



IBM Software Group

# Use of systems modeling to promote and facilitate a shared vision of complex systems

**Gavin Arthurs PE**  
**Sr. Technical Specialist – IBM Rational**



Innovation for a smarter planet

© 2009 IBM Corporation

## Agenda

- Complexity in systems
- Systems complexity and our metal models
- Modeling
- Applying systems modeling



# The world is smaller and flatter and is getting a lot smarter



## INCOSE

- A system is a construct or collection of different elements that together produce results not obtainable by the elements alone. The elements, or parts, can include people, hardware, software, facilities, policies, and documents; that is, all things required to produce systems-level results. The results include system level qualities, properties, characteristics, functions, behavior and performance. The value added by the system as a whole, beyond that contributed independently by the parts, is primarily created by the relationship among the parts; that is, how they are interconnected.

<http://www.incose.org>



# Value is created by interconnection



Vehicle to Vehicle



Dealer



Tolls



Electric Vehicle/  
Hybrid Charging



GPS

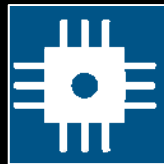


Vehicle to  
Roadside



## Interactive Complexity

- Is being driven by system components that are:



INSTRUMENTED



INTERCONNECTED



INTELEAGENT

- The nature of this complexity is not physical



## Systems Complexity and our mental models

- Team members typically have a relatively narrow view of the system biased by their past experience, areas of expertise and interest in the system.
- As the level of complexity increases (especially non-physical complexity), the opportunity for divergent mental models among the team increases.
- Successful development of today's complex systems demands that the team work efficiently with consistently focus. This means it is essential that a shared vision of adequate fidelity be established
- Systems modeling helps us develop the shared vision



What  
Modeling Is ■ Abstraction of reality



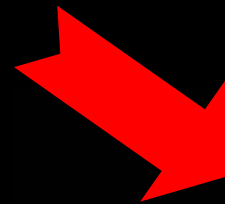
## To Abstract

- Amplification through simplification
  - ▶ Abstractions are not reality
  - ▶ Abstractions are intentionally incomplete



# From Vision (abstraction) to Execution (reality)

## A model



## Reality



<http://www.gehrytechnologies.com/>



## Why a system model

- To abstract – for purpose and focus
- To reason about – compare, synthesize, analyze
- To document – decisions, themes, rational.....
- To communicate – leverage the visual
- To provide a baseline understanding (shared view)

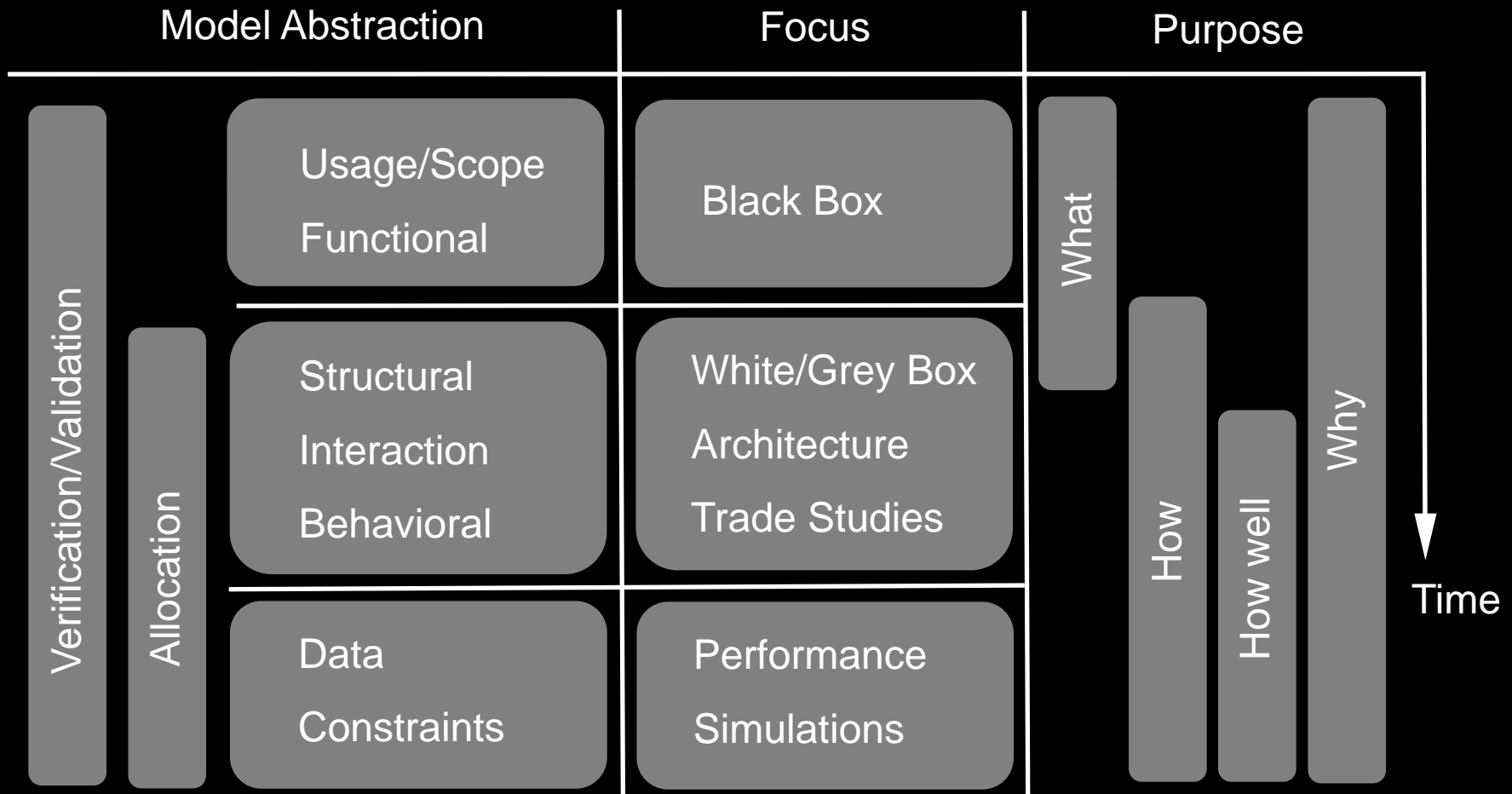


## Developing a system model

- A standards based modeling language
  - ▶ Provides the visual notation
  - ▶ Defines the language semantic
  - ▶ SysML
- A tool
  - ▶ That supports the language (the way you plan on using it)
  - ▶ Is optimized around my workflows
  - ▶ Will support integration in to the lifecycle development environment
- A integrated set of workflows
  - ▶ What abstractions do I use?
  - ▶ How do I organize the model?



# Developing a system model



# Thank You

© Copyright IBM Corporation 2009. All rights reserved. The information contained in these materials is provided for informational purposes only, and is provided AS IS without warranty of any kind, express or implied. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, these materials. Nothing contained in these materials is intended to, nor shall have the effect of, creating any warranties or representations from IBM or its suppliers or licensors, or altering the terms and conditions of the applicable license agreement governing the use of IBM software. References in these materials to IBM products, programs, or services do not imply that they will be available in all countries in which IBM operates. Product release dates and/or capabilities referenced in these materials may change at any time at IBM's sole discretion based on market opportunities or other factors, and are not intended to be a commitment to future product or feature availability in any way. IBM, the IBM logo, Rational, the Rational logo, Telelogic, the Telelogic logo, and other IBM products and services are trademarks of the International Business Machines Corporation, in the United States, other countries or both. Other company, product, or service names may be trademarks or service marks of others.