ACTIVE SIMULATION

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Basic description

- Allows model execution of state machines, activities, interactions and parametrics
- Execution can occur along simulated time

Why do this?

- To validate the model by simulating triggers and seeing whether the modelled system responds as intended

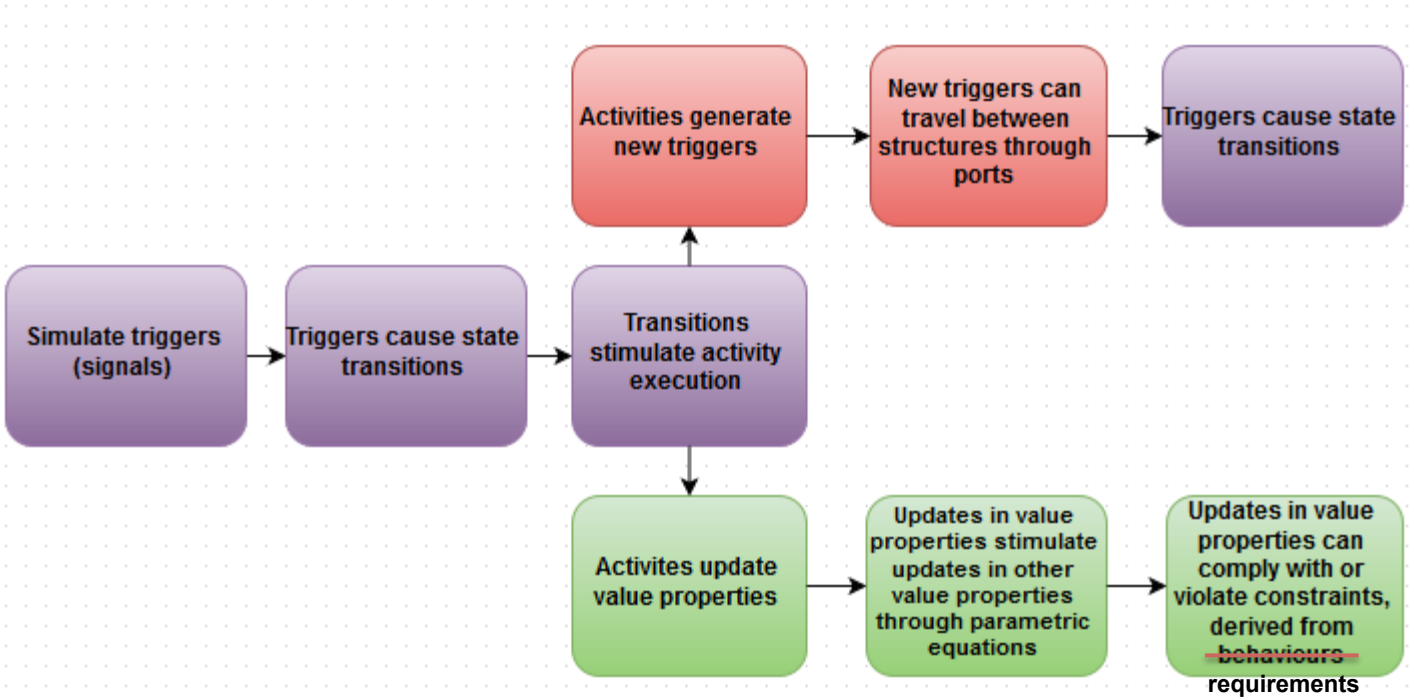
Caveat

- Only a subset of SysML elements is supported

Tool

- Cameo Simulation Toolkit
  - An package that needs to be bought and used in addition to Cameo Systems Modeller

Process logic (a 'non-exhaustive' description)

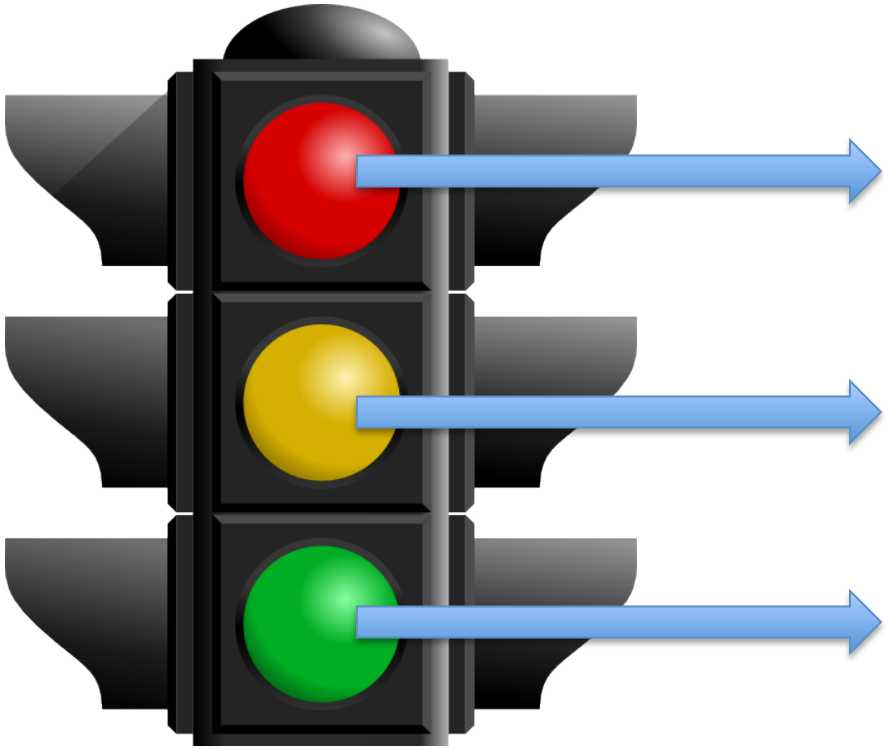


Example 1- Description (not in model)

1. A telescope operator changes several administrative states for a Dish
2. INFRA detects strong winds, leading TM to put a Dish into a stow-lock state

