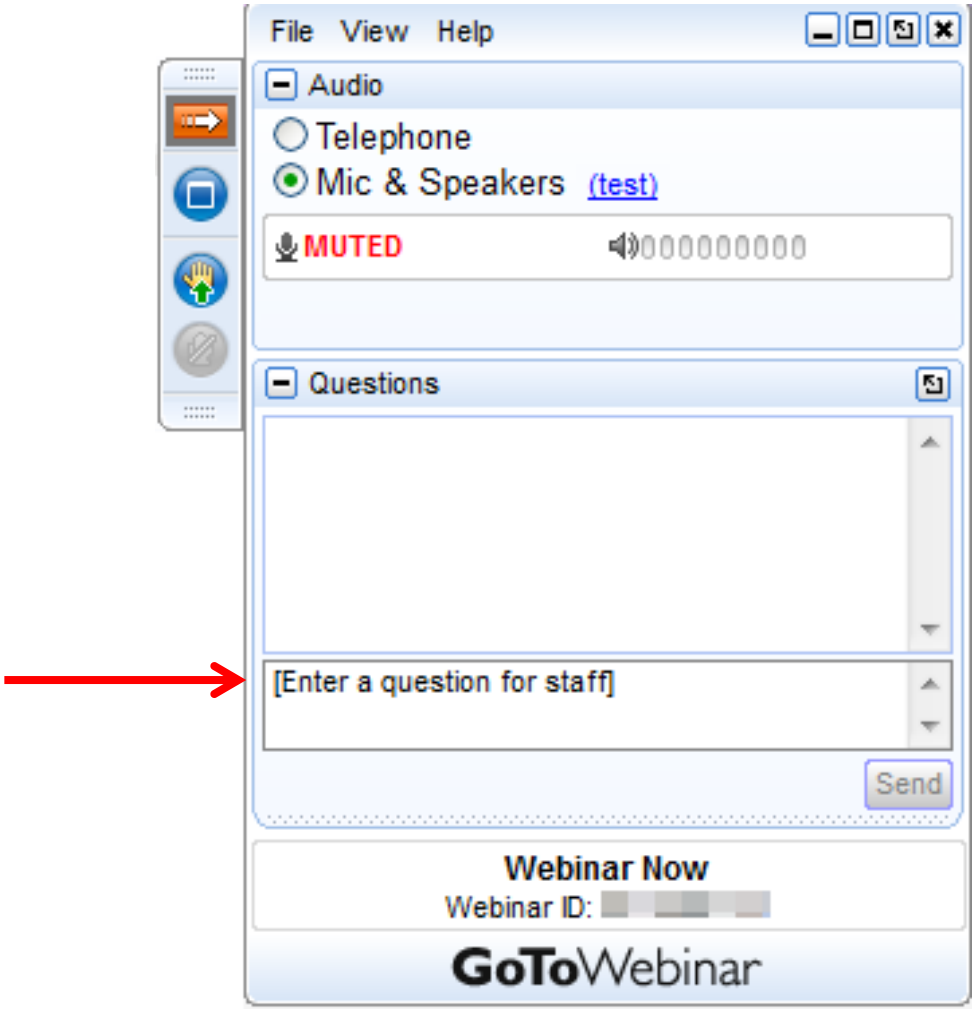
Total mass, cost, and power rollups webinar

Žilvinas Strolia, 2016 October

Q&A: Type your questions here



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Outline

- Rollup analysis definition
- Typical problems and No Magic solutions
- How to apply Rollup Pattern in the tool
- Questions & Answers

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What is Rollup Analysis?

- Rollup calculations are among common use cases in systems engineering.
- Starting with a multi-level bill of materials or master equipment list, systems engineers want to calculate total mass, total cost, or any system metric in general, based on the individual values of all the parts in the system.

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Rollup Types

- Static rollup – systems parameters are static and they do not change during system operation. As an example could be system cost, mass.

- Dynamic rollup – systems parameters are dynamic and they change after the change of system behavior. As an example could power consumption.

