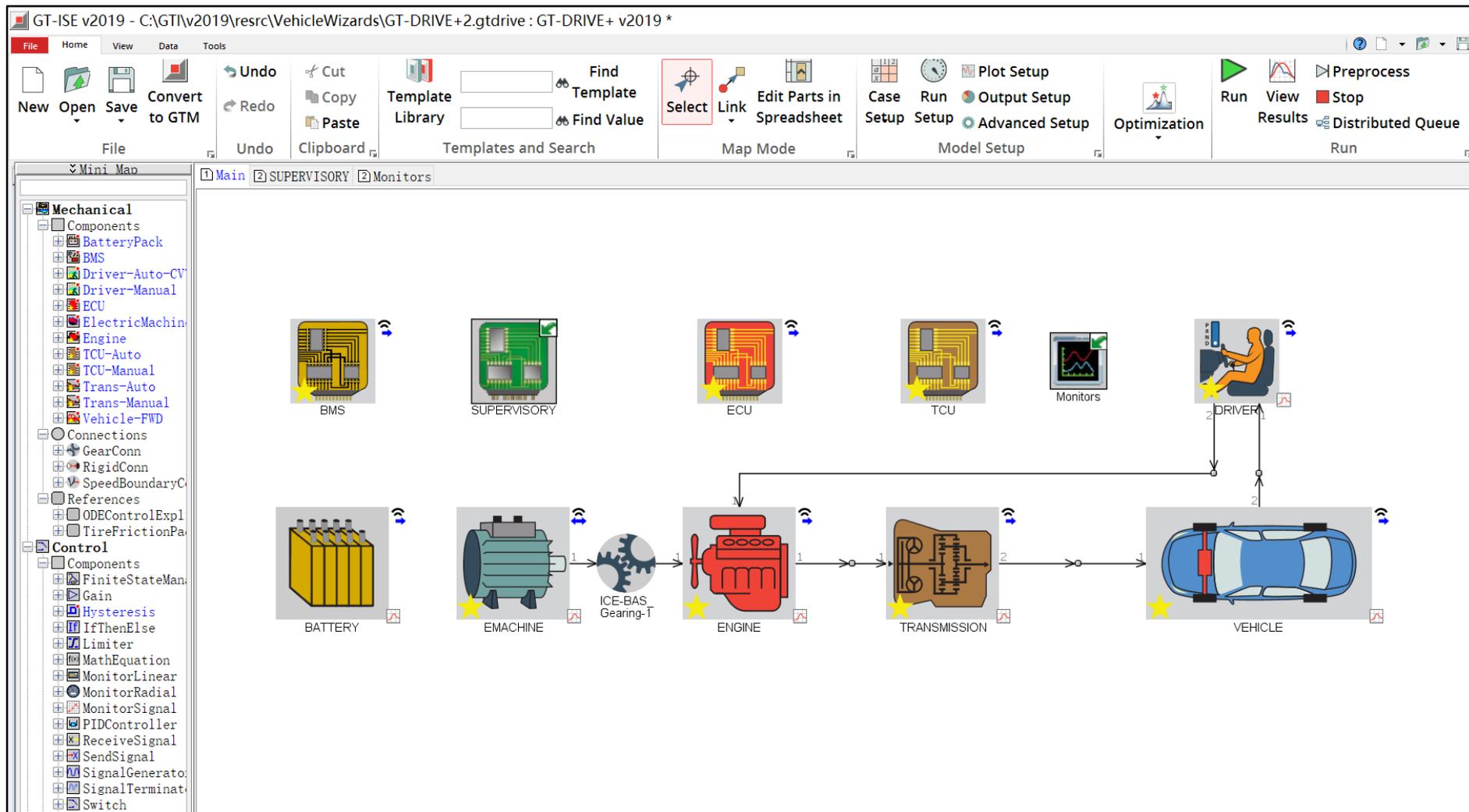
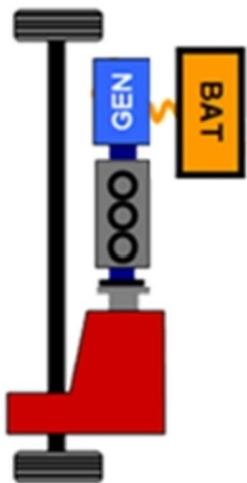
C.定制计算

D.定制输出

E.修改脚本

Choose a Vehicle Configuration

- Battery Electric Vehicle
- P0 Mild Hybrid Electric Vehicle
- P2 Hybrid Electric Vehicle
- P0/P4 Hybrid Electric Vehicle
- P4 Hybrid Electric Vehicle



成为架构师

变量

A.定制模块

B.定制架构

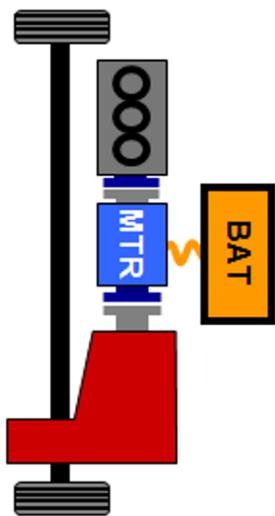
C.定制计算

D.定制输出

E.修改脚本

Choose a Vehicle Configuration

- Battery Electric Vehicle
- P0 Mild Hybrid Electric Vehicle
- P2 Hybrid Electric Vehicle
- P0/P4 Hybrid Electric Vehicle
- P4 Hybrid Electric Vehicle



GT-ISE v2019 - C:\GTI\2019\resrc\VehicleWizards\GT-DRIVE+3.gtdrive : GT-DRIVE+ v2019 *

File Home View Data Tools

New Open Save Convert to GTM

Undo Cut Copy Paste Undo Clipboard

Find Template Find Value

Select Link Edit Parts in Spreadsheet

Case Setup Run Output Setup Advanced Setup Optimization

Run View Results Stop Distributed Queue

Mini Map

Main Supervisory_Controller Monitors

Mechanical

- Components
 - BatteryPack
 - BMS
 - Driver-Manual
 - ECU
 - ElectricMachin
 - Engine
 - TCU-Manual
 - Trans-Manual
 - Vehicle-FWD
- Connections
 - Clutch
 - RigidConn
 - SpeedBoundaryC
- References
 - FrictionCoulom
 - FrictionStatic
 - ODEControlExpl
 - TireFrictionPa

Control

- Components
 - FiniteStateMan
 - Gain
 - Interpolator
 - Limiter
 - Lookup1D
 - MonitorLinear
 - MonitorRadial
 - MonitorSignal
 - PIDController
 - ReceiveSignal
 - SendSignal
 - SignalGenerato
 - SignalTerminat
- References
 - TransShiftStgy
 - TransShiftStgy

变量

A.定制模块

B.定制架构

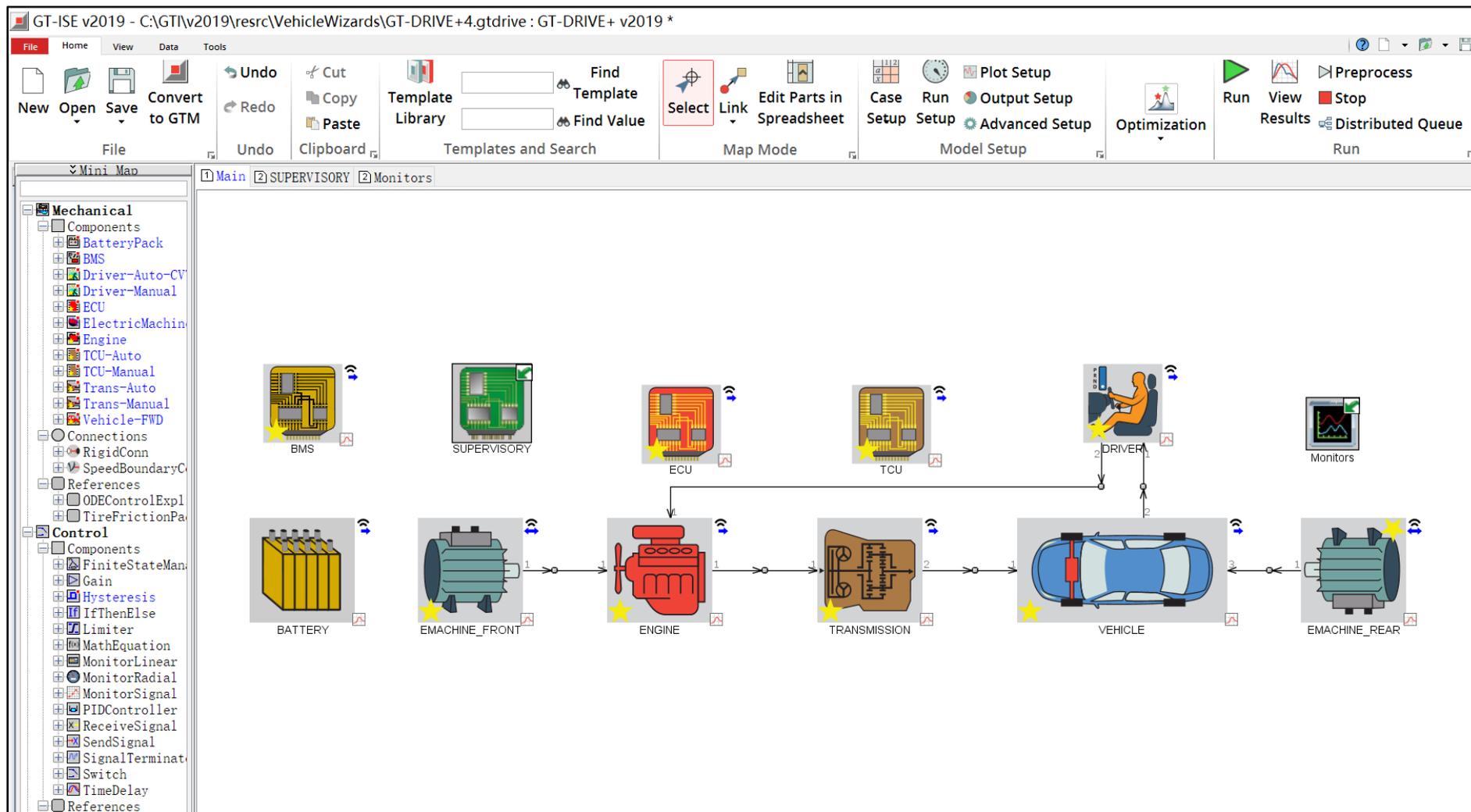
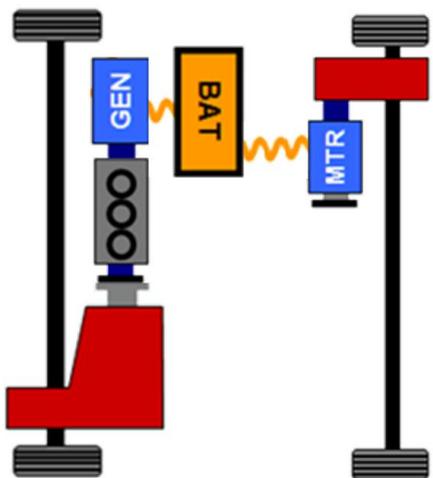
C.定制计算

D.定制输出

E.修改脚本

Choose a Vehicle Configuration

- Battery Electric Vehicle
- P0 Mild Hybrid Electric Vehicle
- P2 Hybrid Electric Vehicle
- P0/P4 Hybrid Electric Vehicle
- P4 Hybrid Electric Vehicle



The screenshot shows the GT-ISE v2019 software interface. The title bar indicates the file path: C:\GTI\2019\resrc\VehicleWizards\GT-DRIVE+4.gtdrive : GT-DRIVE+ v2019 *. The interface includes a menu bar (File, Home, View, Data, Tools), a ribbon with various toolbars (File, Undo, Copy, Paste, Templates and Search, Map Mode, Model Setup, Optimization, Run), and a main workspace. On the left, there is a 'Mini Map' and a tree view showing the project structure under 'Mechanical' and 'Control'. The main workspace displays a detailed vehicle architecture diagram with components like BMS, SUPERVISORY, ECU, TCU, DRIVER, BATTERY, EMACHINE_FRONT, ENGINE, TRANSMISSION, VEHICLE, and EMACHINE_REAR, all interconnected with signal lines and ports.