Citation: Dish state machines (draft) by Corrie Taljaard

Execution colour key



An element that is currently being executed

The last visited element

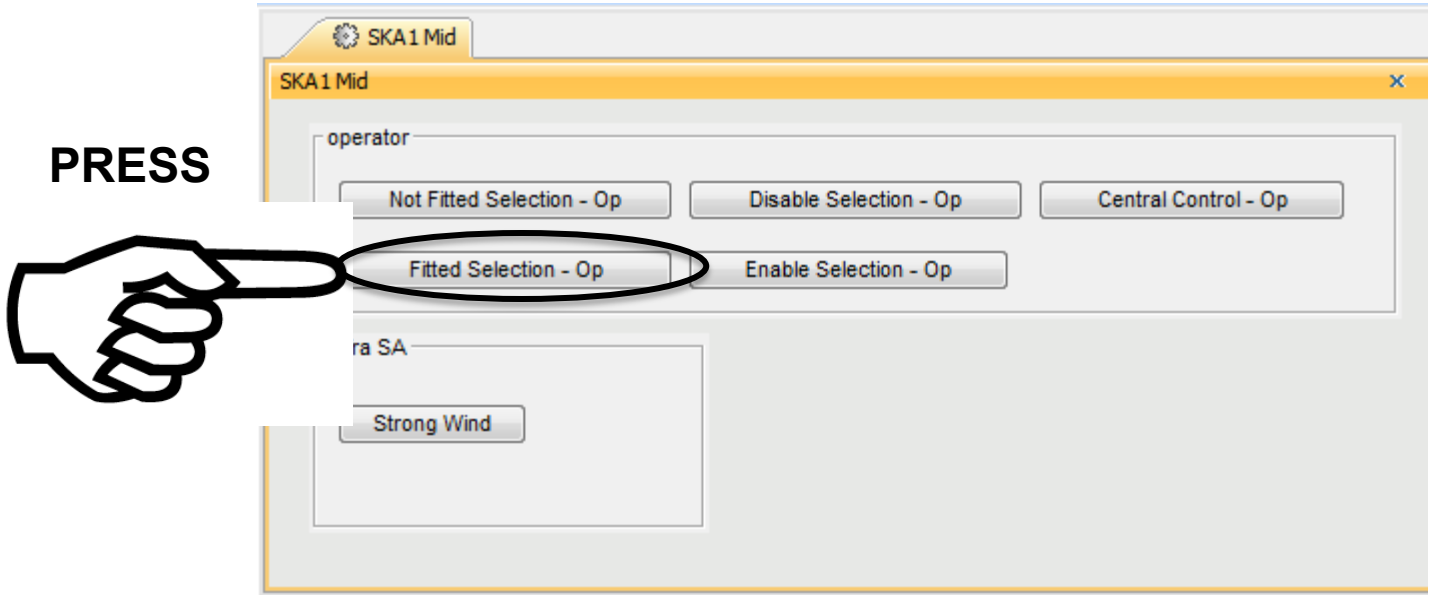
A visited element

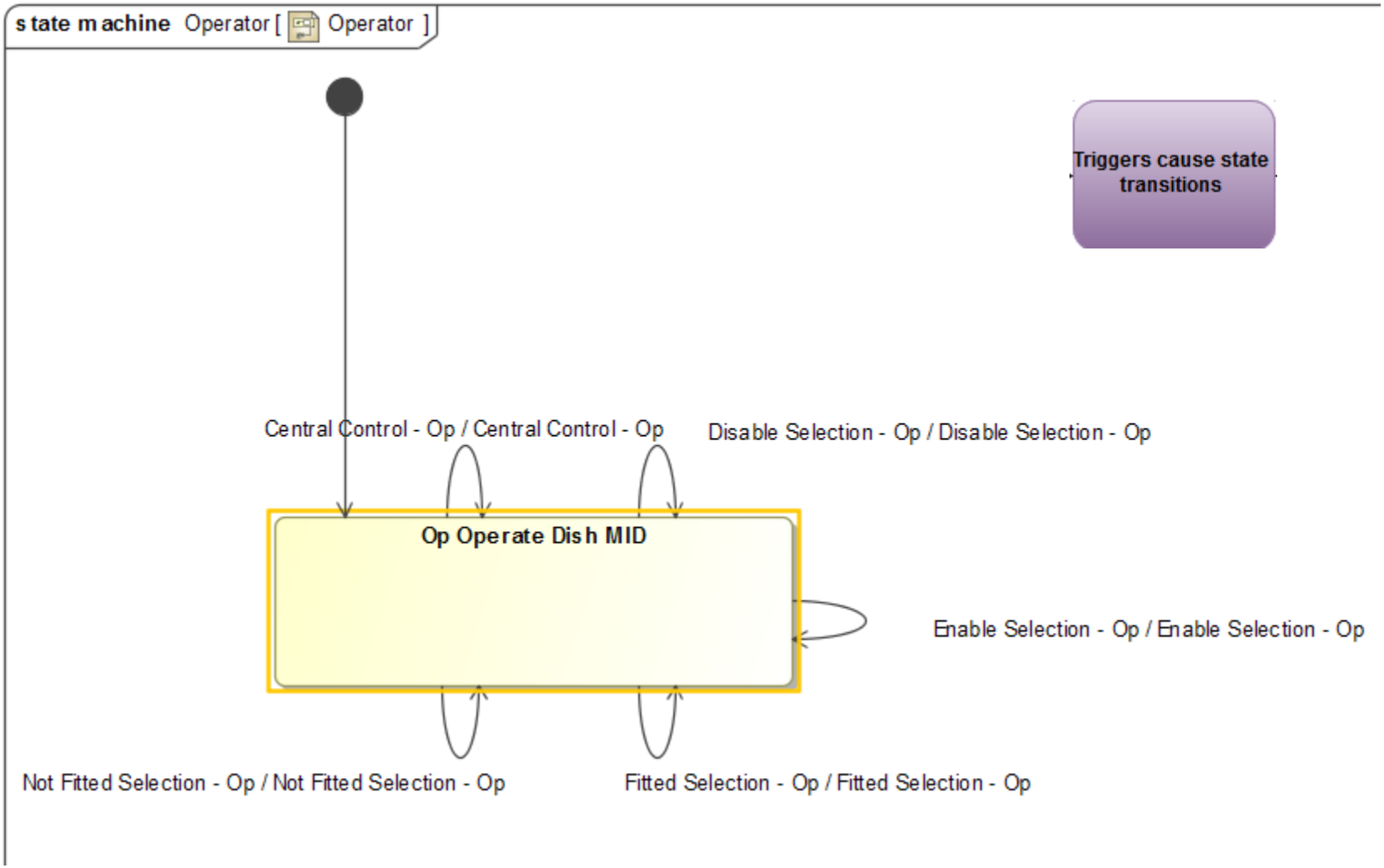
http://mynutratek.com/blog/

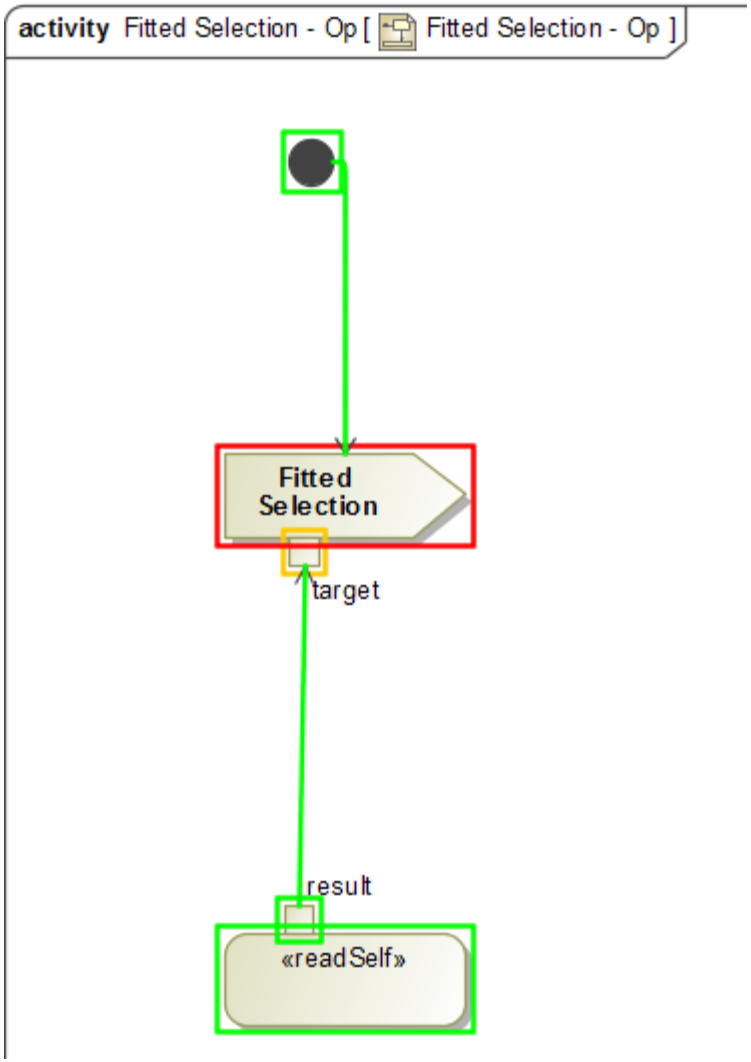
Execute!