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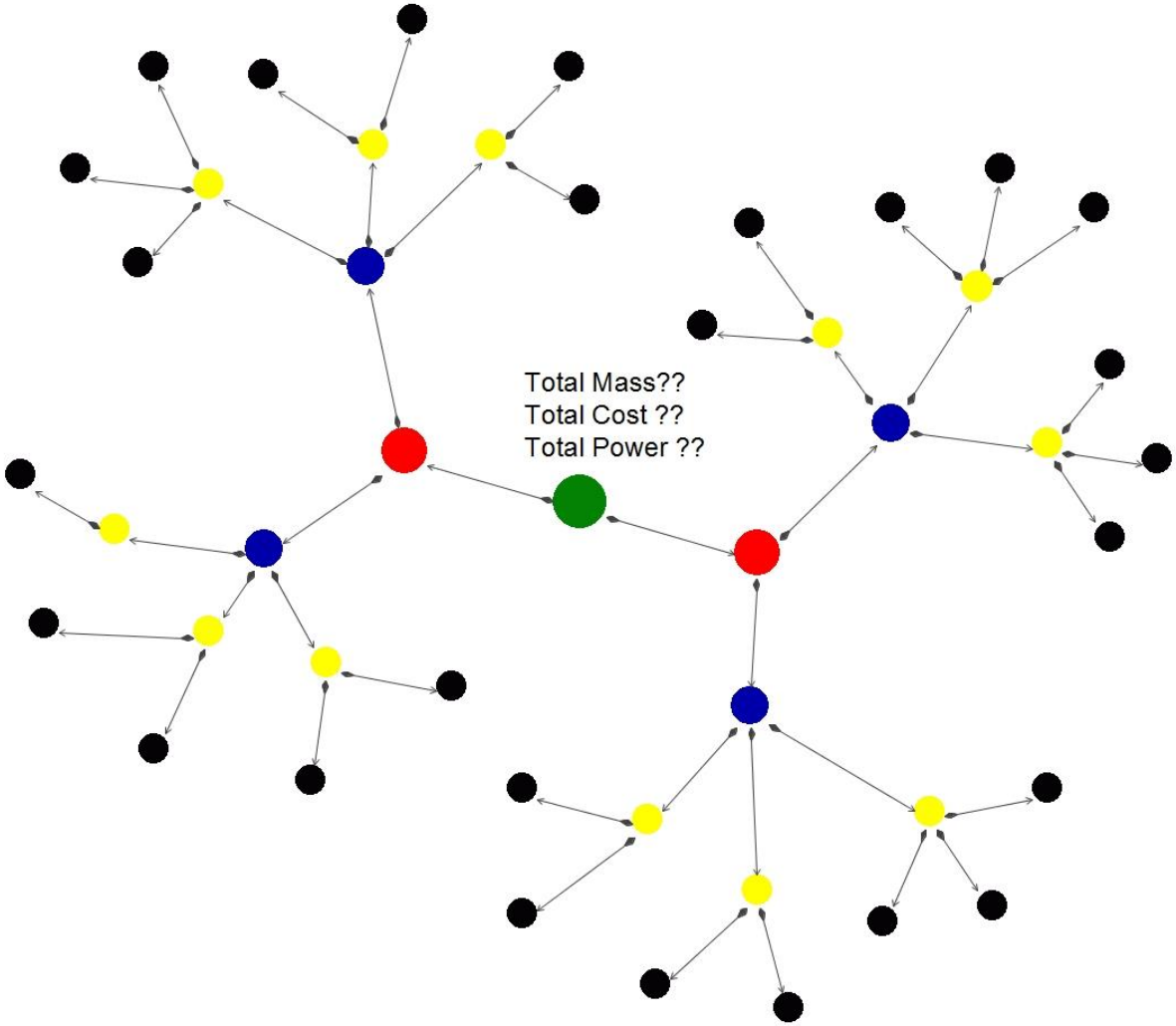
The problem



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Typical way

- Use of non-modeling tools (MS Excel)

Advantages:

- No need to have modeling knowledge

Disadvantages:

- Transfer data from model to non-modeling tool
- Constant maintenance between models
- Can not use dynamic rollups

- Use of regular modeling approach

Advantages

- Everything in the model

Disadvantages:

- Need to create quite a few additional elements to your model
- Could be difficult to maintain

