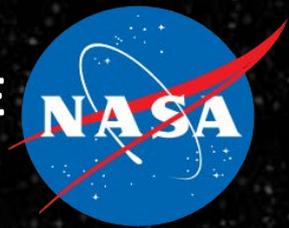
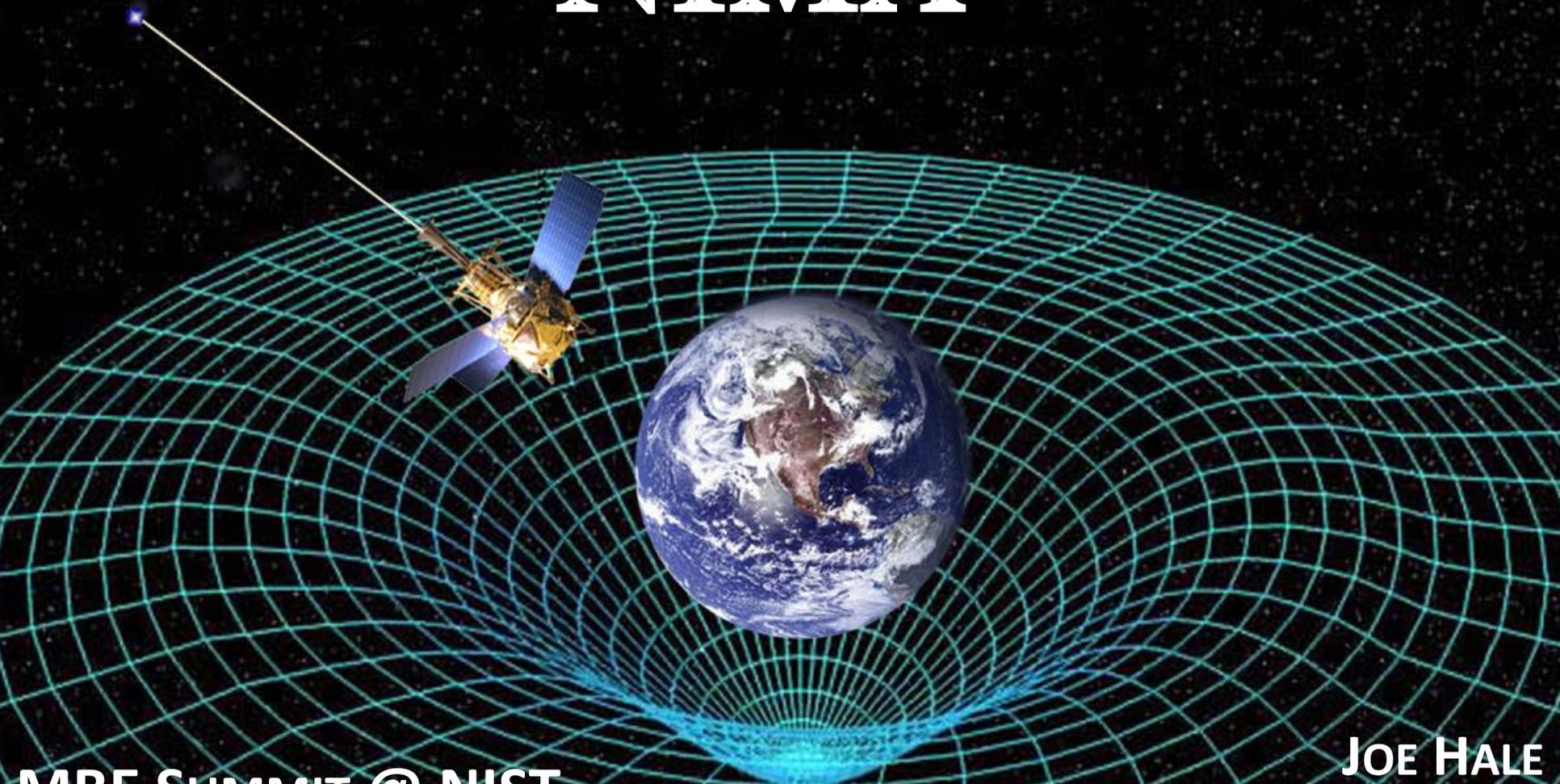


