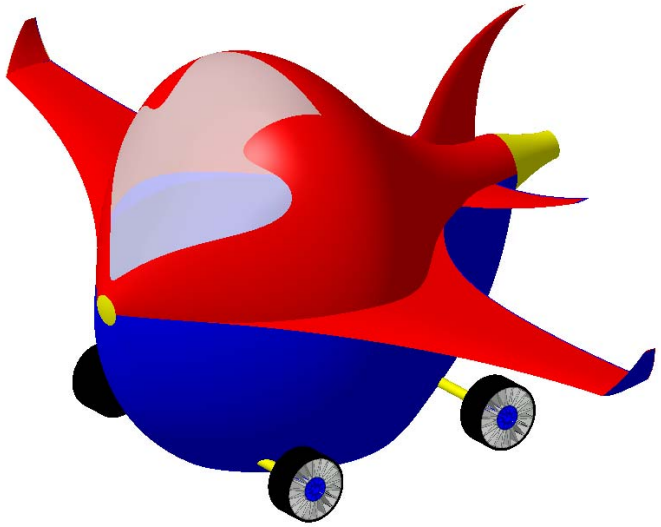
NA Regional Summit 2008 NAFEMS

2020 Vision of Engineering Analysis and Simulation

October 29 - 31, 2008 | Hampton, Virginia

Altair Engineering – PLASVEE 2020



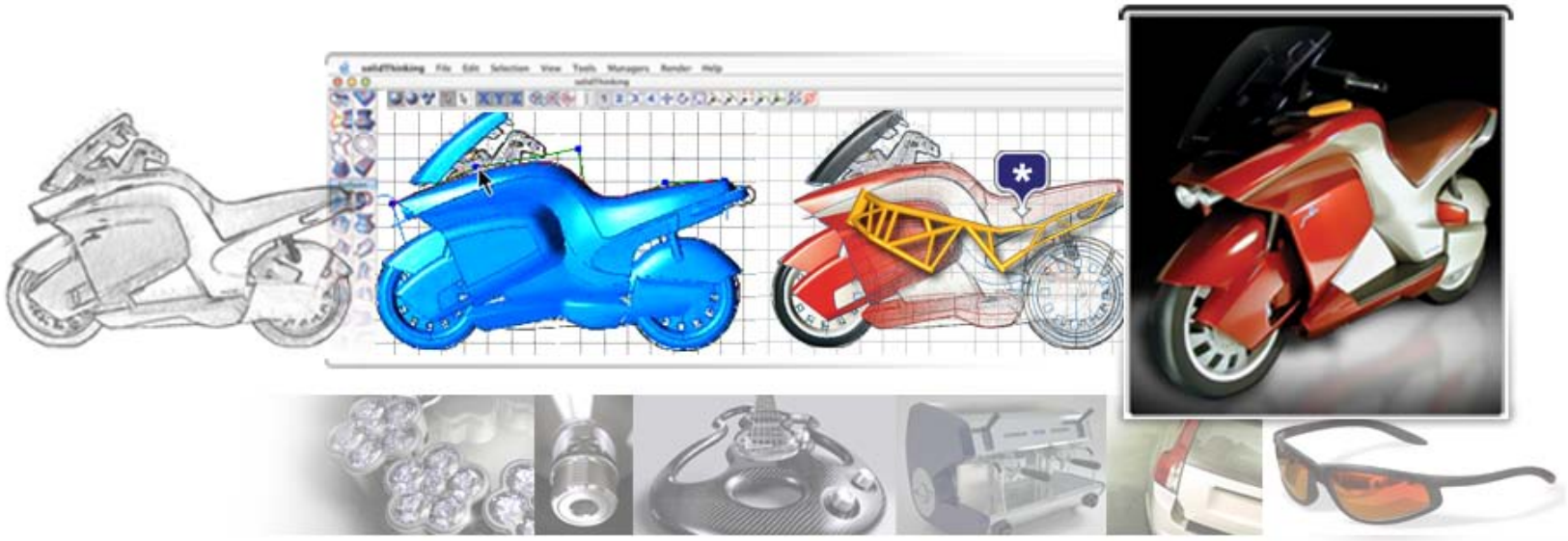
Dr. Robert Yancey

Altair Engineering

Proposal Summary – Key Technologies

- People
  - **Real-time interaction** with the modeling – pre- and post-processing functions allow the results of changes to be visualized in real-time
- Process
  - Modeling will be based on **non-deterministic approaches** (stress range at a point) to be consistent with physical testing and provide for a robust design
  - **Compute power** will be accessed through an internal and external network to allow for multi-disciplinary runs on an as-needed basis
  - All **data will be managed and accessible** to the team including business and technical data
- Technology
  - Modeling will be **multi-physics** to account for structural, electrical, thermal, and fluid effects

