Slides: http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns_challenge_team_mtg_06.29-30-14

INCOSE International Symposium
Las Vegas, NV
June 30 - July 3, 2014

PBSE Patterns Challenge Team

Two meetings at IS2014:

Sunday, June 29, 15:00-17:00; Room: La Cascada III

Monday, June 30, 10:00 – 12:00; Room: El Viento IV

Meeting Agenda

(Time allocated on both Sunday and Monday, as members may be able to attend one or two—however, we don't intend to simply repeat the content, but to advance during the two days.)	**Part 1: Sunday, June 29**	**Part 2: Monday, June 30**
Meeting start up: • Review of meeting objectives and agenda, flow over two meetings at IS2014 • Introduction of attendees and their interests (second day: new attendees)	15:00 – 15:15 PDT (UTC/GMT-7)	10:00 – 10:15 PDT (UTC/GMT-7)
Challenge Team project background: • Reference to pre-reading and information resources • For new team members & interested attendees: Refresher on S*Patterns and their uses in MBSE and Platform Management (second day: quick refresh, continuation, questions) • IS2013, GLRC2013, IW2014, IS2014, GLRC2014 Events	15:15 – 15:45	10:15 – 10:45
Team Discussion of Challenge Work In Progress and Planned: • Reference to Team Objectives: o From charter and IW2014 meeting o Discussion of plans and status by sub-team members o Additional objectives from team members o Linkage to other Working Groups o Access to INCOSE WG web site, shared models, and modeling tools facility o Discussion of team goals proposed in the draft charter o Priorities	15:45 – 16:15	10:45 – 11:15
Planning Next Activities: • Meeting schedule for whole Challenge Team • Sub-team work sessions/meetings • Key milestones • IS2015 papers • GLRC2014 presentations • Outreach: Who else should be involved?	16:15 – 16:45	11:15 – 11:45
Closing: • Contact information • Adjourn	16:45 – 17:00	11:45 – 12:00

Background

- Meeting participant introductions
- This Challenge Team is concerned with <u>*configurable, re-usable system models*</u>, called “S*Patterns”:
  - Models containing a certain minimal set of elements are called S*Models
  - Re-usable, configurable S*Models are called S*Patterns
  - By “Pattern-Based Systems Engineering” (PBSE) we mean MBSE enhanced by these generalized assets
  - These are system-level patterns (<u>models of whole platforms</u>), not small-scale design patterns (e.g., rotary-to-linear motion converter, SDPs, etc.)
- Recent INCOSE tutorials, webinars, & briefings on S*Patterns:
  - May 14, 2014, Enchantment Chapter (New Mexico) PBSE Webinar
  - IW2014 (LA) Eric Berg’s briefing on PBSE at Procter & Gamble
  - GLRC2013 (W. Lafayette, IN) PBSE Tutorial
  - IS2013 (Philadelphia, PA) PBSE Tutorial
  - GLRC2012 (Chicago, IL) PBSE Tutorial
  - April, 2012, Finger Lakes Chapter (Western New York) PBSE Webinar
  - IS2005 (Rochester, NY) PBSE Tutorial

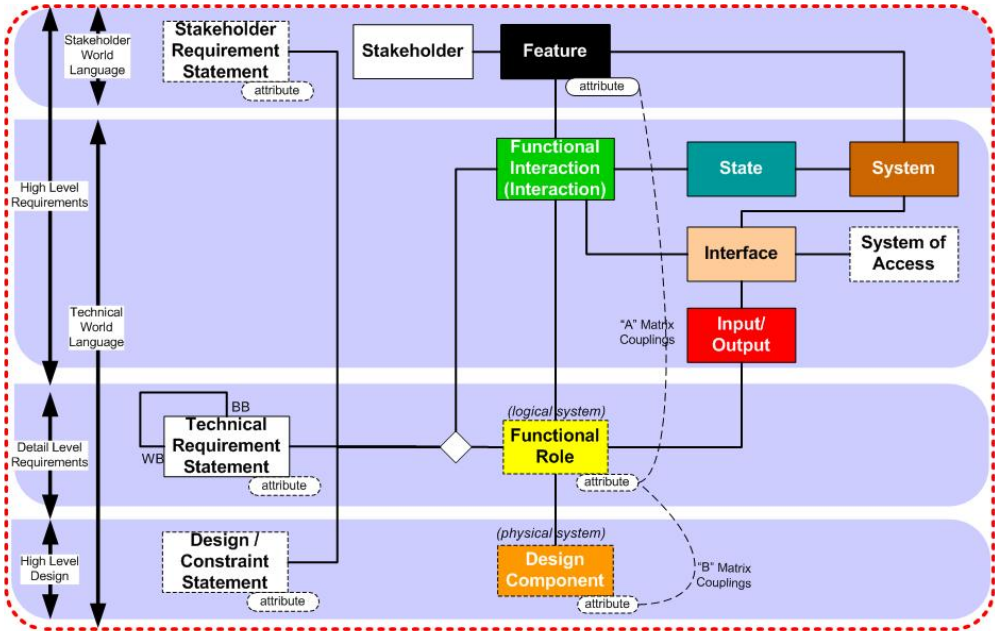
Patterns Challenge Team History

- Participants in INCOSE PBSE tutorials over the years expressed interest in an INCOSE working-group type activity advancing the practice of (model-based) PBSE.
- So, in the summer of 2013, Troy Peterson and Bill Schindel gained agreement of INCOSE MBSE Initiative co-chairs Sandy Friedenthal and Mark Sampson to start:
  - An additional MBSE Challenge Team on model-based Patterns
  - Objectives summarized in our Challenge Team Charter
  - Web site: http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns
- First meeting of the Challenge Team was January, 2014, at IW:
  - To assess interest in Challenge Team work products . . .
  - As listed in the Charter, as well as others.
  - Attended by 22 on-site and remote participants.
  - Minutes: http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns_challenge_team_mtg_01.27.14

Patterns Demand Strongest Underlying Models

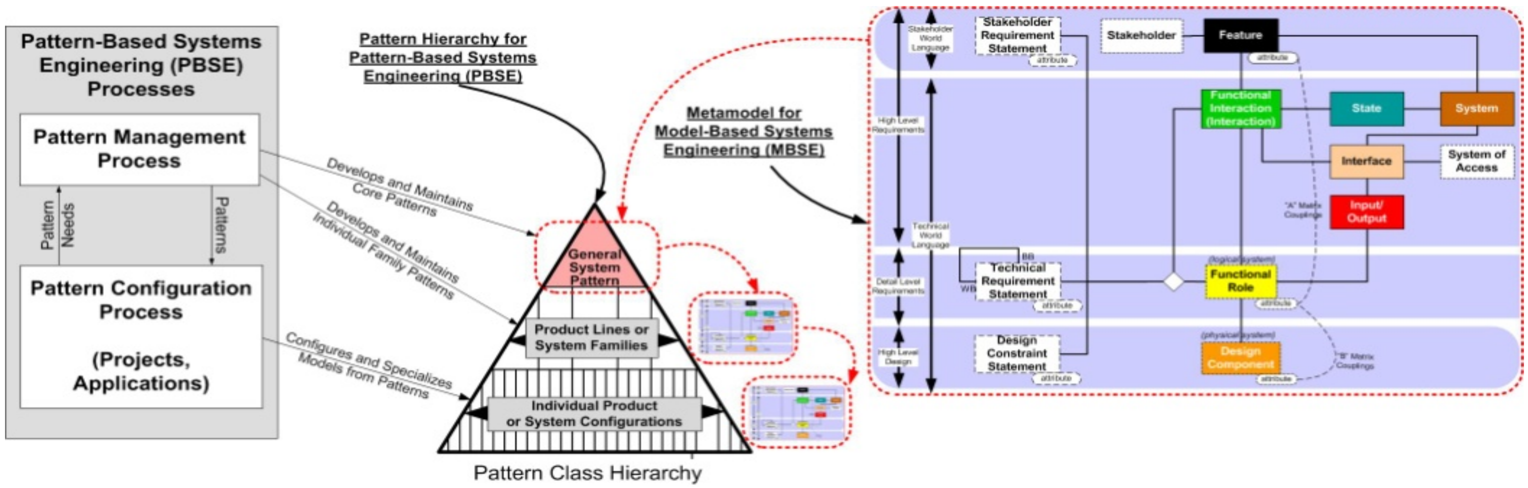
- The S*Metamodel describes the <u>smallest</u> set of ideas necessary to model a system for purposes of engineering or science:
  - Most of them familiar to modelers, and all of them basic to the training of engineers and scientists—*but not always found in their system models*.
  - A metamodel is a model of other models;
  - Sets forth underlying concepts of Requirements, Designs, Failures, Trade-offs, etc. (not modeling language syntax)

- The resulting S*Models may be expressed in SysML or other modeling languages, and constructed / reside in numerous commercial tools and information systems.
- Has been applied to SE in aerospace, transportation, medical, advanced manufacturing, communication, construction, consumer, other domains.



– The PBSE approach respects the systems engineering tradition, body of knowledge, and historical lessons, while providing a high-gain path forward.

– *An S* Pattern is a configurable, re-usable S* Model*. It is an extension of the idea of a Platform (which is a configurable, re-usable design). The Pattern includes not only the Platform, but all the extended system information (e.g., requirements, risk analysis, design trade-offs & alternatives, decision processes, etc.):



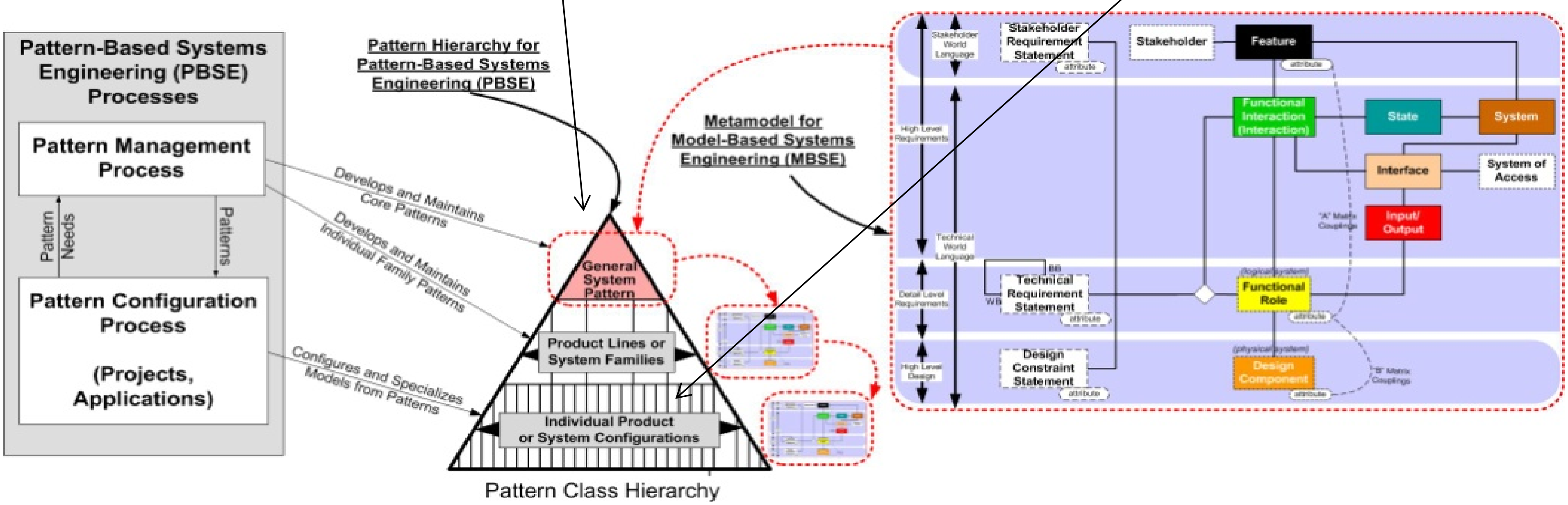
– By including the appropriate S* Metamodel concepts, these can readily be managed in (SysML or other) preferred modeling languages and tools—the ideas involved here are not specific to a modeling language or specific tool—ported to several.