变量

A.定制模块

B.定制架构

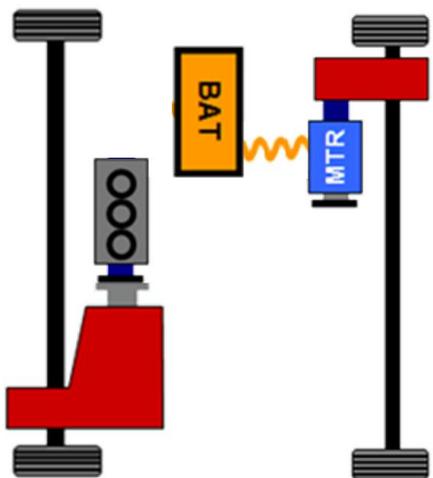
C.定制计算

D.定制输出

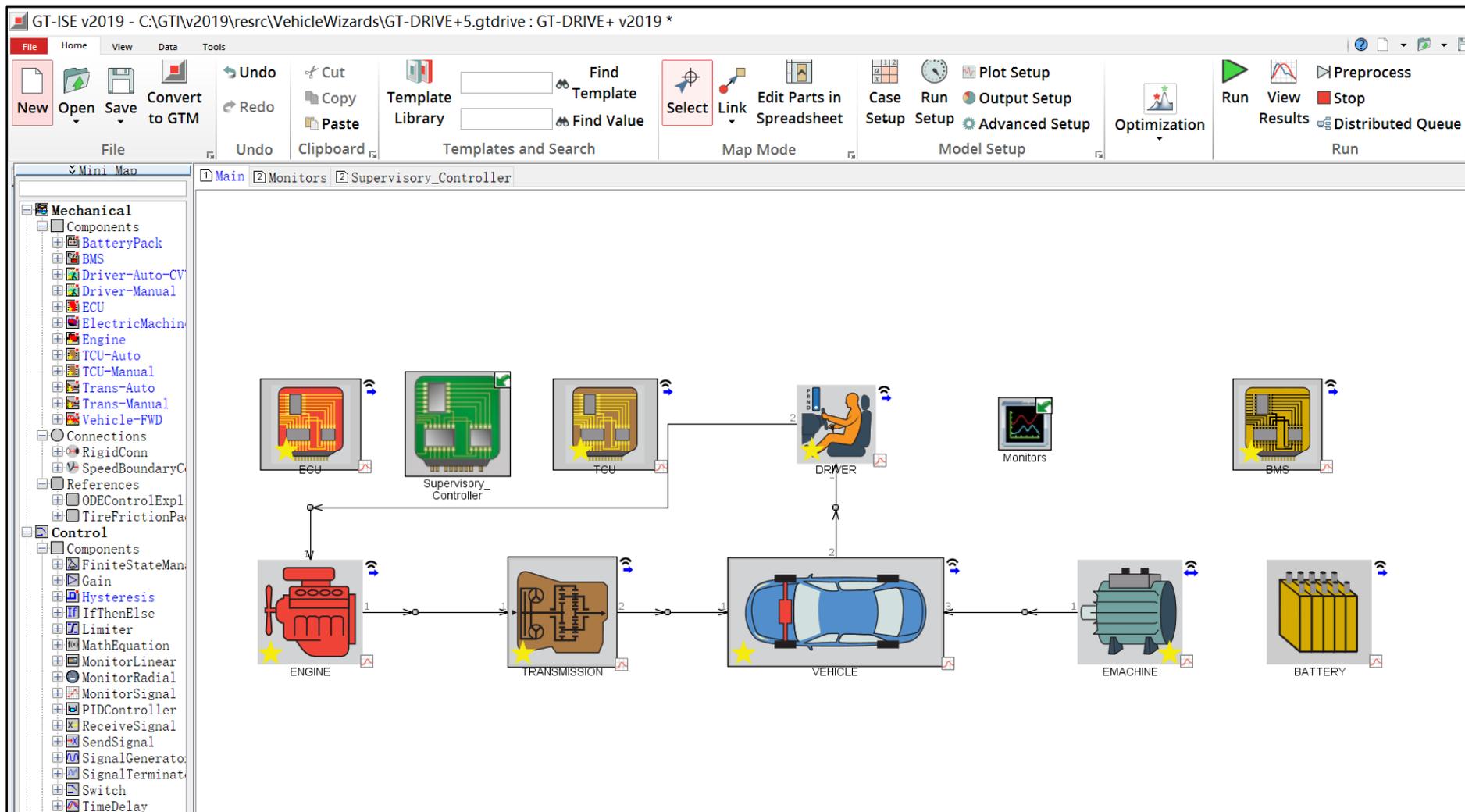
E.修改脚本

Choose a Vehicle Configuration

- Battery Electric Vehicle
- P0 Mild Hybrid Electric Vehicle
- P2 Hybrid Electric Vehicle
- P0/P4 Hybrid Electric Vehicle
- P4 Hybrid Electric Vehicle



GT-ISE v2019 - C:\GTI\v2019\resrc\VehicleWizards\GT-DRIVE+5.gtdrive : GT-DRIVE+ v2019 *



The screenshot displays the GT-ISE v2019 software interface. The top menu bar includes File, Home, View, Data, and Tools. Below the menu is a toolbar with various icons for file operations (New, Open, Save, Convert to GTM), editing (Undo, Redo, Cut, Copy, Paste), and simulation (Run, View Results, Stop, Distributed Queue). The main workspace shows a hierarchical project tree on the left with folders for Mechanical and Control components. The central workspace contains a system architecture diagram with interconnected blocks: ECU, Supervisory_Controller, TCU, DRIVER, Monitors, BMS, ENGINE, TRANSMISSION, VEHICLE, EMACHINE, and BATTERY. Signal lines with ports connect these components, illustrating the system's data flow.

