BRINGING MATHEMATICAL CAPABILITIES TO SYSML WITHIN MAGICDRAW

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Outline

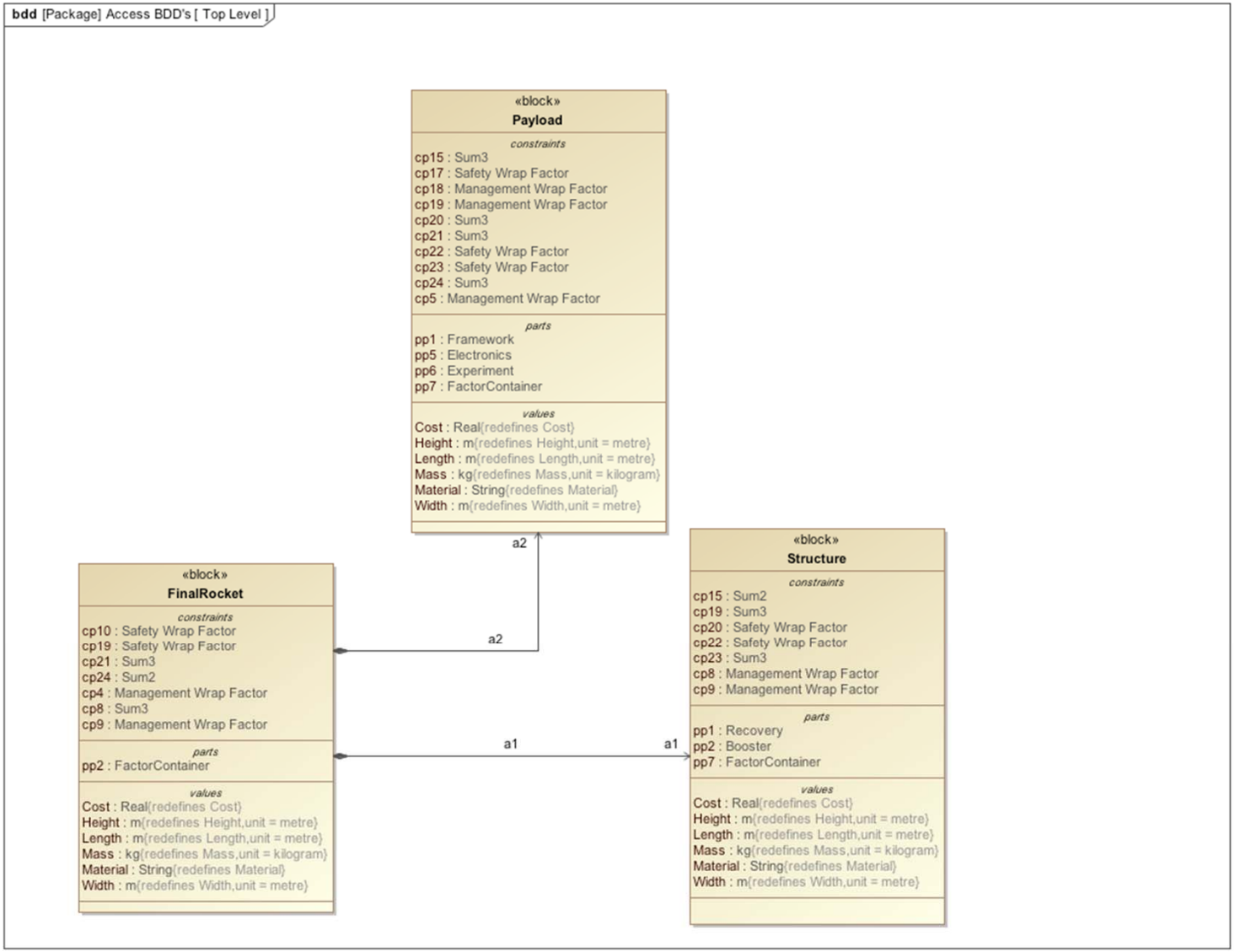
- SysML/MagicDraw
- Problem
- Proposed Solutions
- Team Solution
- Future Work