NASA INTEGRATED MODEL-CENTRIC ARCHITECTURE



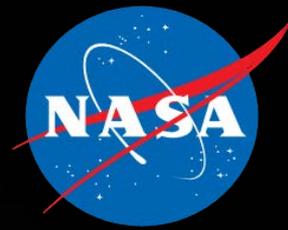
# NIMA



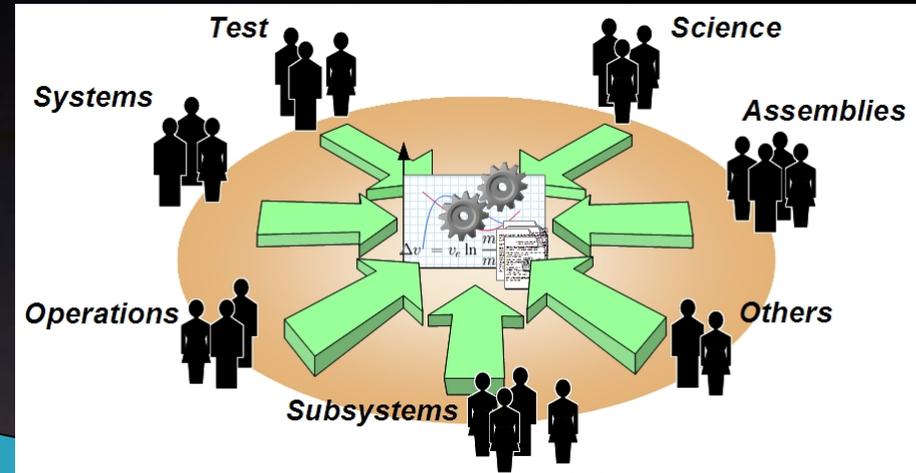
MBE SUMMIT @ NIST  
DECEMBER 18, 2013

JOE HALE  
NASA/MSFC  
JOE.HALE@NASA.GOV

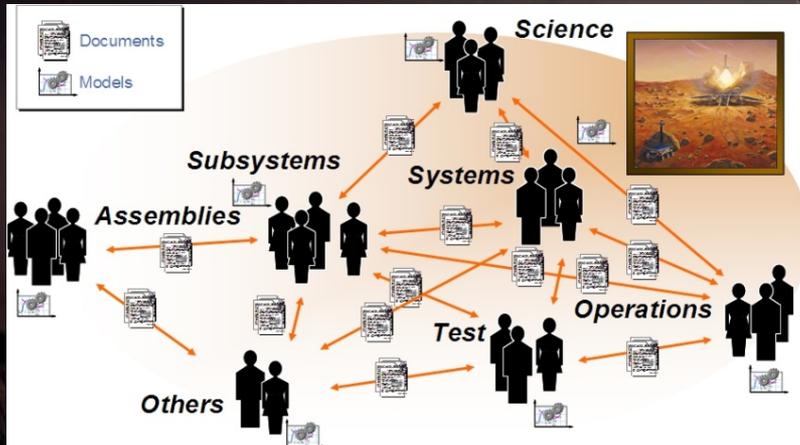
# Document-centric to a Data/Model-centric Architecture



Advance from our current document-centric engineering practice to one in which model-based data representing the technical designs, as well as Program Management & Systems Engineering information, are integrated and evolve throughout the life-cycle, supporting trade studies, design verification and system V&V