变量

A. 定制模块

B. 定制架构

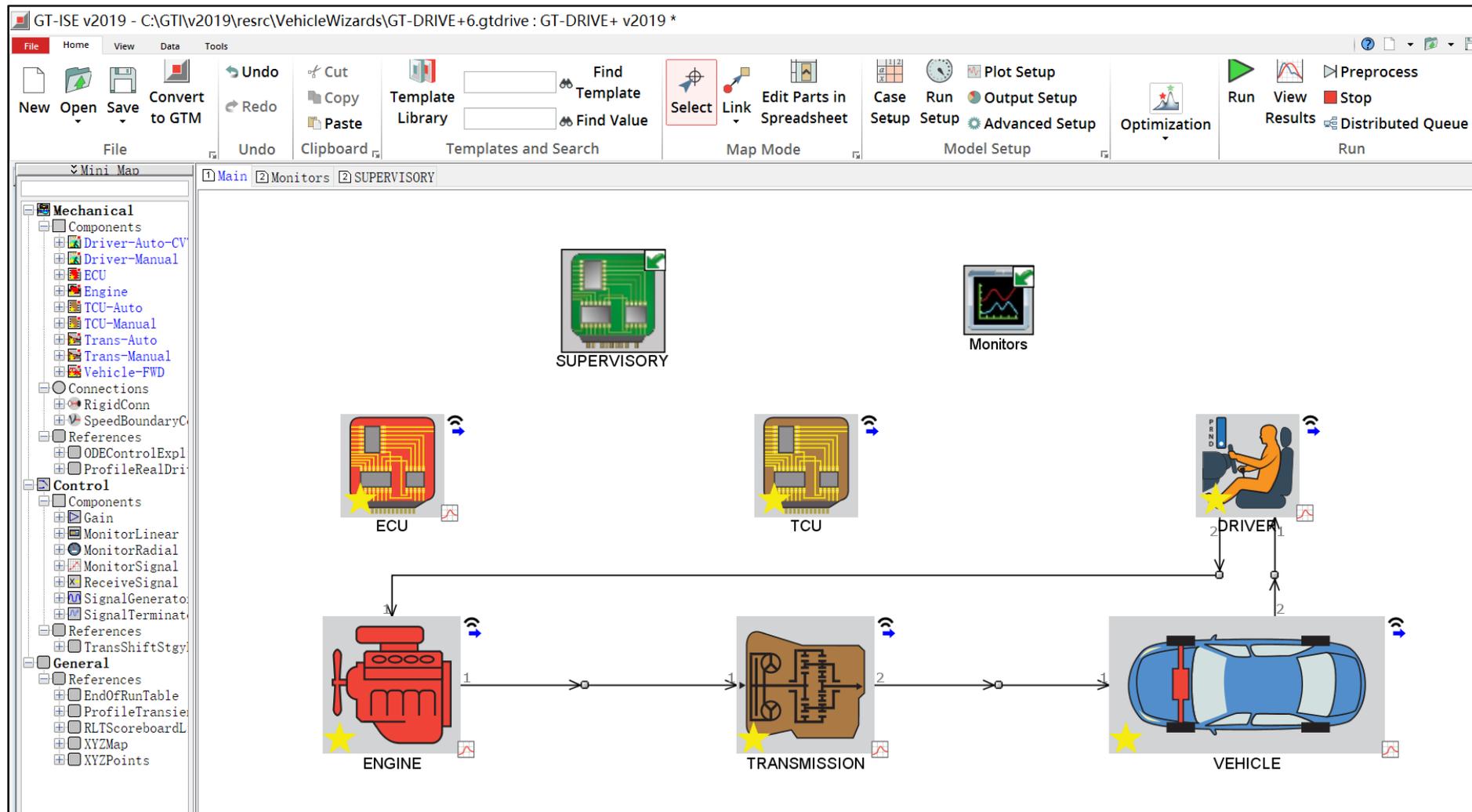
C. 定制计算

D. 定制输出

E. 修改脚本

Choose a Vehicle Configuration

- Conventional Passenger Vehicle
- Conventional Commercial Vehicle



成为架构师

变量

A. 定制模块

B. 定制架构

C. 定制计算

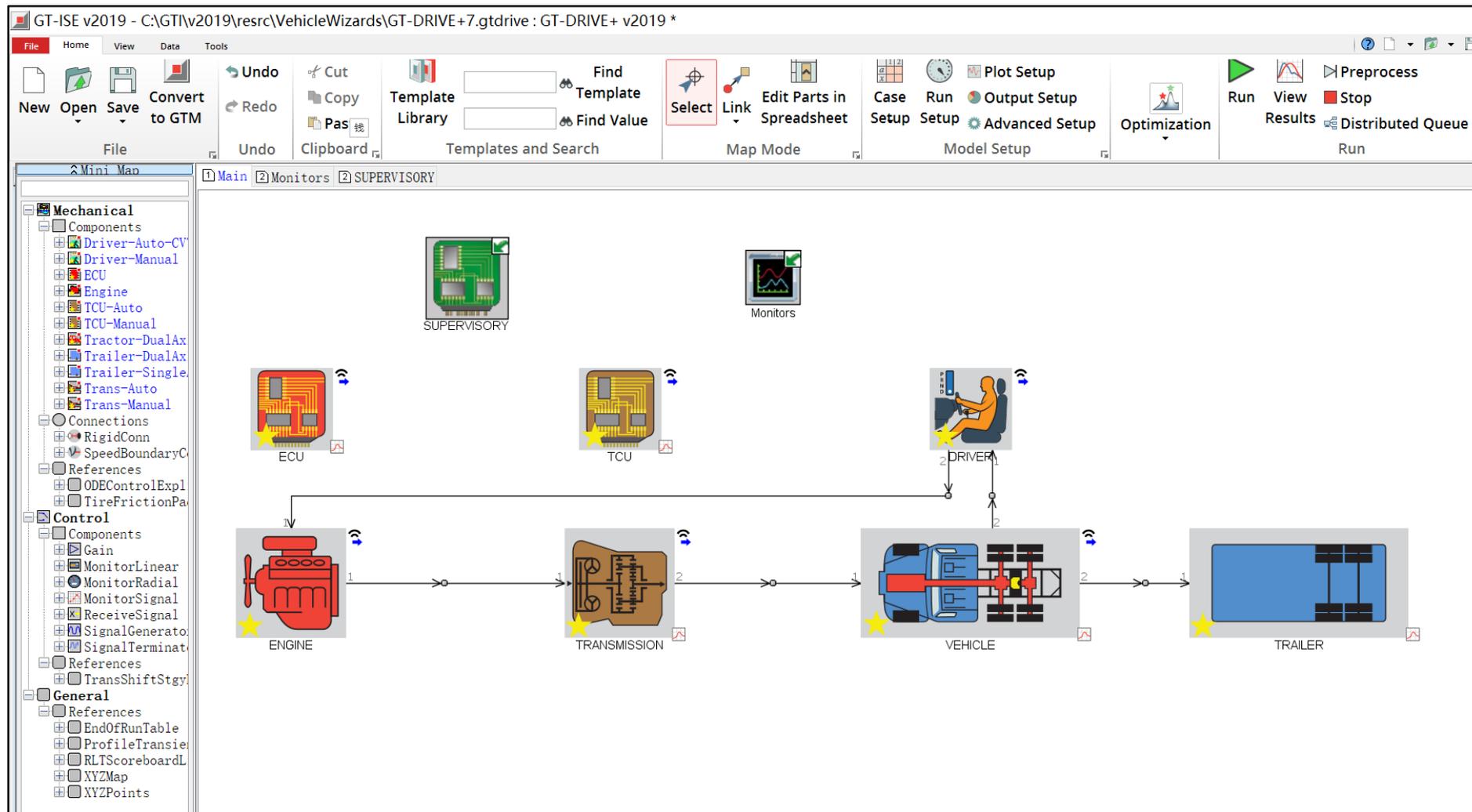
D. 定制输出

E. 修改脚本

Choose a Vehicle Configuration

Conventional Passenger Vehicle

Conventional Commercial Vehicle



变量

A.定制模块

B.定制架构

C.定制计算

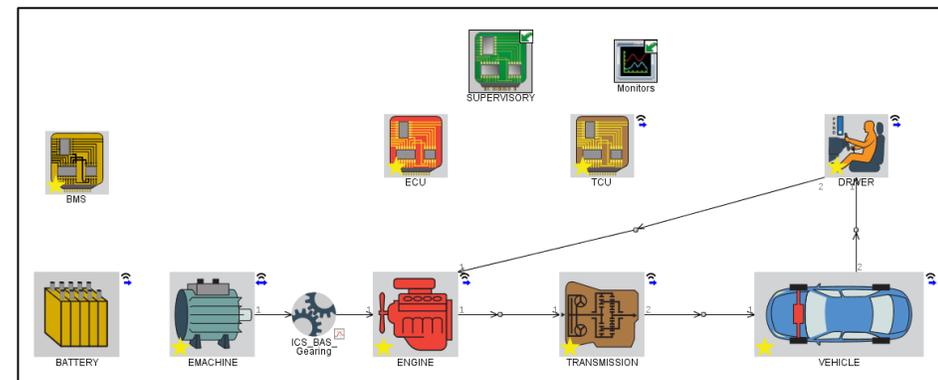
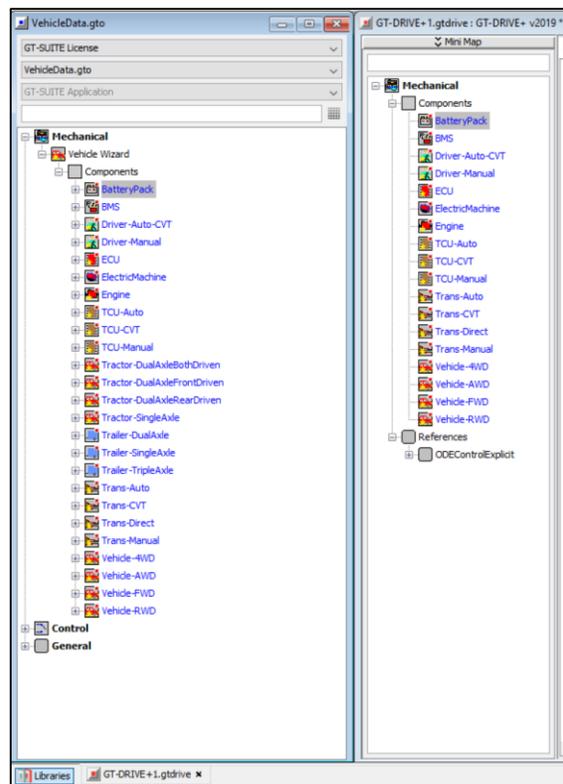
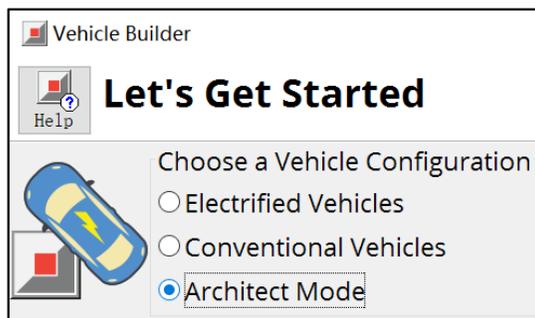
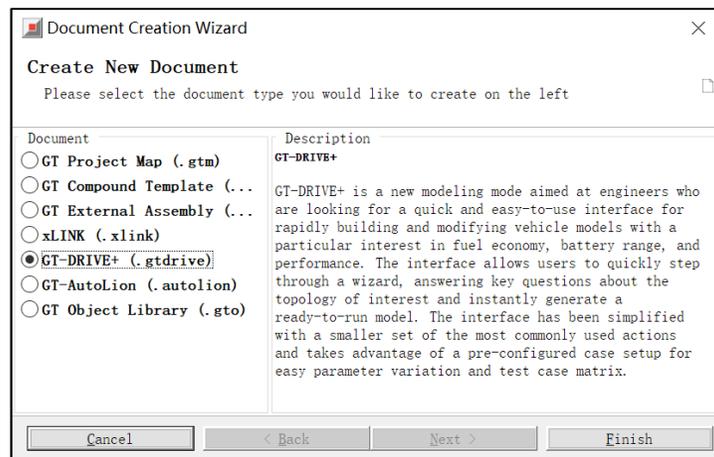
D.定制输出

E.修改脚本

1. New→GT-DRIVE+ →Architect Mode;

2. 将需要的模块拖入;

3. 搭建架构模型



变量

A.定制模块

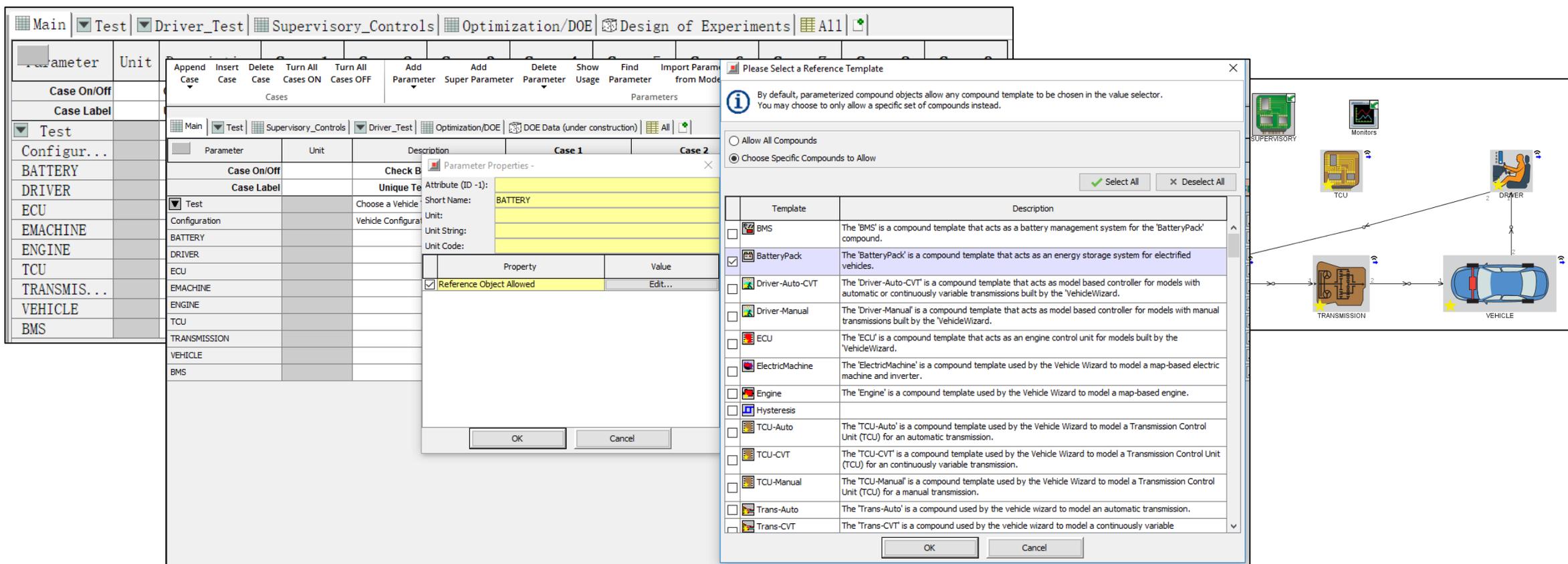
B.定制架构

C.定制计算

D.定制输出

E.修改脚本

4. 设置模块变量。



The screenshot displays a software interface for configuring a vehicle model. On the left, a table lists parameters and their units. In the center, a 'Please Select a Reference Template' dialog box is open, showing a list of templates with 'BatteryPack' selected. On the right, a diagram shows the vehicle architecture with components like SUPERVISORY, Monitors, TCU, DRIVER, TRANSMISSION, and VEHICLE.

Parameter	Unit
Case On/Off	
Case Label	
Test	
Configur...	
BATTERY	
DRIVER	
ECU	
EMACHINE	
ENGINE	
TCU	
TRANSMIS...	
VEHICLE	
BMS	

Please Select a Reference Template

By default, parameterized compound objects allow any compound template to be chosen in the value selector. You may choose to only allow a specific set of compounds instead.