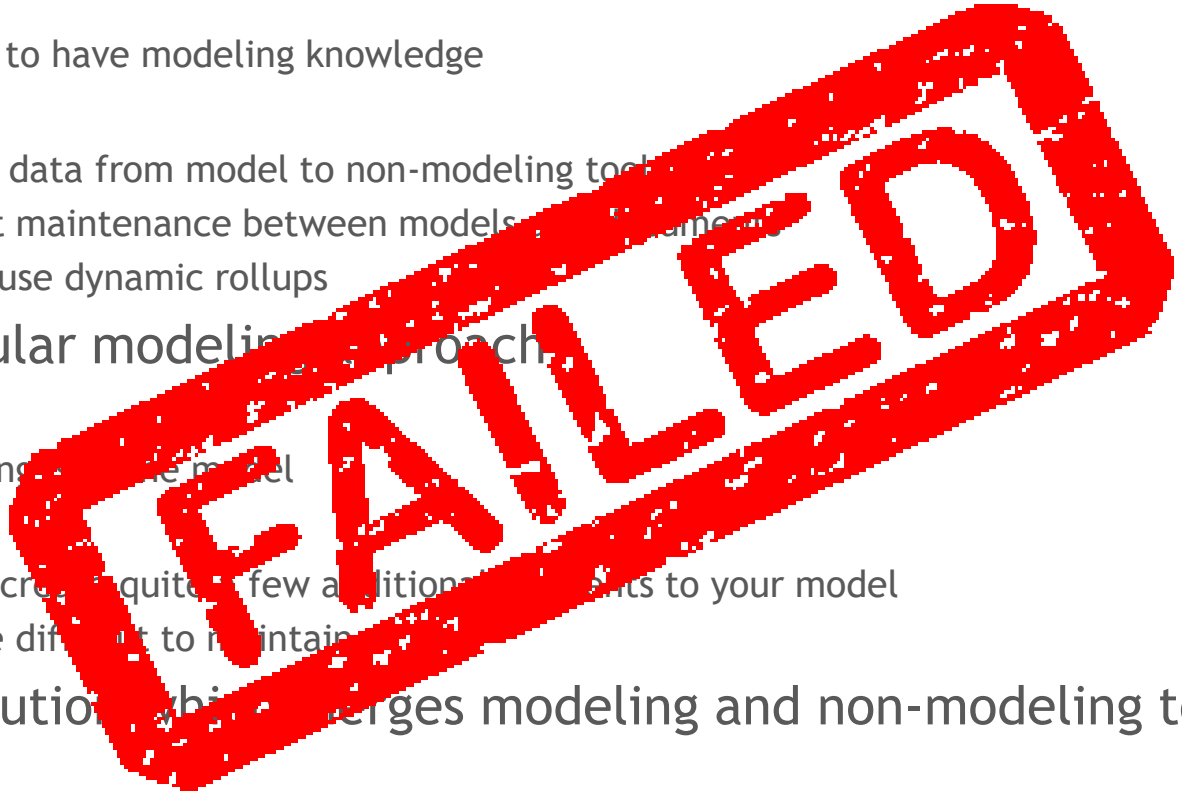
- Custom solution which merges modeling and non-modeling tool

Advantages

- Data is in the model while calculations are done outside modeling tool

Disadvantages

- Costly solution



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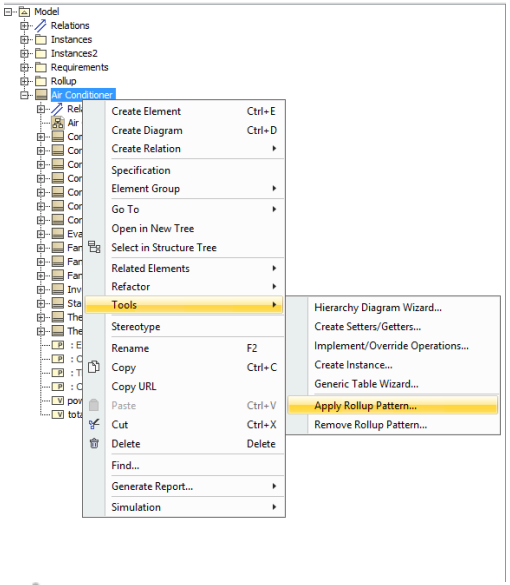
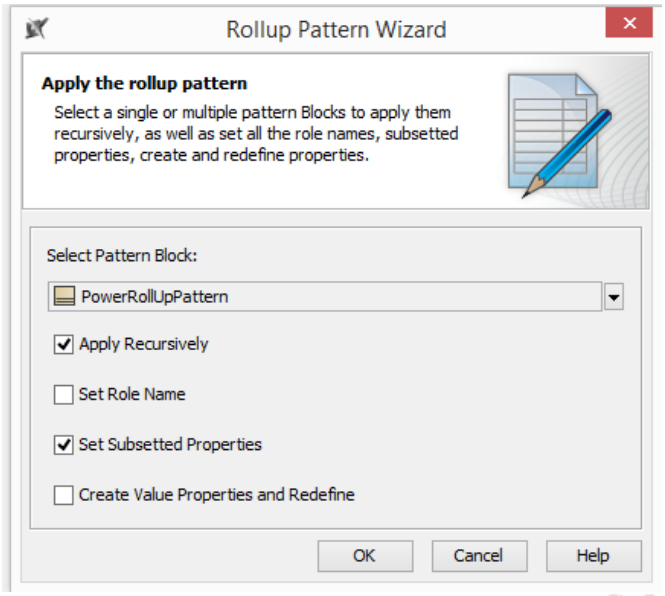
How we improve that?