Simulate triggers (signals)

PRESS

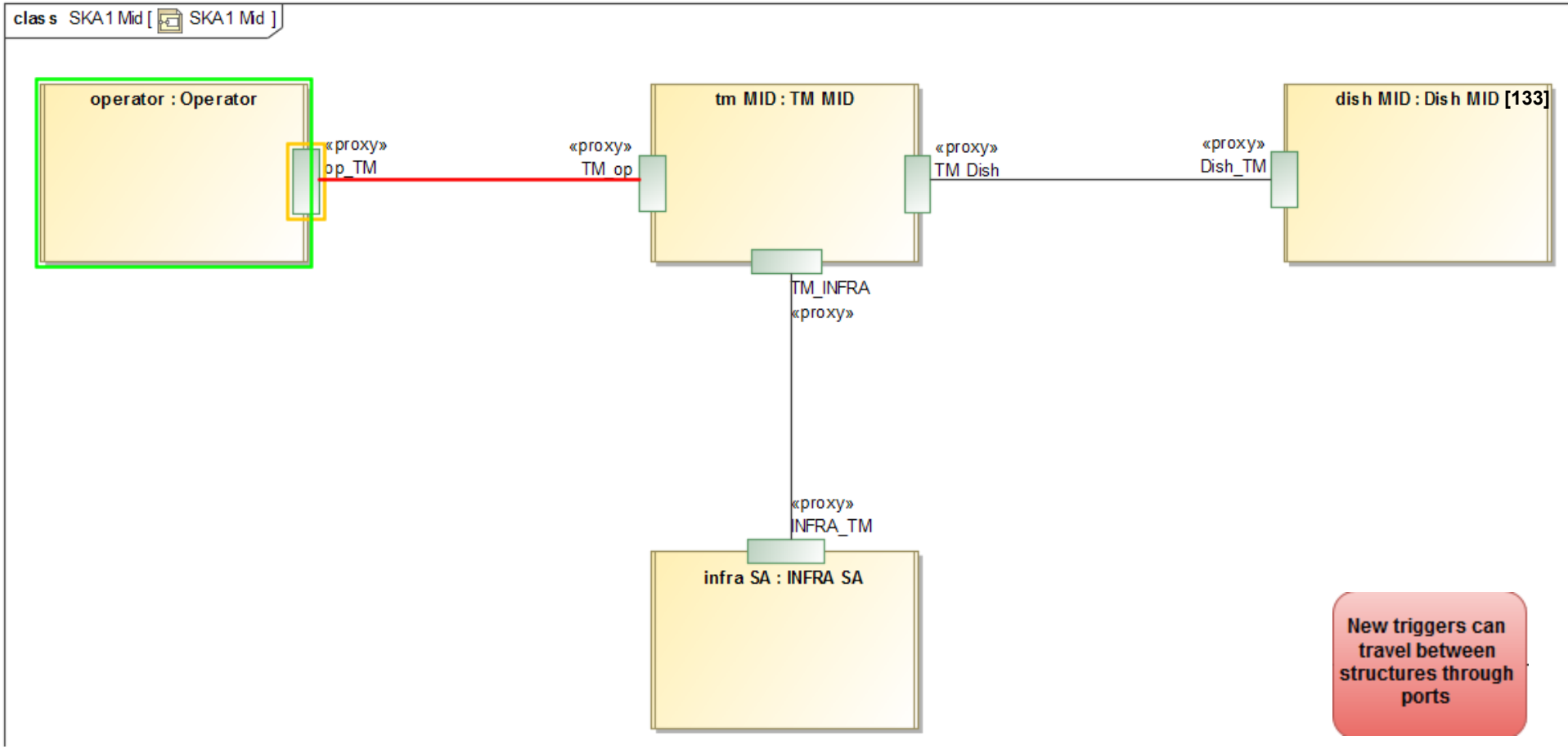



state machine Operator [Operator]
Triggers cause state transitions
Central Control - Op / Central Control - Op
Disable Selection - Op / Disable Selection - Op
Op Operate Dish MID
Enable Selection - Op / Enable Selection - Op
Not Fitted Selection - Op / Not Fitted Selection - Op
Fitted Selection - Op / Fitted Selection - Op