Allow All Compounds
 Choose Specific Compounds to Allow

Template	Description
<input type="checkbox"/> BMS	The 'BMS' is a compound template that acts as a battery management system for the 'BatteryPack' compound.
<input checked="" type="checkbox"/> BatteryPack	The 'BatteryPack' is a compound template that acts as an energy storage system for electrified vehicles.
<input type="checkbox"/> Driver-Auto-CVT	The 'Driver-Auto-CVT' is a compound template that acts as model based controller for models with automatic or continuously variable transmissions built by the 'VehicleWizard'.
<input type="checkbox"/> Driver-Manual	The 'Driver-Manual' is a compound template that acts as model based controller for models with manual transmissions built by the 'VehicleWizard'.
<input type="checkbox"/> ECU	The 'ECU' is a compound template that acts as an engine control unit for models built by the 'VehicleWizard'.
<input type="checkbox"/> ElectricMachine	The 'ElectricMachine' is a compound template used by the Vehicle Wizard to model a map-based electric machine and inverter.
<input type="checkbox"/> Engine	The 'Engine' is a compound template used by the Vehicle Wizard to model a map-based engine.
<input type="checkbox"/> Hysteresis	
<input type="checkbox"/> TCU-Auto	The 'TCU-Auto' is a compound template used by the Vehicle Wizard to model a Transmission Control Unit (TCU) for an automatic transmission.
<input type="checkbox"/> TCU-CVT	The 'TCU-CVT' is a compound template used by the Vehicle Wizard to model a Transmission Control Unit (TCU) for a continuously variable transmission.
<input type="checkbox"/> TCU-Manual	The 'TCU-Manual' is a compound template used by the Vehicle Wizard to model a Transmission Control Unit (TCU) for a manual transmission.
<input type="checkbox"/> Trans-Auto	The 'Trans-Auto' is a compound used by the vehicle wizard to model an automatic transmission.
<input type="checkbox"/> Trans-CVT	The 'Trans-CVT' is a compound used by the vehicle wizard to model a continuously variable

变量

A.定制模块

B.定制架构

C.定制计算

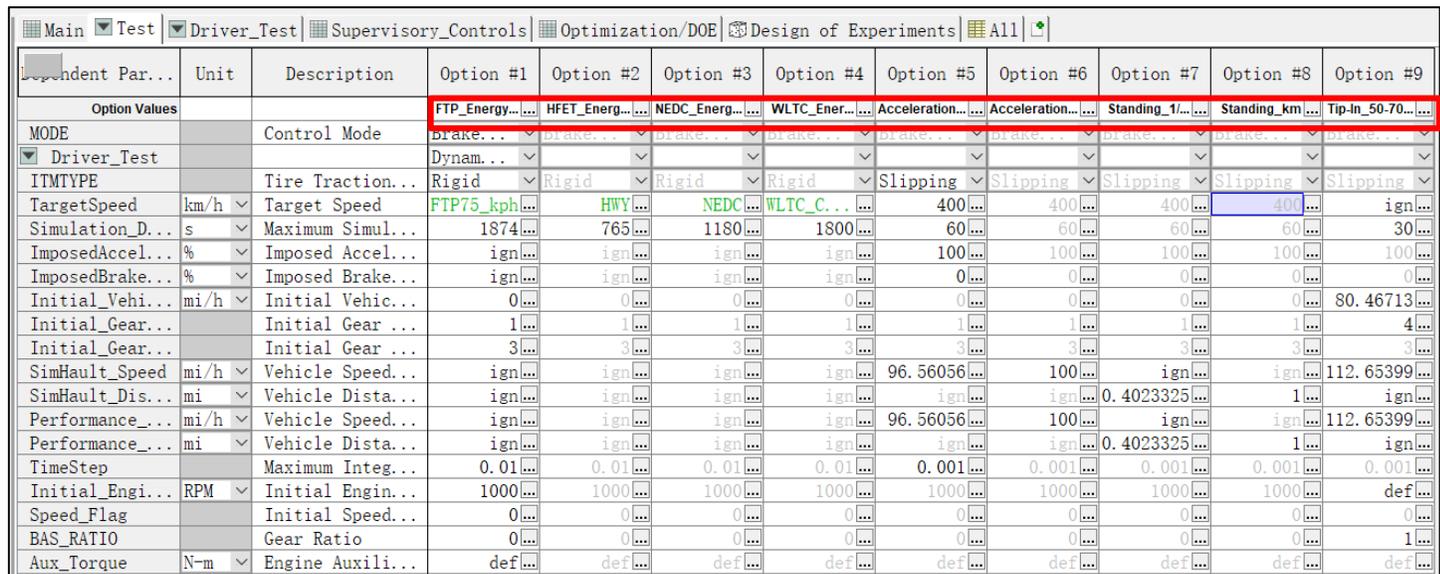
D.定制输出

E.修改脚本

计算任务的制定，是为了让同一个模型能执行多种计算任务，并使计算的设置和选择更方便、更友好。

可以定制哪些计算？

- ✓ 100公里加速
- ✓ 400米加速
- ✓ 60~80公里、80~100公里加速
- ✓ 定速巡航、定速爬坡
- ✓ 最大车速、最大爬坡度
- ✓ NEDC、WLTC、RDE、自定义路谱测试
- ✓ 循环路谱、定速续航里程
- ✓ 等等



Dependent Par...	Unit	Description	Option #1	Option #2	Option #3	Option #4	Option #5	Option #6	Option #7	Option #8	Option #9
Option Values			FTP_Energy...	HFET_Energ...	NEDC_Energ...	WLTC_Ener...	Acceleration...	Acceleration...	Standing_1/...	Standing_km...	Tip-In_50-70...
MODE		Control Mode	Brake...	Brake...	Brake...	Brake...	Brake...	Brake...	Brake...	Brake...	Brake...
Driver_Test			Dynam...								
ITMTYPE		Tire Traction...	Rigid	Rigid	Rigid	Rigid	Slipping	Slipping	Slipping	Slipping	Slipping
TargetSpeed	km/h	Target Speed	FTP75_kph...	HWY...	NEDC...	WLTC_C...	400...	400...	400...	400...	ign...
Simulation_D...	s	Maximum Simul...	1874...	765...	1180...	1800...	60...	60...	60...	60...	30...
ImposedAccel...	%	Imposed Accel...	ign...	ign...	ign...	ign...	100...	100...	100...	100...	100...
ImposedBrake...	%	Imposed Brake...	ign...	ign...	ign...	ign...	0...	0...	0...	0...	0...
Initial_Vehi...	mi/h	Initial Vehic...	0...	0...	0...	0...	0...	0...	0...	0...	80.46713...
Initial_Gear...		Initial Gear ...	1...	1...	1...	1...	1...	1...	1...	1...	4...
Initial_Gear...		Initial Gear ...	3...	3...	3...	3...	3...	3...	3...	3...	3...
SimHault_Speed	mi/h	Vehicle Speed...	ign...	ign...	ign...	ign...	96.56056...	100...	ign...	ign...	112.65399...
SimHault_Dis...	mi	Vehicle Dista...	ign...	ign...	ign...	ign...	ign...	ign...	0.4023325...	1...	ign...
Performance...	mi/h	Vehicle Speed...	ign...	ign...	ign...	ign...	96.56056...	100...	ign...	ign...	112.65399...
Performance...	mi	Vehicle Dista...	ign...	ign...	ign...	ign...	ign...	ign...	0.4023325...	1...	ign...
TimeStep		Maximum Integ...	0.01...	0.01...	0.01...	0.01...	0.001...	0.001...	0.001...	0.001...	0.001...
Initial_Engi...	RPM	Initial Engin...	1000...	1000...	1000...	1000...	1000...	1000...	1000...	1000...	def...
Speed_Flag		Initial Speed...	0...	0...	0...	0...	0...	0...	0...	0...	0...
BAS_RATIO		Gear Ratio	0...	0...	0...	0...	0...	0...	0...	0...	1...
Aux_Torque	N-m	Engine Auxili...	def...	def...	def...	def...	def...	def...	def...	def...	def...

变量

A.定制模块

B.定制架构

C.定制计算

D.定制输出

E.修改脚本

1. 定义变量;
2. 设置超级变量;
3. 设置计算任务。

Main Test Driver_Test Supervisory_Controls Optimization/DOE Design of Experiments All											
Parameter	Unit	Description	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
Case On/Off		Check Box to Turn Case On	<input checked="" type="checkbox"/>								
Case Label		Unique Text for Plot Legends									
Dependent Par...	Unit	Description	Option #1	Option #2	Option #3	Option #4	Option #5	Option #6	Option #7	Option #8	Option #9
Option Values			FTP_Energy...	HFET_Energ...	NEDC_Energ...	WLTC_Ener...	Acceleration...	Acceleration...	Standing_1/...	Standing_km...	Tip-In_50-70...
MODE		Control Mode	Brake...								
Driver_Test			Dynam...								
ITMTYPE		Tire Traction...	Rigid	Rigid	Rigid	Rigid	Slipping	Slipping	Slipping	Slipping	Slipping
TargetSpeed	km/h	Target Speed	FTP75_kph	HWY	NEDC	WLTC_C...	400	400	400	400	ign
Simulation_D...	s	Maximum Simul...	1874	765	1180	1800	60	60	60	60	30
ImposedAccel...	%	Imposed Accel...	ign	ign	ign	ign	100	100	100	100	100
ImposedBrake...	%	Imposed Brake...	ign	ign	ign	ign	0	0	0	0	0
Initial_Vehi...	mi/h	Initial Vehic...	0	0	0	0	0	0	0	0	80.46713
Initial_Gear...		Initial Gear ...	1	1	1	1	1	1	1	1	4
Initial_Gear...		Initial Gear ...	3	3	3	3	3	3	3	3	3
SimHault_Speed	mi/h	Vehicle Speed...	ign	ign	ign	ign	96.56056	100	ign	ign	112.65399
SimHault_Dis...	mi	Vehicle Dista...	ign	ign	ign	ign	ign	ign	0.4023325	1	ign
Performance...	mi/h	Vehicle Speed...	ign	ign	ign	ign	96.56056	100	ign	ign	112.65399
Performance...	mi	Vehicle Dista...	ign	ign	ign	ign	ign	ign	0.4023325	1	ign
TimeStep		Maximum Integ...	0.01	0.01	0.01	0.01	0.001	0.001	0.001	0.001	0.001
Initial_Engi...	RPM	Initial Engin...	1000	1000	1000	1000	1000	1000	1000	1000	def
Speed_Flag		Initial Speed...	0	0	0	0	0	0	0	0	0
BAS_RATIO		Gear Ratio	0	0	0	0	0	0	0	0	1
Aux_Torque	N-m	Engine Auxili...	def								

变量

A.定制模块

B.定制架构

C.定制计算

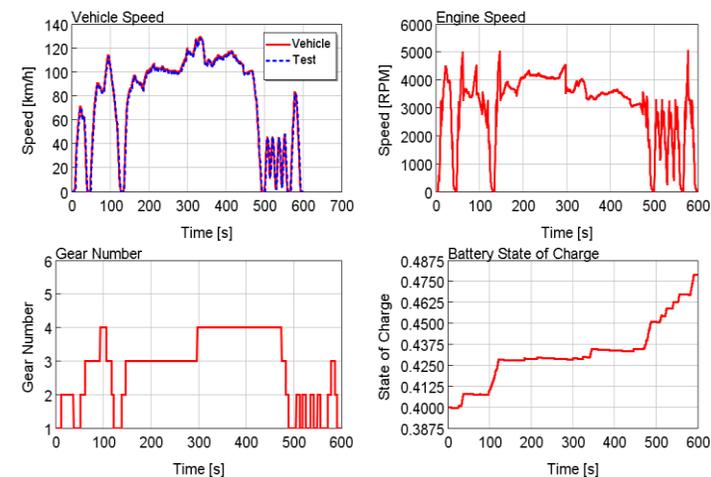
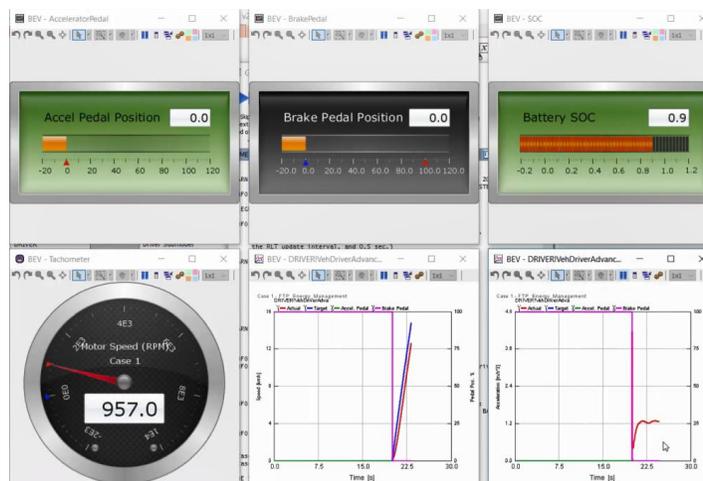
D.定制输出