SysML / MagicDraw

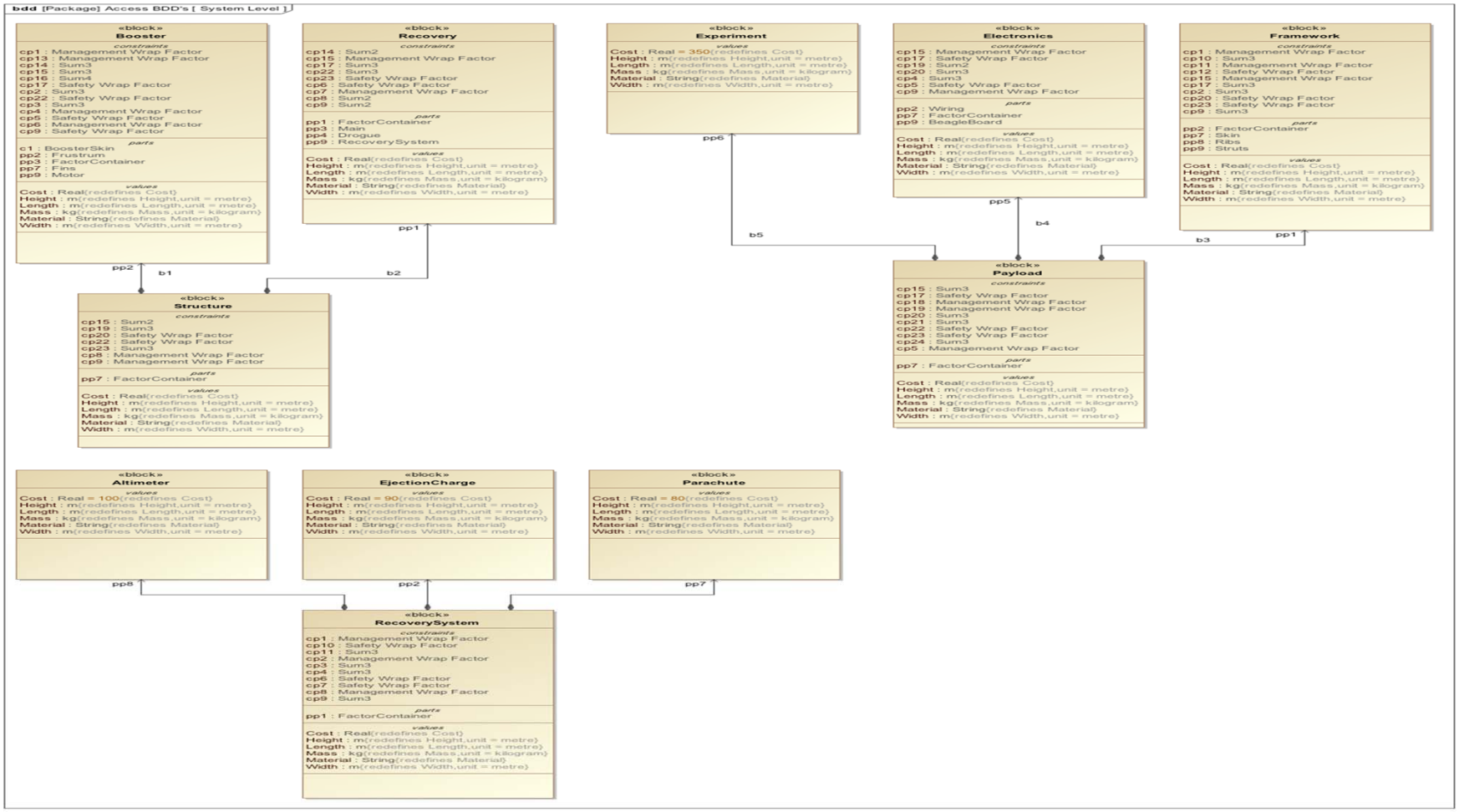
- General purpose modeling language
- Extension of Unified Modeling Language (UML)
- Supports specification, analysis, design, verification, validation of systems