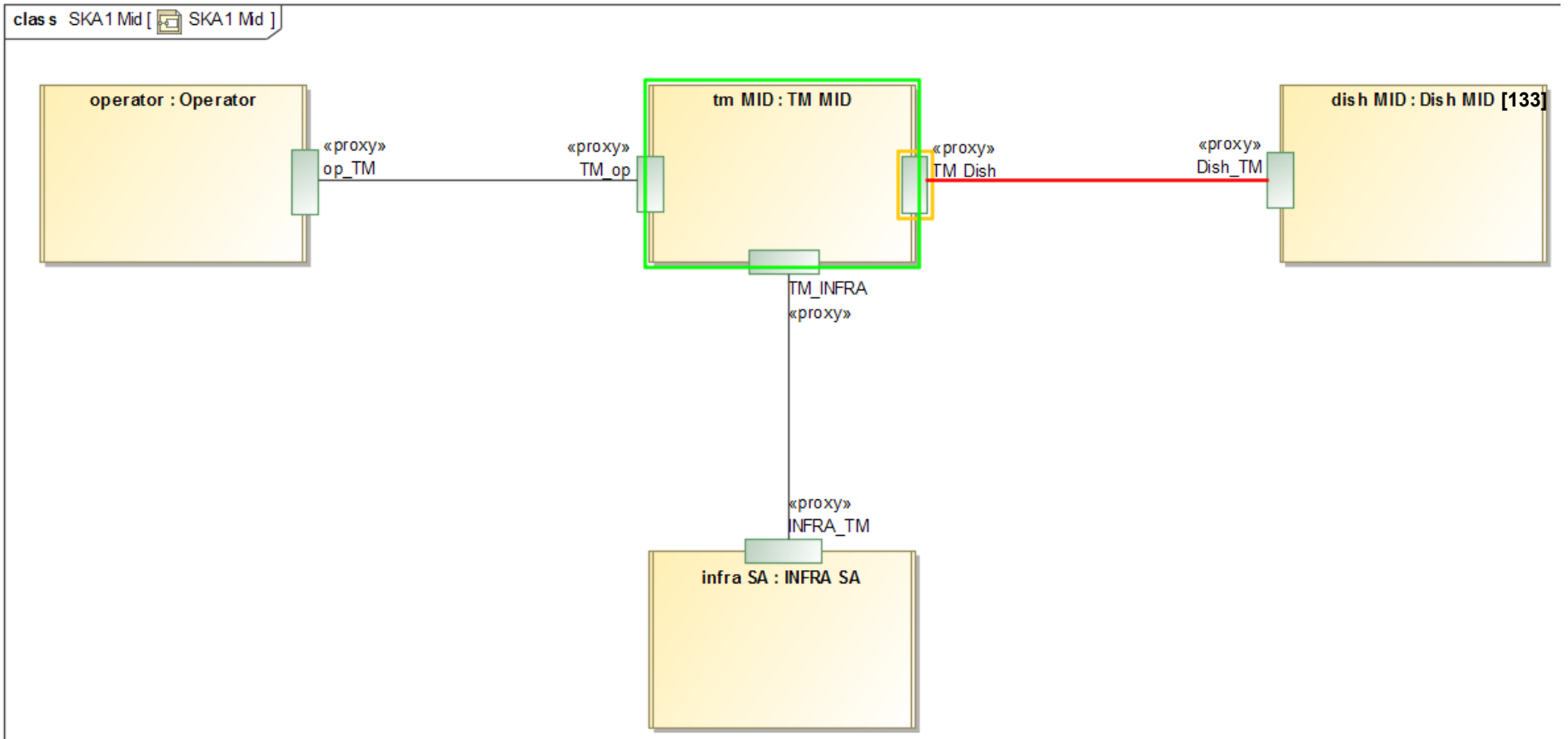
Activities generate new triggers

Transitions stimulate activity execution

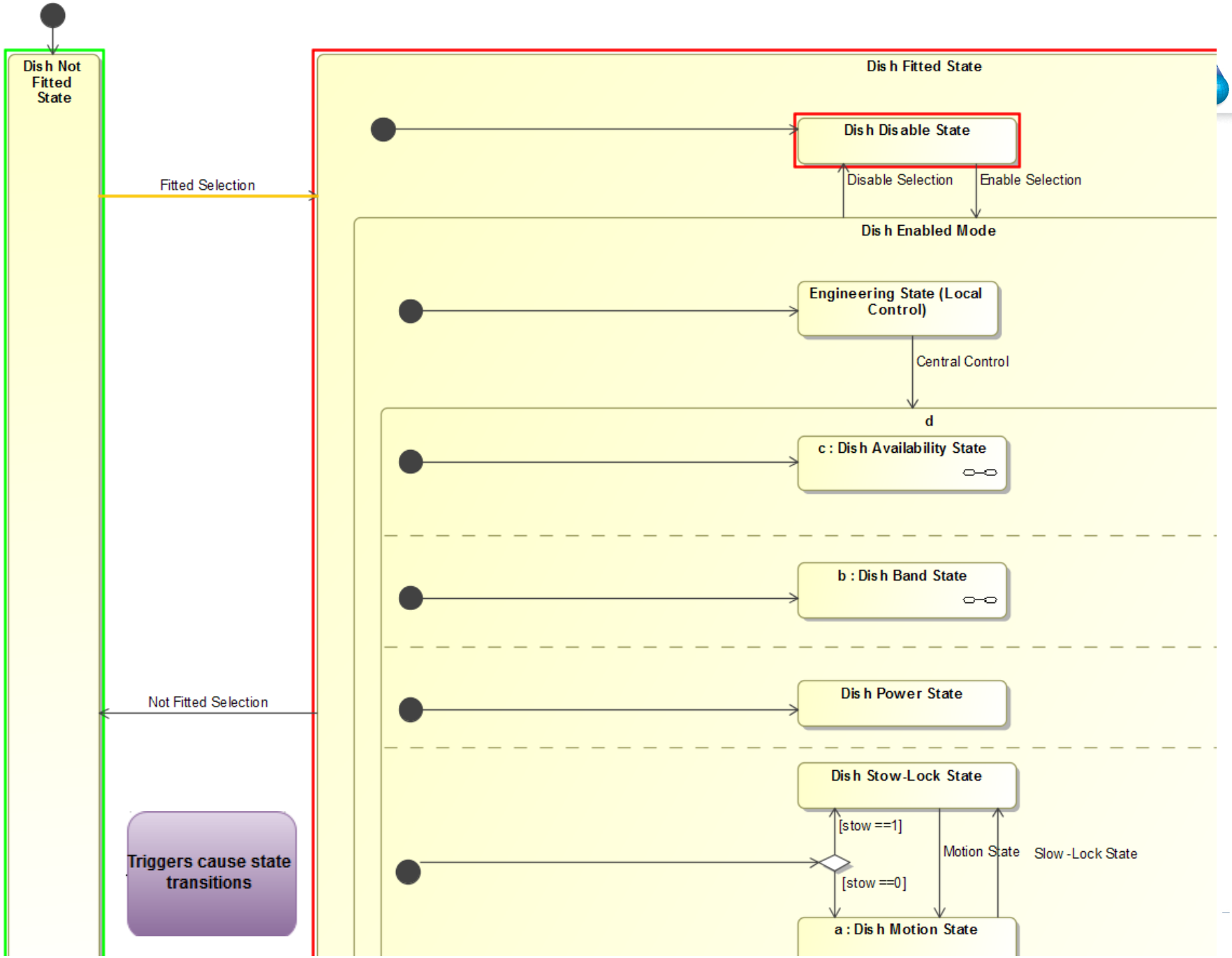

class SKA1 Mid [SKA1 Mid]
operator : Operator
«proxy»
op_TM
«proxy»
TM_op
tm MID : TM MID
«proxy»
TM Dish
«proxy»
Dish_TM
dish MID : Dish MID [133]
TM_INFRA
«proxy»
«proxy»
INFRA_TM
infra SA : INFRA SA
New triggers can travel between structures through ports

- A similar sequence occurs for the block ‘TM MID’, which also owns a state machine
- The triggers for each of its transitions are also linked to activities

This results in:



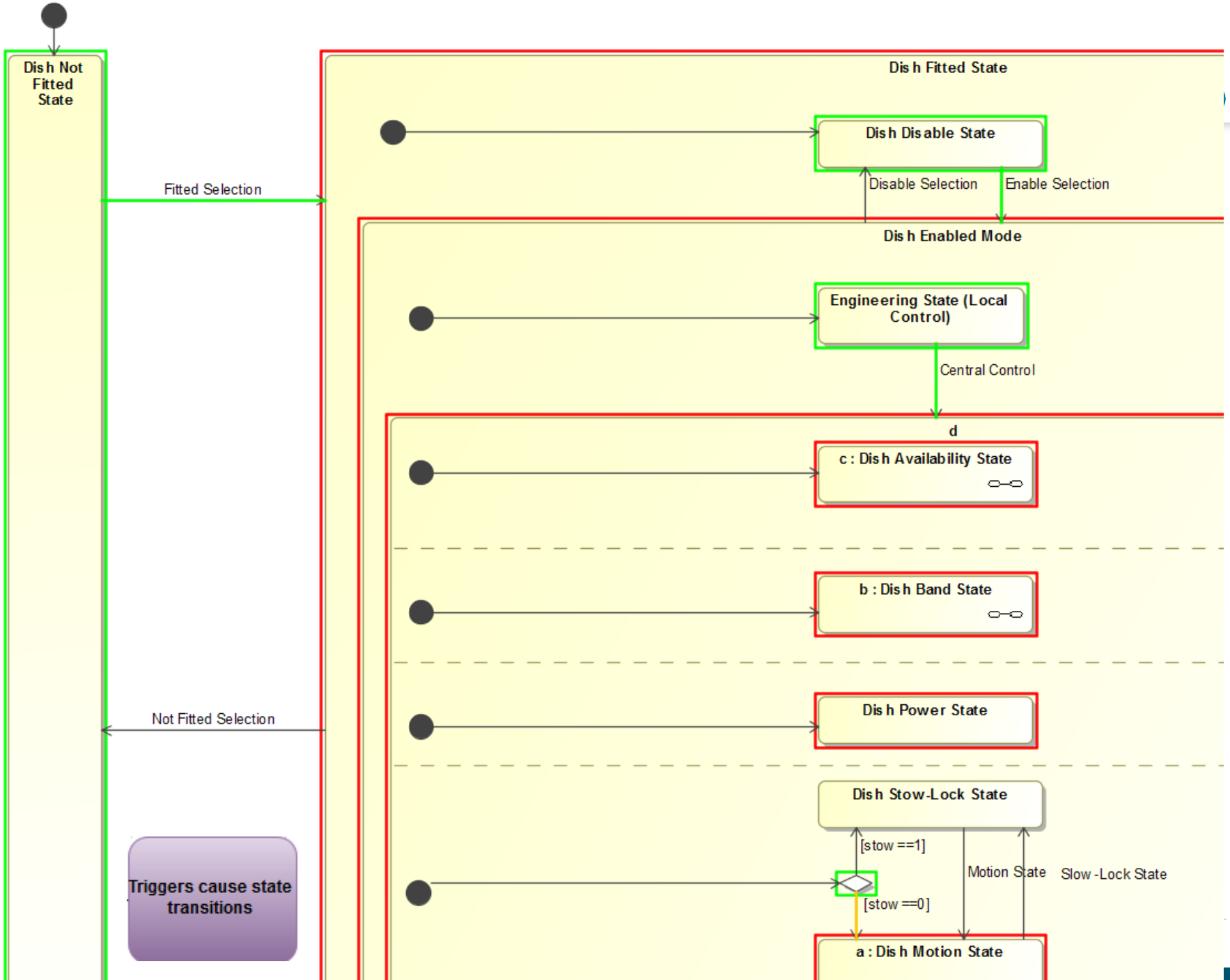
New triggers can travel between structures through ports