E.修改脚本

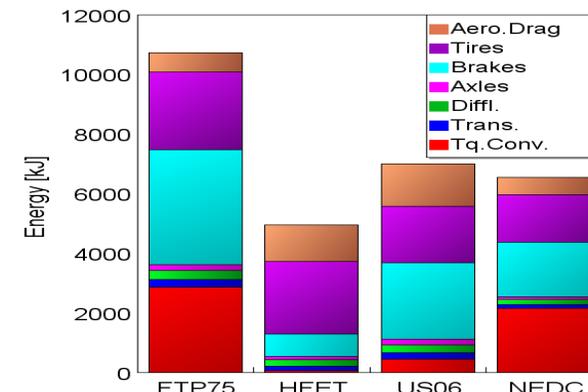
计算结果输出的制定，是为了在模型计算过程中监控需要的结果，和模型计算完成后直接汇总需要的结果并输出。

可以定制哪些输出？

- ✓ 仪表盘，计算过程中监控关键参数
- ✓ 曲线
- ✓ 表格
- ✓ 能量损失分布
- ✓ 等等



	Engine:1.5L_Turbo Vehicle:Coupe	Engine:1.5L_Turbo Vehicle:Sedan	Engine:1.5L_Turbo Vehicle:Hatchback	Engine:2.0L_NA Vehicle:Coupe	Engine:2.0L_NA Vehicle:Sedan	Engine:2.0L_NA Vehicle:Hatchback
FTP Fuel Economy [mpg]	31.8	30.8	29.9	19.6	18.9	18.3
NEDC Fuel Consumption [L/100 km]	7.66	7.94	8.15	11.9	12.4	12.8
0-60 mph Time [s]	7.46	7.83	8.22	11.2	12.0	12.7
1/4 Mile Time [s]	16.0	16.3	16.6	18.4	18.7	19.1
1/4 Mile Top Speed [km/h]	142	139	137	122	119	117
50-70 mph time (s) [s]	5.35	5.81	6.24	7.76	8.49	9.16



变量

A.定制模块

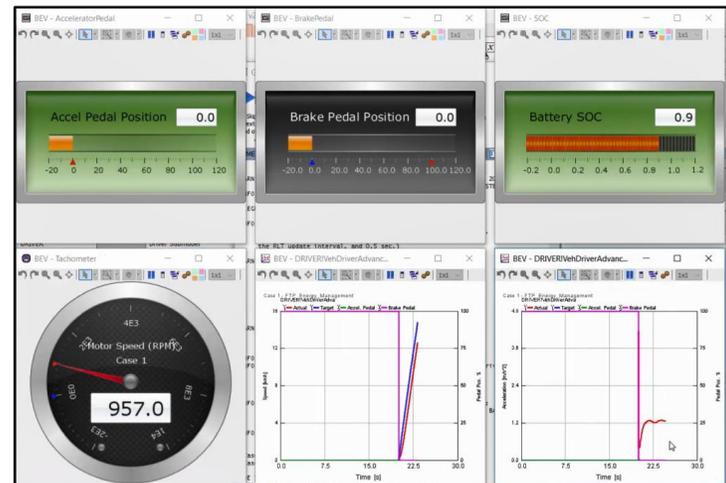
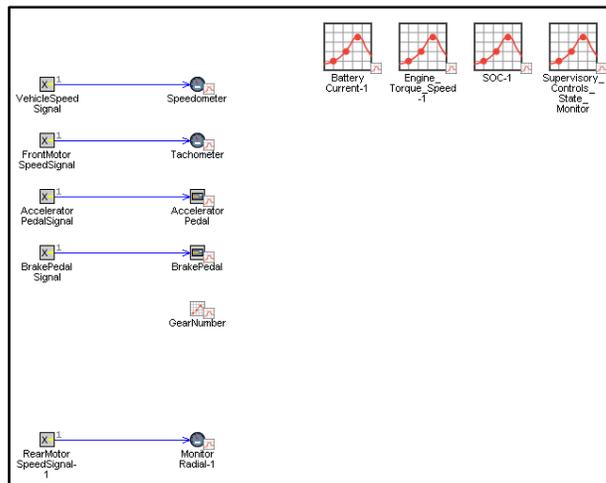
B.定制架构

C.定制计算

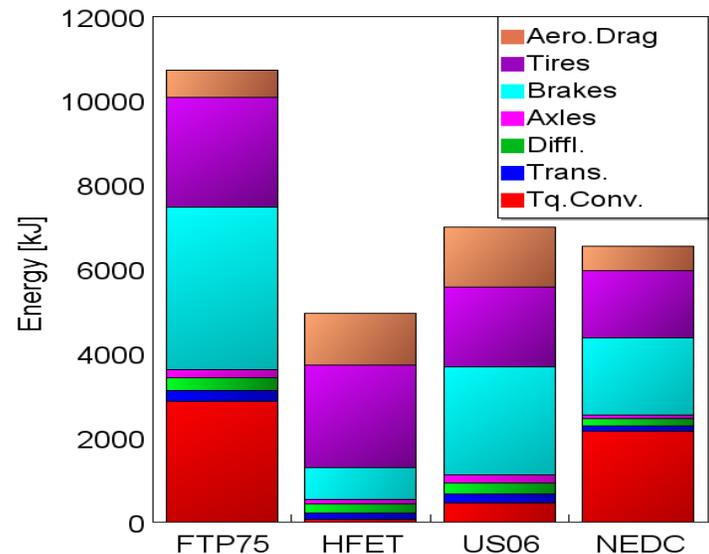
D.定制输出

E.修改脚本

1. 设置监控参数;
2. 设置Plots输出;
3. 设置整车能量损失输出;



Main		Advanced		Actuator Position		GT-POST Output		Plots	
Select / Unselect All Plots		<input checked="" type="checkbox"/>	Max Plot...	Plot Range					
<input checked="" type="checkbox"/> Machine Speed	<input checked="" type="checkbox"/>		def	def					
<input checked="" type="checkbox"/> Brake Torque	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> ScoreboardRLTs	<input checked="" type="checkbox"/> UserScoreboardRLTs	<input checked="" type="checkbox"/> EndOfRunTables					
<input checked="" type="checkbox"/> Brake Power	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Data_Storage	<input checked="" type="checkbox"/> General	<input checked="" type="checkbox"/> GT-POST_Setup	<input checked="" type="checkbox"/> Flow	<input checked="" type="checkbox"/> ODE-Mech			
<input checked="" type="checkbox"/> Electrical Power	<input checked="" type="checkbox"/>	Attribute		Object Value					
<input checked="" type="checkbox"/> Efficiency	<input checked="" type="checkbox"/>	Legend for Plot Header (OBSOLETE)							
<input checked="" type="checkbox"/> Losses	<input checked="" type="checkbox"/>	Timestep Plot			<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/> Temperature	<input checked="" type="checkbox"/>	Store RLts for Tracking Memory (RAM) Consumption			<input type="checkbox"/>				
		Vehicle Energy Use and Loss Plots			<input checked="" type="checkbox"/>				
		Suppress .brf file (file not available in future)			<input checked="" type="checkbox"/>				



变量

A.定制模块

B.定制架构

C.定制计算

D.定制输出

E.修改脚本

4. 制定输出表格。

Template: EndOfRunTable - 2D ("Configuration" and "Tests") Table of RLTs

Home Data Advanced

Constraint RLT index used in combination with the...

Connectivity Information Show Examples

Attribute Abilities

Object Comment:

Part Comment:

Add Long Comment

Template Documentation Help

Comments

Object Usage

VehicleResultsSummary

VehicleResultsSummary

Run Settings

Output Settings

A...	RLT Index (full)	RLT Short Name	Template for RLT Short Name	Constraint RLT	Constraint RLT Value	Label
0						
1	userrlt01:BATTERY...	ign...	ign...	test+...	FTP_Energy_Management	FTP Battery Consumption
2	userrlt01:BATTERY...	ign...	ign...	test+...	HPET_Energy_Management	HPET Battery Consumption
3	userrlt01:BATTERY...	ign...	ign...	test+...	NEDC_Energy_Management	NEDC Battery Consumption
4	userrlt01:BATTERY...	ign...	ign...	test+...	WLTC_Energy_Management	WLTC Battery Consumption
5	times01:VEHICLE...	ign...	ign...	test+...	Acceleration_0-60mph	0-60 mph Time
6	times01:VEHICLE...	ign...	ign...	test+...	Acceleration_0-100kph	0-100 kph Time
7	timed01:VEHICLE...	ign...	ign...	test+...	Standing_1/4_Mile	Standing 1/4 Mile Time
8	speedd01:VEHICLE...	ign...	ign...	test+...	Standing_1/4_Mile	Standing 1/4 Mile Top Sp...
9	timed01:VEHICLE...	ign...	ign...	test+...	Standing_km	Standing km Time
10	speedd01:VEHICLE...	ign...	ign...	test+...	Standing_km	Standing km Top Speed
11						

Data_Storage
 General
 GT-POST_Setup
 Flow
 ODE-Mech

ScoreboardRLTs
 UserScoreboardRLTs
 EndOfRunTables

Attribute	Object Value
EndOfRunTables are designed for displaying RLTs from single o...	
Location of Model Configuration Sweep	1xN Table Only (no sweep)
Parameter Defining Configurations	Configuration...
Results for each Model Configuration...	Column
EndOfRunTable Object 1	VehicleResultsSummary...
EndOfRunTable Object 2	ign...
EndOfRunTable Object 3	ign...
EndOfRunTable Object 4	ign...
EndOfRunTable Object 5	ign...

	Engine:1.5L_Turbo Vehicle:Coupe	Engine:1.5L_Turbo Vehicle:Sedan	Engine:1.5L_Turbo Vehicle:Hatchback	Engine:2.0L_NA Vehicle:Coupe	Engine:2.0L_NA Vehicle:Sedan	Engine:2.0L_NA Vehicle:Hatchback
FTP Fuel Economy [mpg]	31.8	30.8	29.9	19.6	18.9	18.3
NEDC Fuel Consumption [L/100 km]	7.66	7.94	8.15	11.9	12.4	12.8
0-60 mph Time [s]	7.46	7.83	8.22	11.2	12.0	12.7
1/4 Mile Time [s]	16.0	16.3	16.6	18.4	18.7	19.1
1/4 Mile Top Speed [km/h]	142	139	137	122	119	117
50-70 mph time (s) [s]	5.35	5.81	6.24	7.76	8.49	9.16