- Visual Tool to use SysML = MagicDraw

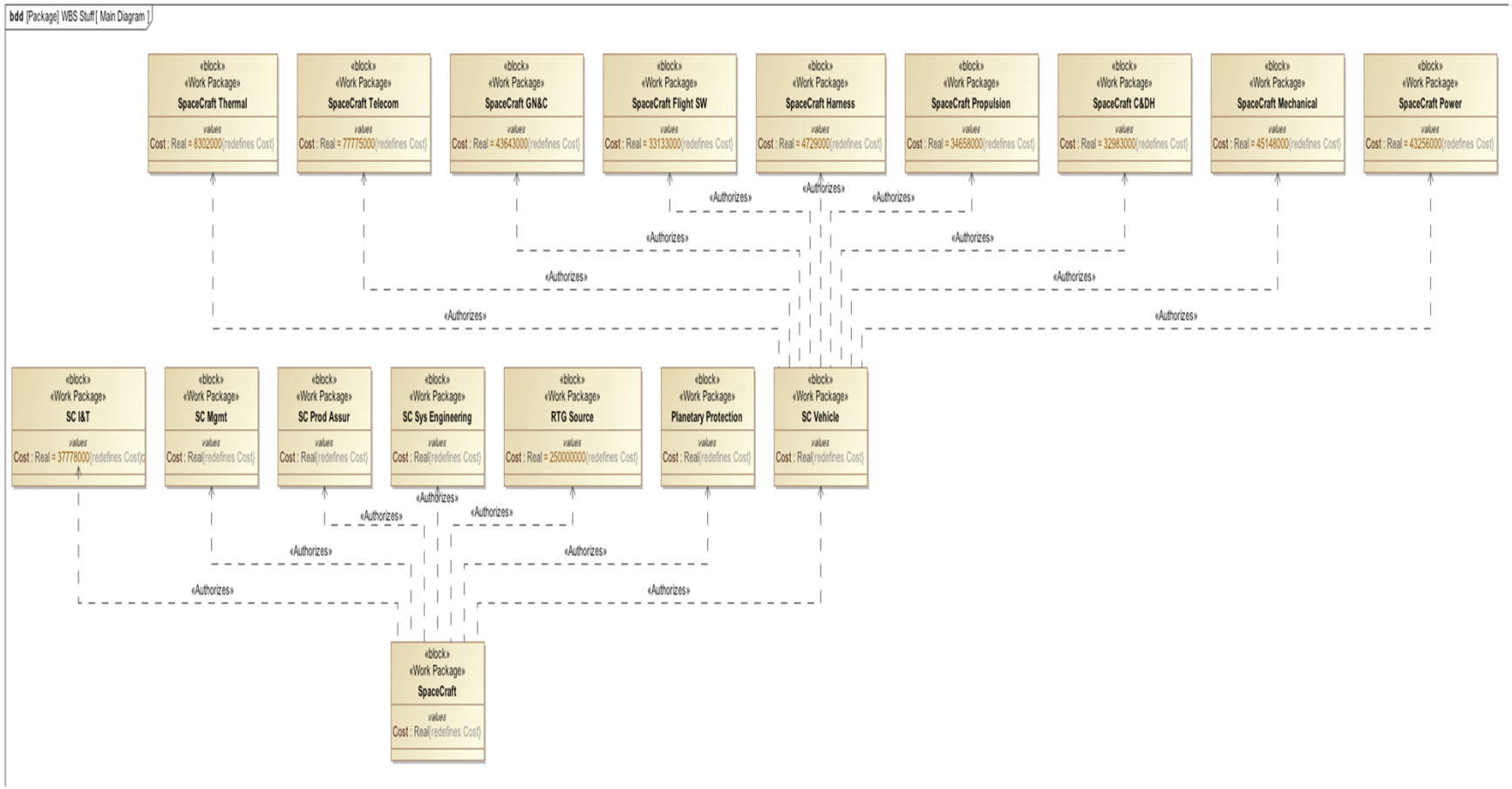
Example: Rocket Rollup



Example: Rocket Systems



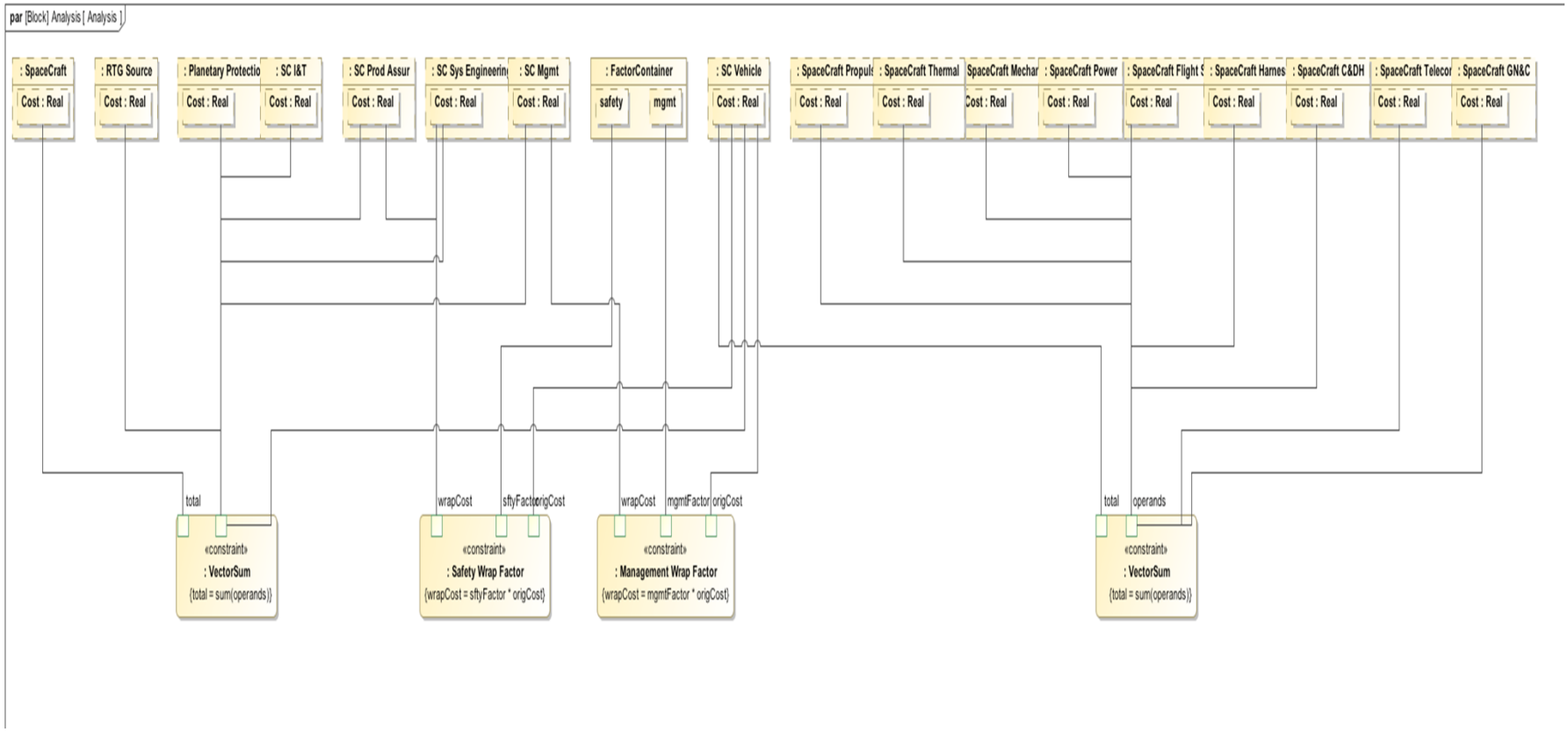
Example: Work Breakdown Structure



Problem

- Current analysis implies waiting for someone else to do their own part before you can do your own part of the analysis
- SysML is good Modeling, but not Analysis
- You can SHOW how analysis should be done, but not actually DO analysis
- There are other tools out there to interface with MagicDraw and do math