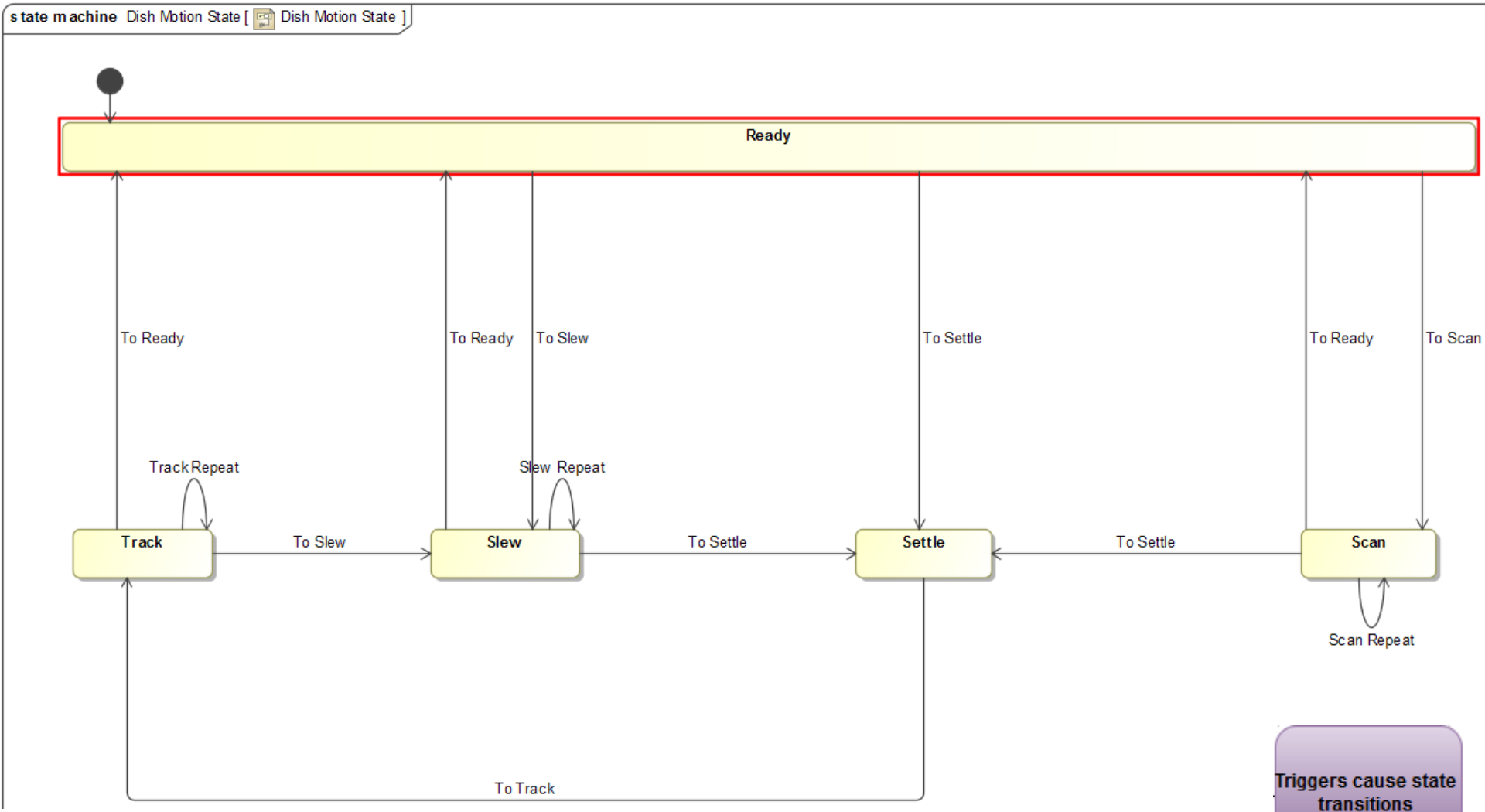

Dish Not Fitted State
Fitted Selection
Not Fitted Selection
Triggers cause state transitions
Dish Fitted State
Dish Disable State
Disable Selection
Enable Selection
Dish Enabled Mode
Engineering State (Local Control)
Central Control
d
c : Dish Availability State
b : Dish Band State
Dish Power State
Dish Stow-Lock State
[stow ==1]
[stow ==0]
Motion State
Slow -Lock State
a : Dish Motion State

The sequence of triggers:

‘Enable Selection – Op’ → ‘Central Control – Op’

results in:


Dish Not Fitted State
Fitted Selection
Not Fitted Selection
Triggers cause state transitions
Dish Fitted State
Dish Disable State
Disable Selection
Enable Selection
Dish Enabled Mode
Engineering State (Local Control)
Central Control
d
c : Dish Availability State
b : Dish Band State
Dish Power State
Dish Stow-Lock State
[stow ==1]
[stow ==0]
Motion State
Slow -Lock State
a : Dish Motion State



