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MBSE Across Formulation and Early Implementation Lifecycle at JPL

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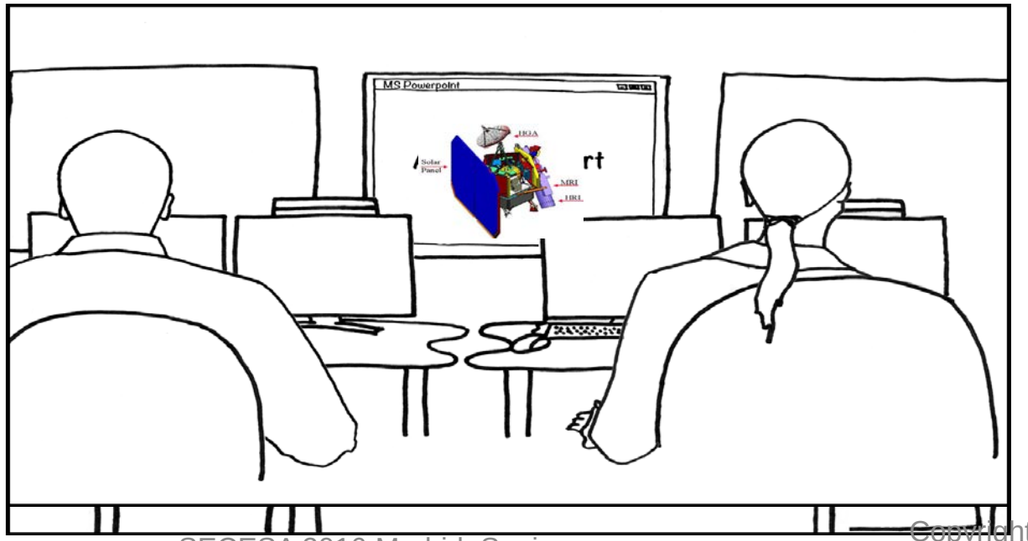
Early Lifecycle Overview: Today's Paradigm

At each transition in the formulation lifecycle, significant information is lost due to the ad hoc organization of people, processes, and tools

Idea → Architecture Team → Team X → Proposals → Early Implementation



- Team X infrastructure produces good single point designs within the sessions, but it is expensive to assess design sensitivities and external model integration is difficult
- At the study end, the subsystems typically create static PPT reports. The integrated models are inaccessible outside the Team X environment
- Short of returning to Team X, any further maturation of the concept is entirely ad-hoc

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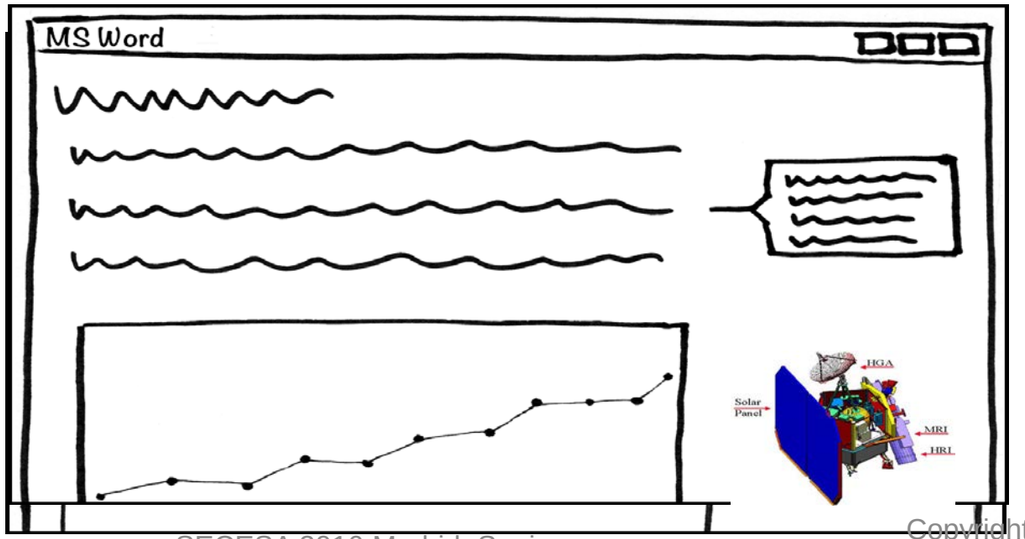
Early Lifecycle Overview: Future Paradigm

A common, model-based infrastructure will streamline transitions across the formulation lifecycle, while reducing cost and adding new capabilities

Idea → Architecture Team → Team X → Proposals → Early Implementation



- Infrastructure supports studies with common data sources; subsystem engineers use higher-fidelity models
- Several types of new capabilities:
  - Dynamically generated PPT, Word, and PDF reports
  - Ingestion of new & customer-generated models and data
  - Advanced visualization & CAD tools
- Customer team can continue to mature the concept and explore design sensitivities following the Team X sessions