Example: WBS Parametric Diagram

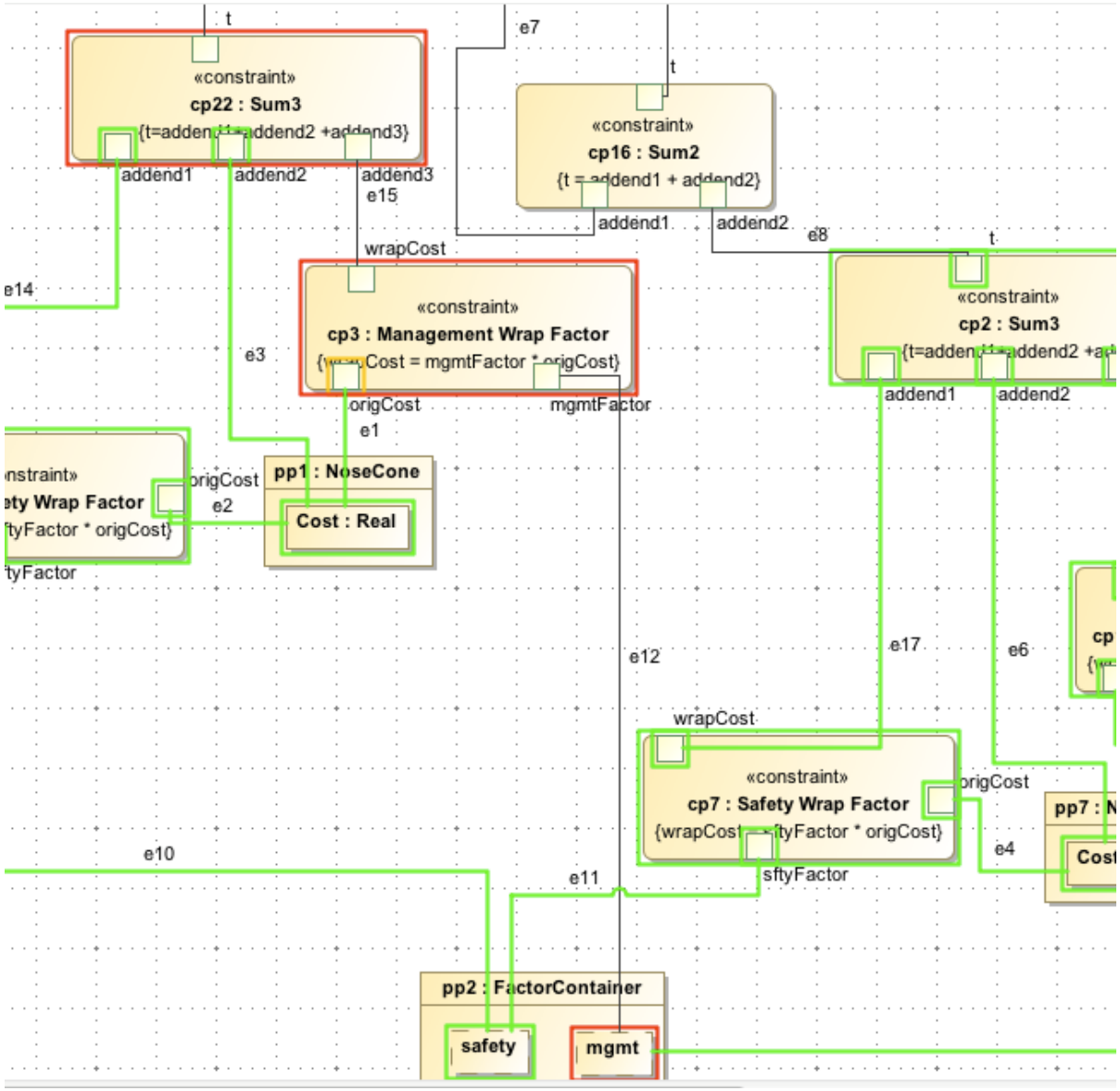


Proposed Solutions

	A	B	C	J	K	L	M	N	O	S	T	U	V	W	X	AB	AC	AD
1	(1) DECISION STATEMENT: Recommend the best tool for computations that can integrate with current and future SysML models f																	
2																		
3		**Desciption**																
4		Tool		ParaMagic			Cameo Sim			nny's Plug			(J)Python				lugin/Script	
5		Math Engine		Mathematic			Matlab			lathematic			(J)Python				QVT	
6																		
7		**(2) LIST CRITERIA**	**(4) OPTIONS**	**1c**			**2a**			**3**			**4**				**6**	
15		***WANTS***	**(3) WEIGHT**	**score**	**wt score**	**Notes**	**score**	**wt score**	**Notes**		**wt score**	**Notes**	**score**	**wt score**	**Notes**		**wt score**	**Notes**
18		Flexibility	10	4	40		1	10			30		3	30			10	
20		Operability	10	1	10		3	30			20		3	30			30	
22		Results Validation	10	2	20		5	50			40		4	40			10	
23		Model Validation	10	1	10		1	10			10		1	10			10	
25		Visibility of Parametric Constraints	10	1	10		4	40			30		2	20			20	
27		Adaptability to Growing Needs	10	1	10		1	10			40		2	20			10	
28		Portabilty (Mac vs Windows)	10	5	50		5	50			20		4	40			40	
29		Ease of Integration	10	4	40		5	50			10		3	30			20	
30		Appropriateness	10	3	30		2	20			20		4	40			40	
31																		
32																		
33		**Total:**	**450**		**220**			**270**			**220**			**260**			**190**	
34	(5) CALCULATE HIGHEST WEIGHTED SCORE																	

