

# WHAT IS BEST PRACTICE FOR ACHIEVING ISO26262 COMPLIANCE? MGI Group, 17.10.2017

## SOFTWARE QUALITY. MADE IN GERMANY.

SOLUTIONS FOR INTEGRATED QUALITY ASSURANCE  
OF EMBEDDED SOFTWARE



- Simulink/Stateflow is a powerful modeling language.
- Application level functionality can be expressed in various patterns capturing the same semantics.
- High risk of inconsistent modeling approaches leading to
  - misunderstandings,
  - errors,
  - high review effort.
- Challenge:
  - Reduce number of alternative modeling patterns in order to achieve a stringent modeling style.

## □ Question:

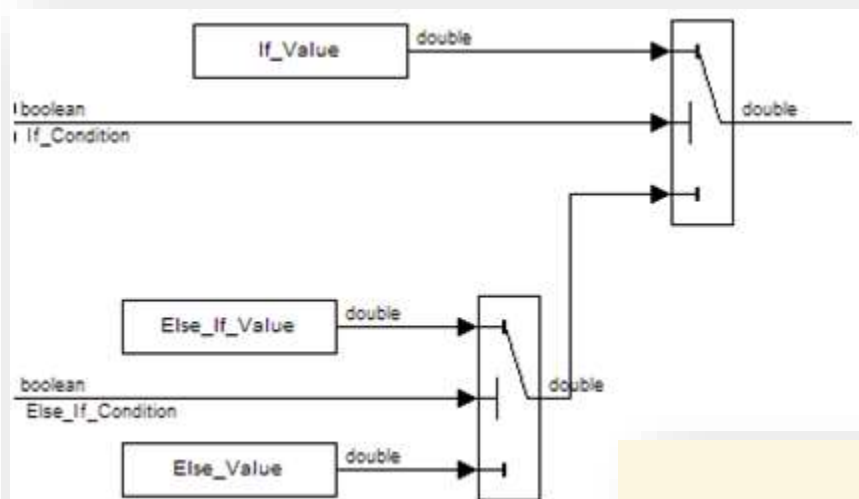
- Is it possible to select a single modeling pattern from the set of options as a general rule?
- Is it possible to specify a general modeling style as a collection of unique patterns?

## □ Approach

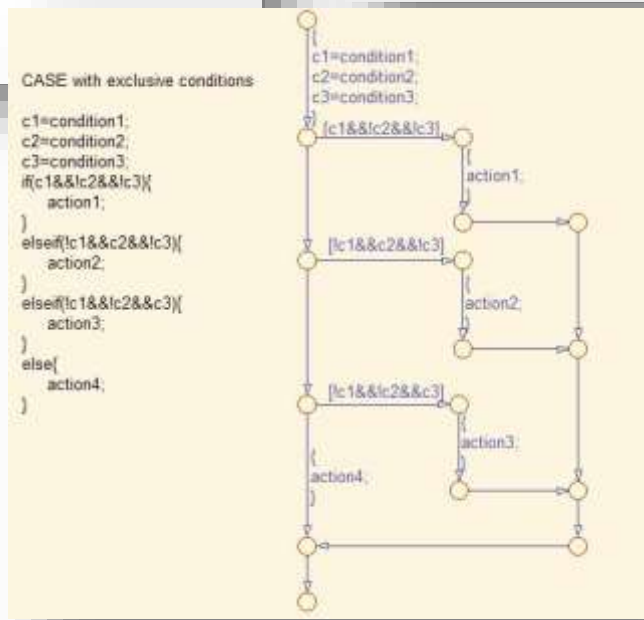
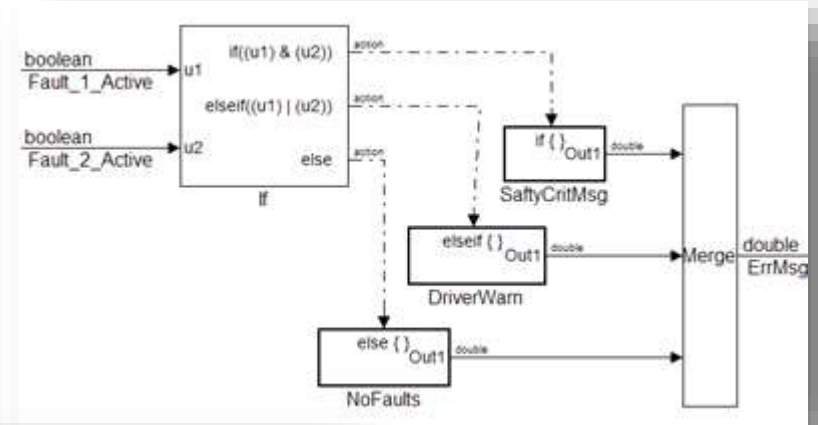
- Let us discuss multiple pattern variants regarding
  - a) Equality of expressiveness
  - b) Constraints of ease of use
  - c) General applicability
  - d) Impact on generated code