成为架构师

变量

A.定制模块

B.定制架构

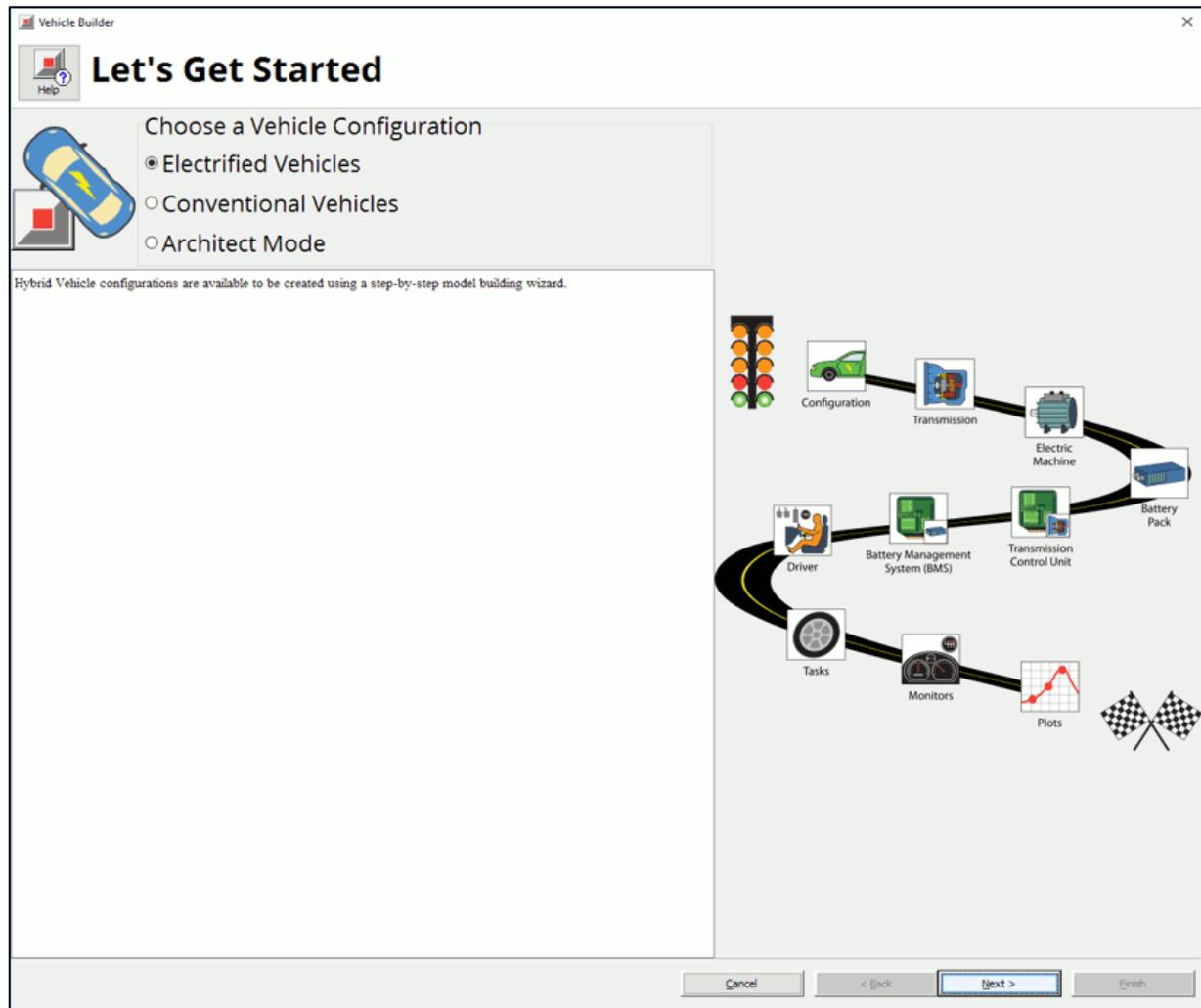
C.定制计算

D.定制输出

E.修改脚本

前面建立的.gtdrive即可直接当做架构模板直接供用户使用。

但若要实现GT-Drive+将建模流程化的功能，还需要修改.xml脚本文件。



变量

A.定制模块

B.定制架构

C.定制计算

D.定制输出

E.修改脚本

```
28 wizard.  
29 &lt;/p&gt;  
30  
31 &lt;p&gt;  
32 Once the model is built, pre-defined vehicle tests (driving cycle  
33 analyses, acceleration performance tests) can be run.  
34 &lt;/p&gt;  
35  
36 &lt;/font&gt;  
37 &lt;/html&gt;  
38 "  
39 icon="vw_p0_intro_page.png"  
40 gtmFile="P0MildHEV_Liujx.gtdrive"  
41 gtoFile="VehicleData.gto">  
42 <!--This marks the beginning of new chapter. Progress Image, Title and Icon Image ca  
43 <chapter progressImage="vw_p0_vehicle.png" title="Driveline" icon="VW-Vehicle.svg">  
44 <!--This marks the beginning of new Part. Part Name can be specified as shown on Li  
45 be skipped by selecting None. User needs to select from one of the template options  
46 be Linked for Template help and Object Help by specifying its name as shown on line  
47 <part  
48 partName="VEHICLE"  
49 allowOmit="0.0"  
50 templateHelpName="VWVehicleTemplate"  
51 objectHelpName="VWVehicleObject">  
52 <templateOption  
53 description="FWD (Front-Wheel Drive)"  
54 name="Vehicle-FWD"  
55 icon="Vehicle-FWD_big.svg"/>  
56 <templateOption  
57 description="RWD (Rear-Wheel Drive)"  
58 name="Vehicle-RWD"  
59 icon="Vehicle-RWD_big.svg"/>
```

1. 在软件提供的架构脚本基础上进行修改并指向前面生成的.gtdrive架构文件。

```
Welcome Guide | configurations.xml  
1 <?xml version="1.0" encoding="ISO-8859-1"?>  
2 <wizardlist>  
3 <!--This marks the beginning of new Category. Title, Description and image can b  
4 <category title="Electrified Vehicles" description="Hybrid Vehicle configurati  
5 <configfile name="P0HybridWizardConfig.xml"/>  
6 <!--This marks end of category-->  
7 </category>  
8 </wizardlist>
```

2. 再修改Drive+配置脚本，指向前面的架构脚本。

```
<configfile name="P0HybridWizardConfig.xml"/>
```

GT-DRIVE+ 架构师加速产品开发

GT-DRIVE+ 是新一代车辆仿真方式，旨在处理新一代复杂的车辆架构

GT-DRIVE+ 能够提供可随时搭建的车辆特征和建模流程，提高用户工作效率

GT-DRIVE+ 为架构师提供了高效搭建和维护车辆模拟的平台，供终端用户使用

GT-DRIVE+ 与架构师一起将系统仿真专业化、流程化、标准化

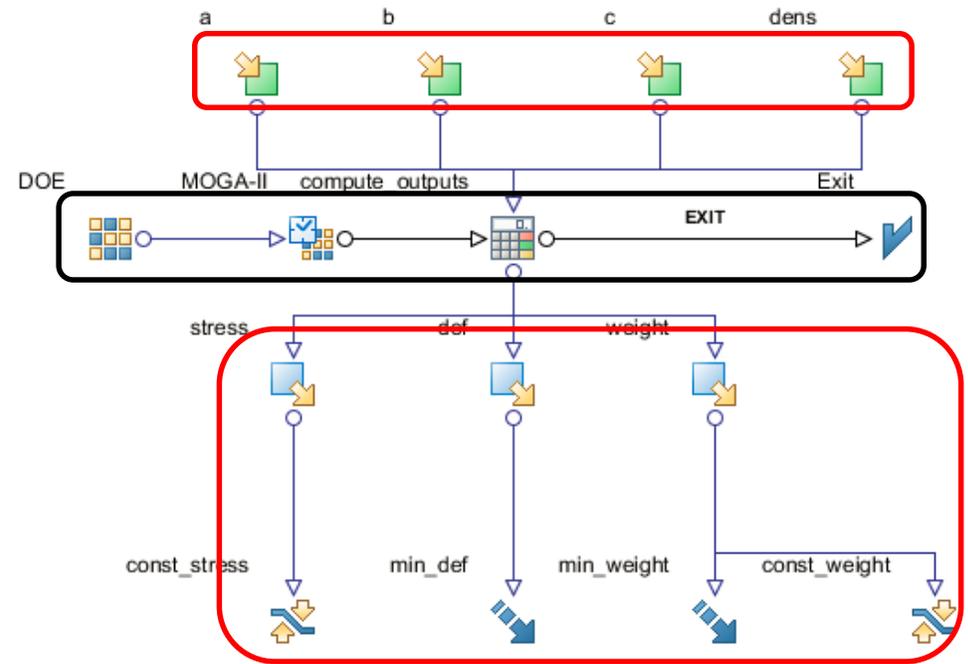
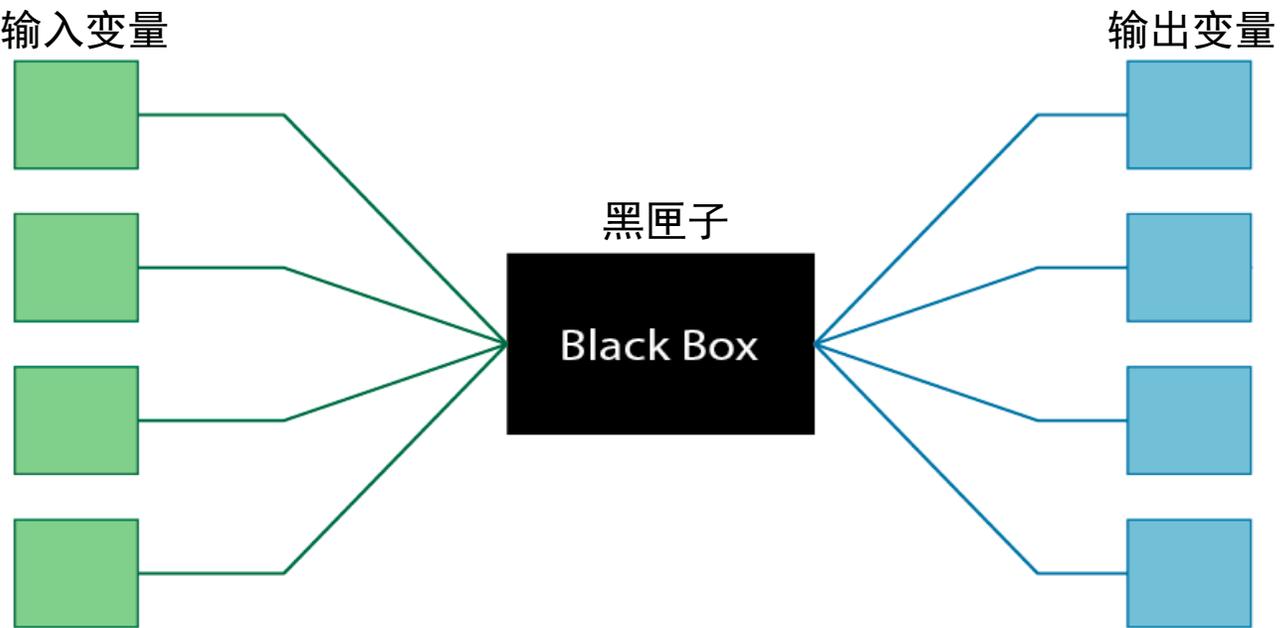
目录

- 什么是GT-DRIVE+ ?
- 什么是架构师 ?
- 成为架构师
- GT&modeFRONTIER联合仿真介绍

GT&MF联合仿真介绍

modeFRONTIER简介

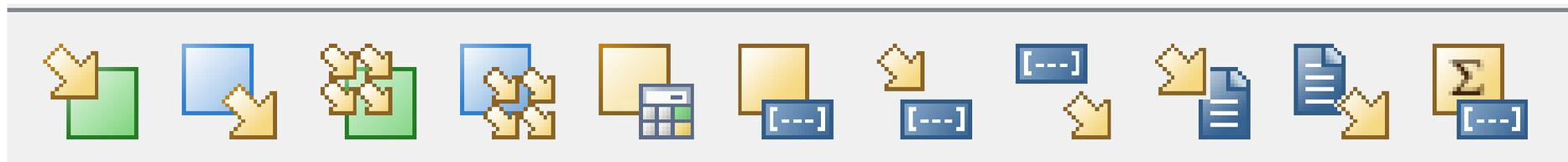
modeFRONTIER是一个通用的多目标及多学科和优化软件，可以实现与诸多第三方仿真工具的无缝集成，来完成设计仿真流程的自动化，以及优化决策的分析。