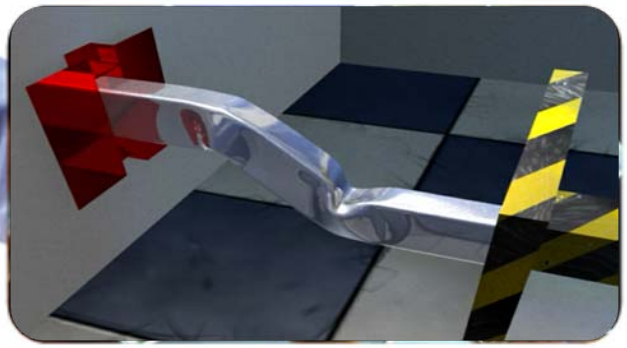
Ideation and Styling – Coupled with Simulation



- **Synthesis** within conceptual design tools will guide esthetics and performance
- Industrial designers able to play with **physical behavior** of concept designs
- **Interactive-speed** physical simulation and **photo realistic** rendering
- A variety of **trade-offs** can be evaluated early
  - Compare carbon footprint for various manufacturing process choices
  - Compare time and cost associated with a material change

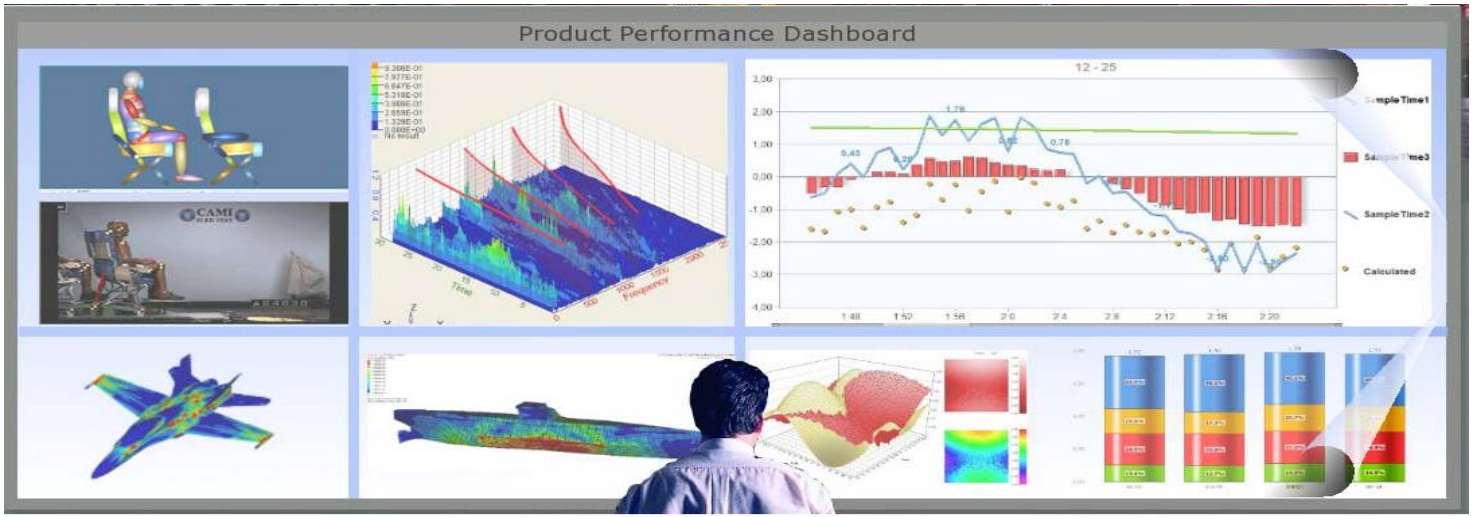
Blending the Real and Virtual Worlds

- **Multi-touch interfaces** and 6 axis pen control
- Visualize simulation results with near **photo realistic** quality (NPR) in real time
- **Immersive** visualization and interaction
- **Virtual Test Lab**