– The order-of-magnitude changes have been realized because projects that use PBSE rapidly start from an existing Pattern, gaining the advantages of its content, and feed the pattern with what they learn, for future users.

– The "game changer" here is the shift from "learning to model" to "learning our (your) model", freeing many people to rapidly configure, specialize, and apply patterns to deliver value in their model-based projects.

A little more about S*Patterns, before we discuss team projects

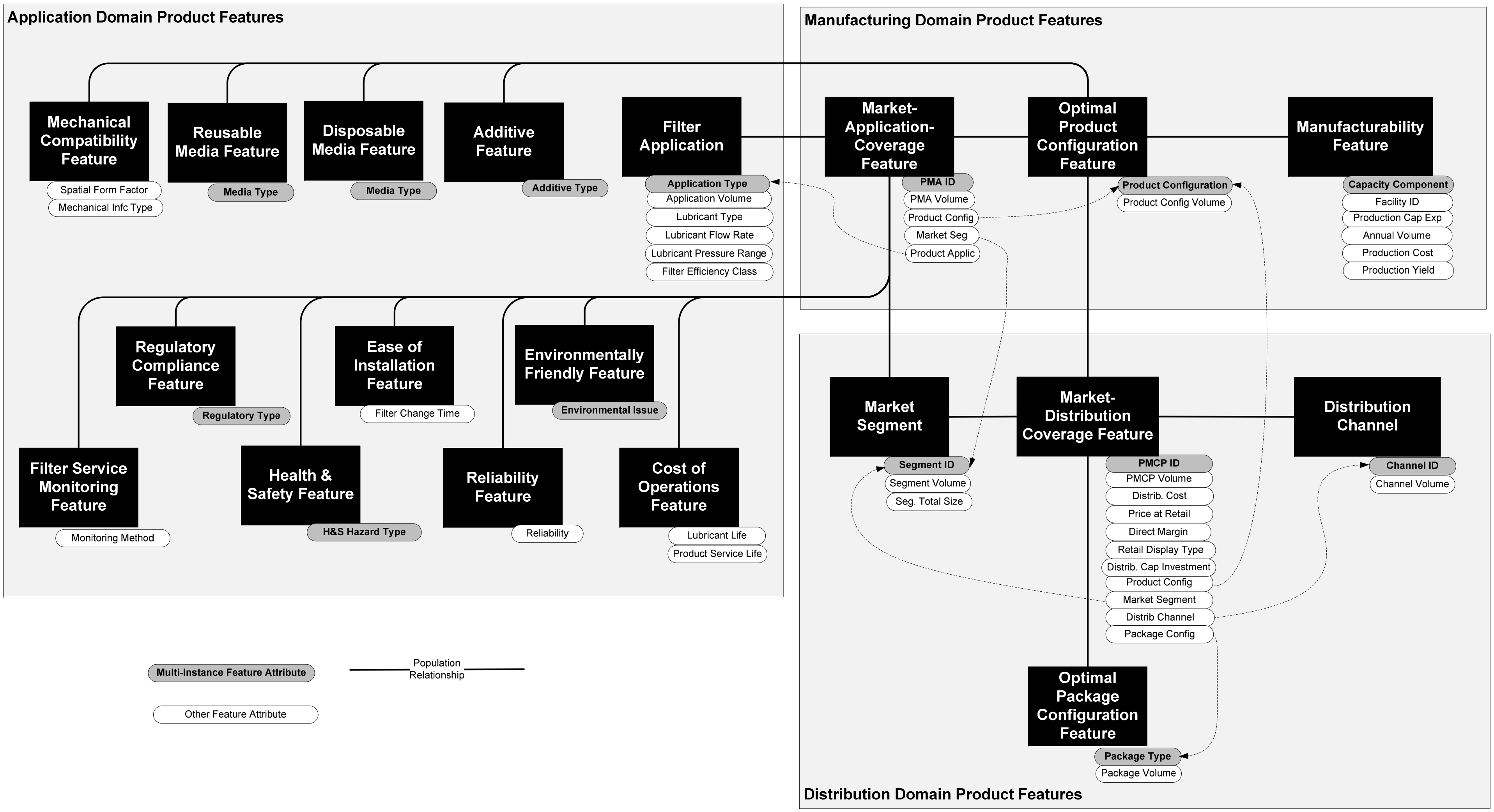
- Fixed (Pattern) Portion, Variable (Configuration) Portion, and the Configuration Process:
  - The generalized S*Pattern is expressed in exactly the same S*Metamodel classes and relationships as a specific configured S*Model derived from it.
  - “Configuring” a pattern means a process limited to exactly two things:
    - Populating (or de-populating) instances of classes and relationships
    - Setting the values of attributes (parameters)



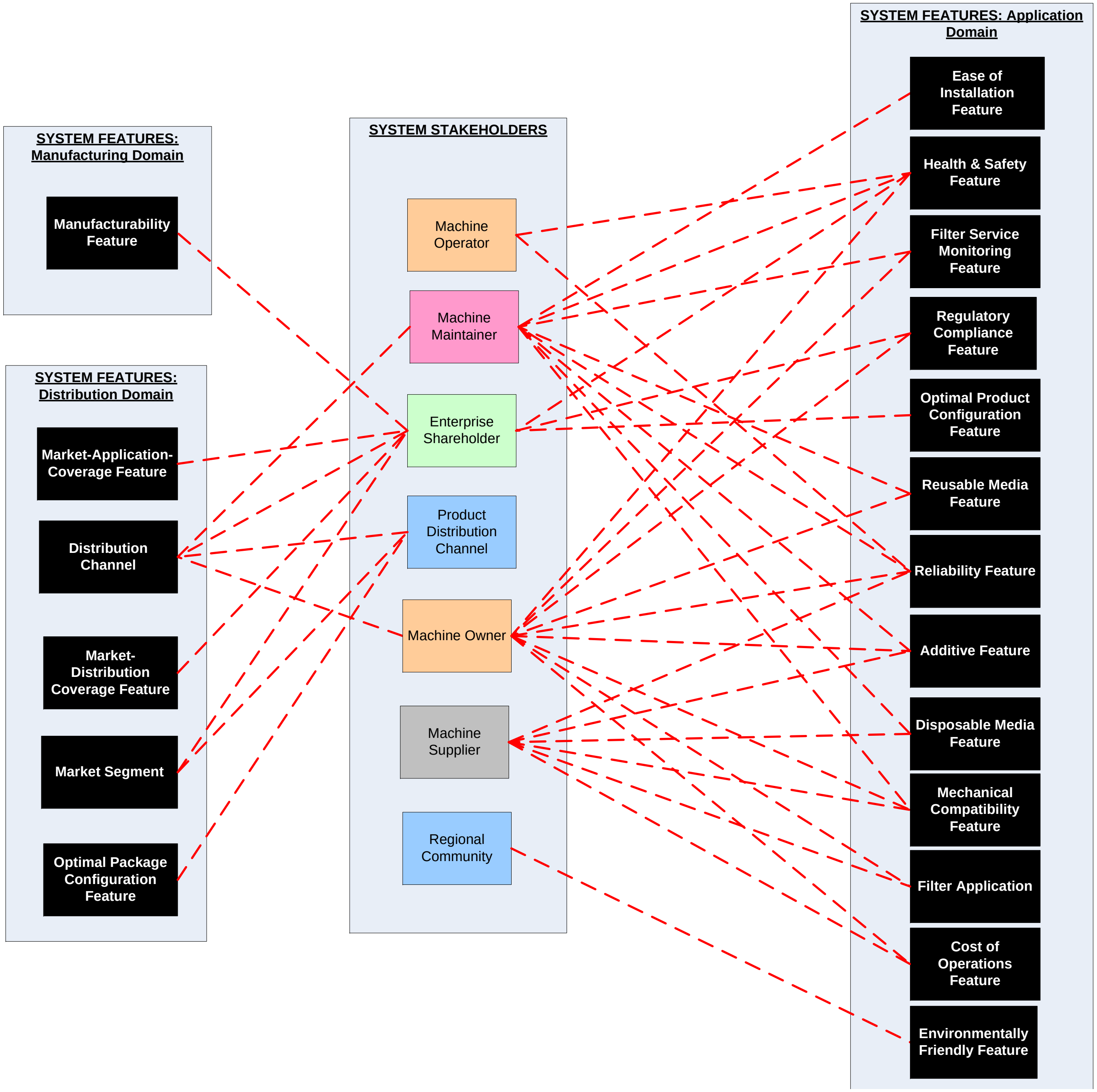
A little more about S*Patterns, before we discuss team projects

- Having an S*Pattern meeting the underlying S*Metamodel demands has some surprising positive consequences beyond basic benefits of MBSE:
  - The Stakeholder Feature portion of the pattern directly generates a formal Trade Space / Scoreboard for arguing, defending all decisions.
  - "Configuring" the (low dimension) Stakeholder Feature portion of the Pattern for a specific project or system configuration can "automatically" generate the (high dimension) configured Technical Requirements for that system configuration.
  - For a sufficiently built-out S*Pattern, the same applies to the System Design (physical architecture, allocations, attribute couplings, etc.).
  - The S*Pattern can rapidly generate very complete first draft FMEA tables, since S*Features lead directly to modeled Effects, S*Requirements lead directly to modeled Counter-Requirements (functional failures), S*Design Components lead directly to modeled Failure Modes, and combinatorial FMEA analyses of the three together may be rapidly generated by machine matching algorithm.
- All these produce much faster initial drafts that are much more complete and consistent than manual approaches, but which can (should) still be subject to the normal human SME review and update:
  - We are not suggesting turning our thinking and fate over to the model, without human judgment, expertise, etc.