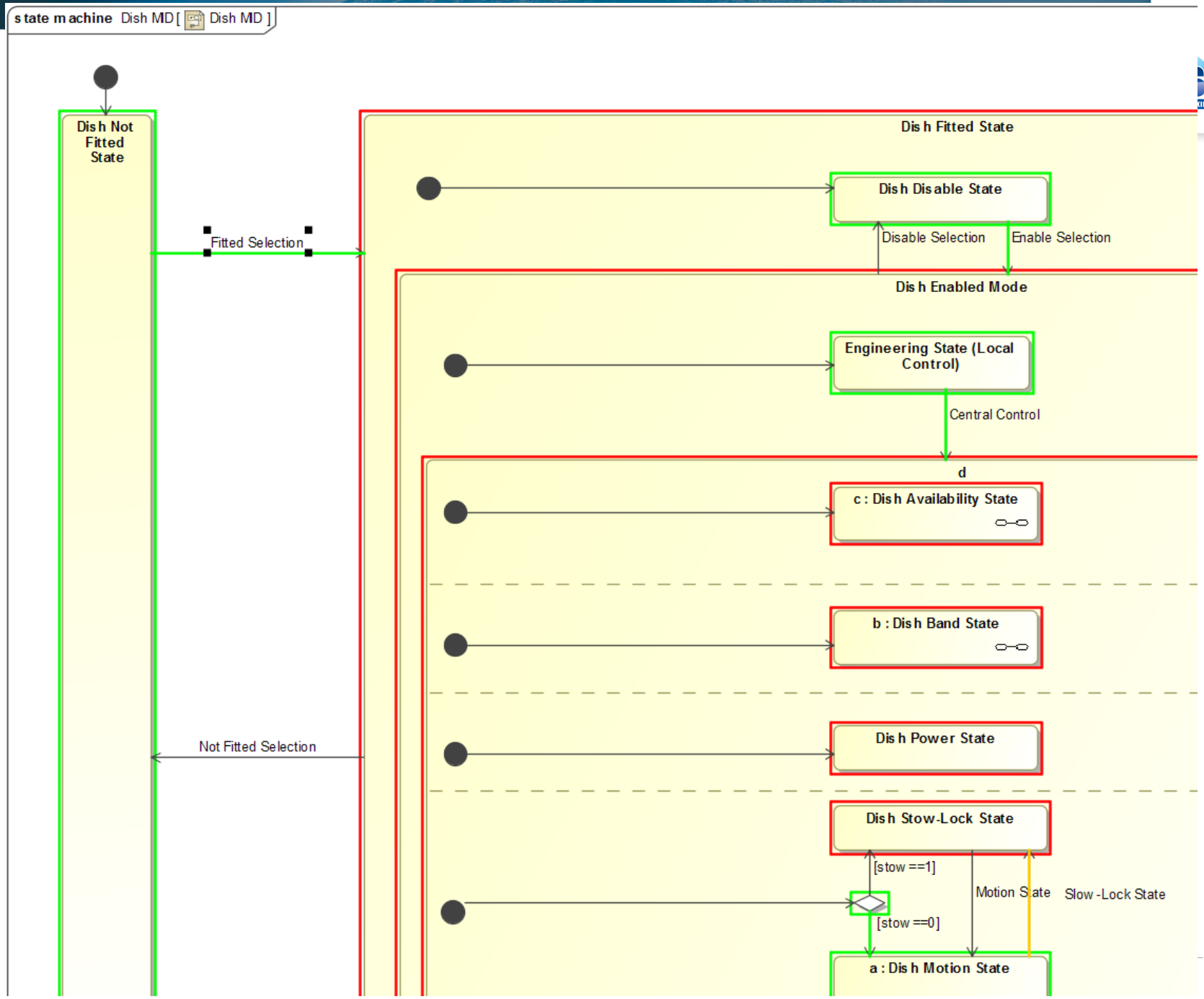
Triggers cause state transitions

Then. The trigger:

‘Strong Wind’

results in an interaction between the blocks ‘INFRA SA’, TM MID’, and ‘DISH MID’

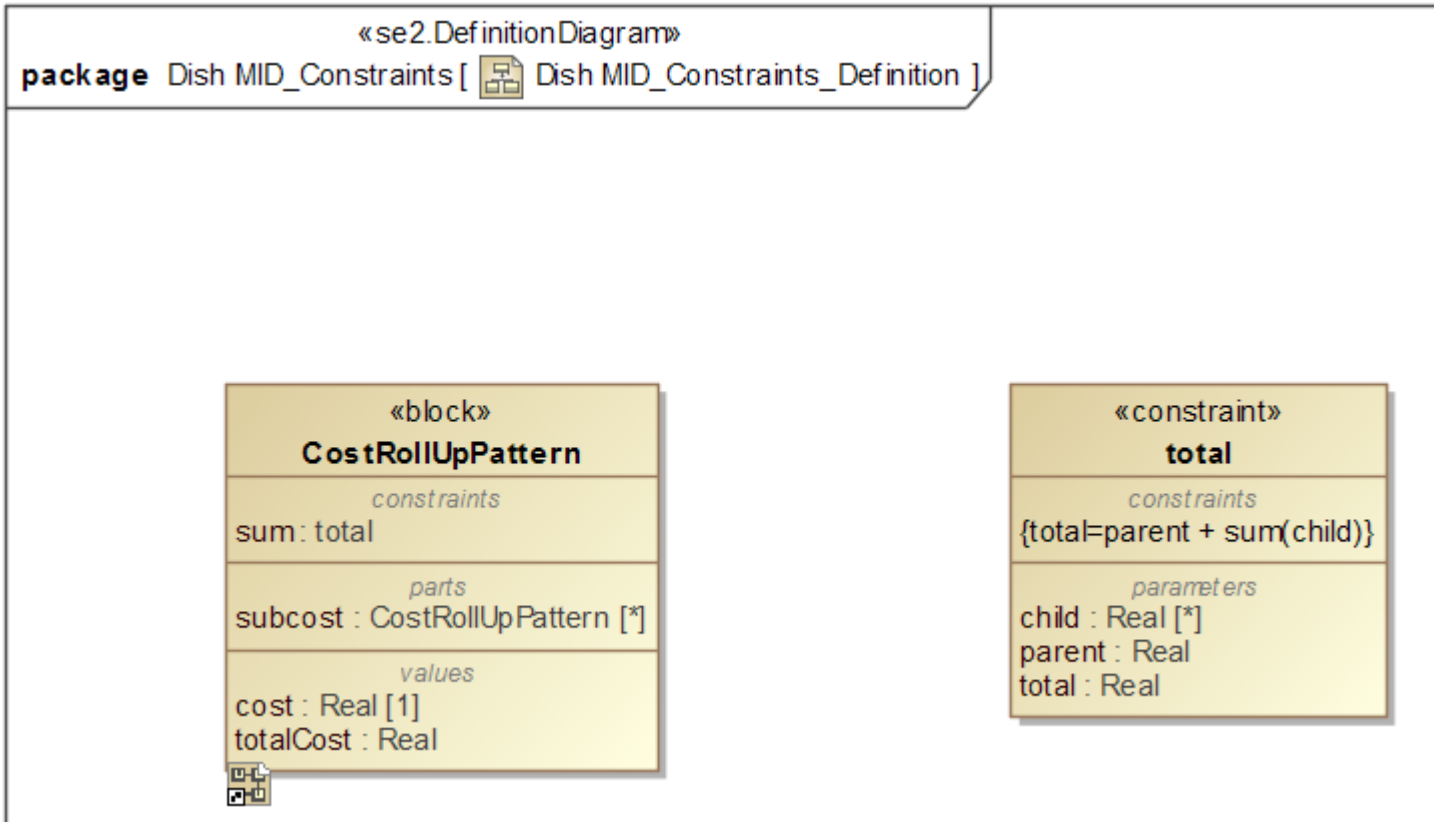
which results in:


state machine Dish MD [Dish MD]
Dish Not Fitted State
Fitted Selection
Not Fitted Selection
Dish Fitted State
Dish Disable State
Disable Selection
Enable Selection
Dish Enabled Mode
Engineering State (Local Control)
Central Control
d
c : Dish Availability State
b : Dish Band State
Dish Power State
Dish Stow-Lock State
[stow ==1]
[stow ==0]
Motion State
Slow -Lock State
a : Dish Motion State