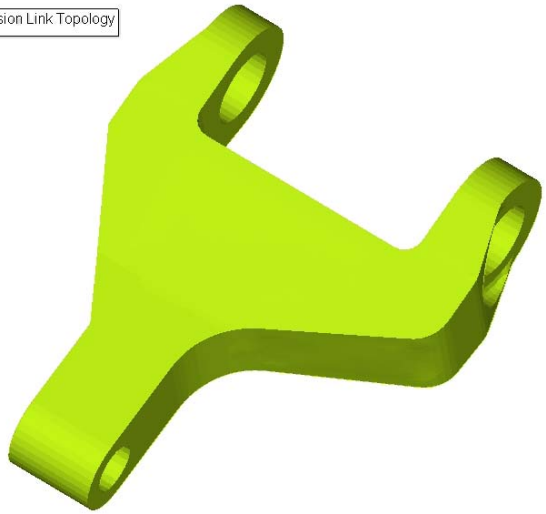
Requirements/Constraints Based Optimization

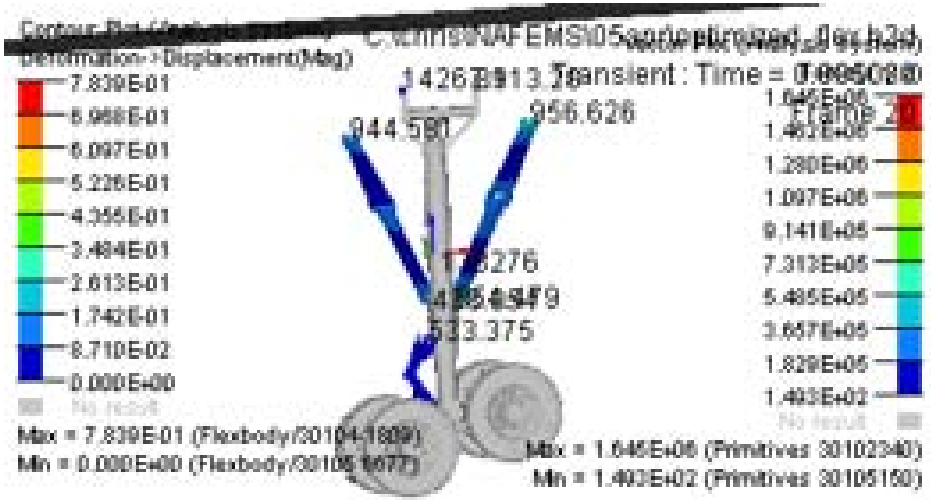
- Employ **Product Performance Intelligence** (PPI) Technologies
  - Intelligent Decisions throughout Product Lifecycle
- **Requirements** lead the design and evaluation process
  - **Early input** from many sources (styling, marketing, engineering)
  - All **Objectives** will be stated mathematically
  - All **constraints** managed (including cost, packaging, schedule)
- Multi-Disciplinary optimization
  - Intelligent **Dashboards** to carry out Trade-off Studies



Optimization Enabled Multi-Disciplinary Platform

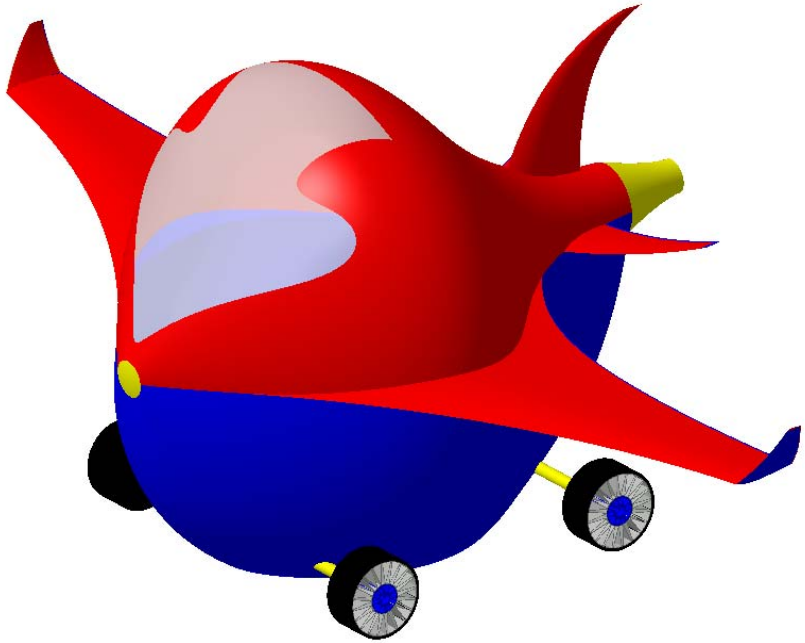
- **Simulation "Driven"** Multi-Disciplinary Optimization Design Process
- **Optimization is embedded** into all analysis tasks
- **Open architecture** standards to allow for best-in-class technologies
- Optimize the **"mean and deviation"**
- Optimize to include **business and manufacturing constraints**