Example S*Pattern Stakeholder Feature Overview Model



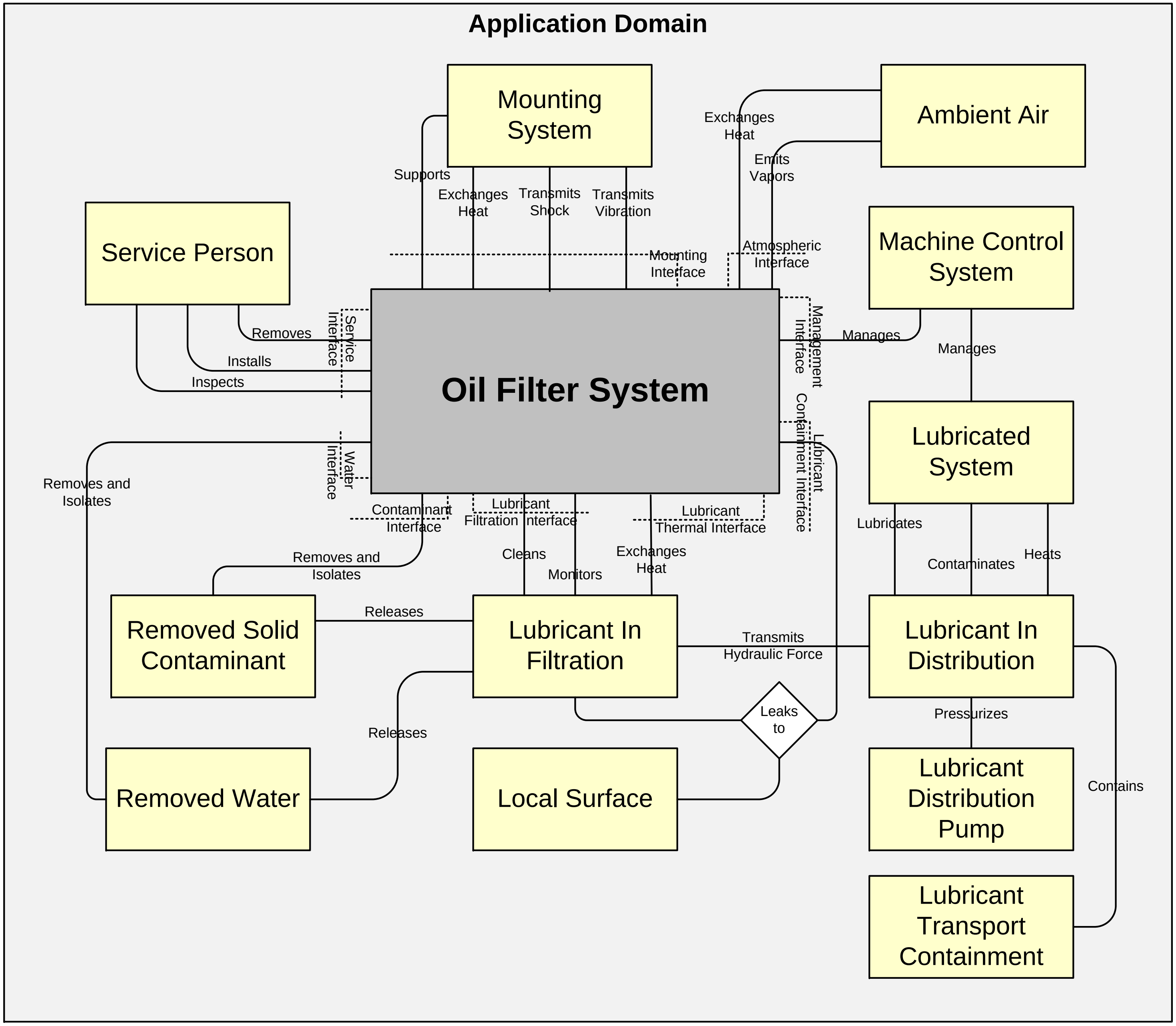
Example S*Pattern Stakeholder Feature Overview Model



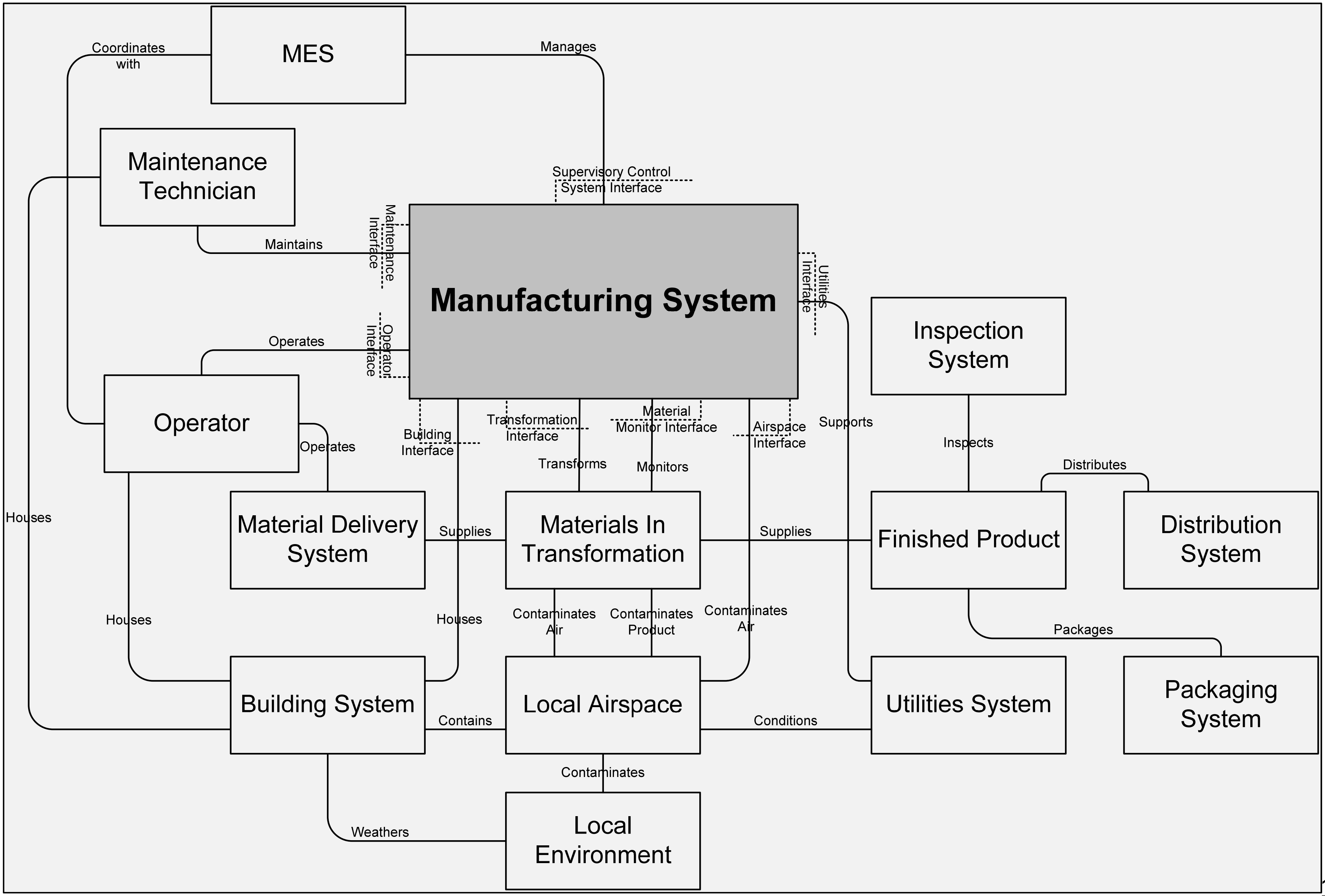
Example S*Pattern Stakeholder Feature Model Extract

Feature	Feature Attribute	Multi-Instance	Attribute Definition	Attribute Units	Attribute Values
Optimal Product Configuration Feature	Product Configuration	X	Identifies the configuration of the product, as a model ID. Multiple configurations may be populated.	N/A	
Optimal Product Configuration Feature	Product Configuration Volume		The number of units of this product configuration produced per year.	Units/Year	
Filter Application	Application Type	X	The type of lubricated system application supported by a lubricant filtration system. More than one type may be instantiated for a single product configuration.	N/A	Consumer Automotive, Commercial Automotive, Fixed Base Engine System, Harsh Environment, High Temperature Environment, Cold Environment
Filter Application	Application Volume		The number of units of this application placed into service during a year.	Units/Year	
Filter Application	Lubricant Type		The type of lubricating fluid to be used.	N/A	
Filter Application	Lubricant Flow Rate		The rate at which the lubricating fluid must be circulated in order to meet equipment lubrication objectives.	GPM	High, Medium, Low
Filter Application	Lubricant Pressure Range		The amount of hydraulic pressure under which the lubricant will circulate.	PSI	High, Medium, Low
Filter Application	Filter Efficiency Class		The profile of filtration efficiency provided by the filter	N/A	
Mechanical Compatibility Feature	Spatial Form Factor		The class of three dimensional structure of a component, subsystem, or space within a system reserved for a component or subsystem.	N/A	
Mechanical Compatibility Feature	Mechanical Interface Type		The mechanical class of the interface between the oil filter and the equipment to which it is connected.	N/A	
Cost of Operation Feature	Lubricant Life		The amount of time that a lubricant is intended to operate, meeting requirements within the specified environment, before it is replaced.	Hours	

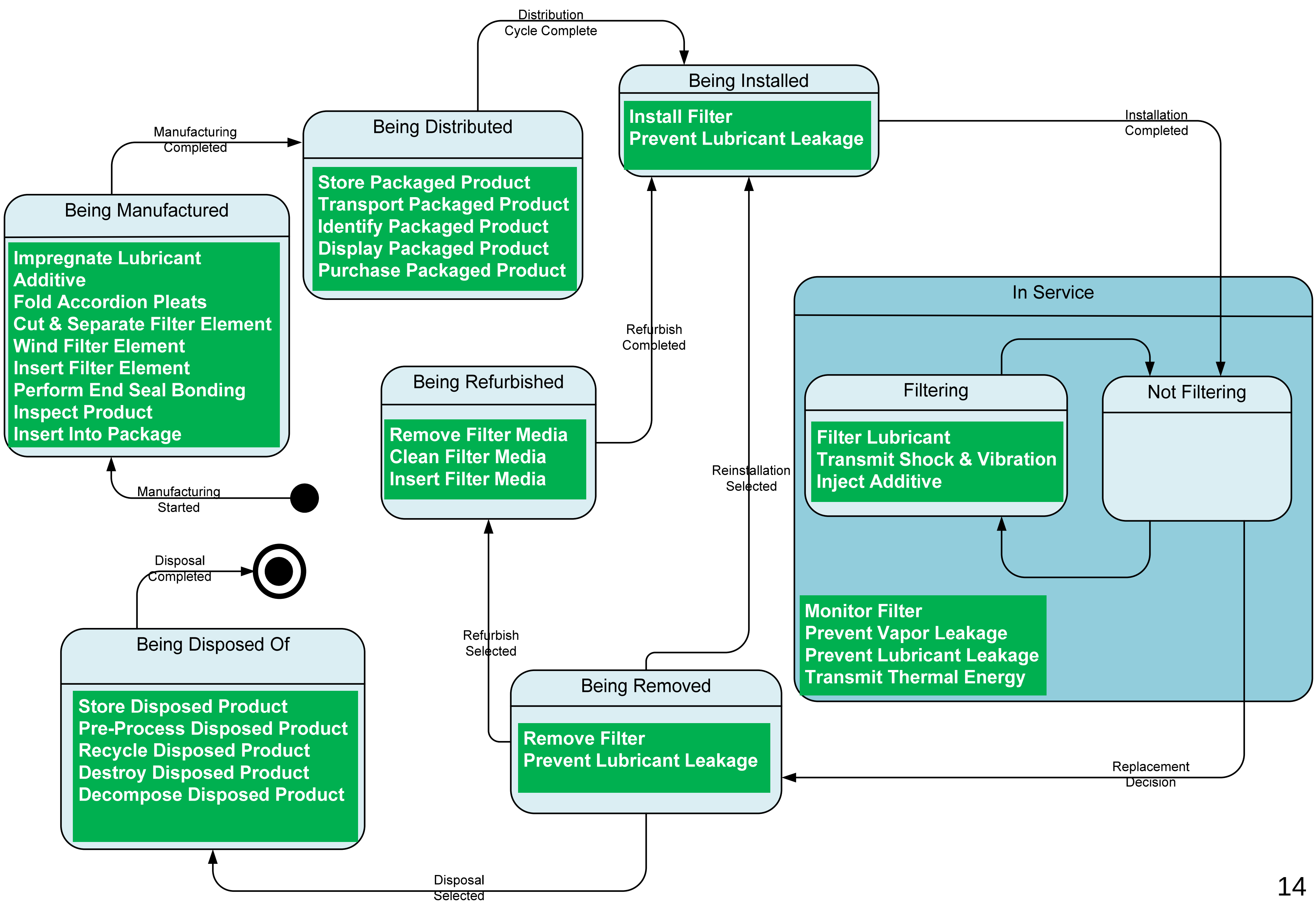
Example S*Pattern Application Domain Model