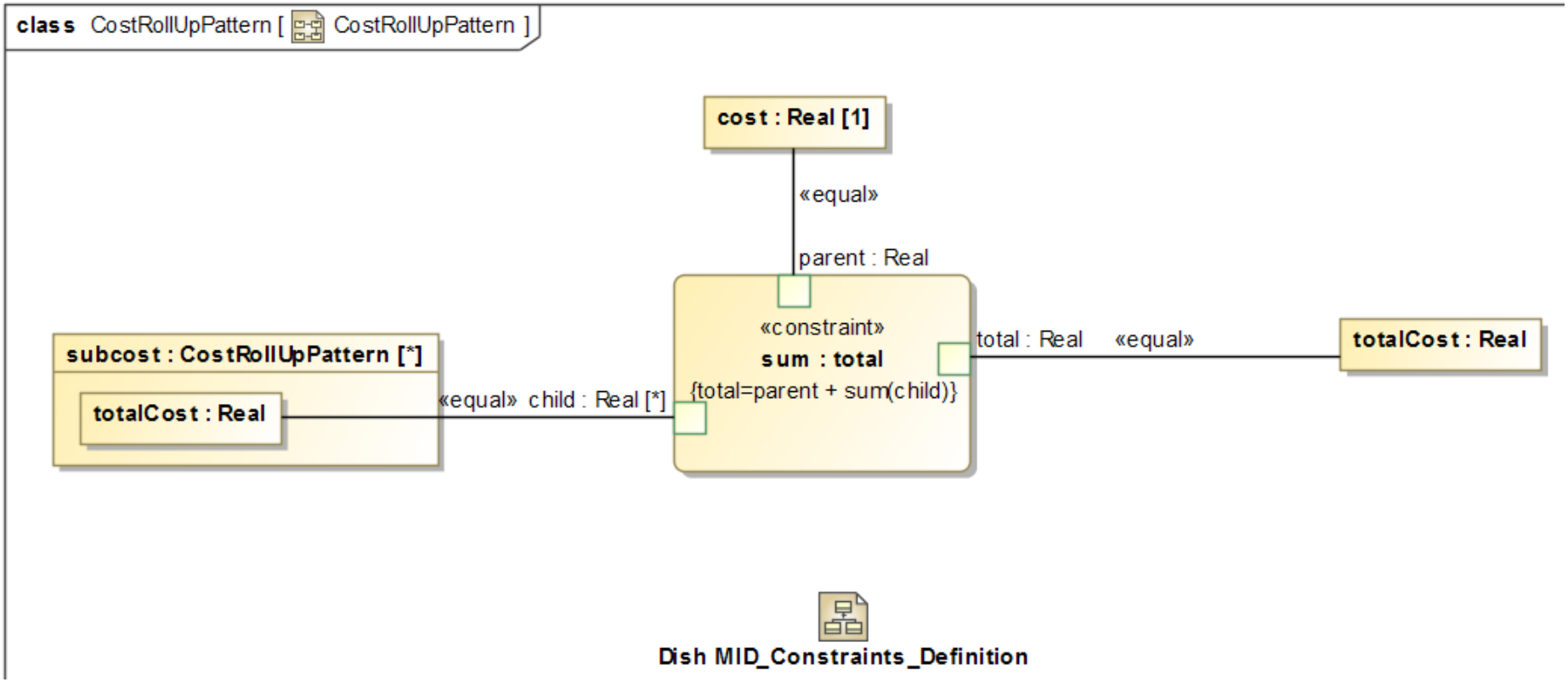
Example 2 (not in model)

- While the Dish is in stow-lock state, a systems engineer decides to do a cost rollup
- The systems engineer does this as follows:

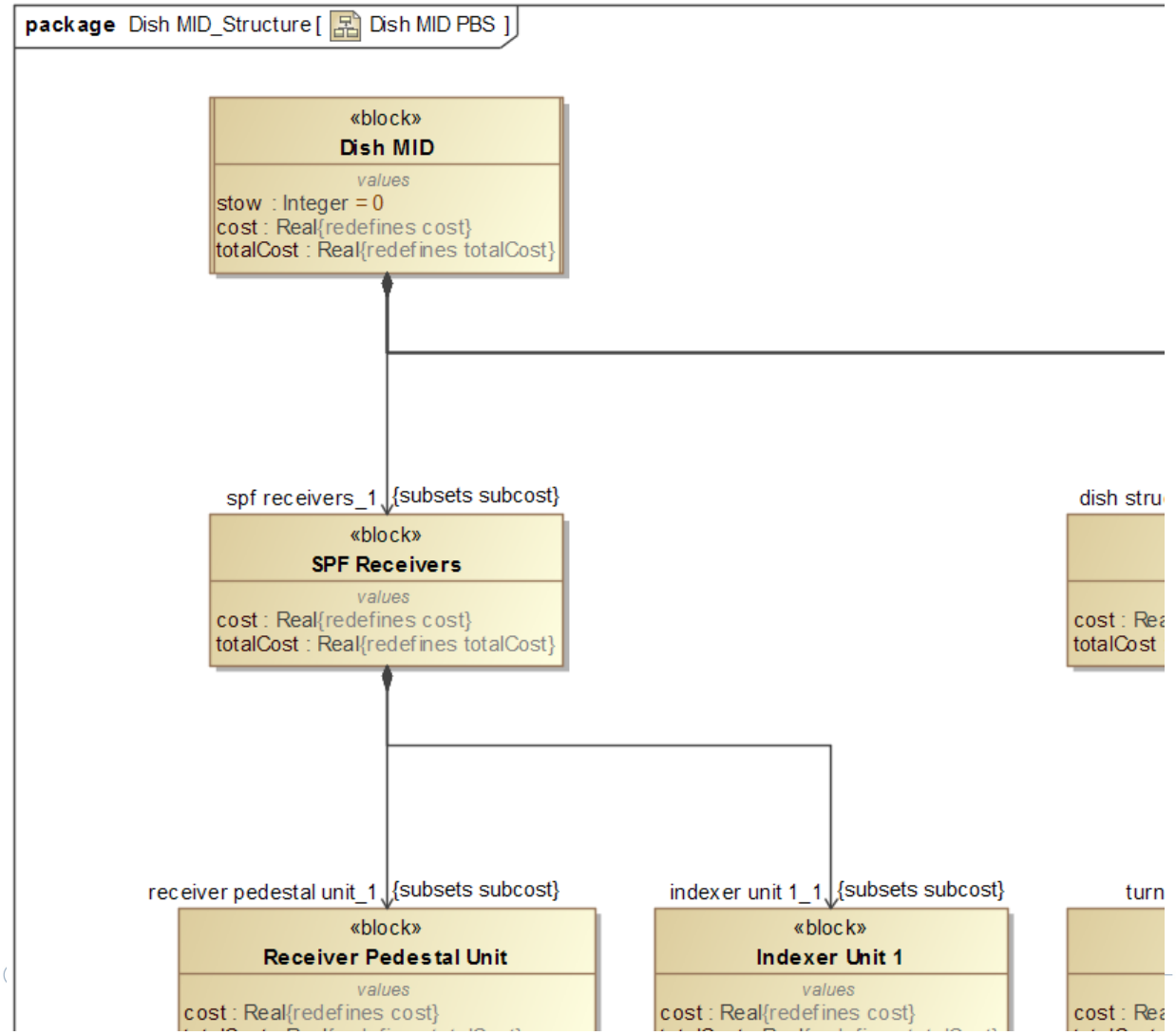
- A reasoning pattern is defined by first creating a specific block and constraint block pair