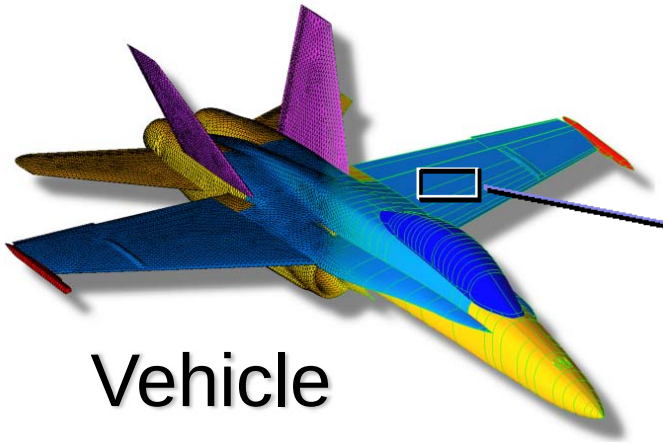
Optimization Problem Set Up

- Constraints and Objectives
  - Price
  - Operating Expense
  - Safety
  - Performance
  - Environmental Impact
- Disciplines
  - Structures
  - Kinematics
  - Fluids
    - Performance
    - Safety
      - Environmental Impact
      - Weight
      - Manufacturing
      - Design and Comfort
      - Efficiency
      - Maintenance
      - Weight
      - Propulsion Systems
      - Manufacturing Methods
      - Materials
      - Weights
      - Performance
      - Durability
      - Performance
      - Comfort

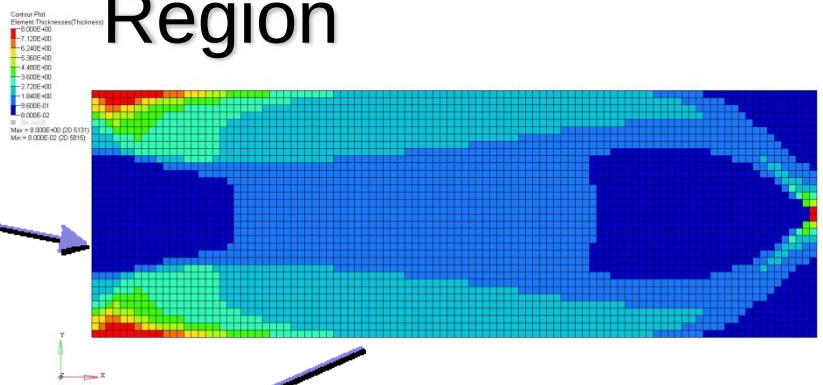


Multi-Disciplinary Optimization Required!