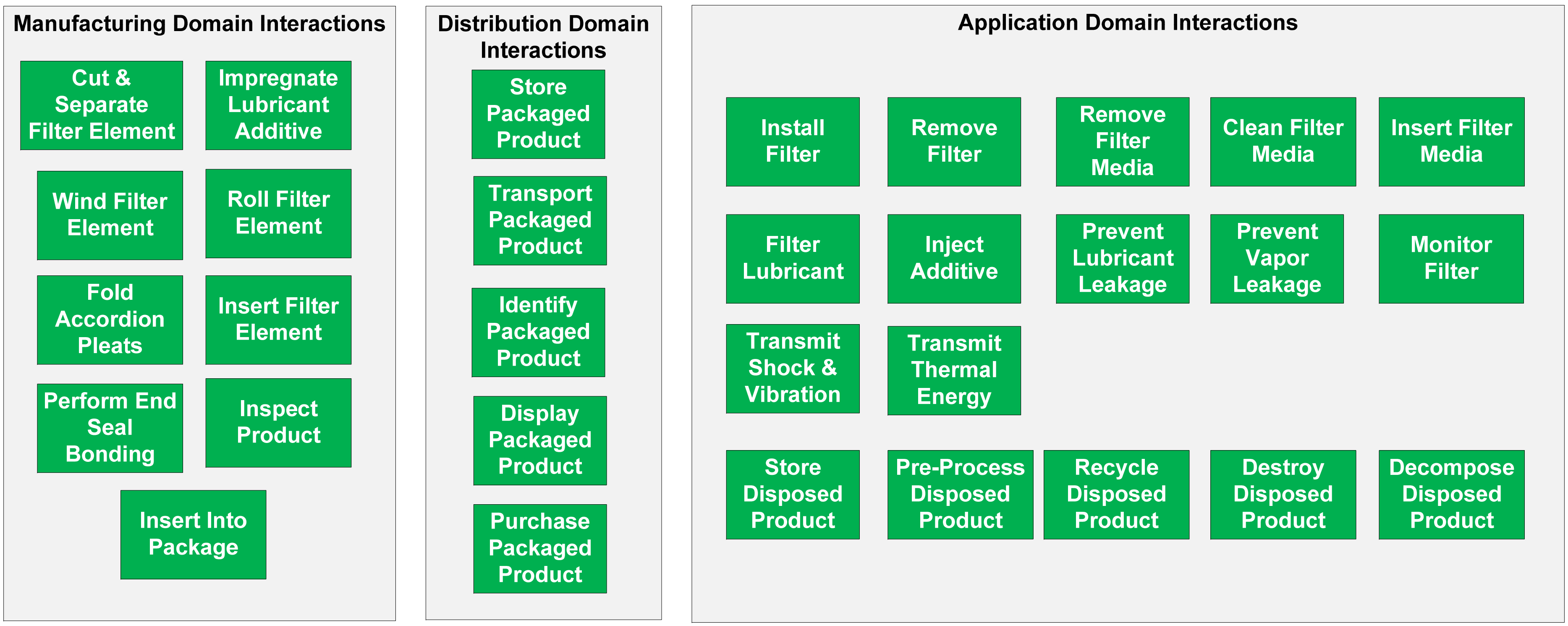
Example S*Pattern Manufacturing Domain Model



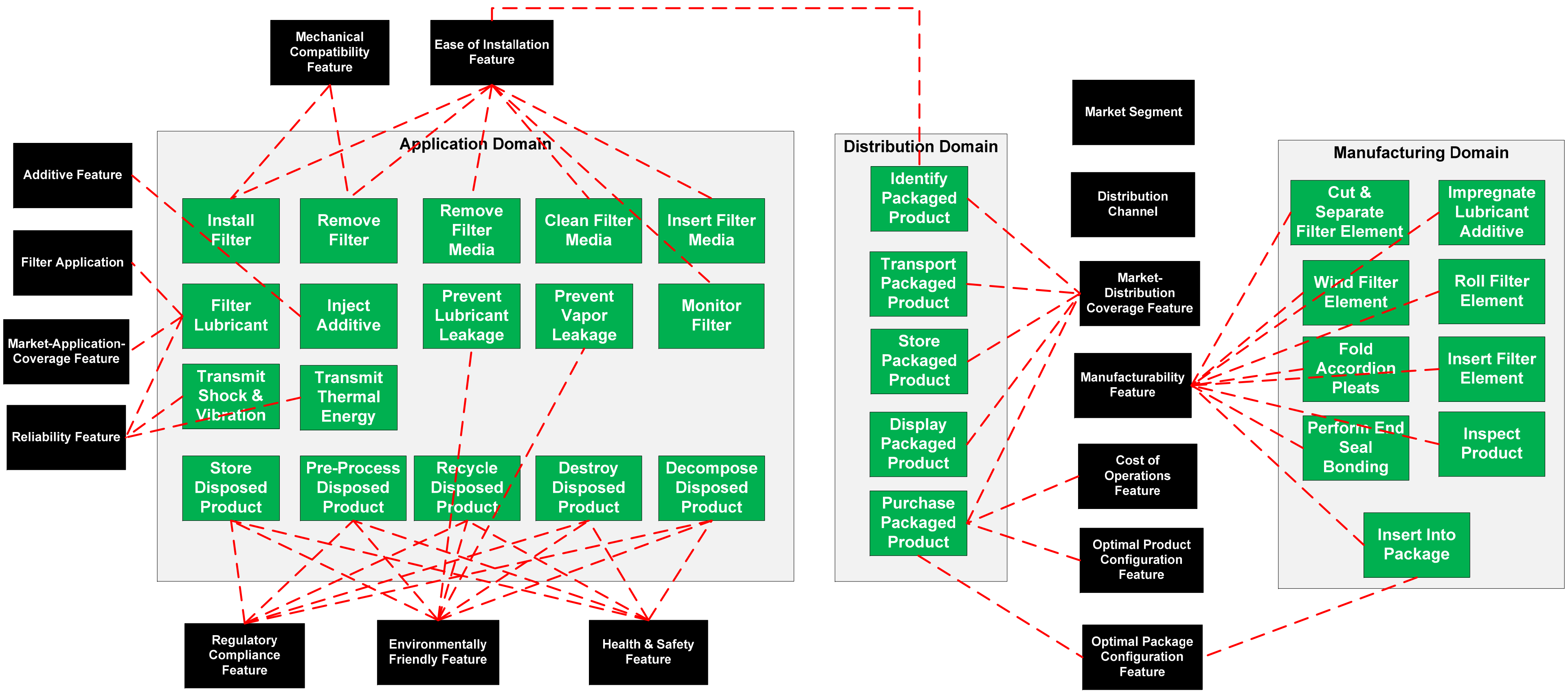
Example S*Pattern State (Modes) Model



Example S*Pattern Interaction Overview Model



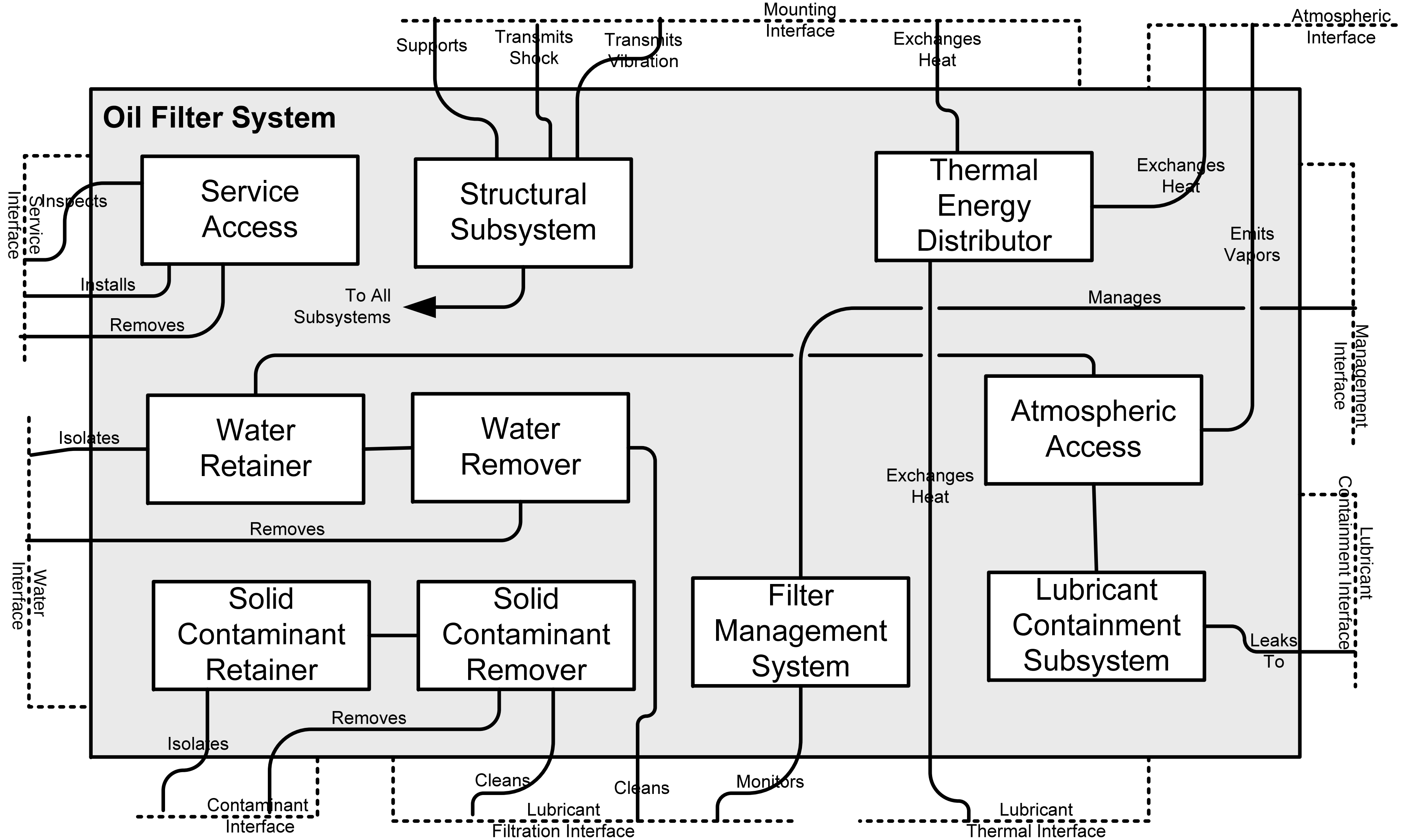
Example S*Pattern Feature-Interaction Associations Model (Part of Pattern Configuration Model)



