Model Based System Engineering Is it a Tectonic Shift from Document Based SE?

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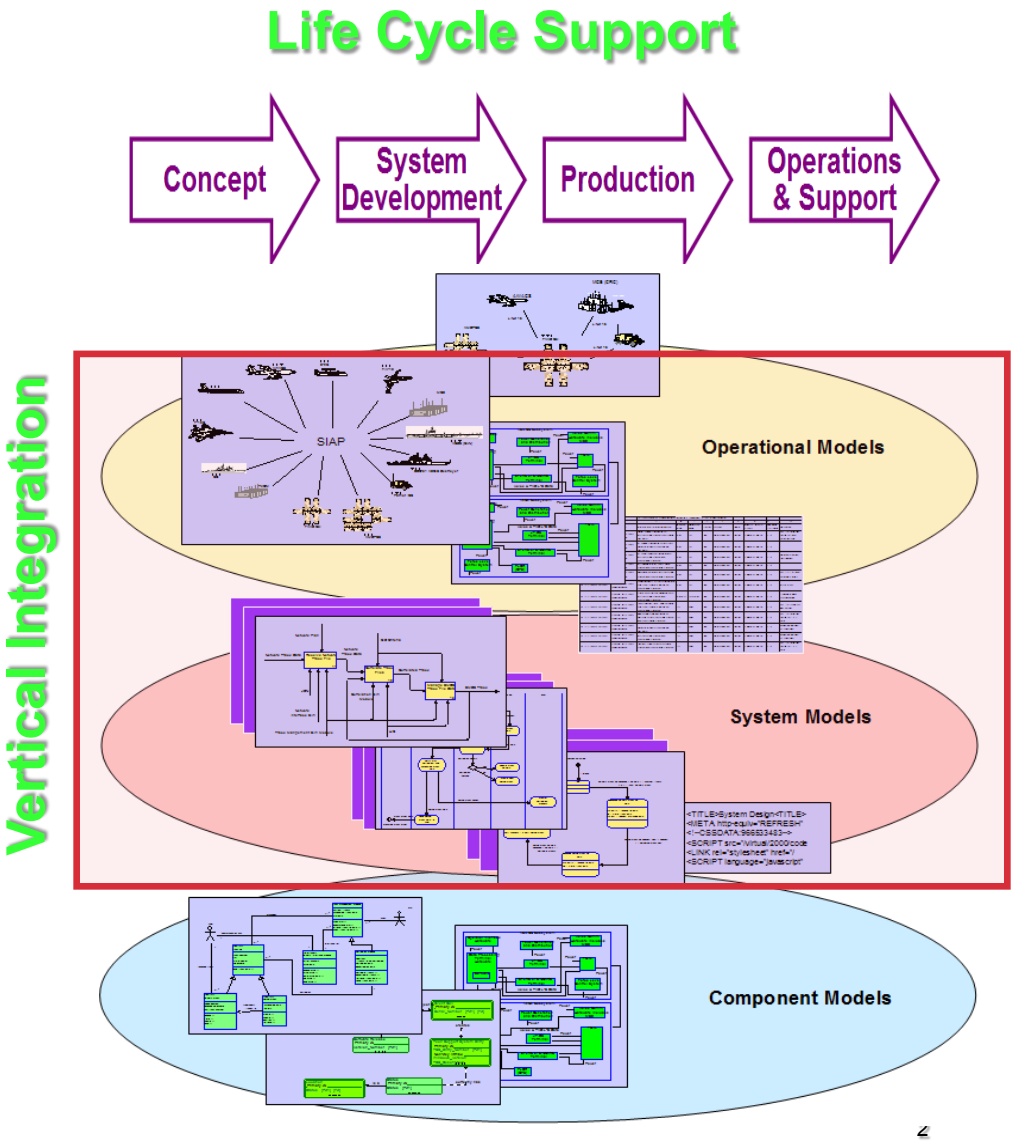
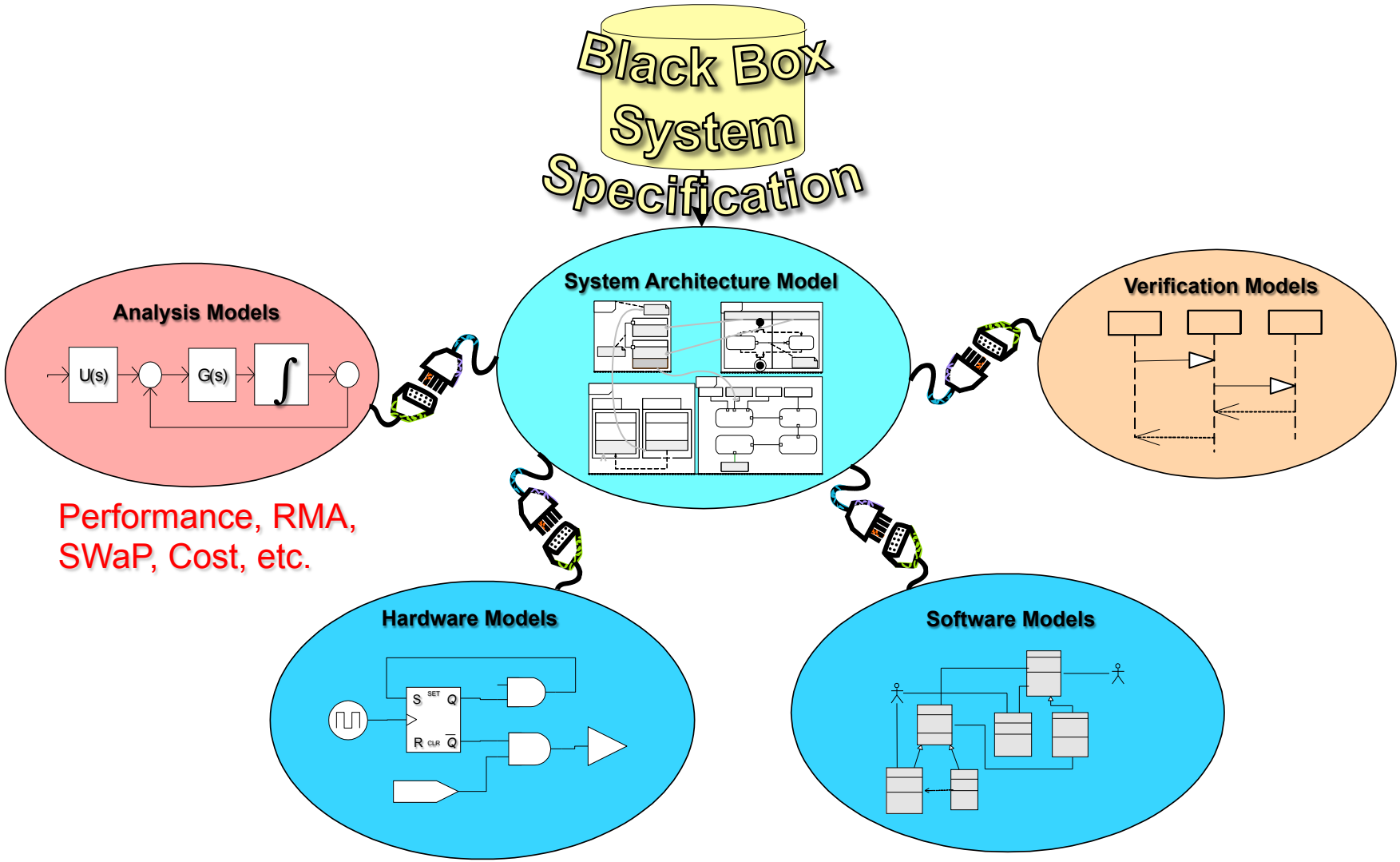
What is MBSE? - Scope