Provide wizard which does all the work for you:

Advantages:

- Calculations are in the model and they are based on SysML
- No need to have deep understanding of how to do modeling
- Quick and straight forward process
- No model pollution with additional elements





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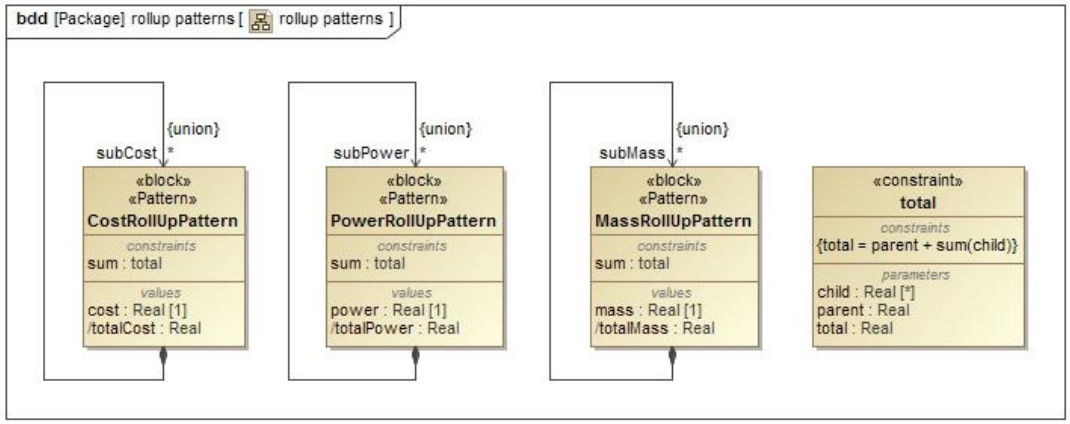
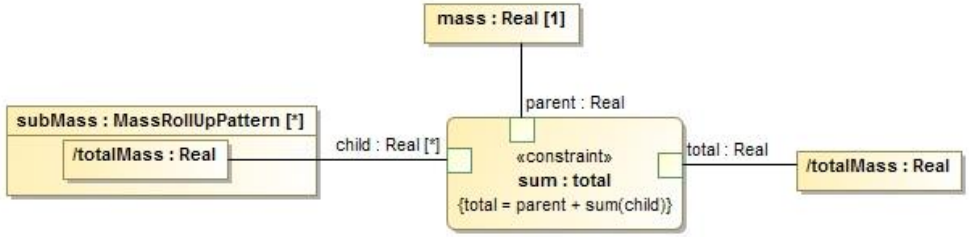
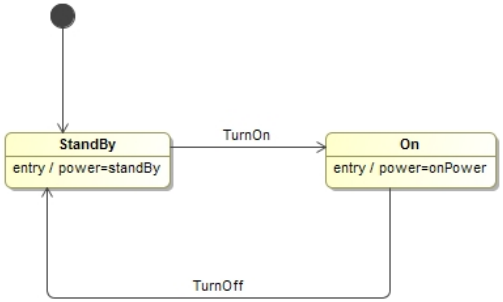
What is underneath?







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You can do even more

Criteria

Classifier: PowerRollUpPattern ... Scope (optional): Instances2 ... Filter:

#	Name	Power : Real	Total Power : Real
1	Instances2		
2	air Conditioner	0.0	847.0
3	air Conditioner.evaporator System	0.0	122.0
4	air Conditioner.evaporator System.fan	0.0	0.0
5	air Conditioner.evaporator System.fan Motor	100.0	100.0
6	air Conditioner.evaporator System.fan PCB	10.0	10.0
7	air Conditioner.evaporator System.status LCD Display	12.0	12.0
8	air Conditioner.condenser System	0.0	650.0
9	air Conditioner.condenser System.compressor	500.0	500.0
10	air Conditioner.condenser System.inverter	50.0	50.0