Example S*Pattern Interaction Overview Model Extract

Interaction Name	Interaction Definition	Oil Filter System	Service Person	Mounting System	Ambient Air	Removed Solid Contaminant	Lubricant In Filtration	Removed Water	Local Surface	Lubricated System	Lubricant In Distribution	Lubricant Distribution Pump	Lubricant Transport Containment	Waste Management System	Manufacturing System	Distribution System	Package	Buyer
Filter Lubricant	The interaction during which the oil filter system filters the lubricant in filtration.	X		X		X	X	X		X	X	x	x					
Impregnate Lubricant Additive	The interaction during which the manufacturing system impregnates the oil filter with lubricant additive.	X													x			
Fold Accordion Pleats	The interaction during which the manufacturing system folds the sheet oil filter element into the form of accordion pleats.	X													x			
Cut & Separate Filter Element	The interaction during which the manufacturing system cuts and separates individual oil filter elements.	X													x			
Wind Filter Element	The interaction during which the manufacturing system winds the fiber oil filter element into a cylindrical shape.	X													x			
Insert Filter Element	The interaction during which the manufacturing system inserts the filter element into the filter housing.	X													x			
Perform End Seal Bonding	The interaction during which the manufacturing system bonds the end seal of the oil filter.	X													x			
Inspect Product	The interaction during which the manufacturing system inspects the finished oil filter product.	X													x			
Insert Into Package	The interaction during which the manufacturing system inserts the finished oil filter product into the package.	X													x	x	x	
Remove Filter Media	The interaction during which maintainer removes the filter media from the oil filter system.	X	X															
Clean Filter Media	The interaction during which the maintainer cleans the filter media.	X	X															
Insert Filter Media	The interaction during which the maintainer inserts the filter media back into the filter housing.	X	X															
Roll Filter Element	The interaction during which the manufacturing system rolls the sheet filter element into a cylindrical shape.	X													x			
Transmit Shock & Vibration	The interaction during which the oil filter system is subject to, and transmits, mechanical shock and vibration originating externally.	X		X														
Monitor Filter	The interaction through which the service person or lubricated equipment monitors the condition of the oil filter.	X	X															
Prevent Vapor Leakage	The interaction through which the oil filter prevents undue quantities of gaseous vapor contaminants from reaching the external local atmosphere.	X			X													
Prevent Lubricant Leakage	The interaction through which the oil filter prevents undue quantities of lubricant from escape from its portion of the lubrication loop.	X					X		X									
Transmit Thermal Energy	The interaction through which the oil filter receives and transmits thermal energy, originating in external components.	X		X	X		X											

Example S*Pattern Logical Architecture Model



Example S*Pattern Requirements Model -- Extract

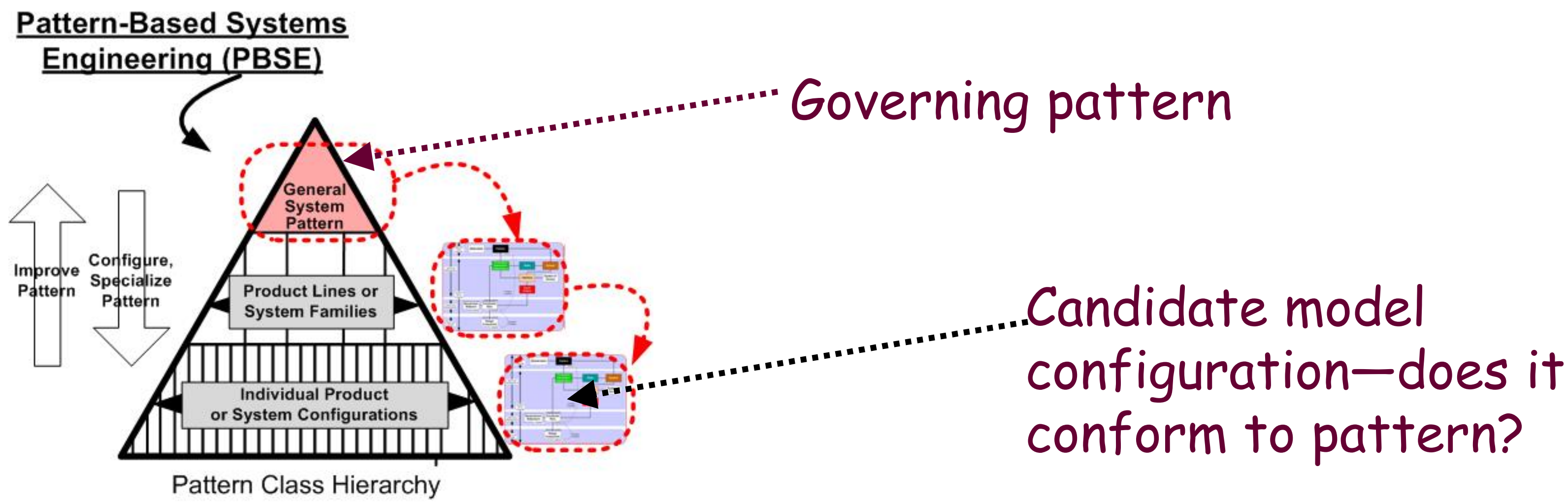
Interaction	Role	ID	Requirement Statement
Filter Lubricant	Oil Filter System	OF-50	For a Return Lubricant stream of [Lubricant Viscosity Range] and [Lubricant Pressure Range], the Oil Filter shall separate Filtered Contaminant particles from the Lubricant output stream, according to the [Filter Particle Size Distribution Profile].
Filter Lubricant	Oil Filter System	OF-51	The Oil Filter shall operate at lubricant pressure of [Max Lubricant Pressure] with structural failure rates less than [Max Structural Failure Rate] over an in-service life of [Min Service Life].
Filter Lubricant	Oil Filter System	OF-52	The Oil Filter shall accommodate a Lubricant flow rate of [Lubricant Flow Rate].
Filter Lubricant	Lubricant Distribution Pump	OF-53	The Pump shall maintain oil pressure within the [Lubricant Pressure Range].
Filter Lubricant	Lubricant In Filtration	OF-54	The Lubricant in Filtration shall have viscosity within the [Lubricant Viscosity Range].
Filter Lubricant	Lubricated Machine	OF-55	The Lubricated Machine shall contribute a Contaminant Load to the lubricant, not to exceed [Lubricant Contaminant Load Rate].
Filter Lubricant	Lubricated Machine	OF-56	The Lubricated Machine shall not heat the lubricant above [Max Lubricant Temperature].
Inject Additive	Oil Filter System	OF-57	The Oil Filter shall inject additive of type [Additive Type] into the Lubricant flow, at a rate of [Additive Injection Rate] per unit of lubricant flow, over the service life of the filter element.
Remove Filter Media	Oil Filter System	OF-90	The Oil Filter System shall permit the removal of its used Filter Media.
Remove Filter Media	Oil Filter System	OF-91	The Oil Filter System filter media removal process shall allow the service person to avoid direct contact contamination with filtered contaminants and lubricant.
Clean Filter Media	Oil Filter System	OF-92	The Oil Filter System shall permit the cleaning of its used Filter Media, for reuse purposes, using cleaning solvent and method of type [Filter Media Cleaning Method and Solvent].
Clean Filter Media	Oil Filter System	OF-93	The Oil Filter System filter cleaning process shall allow the service person to avoid direct contact contamination with filtered contaminants and lubricant.
Insert Filter Media	Oil Filter System	OF-94	The Oil Filter System shall permit the insertion of its Filter Media, of type [Filter Media Type].
Insert Filter Media	Oil Filter System	OF-95	The Oil Filter System filter media insertion process shall allow the service person to avoid direct contact contamination with filtered contaminants and lubricant.
Transmit Shock & Vibration	Oil Filter System	OF-100	The system shall meet its other requirements when subject to a vibration spectrum not exceeding [Max Vibration Spectrum] during its in-service life.
Transmit Shock & Vibration	Oil Filter System	OF-101	The system shall meet its other requirements when subject to shock intensity and frequency not exceeding [Max Shock Intensity and Frequency] during its in-service life.
Monitor Filter	Oil Filter System	OF-102	The system shall provide a means of inspection of its remaining service life before requiring servicing, using [Filter Monitoring Method].
Prevent Vapor Leakage	Oil Filter System	OF-103	When operating within its rated lubricant pressure and temperature, at altitudes not exceeding [Max Service Altitude], the system shall maintain Vapor Leakage to the ambient air space below [Max Vapor Leakage Rate].
Prevent Lubricant Leakage	Oil Filter System	OF-104	When operating within its rated lubricant pressure and temperature, at altitudes not exceeding [Max Service Altitude], the system shall maintain Fluid Leakage to the surrounding space below [Max Fluid Leakage Rate].
Transmit Thermal Energy	Oil Filter System	OF-105	The system shall meet its other requirements while operating in external ambient air temperatures of [External Temperature Range] and lubricant temperatures of [Lubricant Temperature Range].
Install Filter	Oil Filter System	OF-106	The Oil Filter shall be manually installable in ten minutes or less, using only a screwdriver.
Install Filter	Oil Filter System	OF-107	The Oil Filter shall have installation instructions printed on its exterior surface, in [National Language] language.
Install Filter	Oil Filter System	OF-110	The Oil Filter shall not present sharp edge hazards to the installer during the installation process.
Install Filter	Oil Filter System	OF-111	The Oil Filter shall be clearly labeled with instructions to shut down pressurized equipment prior to installation.
Install Filter	Service Person	OF-112	The Service Person with the visual acuity and hand strength of an average 40 year old adult shall be able to install the Oil Filter System.
Install Filter	Service Person	OF-113	The Service Person shall be capable of reading [National Language] at the tenth grade level.