- Formalizes the practice of systems development through the use of models
- Broad in scope
  - Includes multiple modeling domains across life cycle from SOS to component
- Results in quality/productivity improvements & lower risk
  - Rigor and precision
  - Communications among development team and customer
  - Management of complexity



MBSE – The SE Tasks



MBSE Environment Characteristics

- Set of interconnected Models
  - Models are an abstraction of Reality
  - Structure, Behavior and Requirements
- Standard Language
  - Graphical Notation, Syntax, Semantics
  - Visual focus
  - Static and Dynamic
- Shared System Information Base

Information Base Characteristics

	Document Based	MBSE Based
Information	- Mostly Text - Add Hoc Diagrams - Loosely coupled, repeated in multiple documents	- Visual and Textual - Constructs Defined once and re-used - Shared across Domains - Consistent notation in diagrams - Defined relationships
Information Views	By Document	- Provides Viewpoints - Filters By Domain, Problem Space, etc.
Measuring Change Impact	Often Text requirements are isolated from Structure and Behavior	- Relationships define traceability paths - Natural part of the modeling process - Programmatically Automated
Measuring Integrity - Completeness, Quality & Accuracy	By manual inspection	Programmatically Automated

Why Change?

- System Size and Complexity
- Cheaper, Better, Faster

How do we get there?

- What are the Dimensions of Change?
  - Standards
  - Tools
  - Our Customers
  - Our Companies
  - People

Dimensions of Change

- Standards
  - Why: Guide us to the same End Point
  - Continue Support:
    - Not just an Academic View
    - Driven from Practice
  - Consistency across standards when mixed
  - For SE, includes;
    - UML, SysML, UPDM, XMI, MARTE, Diagram Interchange, etc.

Dimensions of Change

- Tools
  - A Given – All tools must be standard compliant
  - How are they Differentiated?
    - Large Complex Models
      - Many Domains, Much More Information
    - Automate Information Management
      - Adds, Deletes & Changes
      - Measure Model Integrity
        - » Completeness, Quality and Complexity
      - Measure and show Change Impact
    - Tool Integration - Seamless

Dimensions of Change

- Our Customers
  - Recognizing the potential for improvement in rigor, completeness and a more visual description
  - Both In RFPs and in the delivered product
  - Executable models to better visualize needs

Dimensions of Change

- Our Companies
  - It takes an investment in tools and people
    - Like any other skill, it must be practiced
  - Need a Business Case and a bit of Faith
    - More time up front, defects detected earlier
  - Must be driven from the Grassroots and the Top
  - MBSE Managers
    - Need Training and Experience

Dimensions of Change

- People Changing
  - People don't like change!
    - If they get Instant Results - Immediate Buy-in
    - A Long Painful Road – More Resistance
  - By the way – You still have to be productive

Conclusion

- System Engineers are doing the same tasks but in a different way
- Is it a Tectonic Shift?– Yes
- Why?
  - Many dimensions of change
- But The promise is:
  - Increase in Productivity & Quality
  - Decrease Risks
  - Detect defects earlier
  - Quantum leap in developing larger, more complex systems