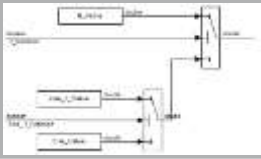
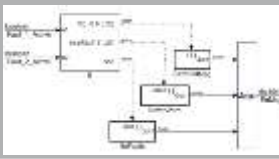

## Switch



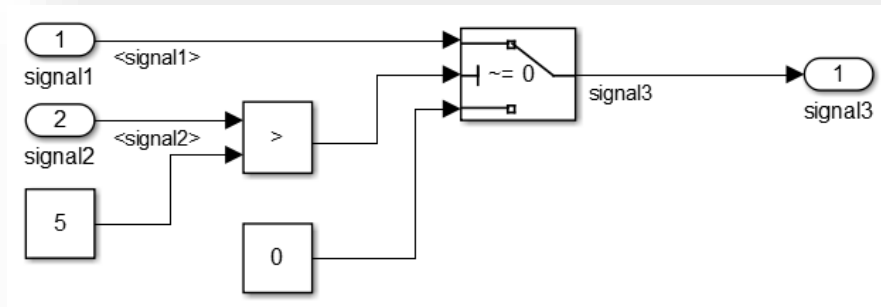
## If



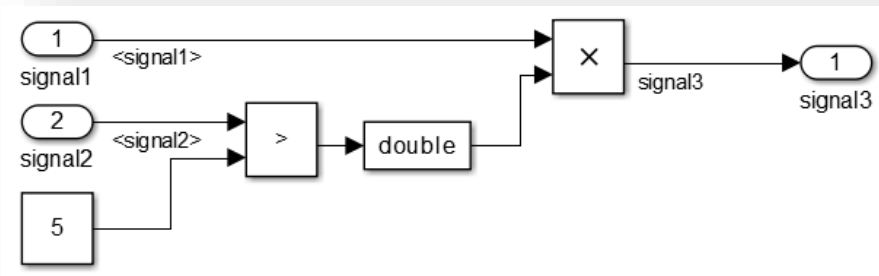
Flowchart

	Switch 	If 	Flowchart 
Equality of expressiveness	equal	equal	equal
Constraints of ease of use	Only for easy constructs		additional definitions of Inputs and Outputs
General applicability		useful for multiple outputs structural	easier for complex input constructs
Impact on generated code			higher memory (if DD variables are not defined in PM)