Pattern Configurations

Product/Feature	Ice Road Trucking	Consumer Auto	Commercial Auto	Fixed Based Engine
Engine Lubricant Filtration Feature	Cold Environment	Consumer Automotive	Commercial Automotive	Fixed Based Engine System
Mechanical Compatibility Feature	X	X	X	X
Cost of Operation Feature	X	X	X	X
Reliability Feature	X	X	X	X
Maintainability Feature	X	X	X	X
Additive Feature	No. 7 Efficiency Boost	No. 5 Life Extension	No. 6 Efficiency Boost	No. 3 Efficiency Boost
Environmentally Friendly Feature	X	X	X	X

Checking holistic alignment of a Configuration to a Pattern

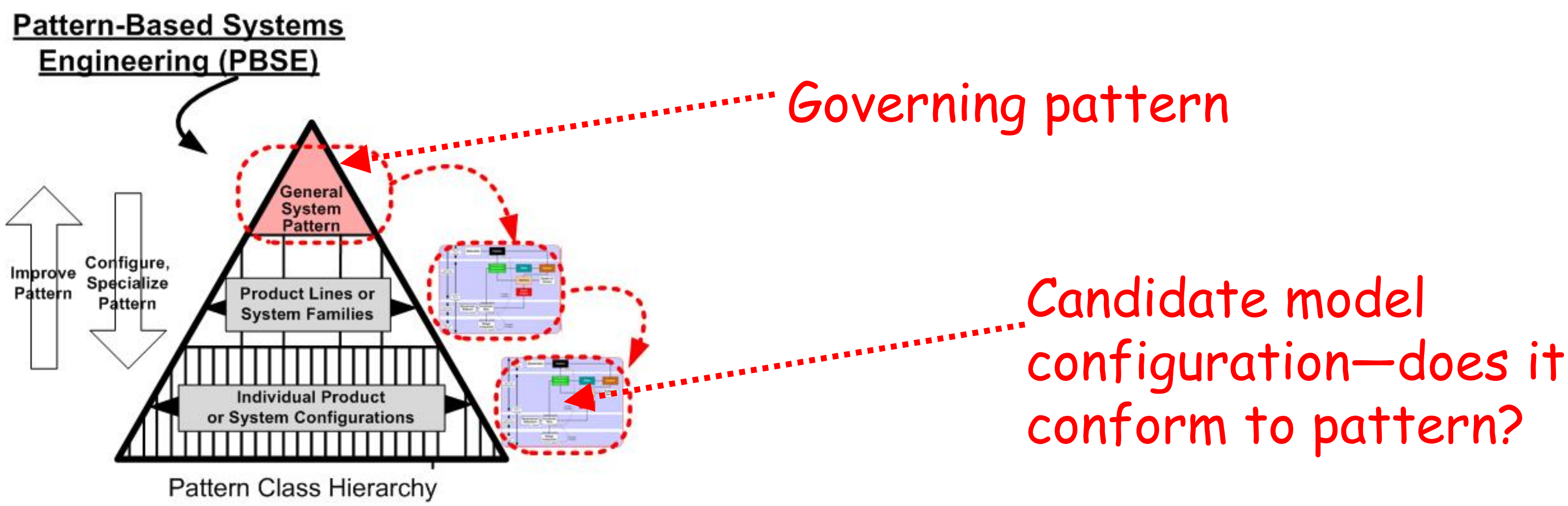
- Gestalt Rules express what is meant by holistic conformance to a pattern:
  - Expressing regularities of whole systems, not just same "parts"



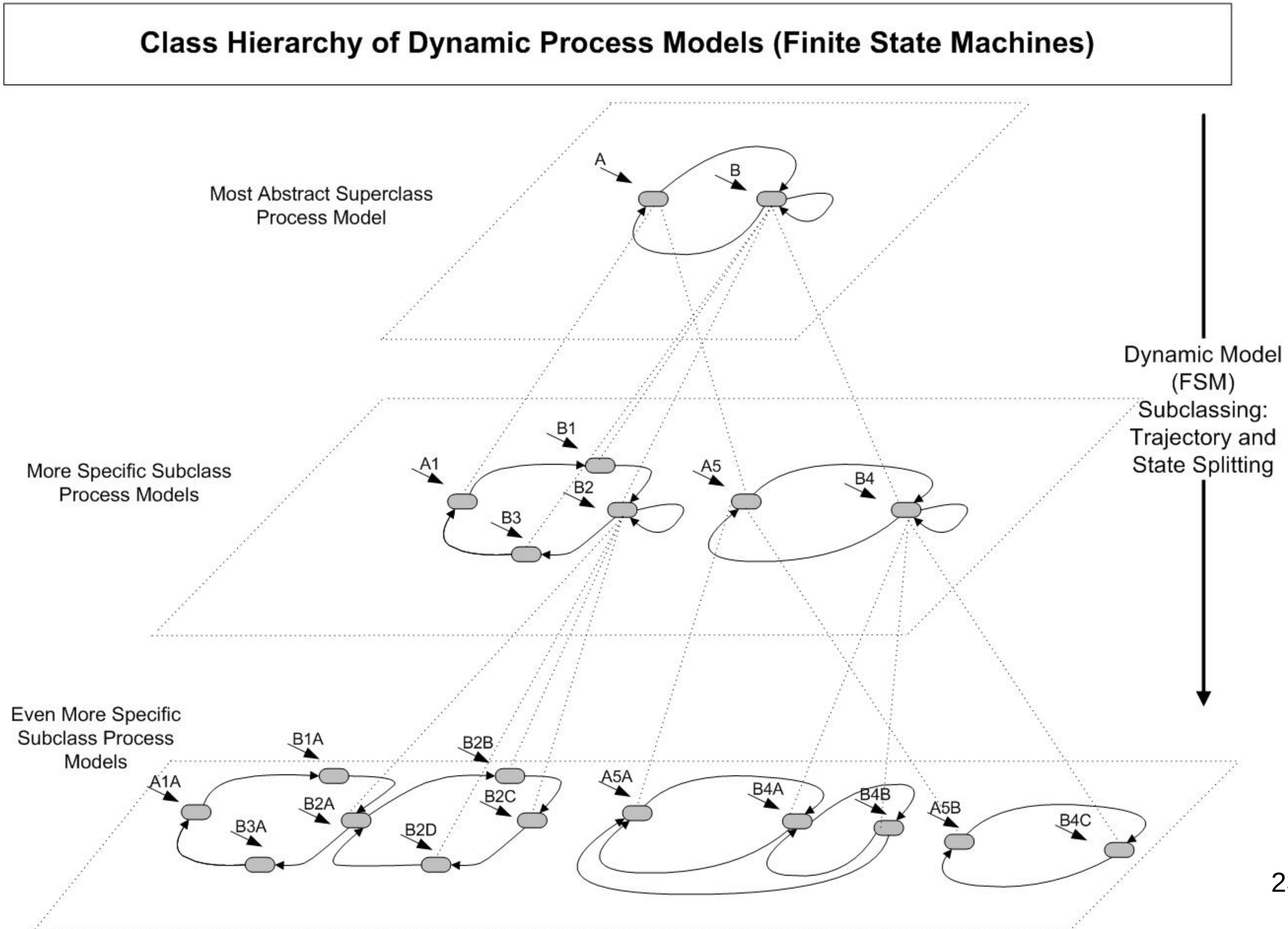
Checking holistic alignment to a pattern

The Gestalt Rules

1. Every component class in the candidate model must be a subclass of a parent superclass in the pattern—no “orphan classes”.
2. Every relationship between component classes must be a subclass of a parent relationship in the pattern, and which must relate parent superclasses of those same component classes—no “orphan relationships”.
3. Refining the pattern superclasses and their relationships is a permissible way to achieve conformance to (1) and (2).

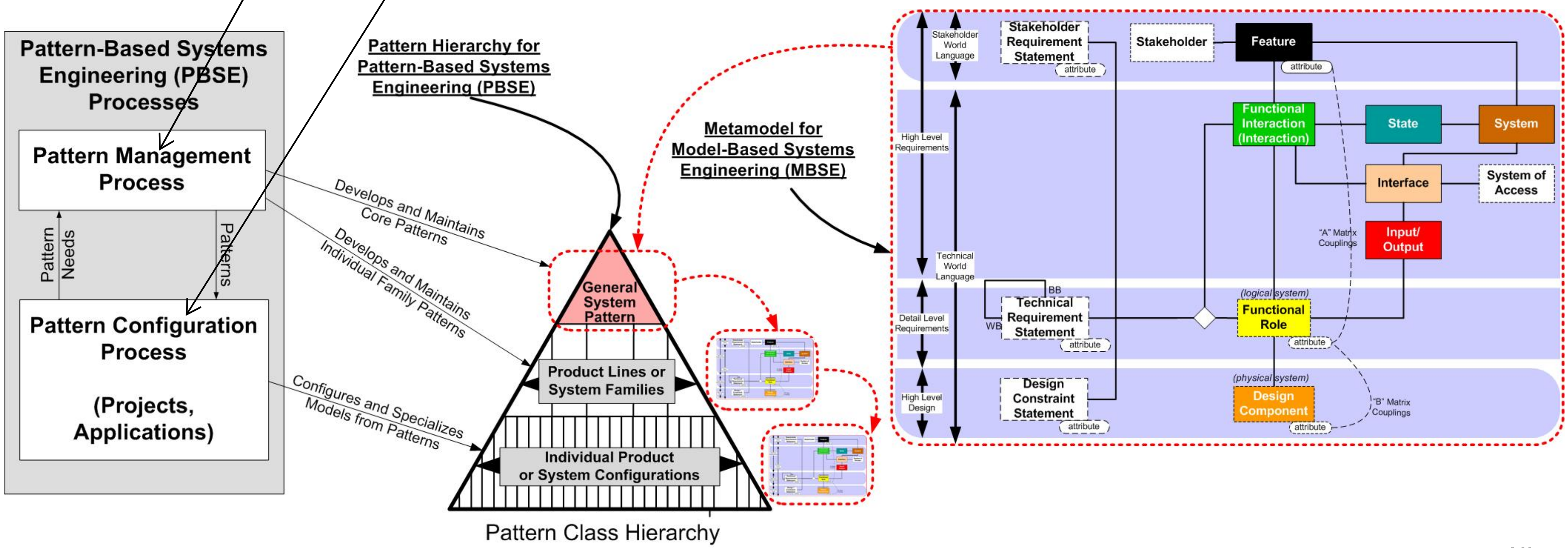


Example: State Model Pattern—illustrates how *visual* is the "class splitting" and "relationship rubber banding" of the Gestalt Rules



Pattern-Based Systems Engineering (PBSE)

- Pattern-Based Systems Engineering (PBSE) has two overall processes:
  - **Pattern Management Process**: Generates the general pattern, and periodically updates it based on application project discovery and learning;
  - **Pattern Configuration Process**: Configures the pattern into a specific model for application in a project.