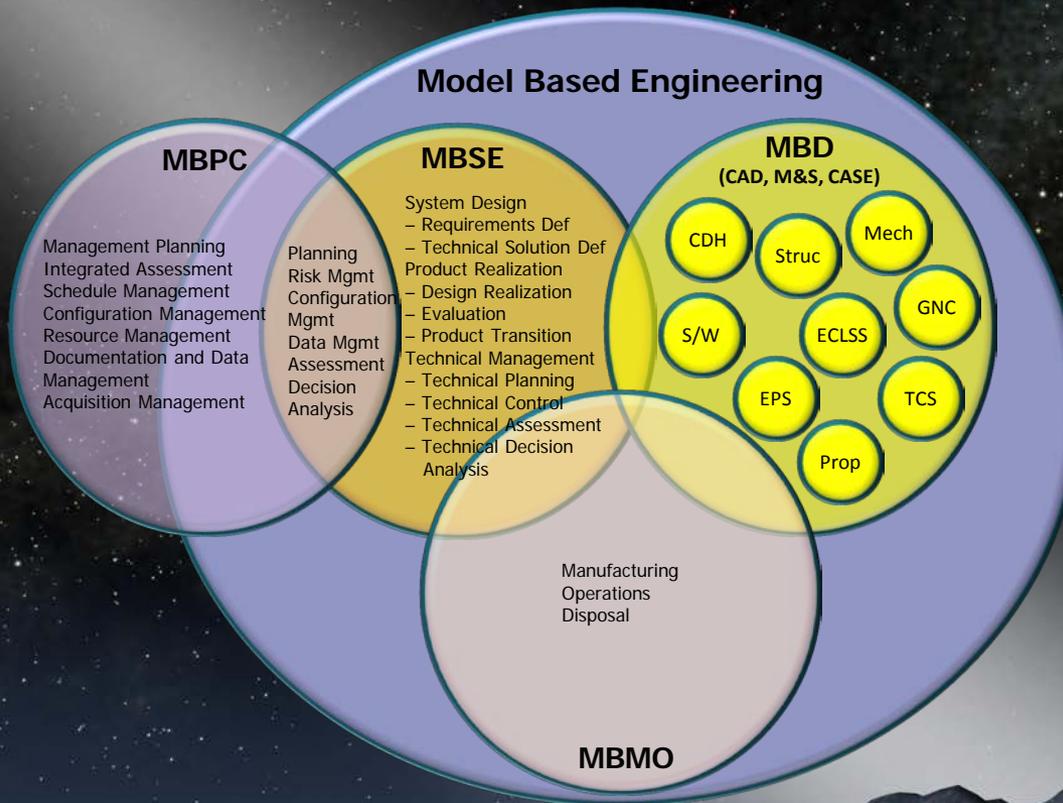
Future: Model-based data exchange among disciplines, domains, and partners



Today: Document driven & standalone models

To do this we must:

- Enhance the ability to share and exchange information
- Improve workforce knowledge, skills and abilities
- Facilitate the exchange and adoption of model-based practices and technical solutions



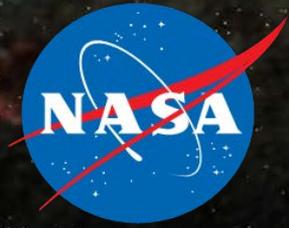
**MBSE (Model Based Systems Engineering)** – A formalized application of modeling to support system requirements, design, analysis, *technical management*, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases. (17 SE Processes 7123)

**MBE (Model Based Engineering)** – An approach to engineering that uses models as an integral part of the technical baseline that includes requirements, analysis, design, implementation, and verification of a capability, system and/or product throughout the acquisition life cycle. (NDIA M&S)

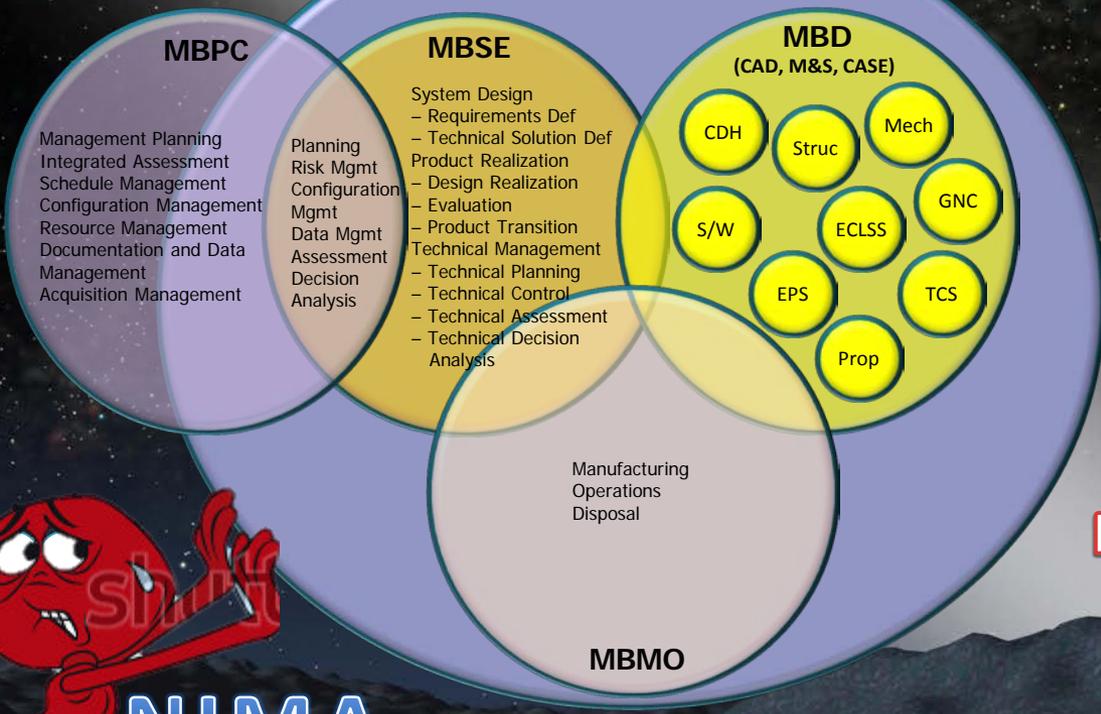
**MBD (Model Based Design)** – Mathematical and visual method of addressing problems associated with designing complex control signal processing and communication systems