## Switch

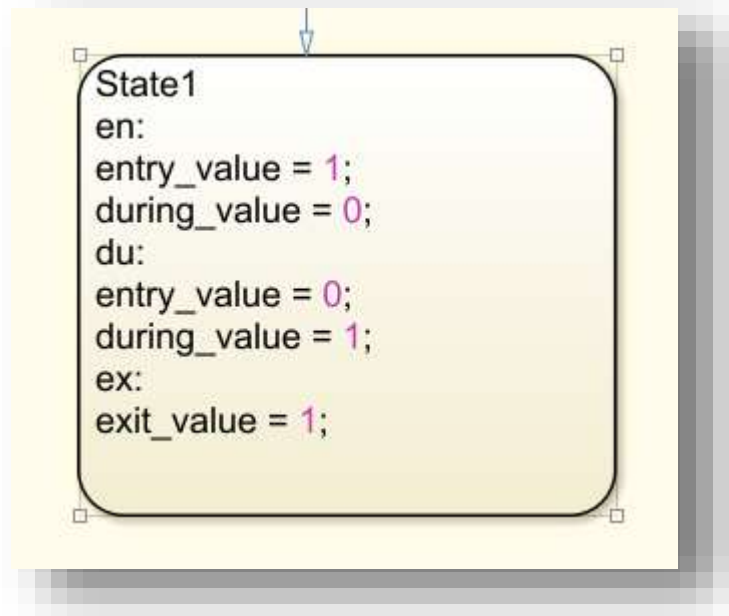


## Calculate

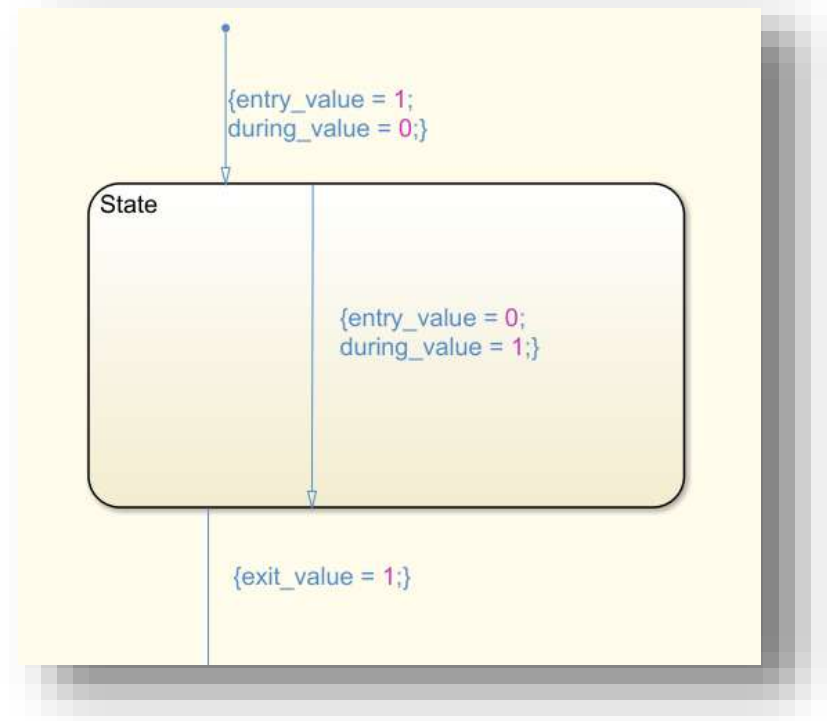


	Switch	Calculate
Equality of expressiveness		
Constraints of ease of use	readability, maintainability	
General applicability	Defensive implementation technique	Risk of wrong casting -> should be forbidden
Impact on generated code		multiplication is more time-consuming