GT&MF联合仿真介绍

输入变量

- 自定义（连续、离散）
- 外部导入
- DOE生成

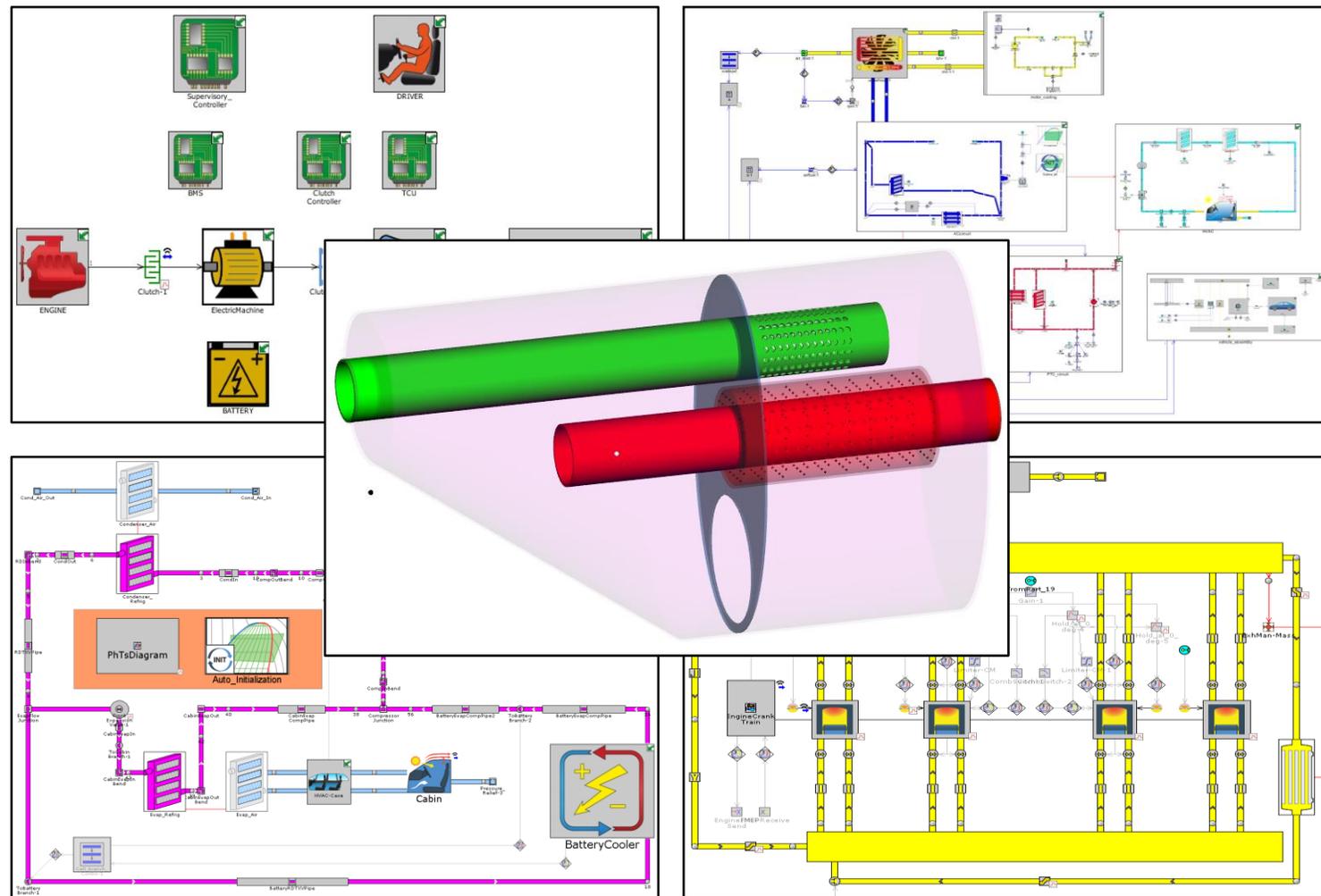


GT&MF联合仿真介绍

黑匣子

GT模型

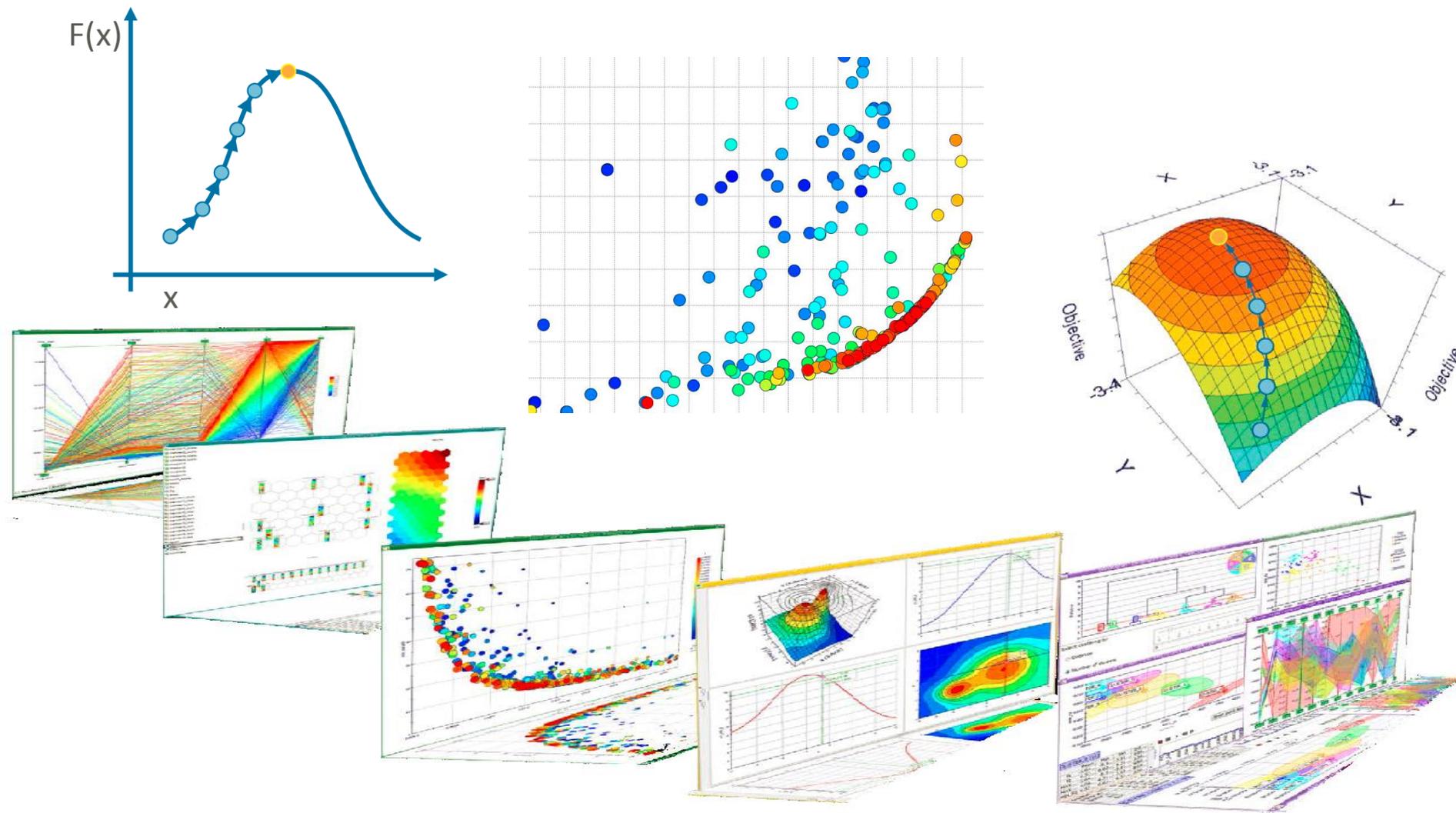
- 整车动力性/经济型模型
- 热管理模型
- 空调系统模型
- 发动机模型
- 消声器模型
- 等



GT&MF联合仿真介绍

分析输出

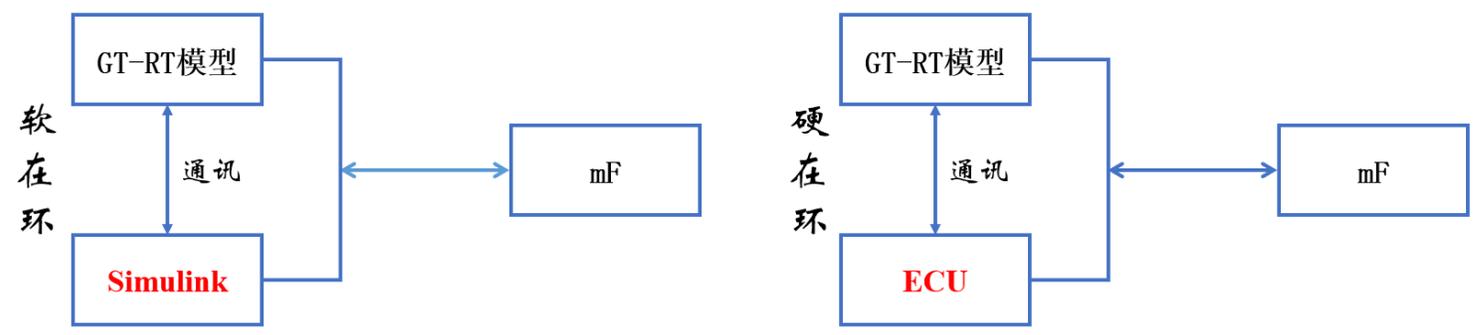
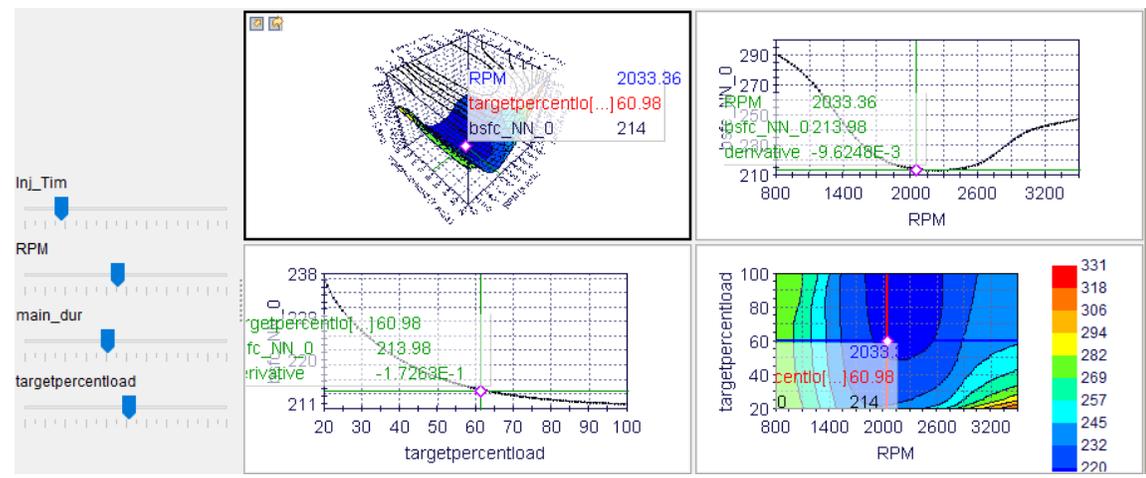
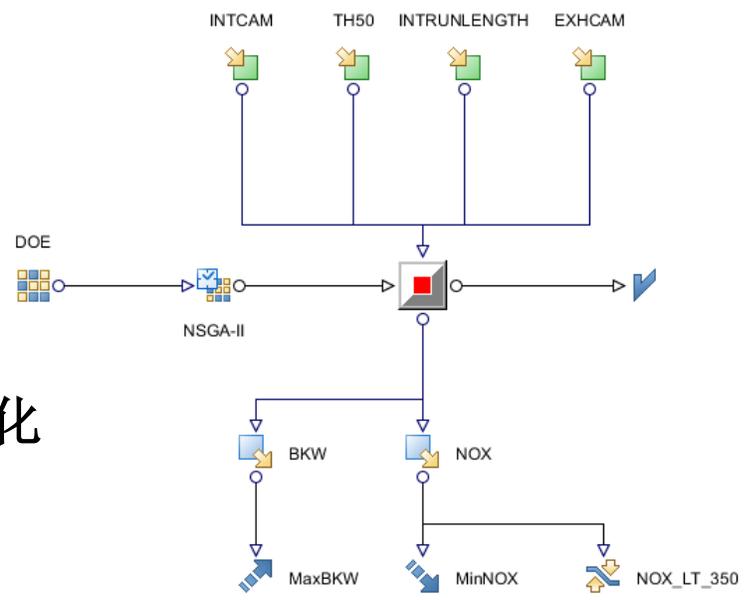
- 单目标优化
- 多目标优化
- 响应面生成
- 优化分析