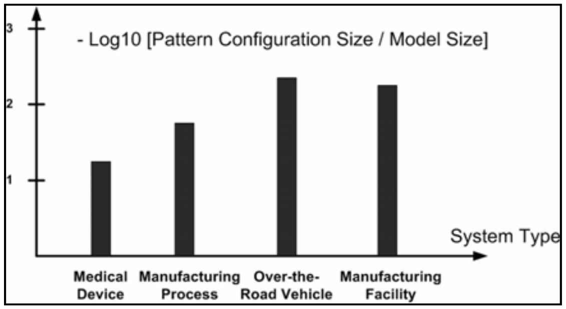


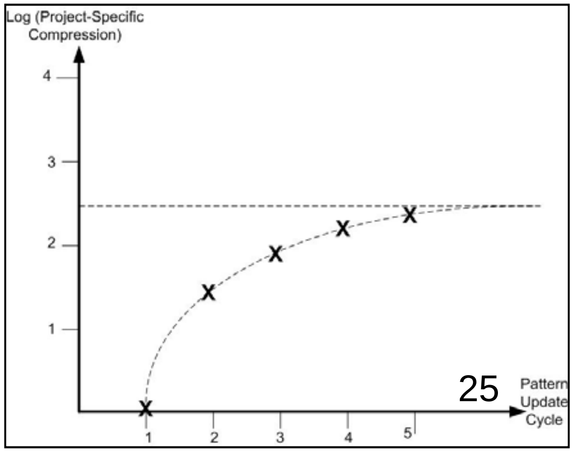
Pattern Configurations, Model Compression

- A table of configurations illustrates how patterns facilitate compression;
- Each column in the table is a compressed system representation with respect to (“modulo”) the pattern;
- The compression is typically very large;
- The compression ratio tells us how much of the pattern is variable and how much fixed, across the family of potential configurations.

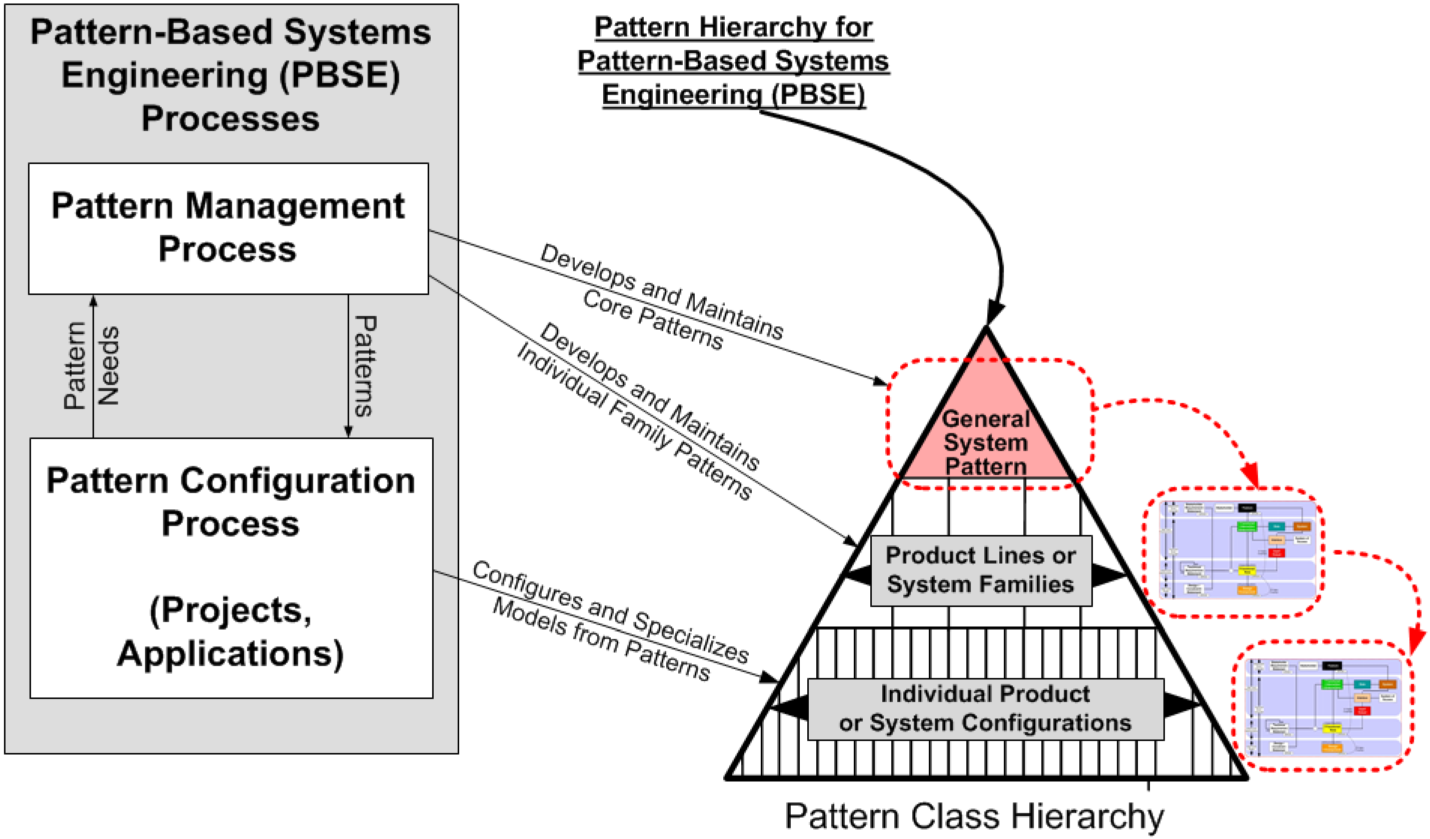
Lawnmower Product Line: Configurations Table

		Units	Walk-Behind	Walk-Behind	Walk-Behind	Riding	Riding	Riding Mower	Autonomous
			Push Mower	Mower	Self-Propelled	Rider	Tractor	Tractor	Autonomous
			Push Mower	Self-Propelled	Wide Cut	Rider	Lawn	Garden	Auto Mower
	Model Number		M3	M5	M11	M17	M19	M23	M100
	Market Segment		Sm Resident	Med Resident	Med Resident	Lg Resident	Lg Resident	Home Garden	High End Suburban
Power	Engine Manufacturer		B&S	B&S	Tecumseh	Tecumseh	Kohler	Kohler	Elektroset
	Horsepower	HP	5	6.5	13	16	18.5	22	0.5
Production	Cutting Width	Inches	17	19	36	36	42	48	16
	Maximum Mowing Speed	MPH	3	3	4	8	10	12	2.5
	Maximum Mowing Productivity	Acres/Hr			1.6				
	Turning Radius	Inches	0	0	0	0	126	165	0
	Fuel Tank Capacity	Hours	1.5	1.7	2.5	2.8	3.2	3.5	2
	Towing Feature						x	x	
	Electric Starter Feature				x	x	x	x	
	Basic Mowing Feature Group		x	x	x	x	x	x	x
Mower	No. of Anti-Scalping Rollers		0	0	1	2	4	6	0
	Cutting Height Minimum	Inches	1	1.5	1.5	1.5	1	1.5	1.2
	Cutting Height Maximum	Inches	4	5	5	6	8	10	3.8
	Operator Riding Feature					x	x	x	
	Grass Bagging Feature		Optional	Optional	Optional	Optional	Optional	Optional	
	Mulching Feature		Standard	Factory Installed	Dealer Installed				
	Aerator Feature					Optional	Optional	Optional	
	Autonomous Mowing Feature								x
	Dethatching Feature					Optional	Optional	Optional	
Physical	Wheel Base	Inches	18	20	22	40	48	52	16
	Overall Length	Inches	18	20	23	58	56	68	28.3
	Overall Height	Inches	40	42	42	30	32	36	10.3
	Width	Inches	18	20	22	40	48	52	23.6
	Weight	Pounds	120	160	300	680	705	1020	15.6
	Self-Propelled Mowing Feature			x	x	x	x	x	x
	Automatic TransmFeature							x	
Financials	Retail Price	Dollars	360	460	1800	3300	6100	9990	1799
	Manufacturer Cost	Dollars	120	140	550	950	1800	3500	310
Maintenance	Warranty	Months	12	12	18	24	24	24	12
	Product Service Life	Hours	500	500	600	1100	1350	1500	300
	Time Between Service	Hours	100	100	150	200	200	250	100
Safety	Spark Arrest Feature		x	x	x	x	x	x	





Business process optimized for PBSE fulfill a different vision:



Why do most representations of the systems engineering process appear to assume starting from no formal knowledge about the system of interest & its domain?

Patterns Challenge Team Deliverables

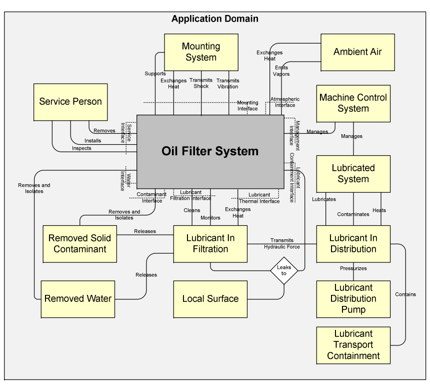
- Types of deliverables considered in our Team Charter:
  a) Target System Patterns
  b) Target System Pattern Applications
  c) Business Process Implications Model of PBSE
  d) Demonstration of PBSE support in Tools and Information Systems
  e) PBSE Tutorials
  f) Other target products

- Specific cases of the above deliverables have come to our team from three sources:
  - The original Product + Production System example pattern that originated team's Charter (Oil Filtration System + its Manufacturing System)
  - Several other patterns and applications nominated by interested attendees at the team's January IW2014 organizing meeting
  - Several other patterns and applications to support work being pursued by other INCOSE members and WGs, subsequently nominated.

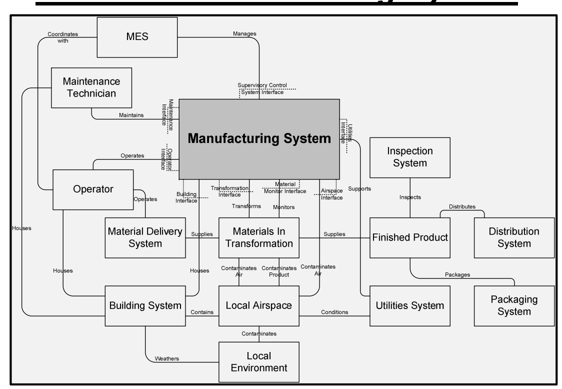
Original Charter: Patterns Spanning Organizational Domains

- Our team’s Charter and the example pattern we showed illustrate patterns that *span organizational domains*; e.g.:
  - A product system, in its application domain, *along with* . . .
  - The production system that produced that product
  - . . . and possibly other related domains (support, distribution, etc.)
- This *cross-domain patterns* approach is particularly encouraged by our MBSE Initiative’s leadership:
  - So, at least one of the projects this team is pursuing is a cross-domain product application and production pattern family.

Oil Filter, Application Domain



Oil Filter Manufacturing System



During IW, attendees also suggested work on other patterns

1. Restaurant System Pattern : Describing requirements and possibly high level design of Service Providing System/Kitchen “Meal Manufacturing” System/Business Process System, configurable for different classes of restaurants.

Interest from: Katie Trase, Eric Berg, JD Baker

Purpose: Illustrate System Requirements Patterns

During IW, attendees also suggested work on other patterns

2. Engineering Verification Pattern: Describing (a) the structure of Target Engineered System model data to “pre-cast” it in an expected form that is suited for ease of verification analysis (in the most advanced case, by automated analysis; in other cases, by human analysis), along with (b) the Verification Process Pattern for the verification business process, providing configurability to different verification agents, to indicate what kind of agent is required to analyze or verify a given case—different levels of seniority or experience, or even an automated agent, in different cases.