State Actions

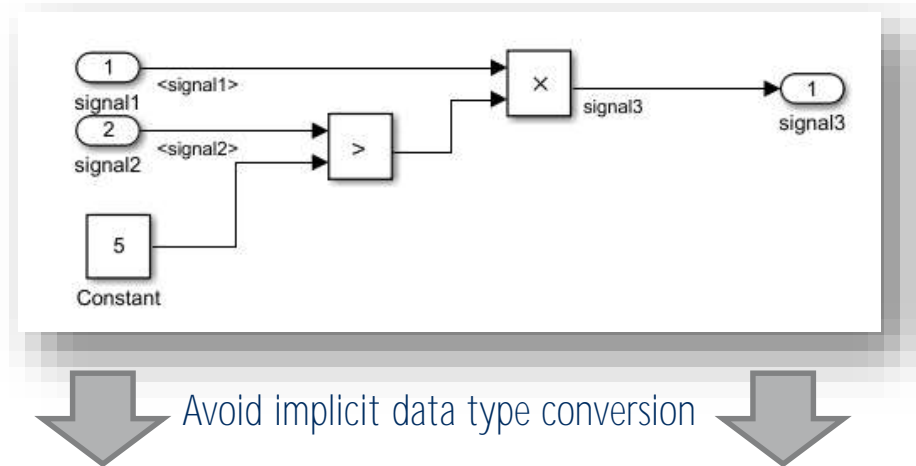


Transition Actions

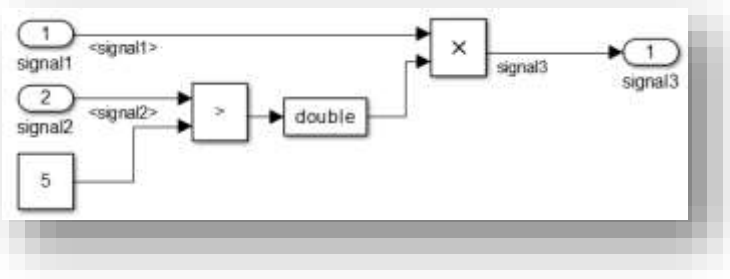




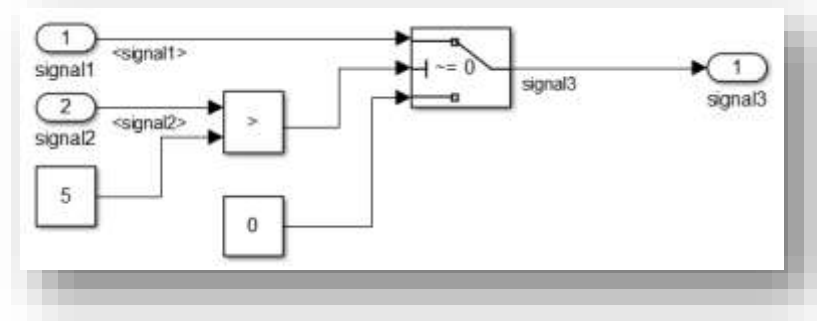
	State Actions 	Transition Actions 
Equality of expressiveness	no conditional expressions	mix conditions and actions
Constraints of ease of use		
General applicability		readability, use a defined pattern to model 'during actions' with transitions
Impact on generated code		

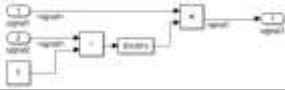
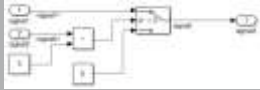