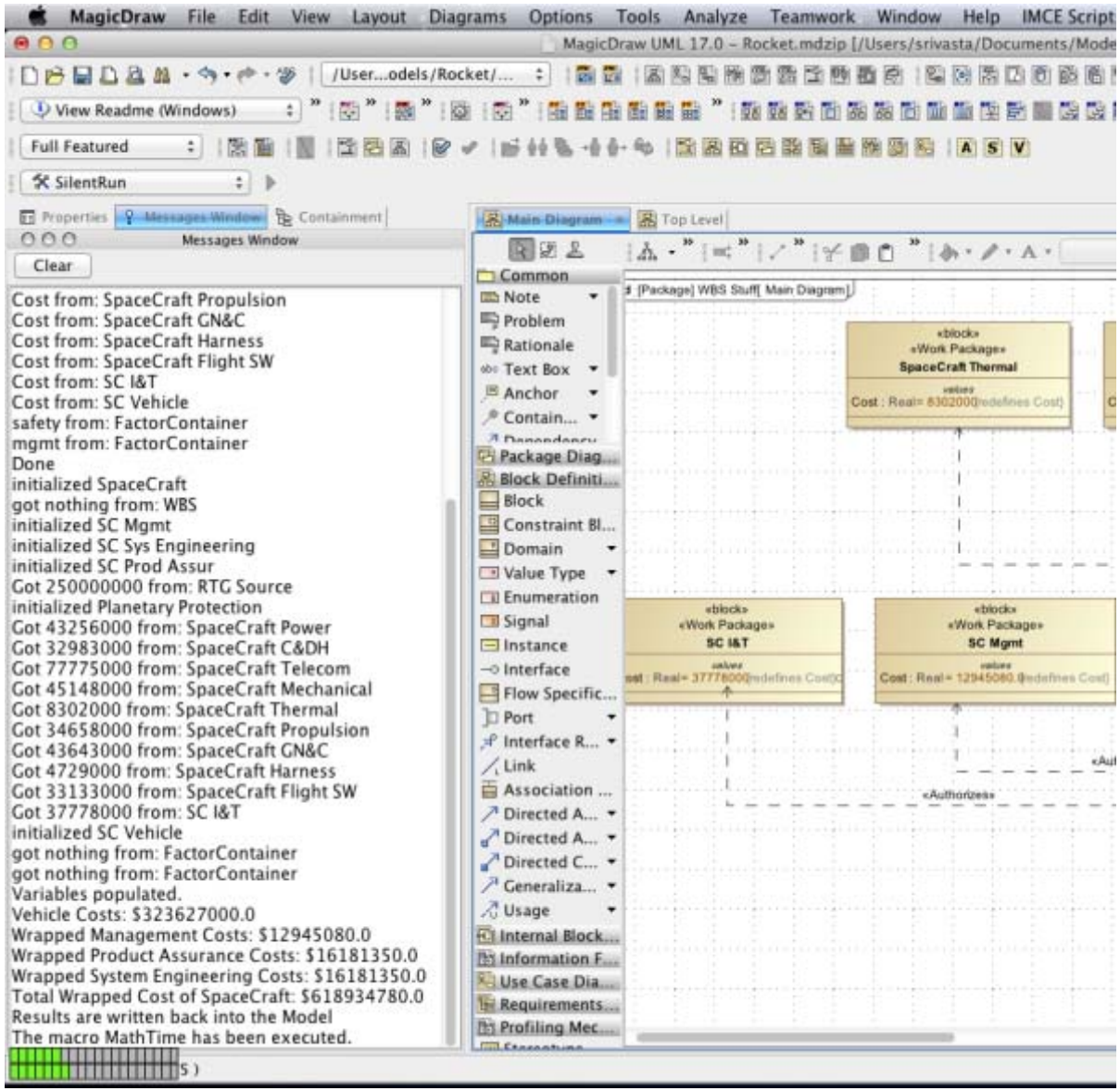
Cameo Simulation Toolkit

- Can watch math execute
  - Equivalent to a trace
- Causal Relationships
- Works on already linked diagram
  - Single port to port connections



(J)Python Code

- Uniquely suited to a particular model
  - Changes to model require new code (sometimes)
- Demands strict adherence to naming conventions – brittle
- Robust in terms of actual math capabilities
  - Sympy works with Python but not Jython as of yet



Summary

- Needed a tool to do math in SysML
- Completed a trade study of likely candidates
- Tested out the two highest ranking candidates [(J)Python and Cameo]
- Concluded that the (J)Python scripts offer more flexibility than Cameo

Future Work

- Integrate parametric diagrams with Jython script
- Integration with other solvers
  - Mathematica, etc.
- Sympy with Jython

Thanks!

- Frank Dekens : Mentor
- Todd Bayer : Co-Mentor

- Chris, Bjorn, Seung, Louise, Doris and the MEA team

Questions?