Interest from: Dan Dvorak, Andy Pickard

Purpose: Improve target system models and engineering processes to gain effectiveness and efficiency in the review process.

During IW, attendees also suggested work on other patterns

3. SEMP/SEP generation pattern: Describing the auto-generation of SEMPs/SEPs from target system patterns.

- Interest from: Shams Viranio, JD Baker, Bill Schindel

- Purpose: aid to anyone generating a SEMP/SEP; education for engineering students.

During IW, attendees also suggested work on other patterns

4. NDIA Domains Pattern: Aid in the form of a high level System Pattern, conforming to the seven defense system domains categorized by NDIA, including their cross-domain relationships.

Interest from: Crash Konwin, Troy Peterson, Shams Viranio

Purpose: Provide configurable pattern (model) basis for NDIA domains, and their relationships.

Additional patterns nominated by others, to support work being pursued by INCOSE members and WGs

5. Northrop Grumman (Tamara Valinoto):
   – Electronic Systems Pattern

6. Booz Allen Hamilton (Troy Peterson):
   – Vehicle Systems Pattern

7. INCOSE Agile Systems Working Group (Rick Dove):
   – Agile System Architectural Pattern
   – Agile SE

8. INCOSE Security Working Group (Rick Dove):
   – Secure System Pattern

Our near-term, time-based Challenge Team goal

- In the second half of 2014:
  - Make enough sub-team progress on selected patterns important to members to support . . .
  - One or more INCOSE IS2015 papers for Seattle (paper drafts due November, complete in March)
  - One or more INCOSE GLRC2014 presentations for Chicago (October)
- In support of this goal:
  - Bill Schindel offers to hold bi-weekly, web-based Pattern Review Work Sessions throughout the second half of 2014, starting this summer.
  - The purpose of these sessions will be to assist sub-teams in preparing S*Patterns that conform to the S*Metamodel and meet the application goals they have in mind.
- So, the question is:
  - Which sub-teams want to pursue their nominated Patterns during this period?
  - Following is what that would mean . . .

Tentative S*Patterns web meeting work session series time line

- Seeing the sausage-making:
  - Opportunity of seeing approaches and progress by others in the same part of an S*Pattern you are working on (e.g., Features)
- A proposed time schedule, assuming bi-weekly sessions:

Sessions	Configurable S*Pattern Construction
Jul	Configurable Features Model; Domain Model
Aug	Domain Model; Interactions; States
Sep	Detail Interactions; Requirements; Attribute Couplings
Oct	Logical Architecture; Detail Interactions; Requirements
Nov	Physical Architecture; Failure Modes
Dec	More about configuration rules

- Bill's commitment: Provide guidance to sub-teams
- Commitments by participants:
  - Willing to work on draft updates between review sessions
  - Willing to participate in bi-weekly review sessions (1.5-2.0 hours)
  - Also desirable: Willing to consider contributing to an INCOSE paper

Scheduling and communications

- Are you willing to meet bi-weekly, for 1.5-2.0 hours?

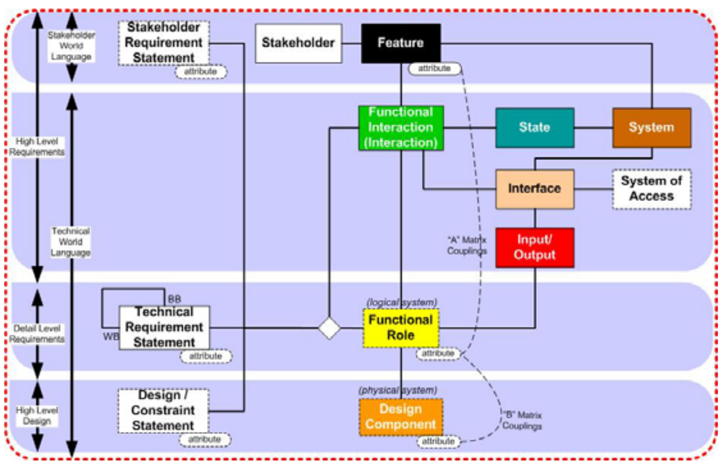
- What day of week / time of day is best for you?
  - Weekdays?
  - Weekends?
  - Evenings?

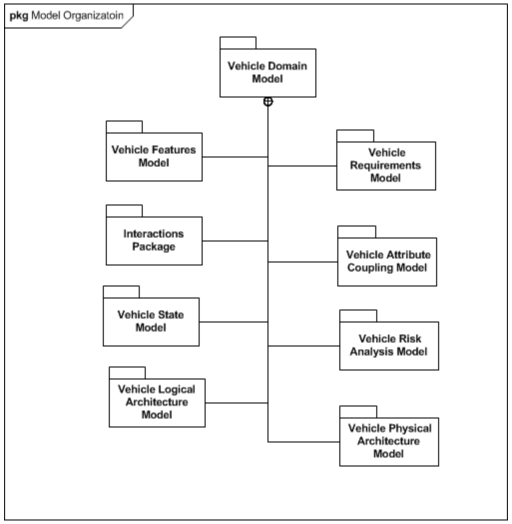
- Team web site:

http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns

What modeling tools, languages will we use?

- S*Metamodel is modeling language independent:
  - Readily expressed in SysML or other modeling languages.
  - For INCOSE work, if the sub-team does not have a conflicting goal, we'd encourage use of SysML, familiar to more in INCOSE.
  - Be prepared to learn a few things that the modeling language standards have not quite caught up with yet.
  - One of our team's spin-offs is feedback to Sandy Friedenthal's inputs on future SysML releases.
  - If you have a different language in mind, we'll help.





Related Activities by Other WGs and MBSE Initiative

- Other groups in the MBSE Initiative are creating a cloud resource for working groups and teams such as ours:
  - On-line shared models repository, for sharing models
  - On-line access to limited set of tool vendor licenses, for use in INCOSE projects
- News from other members, WGs:
  -
  -
  -
  -
  -

1. Eric Berg, “Affordable Systems Engineering: An Application of Model-Based System Patterns To Consumer Packaged Goods Products, Manufacturing, and Distribution”, at INCOSE IW2014 MBSE Workshop, 2014.
2. Bill Schindel, Troy Peterson, “Introduction to Pattern-Based Systems Engineering (PBSE): Leveraging MBSE Techniques”, in Proc. of INCOSE 2013 Great Lakes Regional Conference on Systems Engineering, Tutorial, October, 2013.
3. W. Schindel, “System Interactions: Making The Heart of Systems More Visible”, in Proc. of INCOSE Great Lakes 2013 Regional Conference on Systems Engineering, October, 2013.
4. Bill Schindel, Troy Peterson, “Introduction to Pattern-Based Systems Engineering (PBSE): Leveraging MBSE Techniques”, in Proc. of INCOSE 2013 International Symposium, Tutorial, June, 2013.
5. ”Abbreviated Systematica Glossary, Ordered by Concept, V 4.2.2, ICTT System Sciences, 2013.
6. W. Schindel, “Introduction to Pattern-Based Systems Engineering (PBSE)”, INCOSE Finger Lakes Chapter Webinar, April 26, 2012.
7. ------------------, “Integrating Materials, Process & Product Portfolios: Lessons from Pattern-Based Systems Engineering”, in Proc. of 2012 Conference of Society for the Advancement of Material and Process Engineering, 2012.
8. ------------------, “What Is the Smallest Model of a System?”, in Proc. of the INCOSE 2011 International Symposium, International Council on Systems Engineering (2011).
9. ------------------, “The Impact of ‘Dark Patterns’ On Uncertainty: Enhancing Adaptability In The Systems World”, in Proc. of INCOSE Great Lakes 2011 Regional Conference on Systems Engineering, Dearborn, MI, 2011
10. ------------------l, “Failure Analysis: Insights from Model-Based Systems Engineering”, in *Proceedings of INCOSE 2010 Symposium*, July 2010.
11. J. Bradley, M. Hughes, and W. Schindel, “Optimizing Delivery of Global Pharmaceutical Packaging Solutions, Using Systems Engineering Patterns”, in Proc. of the INCOSE 2010 International Symposium (2010).
12. W. Schindel, “Pattern-Based Systems Engineering: An Extension of Model-Based SE”, INCOSE IS2005 Tutorial TIES 4, (2005).
13. ------------------, “Requirements Statements Are Transfer Functions: An Insight from Model-Based Systems Engineering”, in *Proc. of INCOSE 2005 International Symposium*, (2005).
14. W. Schindel, and V. Smith, “Results of Applying a Families-of-Systems Approach to Systems Engineering of Product Line Families”, SAE International, Technical Report 2002-01-3086 (2002)..

The references above may be downloaded from:

https://sites.google.com/site/incosepbsewgtempaccess/

From Draft Charter: Team Stakeholders / Measures of Success

- **System Innovation / Development Teams**: Enjoy the benefits of MBSE with lower per-project model-origination and refinement time, effort, skill load, and risk, by employing configured System Patterns as early draft models.
- **System Modelers**: Extend the span of influence of skilled individual modelers by making their models effectively available, applicable, and impactful to more projects, systems, and products.
- **Product Line Managers, Platform Managers, Portfolio Managers**: Improve the effectiveness of families-of-systems disciplines, measured in terms of economic leverage.
- **System Verification Teams**: Improve the performance of system verification planning and execution in high risk or complexity systems.
- **System Life Cycle Groups**: Improve satisfaction with the early fit of systems to the learned needs of system life cycle communities, including manufacturing, distribution, end user, operations, and maintenance, over a broad range of issues that should not be re-discovered each generation (functionality, safety, many other aspects).
- **Tool Suppliers**: Improve the ROI demonstrated by tools.
- **Enterprises**: Improve organizational-level learning across individual people and projects, reducing occurrences of re-learning the same lessons and repeating the same mistakes.

From Draft Charter: General Plan Overview / Description

Phase 1: (Time period to be established)

1. Supplement start-up team membership with other interested team members, sharing and refining charter and gaining team buy-in to this plan.
2. Bring team membership to a common level of PBSE understanding, using PBSE Tutorials conducted in recent years at IS, GLRC, and chapter levels, including example System Pattern content.
3. Identify target products for near-term work by the team:
    a. Target System Patterns
    b. Target System Pattern Applications
    c. Business Process Implications Model of PBSE
    d. Demonstration of PBSE support in Tools and Information Systems
    e. PBSE Tutorials
    f. Other target products

Phase 2: (Time period to be established)

4. Create and validate targeted Challenge Team products, prioritized from above

Phase 3: (Time period to be established)

5. Make Challenge Team products available to INCOSE membership, extending benefits.

From Draft Charter: A Specific Challenge Encouraged by MBSE Initiative Leadership (for Infusion of MBSE Across Organizations)

- Generate two or more configured MBSE models across multiple systems and system domains from single system pattern asset(s) leveraged across them.
- The specific domains and systems will be chosen based on the team membership's priority interests, but are currently expected to include at least one multiple-configuration manufactured product line system, as well as the manufacturing system that produces it, linked together.
- This challenge will include quantification of the demonstrated economies or other gains obtained through pattern asset leverage, and the infrastructure (e.g., tools, processes) necessary to support those gains.
- An IS2015 paper describing this is likewise encouraged.

From Draft Charter: Individuals Indicating Interest in 2013

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