**MBPC (Model Based Project Control)** - A formalized application of modeling to support schedule, budget, organizational activities related to the system(s) of interest.

**MBMO – Model Based Manufacturing and Operations** – A formalized application of modeling to support manufacturing and operations



# Model Based Engineering

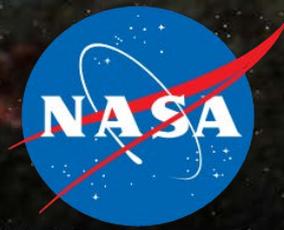


Model-Centric

NIMA

Document-Centric





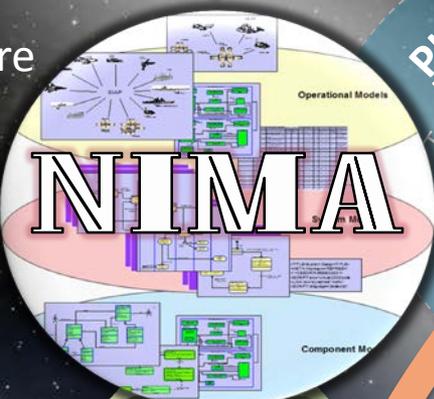
# NIMA Approach

Develop, implement, and exercise a technologies & methodologies infusion pathway to help move the Agency from a Document-centric to a Data/Model-centric Capability and Culture



# NIMA-to-Project View

A cross-center team working to enable/facilitate transition from document-centric to data/model-centric process/practices/culture within and across NASA



## App Store

Access to model-centric solutions

## Enabling Systems

Definition of required enabling capabilities, e.g. workforce training, IT, ...

## GUIDANCE

Standards, Requirements, and Guidance for MC Data exchange & management and MC methodologies

## PILOTS

Testing & limited implementation of NIMA practices and technical solutions

Feedback on Solutions

## NASA Projects

Model-based practices and technical solutions are available to Project personnel

Training needed to use NIMA processes and practices are identified and made available to project personnel

Enabling IT requirements for resources and capabilities are identified

Standards guide data exchange and management for interoperability, consistency, and integrity

Information & best practices

### OCE SEWG CoPs

MBSE	PDLM	M&S	CAD
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Industry

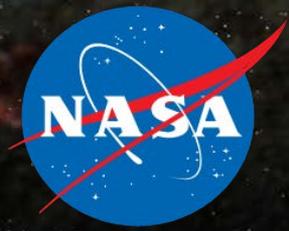
Academia

Centers  
(e.g. HR)

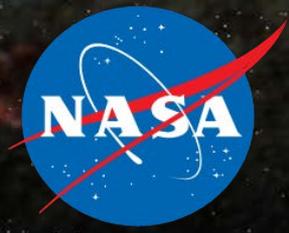
Vendors

Subject Matter Experts & Other Resources

# FY14 NIMA Infrastructure Development



- Define processes to ID, Filter, Prioritize, and Select candidates for AppStore, Standards, Handbooks, & Training
- Define and develop AppStore functionality
- Define processes to capture/develop content for AppStore, Standards, Handbooks, & Training



# Initial FY 2014 Focus Areas for AppStore and Standards/Handbooks Content:

- Refinement and utilization of a SE Process Model (based on NPR 7123.1)
- Development of an Agency Handbook for Modeling & Simulation Verification, Validation, & Accreditation (M&S VV&A)
- Assessment of DARPA Adaptive Vehicle Make (AVM)
- Two study efforts, consisting of research, benchmarking, and development of follow-on recommendations:
  - CM/DM of models/databases
  - Contractual language for the exchange of models and electronic data