Simulation

Trigger:

Variables | Breakpoints

Name	Value
Air Conditioner {totalPower <= 1000.0}	air Conditioner : Air Conditioner@4626a343
power : Real	0,0000
totalPower : Real	847,0000
: Evaporator System {subsets subPower}	air Conditioner.evaporator System : Evaporator System.
power : Real	0,0000
totalPower : Real	122,0000
: Fan {subsets subPower}	air Conditioner.evaporator System.fan : Fan@4942b145
power : Real	0,0000
totalPower : Real	0,0000
sum : total {total = parent + sum(child)}	total@2bd06335
: Fan Motor {subsets subPower}	air Conditioner.evaporator System.fan Motor : Fan Motc
power : Real	100,0000
totalPower : Real	100,0000
sum : total {total = parent + sum(child)}	total@5d93afac
: Fan PCB {subsets subPower}	air Conditioner.evaporator System.fan PCB : Fan PCB@.
power : Real	10,0000
totalPower : Real	10,0000
sum : total {total = parent + sum(child)}	total@47bbcb3f

Simulation

Trigger:

Variables | Breakpoints

Name	Value
Air Conditioner {totalPower <= 1000.0}	air Conditioner : Air Conditioner@4626a343
power : Real	0,0000
totalPower : Real	1147,0000
: Evaporator System {subsets subPower}	air Conditioner.evaporator System : Evaporator System.
power : Real	0,0000
totalPower : Real	122,0000
: Fan {subsets subPower}	air Conditioner.evaporator System.fan : Fan@4942b145
power : Real	0,0000
totalPower : Real	0,0000
sum : total {total = parent + sum(child)}	total@2bd06335
: Fan Motor {subsets subPower}	air Conditioner.evaporator System.fan Motor : Fan Motc
power : Real	100,0000
totalPower : Real	100,0000
sum : total {total = parent + sum(child)}	total@5d93afac
: Fan PCB {subsets subPower}	air Conditioner.evaporator System.fan PCB : Fan PCB@.
power : Real	10,0000
totalPower : Real	10,0000
sum : total {total = parent + sum(child)}	total@47bbcb3f
: Status LCD Display {subsets subPower}	air Conditioner.evaporator System.status LCD Display :
power : Real	12,0000
totalPower : Real	12,0000
sum : total {total = parent + sum(child)}	total@69686fd8
sum : total {total = parent + sum(child)}	total@69d7ed2e

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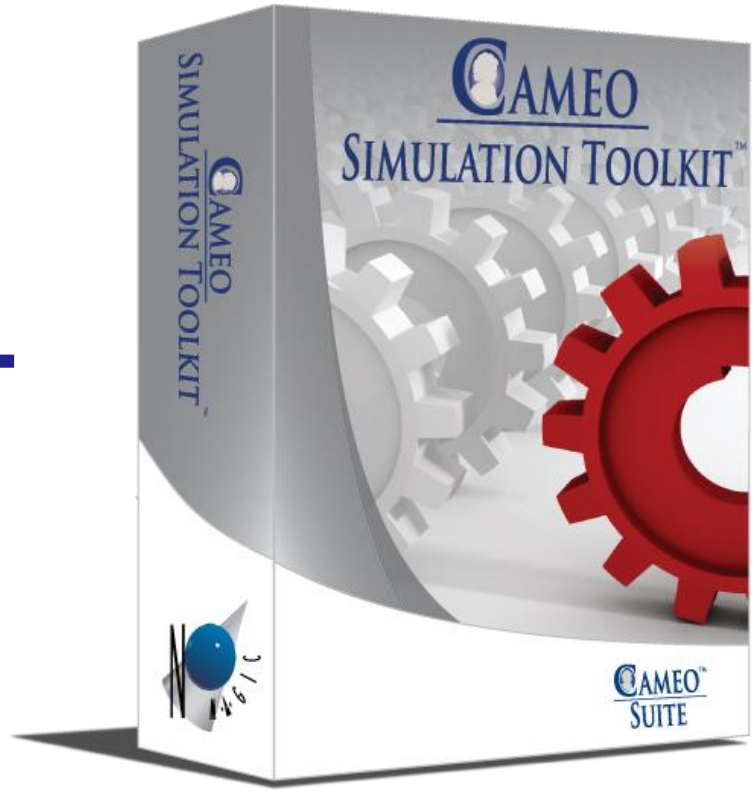

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