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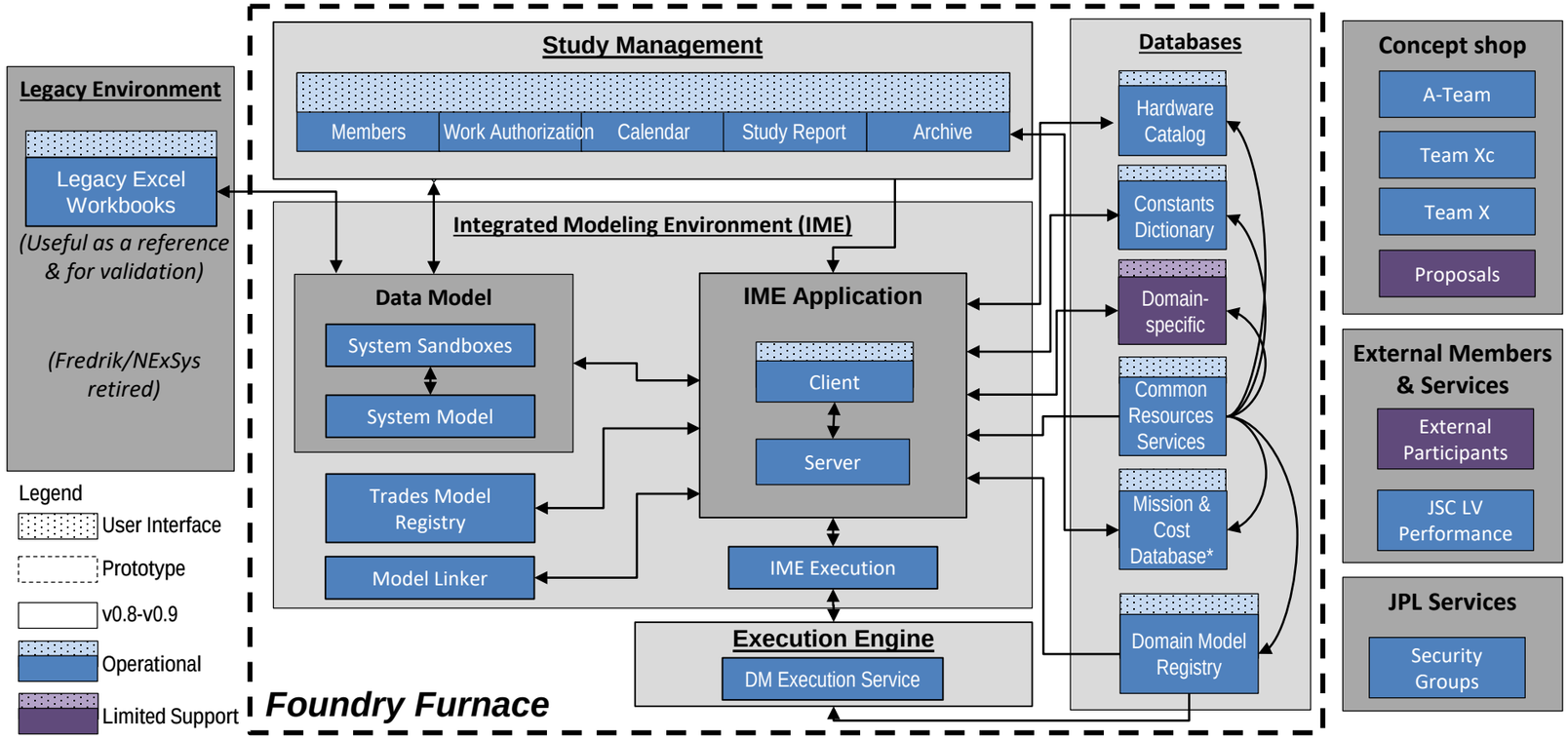
JPL Proposed MBSE Formulation Deployment for FY18

JPL's Foundry Furnace: web-based concurrent engineering for formulation



We reviewed several COTS solutions, but found that there are very few ***concurrent engineering*** tools that provide the sort of easy, immediate access that we require

For more details, please attend Jonathan Murphy's talk, 'JPL's Foundry Furnace', 6 Oct, 10 am

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Debate / Discussion Topics

There are fundamental differences between *Early Formulation Teams* and *Project Implementation Teams* that may result in different MBSE solutions

Early Formulation Teams	Project Implementation Teams
Concept Designs worked in hours/days Does not support SySML Implementation	Designs worked in month time scales Amenable to SysML Implementation
Various part-time staff members Customized front-end web-based interface	Dedicated full-time team members Amenable to COTS front-end, e.g., MagicDraw
Support multiple concepts and architectures, e.g., Earth, Mars, Astrophysics, Solar System, Lunar, etc. Requires very agile structure for linking models and data that makes it easy to build and tear down quickly	Support detailed design of a single mission concept Amenable to more complex and higher performing applications

Potential Solution: Execute a data model transformation as a concept team transitions from *Early Formulation* to *Project Implementation*

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