Explicit Data Type Conversion

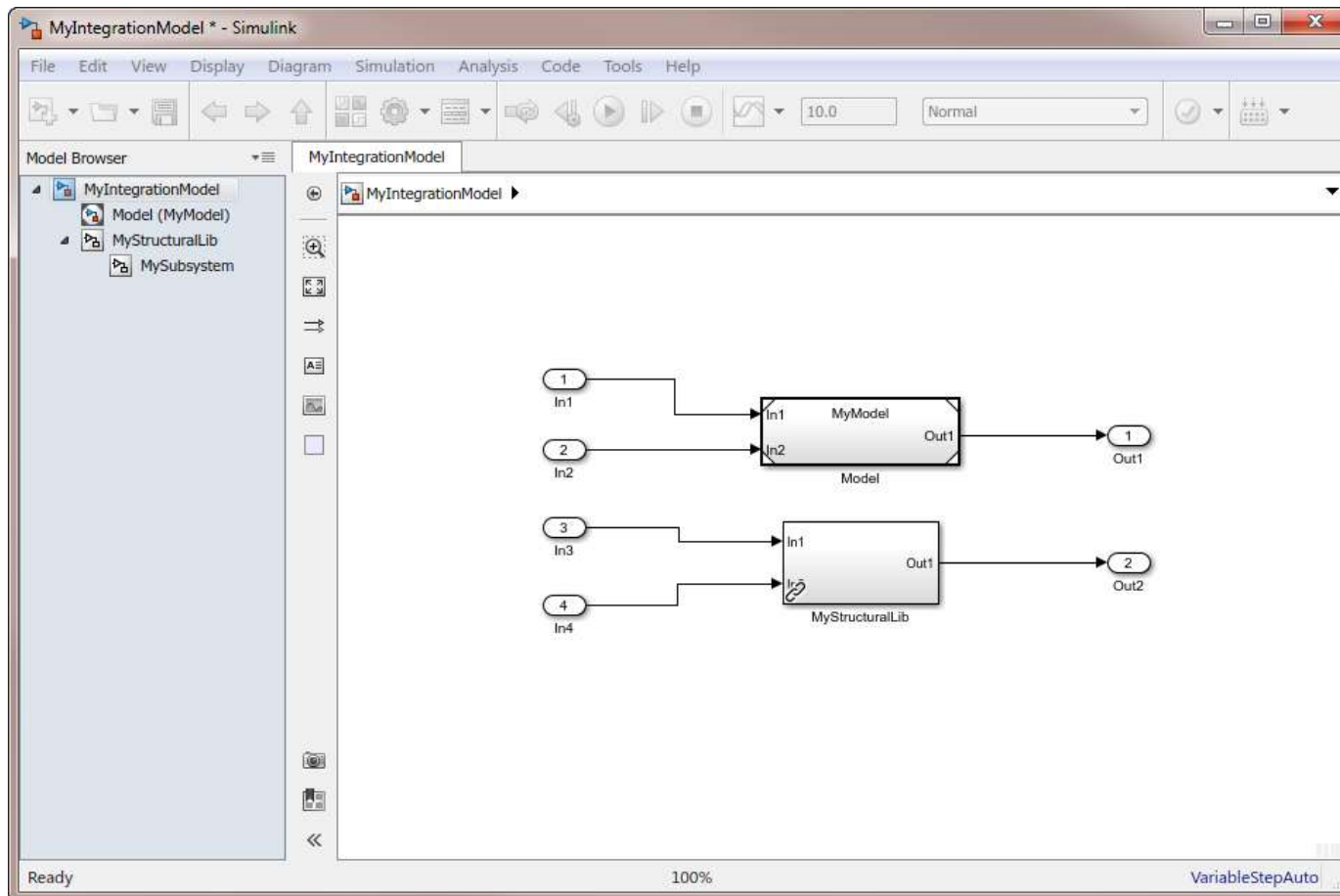


Remodeling



	Explicit Data Type Conversion	Remodeling
		
Equality of expressiveness		not always possible, e.g for reuse of lib blocks of specific type
Constraints of ease of use		
General applicability		In this case better, because no data type conversion
Impact on generated code	data type conversion produces more code	

- Structural Decomposition with libraries or referenced models



	Structural Libraries	Model References
Equality of expressiveness	too many differences lead to inequality	
Constraints of ease of use		
General applicability	for reuse of smaller portions of algorithms, to support reuse signal type & name inheritance feasible	the bigger the subsystem is the more likely to use a model reference, e.g. to partition work supports multiple simulation modes per subsystem leading to faster simulation
Impact on generated code		

- Is a modeling style consisting of a set of single patterns feasible?



- Tuesday, January 23, 2018  
3:00 pm CET (Berlin)  
9:00 am EST (Detroit)                      10:00 pm CST (Beijing)  
7:30 pm IST (Bangalore)                      11:00 pm JST (Tokyo)



- Link to Event:  
<https://model-engineers-event-en.webex.com/model-engineers-event-en/onstage/g.php?MTID=e53d8283d9f40c67d55113e2c00a4b145>



## MES USER CONFERENCE 2018 - „MBD TOOL CHAIN FOR AGILE DEVELOPMENT” OCTOBER 11 - 12, 2018

- Venue: Umspannwerk Ost, Palisadenstraße 48, 10243 Berlin (Germany)
- Registration fee: € 220
- Limited number of participants, please register in advance by September 20, 2018

We look forward to welcoming you!





## MES SUMMER SCHOOL ON INTRODUCTION TO MODEL-BASED DEVELOPMENT JUNE 11 - 15, 2018

- Venue: Michelberger Hotel, Warschauer Str. 39-40, 10243 Berlin (Germany)
- Registration fee: € 2,950, incl. full board, hotel, and leisure program in Berlin
- Limited number of participants, please register in advance by May 29, 2018



## MODEL ENGINEERING SOLUTIONS GMBH

Waldenserstraße 2 - 4  
10551 Berlin  
Germany

T: +49 30 2091 6463-0  
F: +49 30 2091 6463-33  
info@model-engineers.com  
www.model-engineers.com