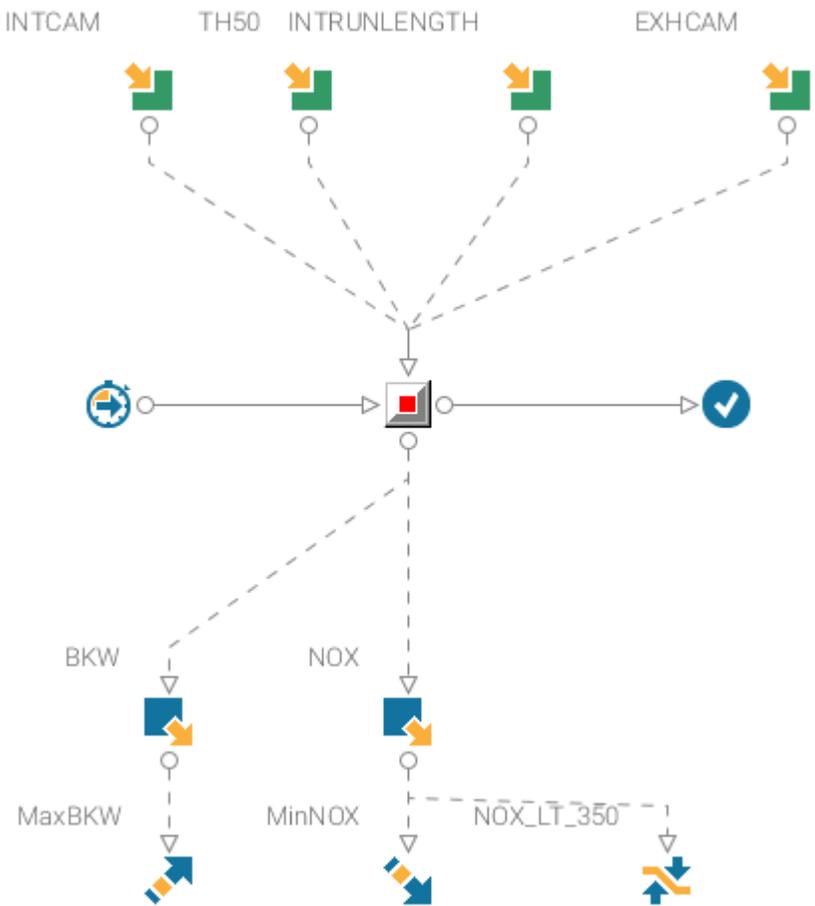
GT&MF联合仿真介绍

能解决的难题:

- 模型标定
- 敏感性分析
- 多参数、多目标优化
- 建立响应面
- 大数据分析
- SiL/HiL



案例1 : modeFRONTIER集成GT



Parameter Chooser: GTSuite19

Input Parameters | Output Parameters

No Filter

- Exhaust Cam Timing [EXHCAM] ↔ EXHCAM
- Initial exhaust pressure [ExhInitP]
- Initial exhaust temperature [ExhInitT]
- Exhaust Runner Length [EXHRUNLENGTH]
- Initial exhaust wall temperature [ExhTWall]
- Intake Valve Lash [ILASH]
- Intake Cam Timing [INTCAM] ↔ INTCAM
- Intake Runner Length [INTRUNLENGTH] ↔ INTRUNLENGTH
- Simulation duration [ncyc]
- rpm
- 50% Burn Point [TH50] ↔ TH50
- Throttle angle [throtang]

Workflow Input Nodes

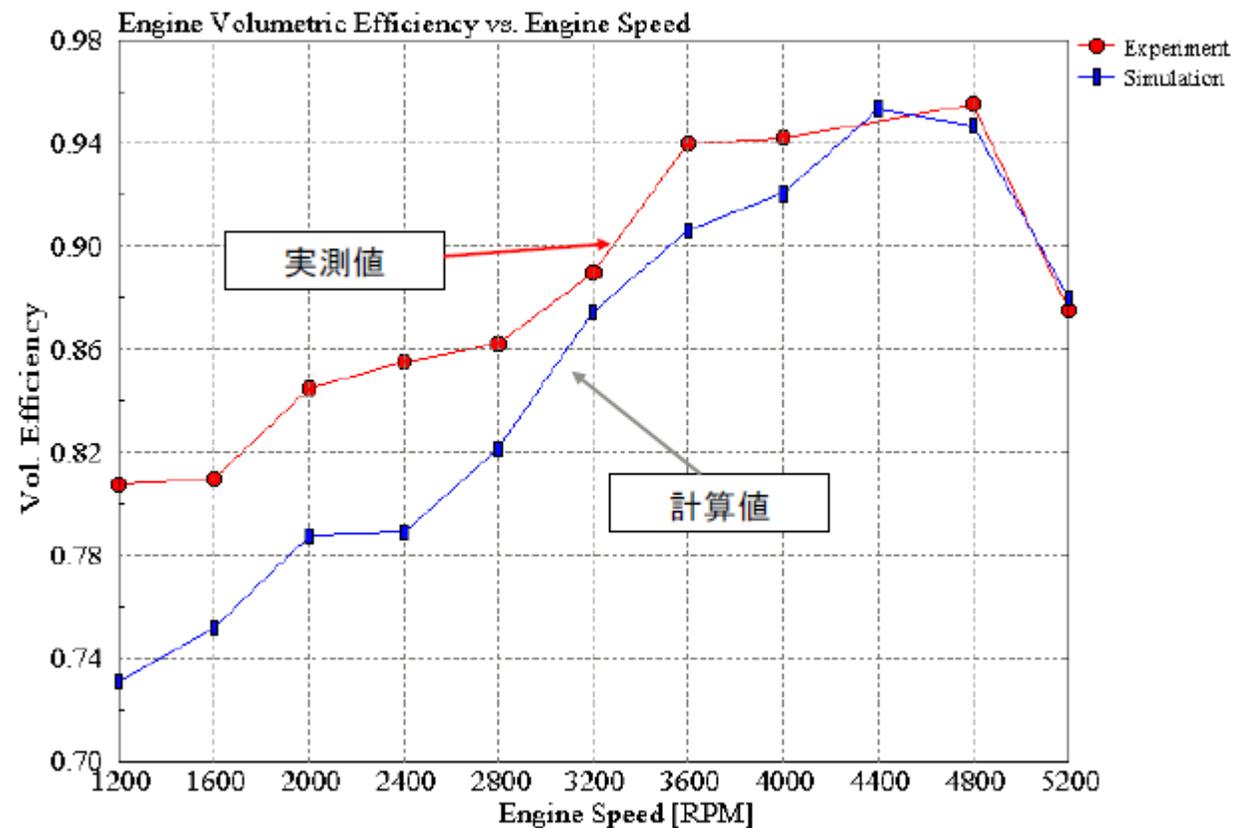
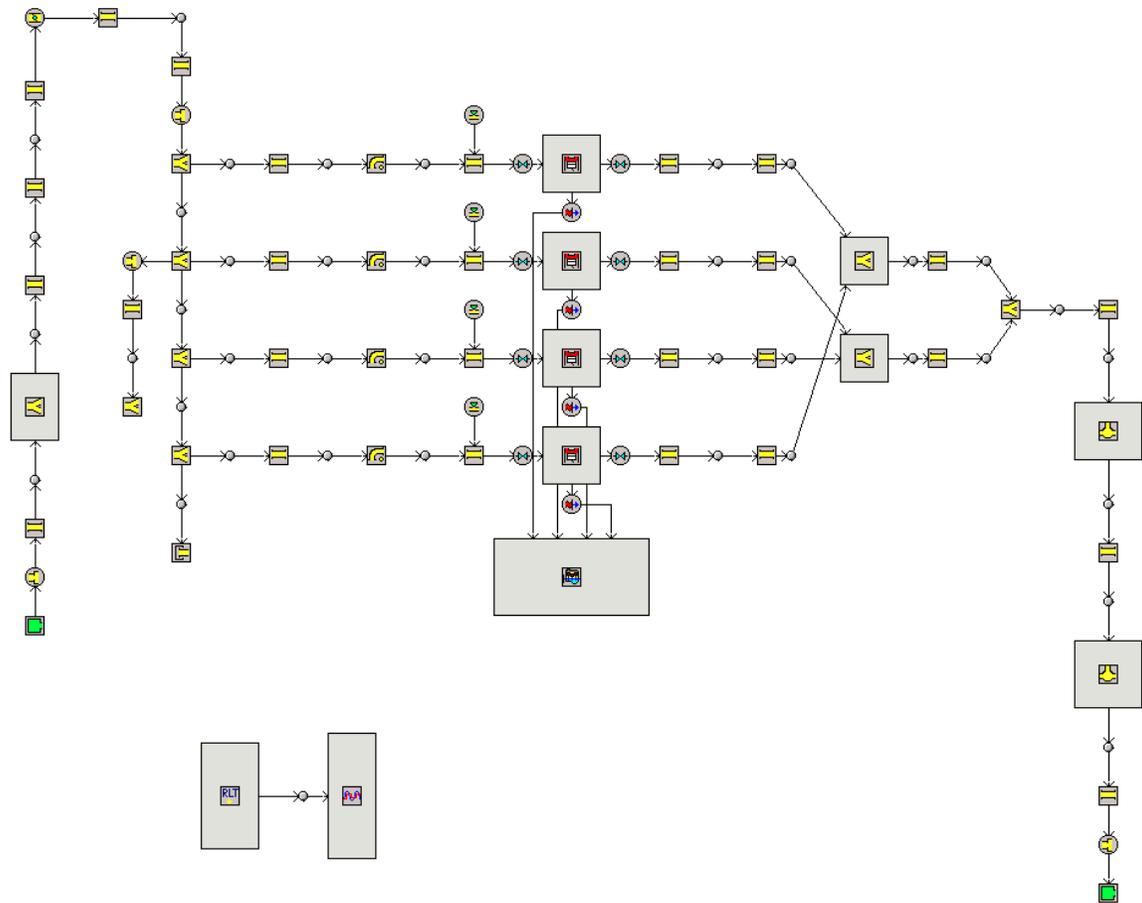
- EXHCAM
- INTCAM
- INTRUNLENGTH
- TH50

Details

Case number	1
Description	50% Burn Point
Parameter Name	TH50
Unit ID	No Unit
Current value	8

Find parameter | Next | Clear All Links | Refresh | OK | Cancel

案例2 : modeFRONTIER集成GT实现参数反演



GT 能提供完整的系统解决方案



多学科: 流体、传热、力学、电学、化学、控制,..



物理: 从详细的预测到系统级，具有不同的保真度



Productivity: 分布计算，优化，自动化，脚本



开放性: Co-sim平台，Co-sim接口，模块化



企业级: Plm 链接，CAD 导入，从 CAD 建模

感谢倾听

期待与您的进一步合作 😊



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