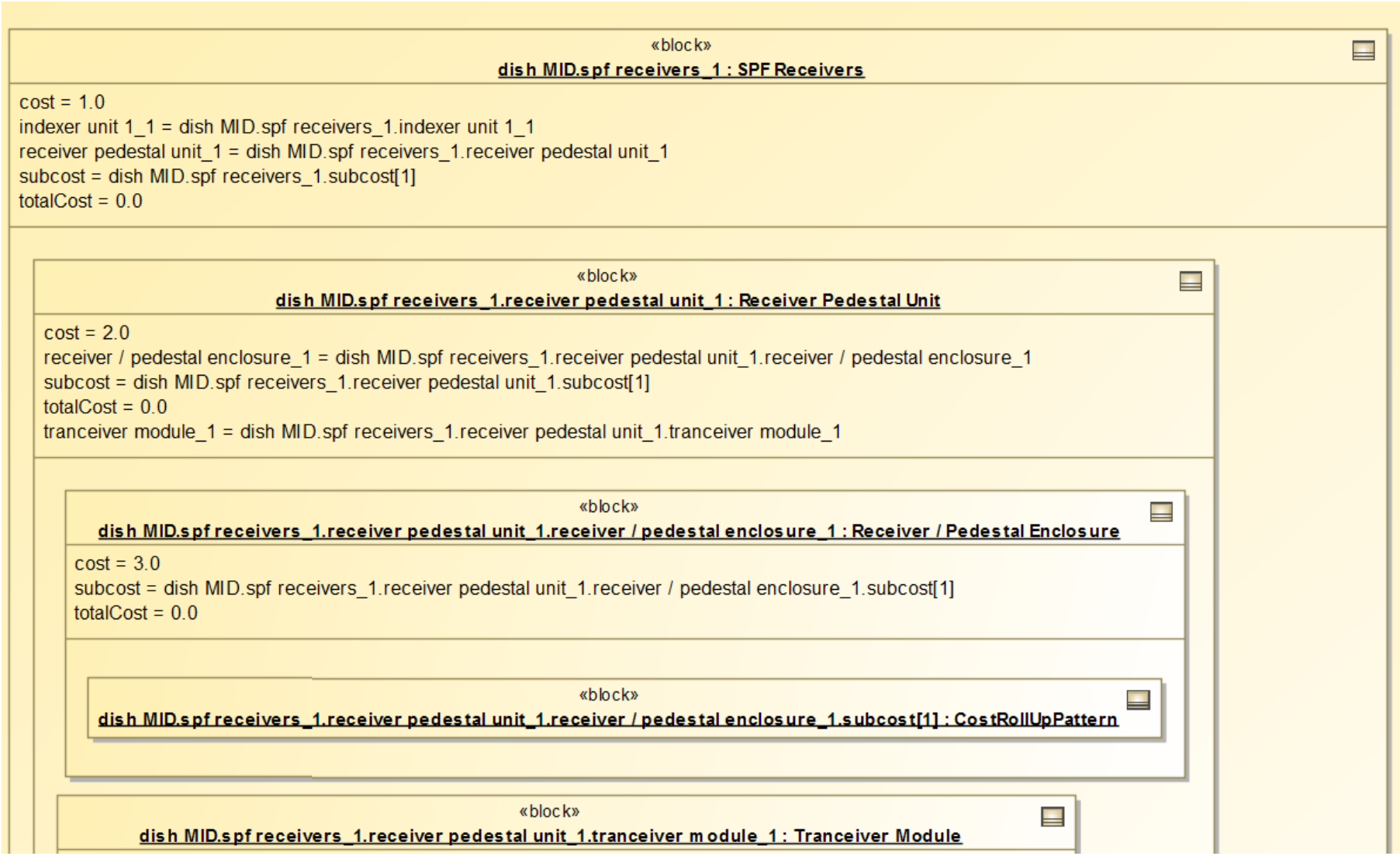
- A parametric diagram is then used to relate these two blocks



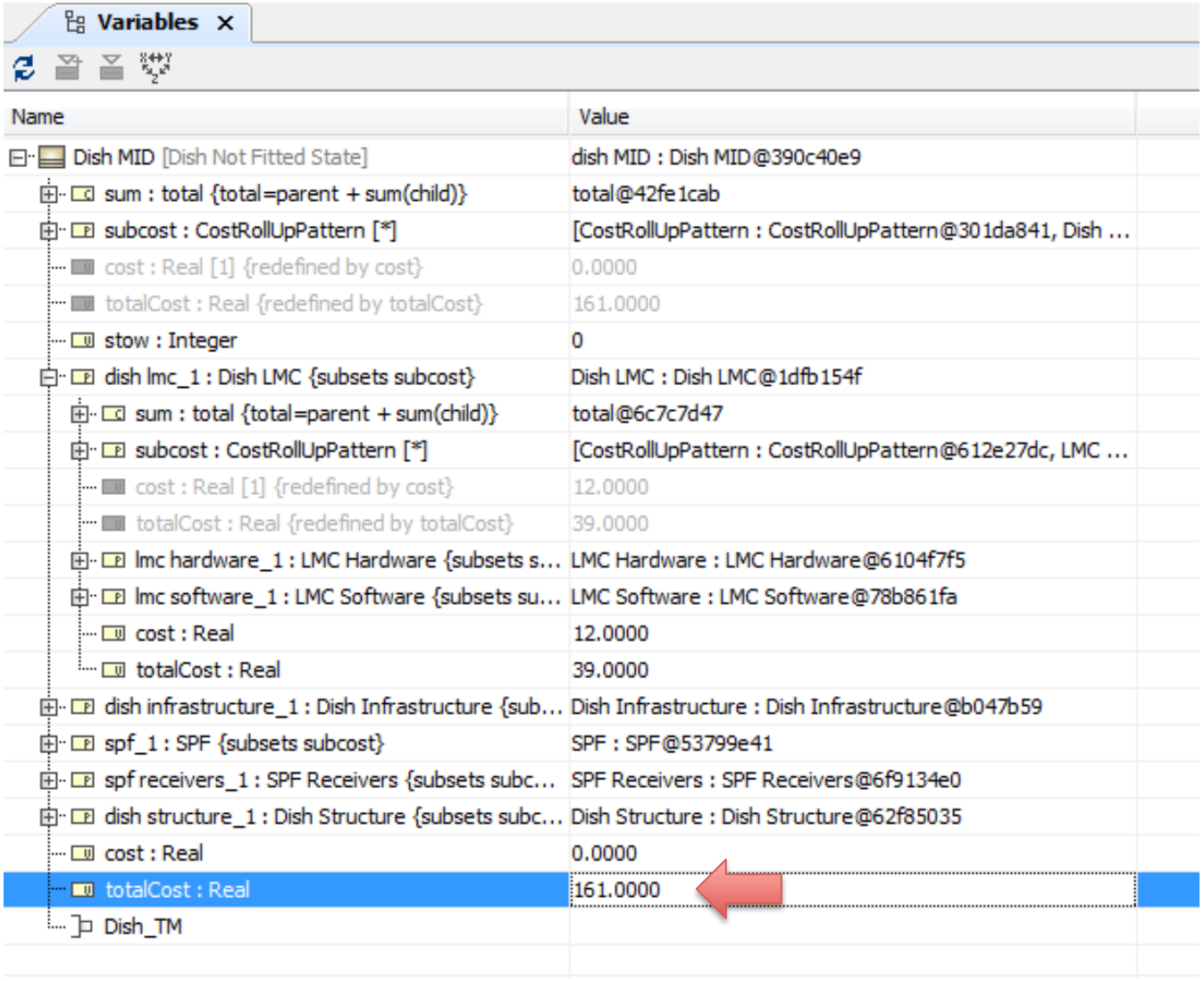
- A PBS is then created, and the reasoning pattern is applied to this PBS



- An instance of this PBS is generated and cost values are specified for all component instances



- Lastly, execute!



"We've done a computer simulation of your projected performance in five years. You're fired."

THANK YOU