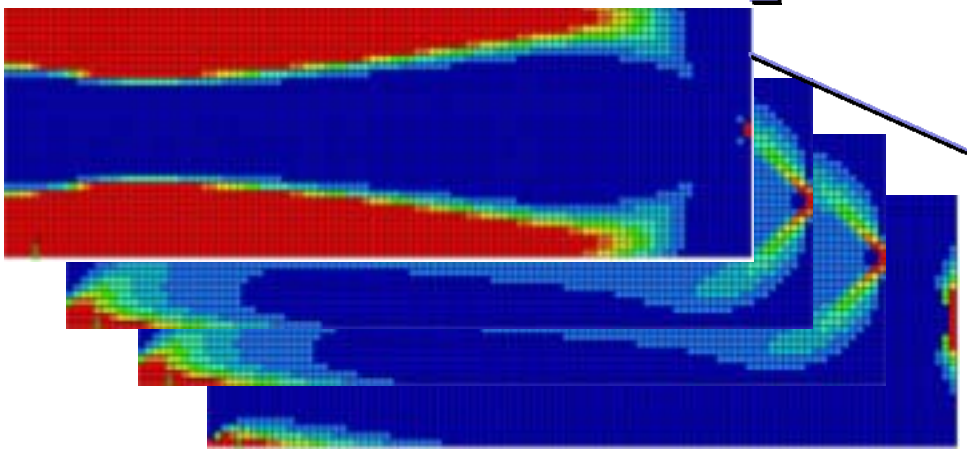
Multi-level Visualization of Results



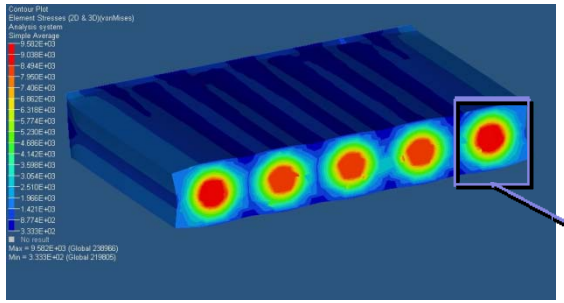
Vehicle



Region

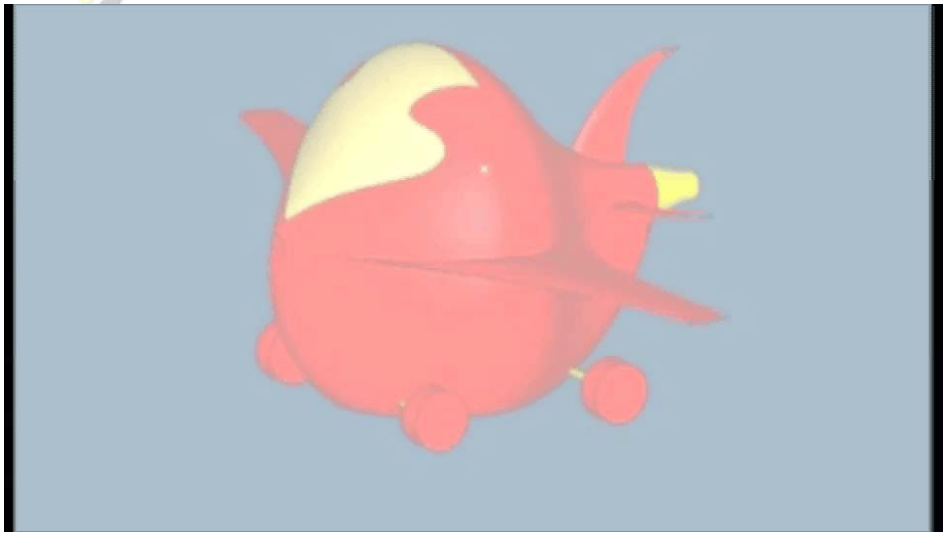


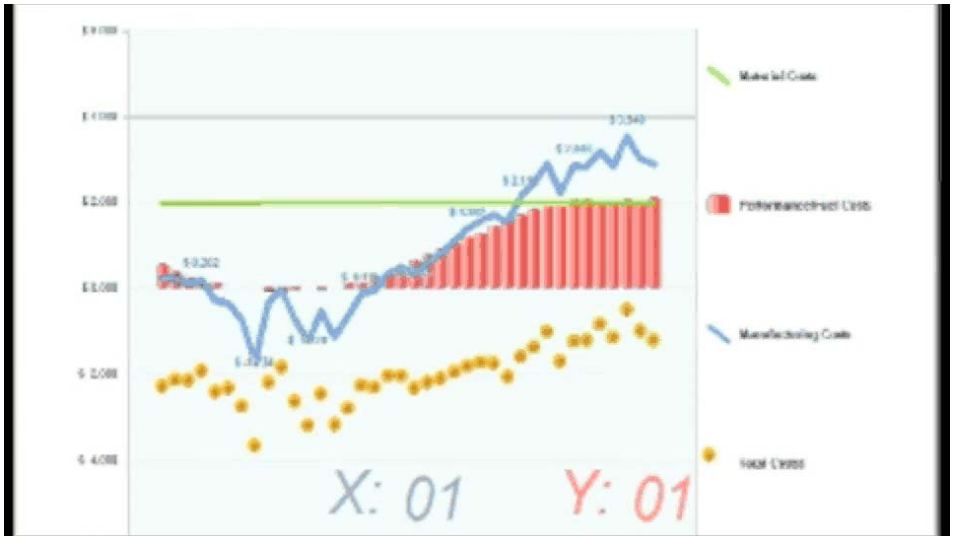
Laminate



Ply

Product Performance Intelligence



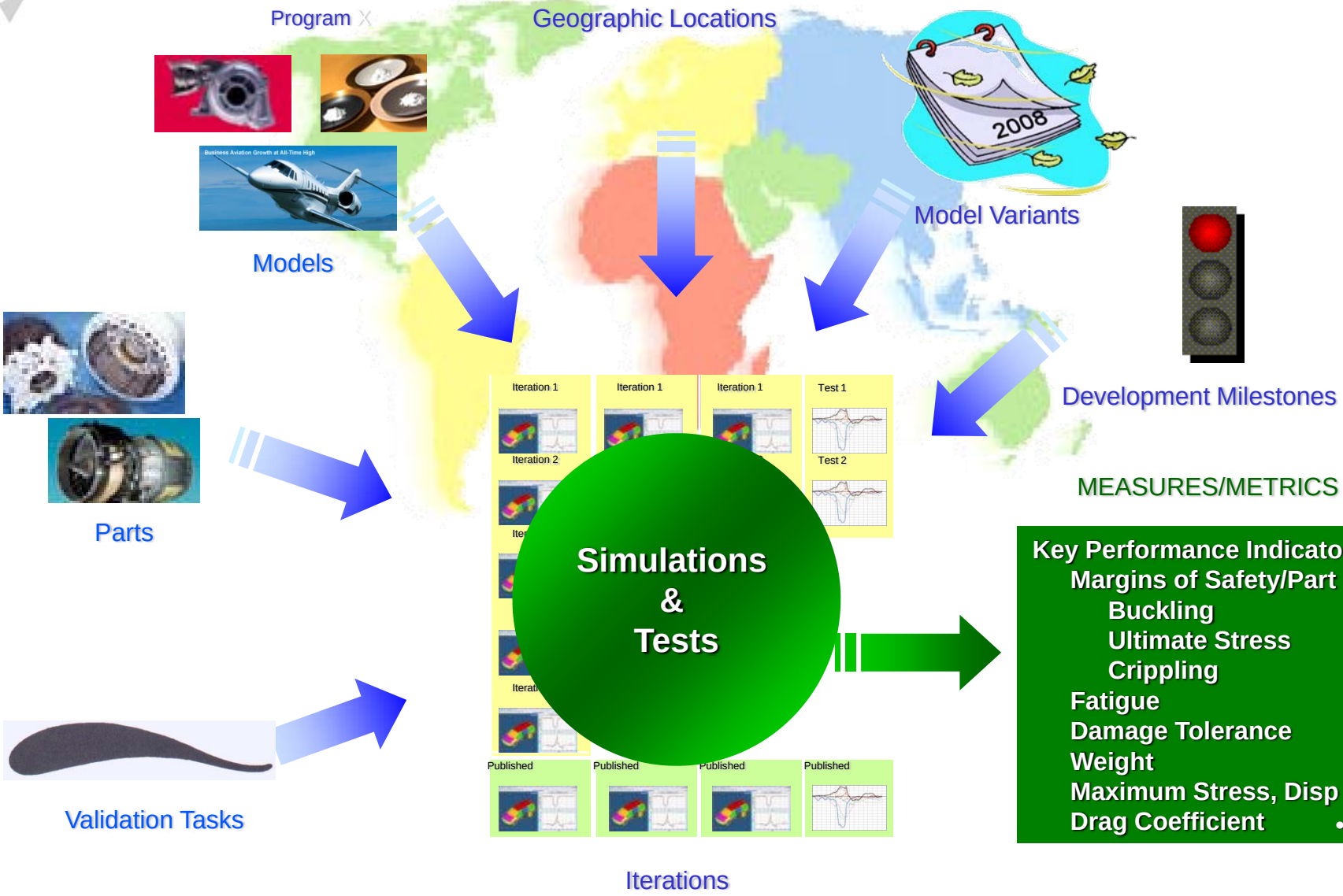


- **Drill down** to perform instant data analysis into all critical product data (Simulation, Test, Material, Costs, Manufacturing, Financial, Supplier)
- **Instant visibility** into product requirements and the ability to analyze changes and perform **“what if” analysis** on any aspect of the data
- **Real time feedback** on design variations
- **Multi-level views** of business and technical data

Centralized Data Structure

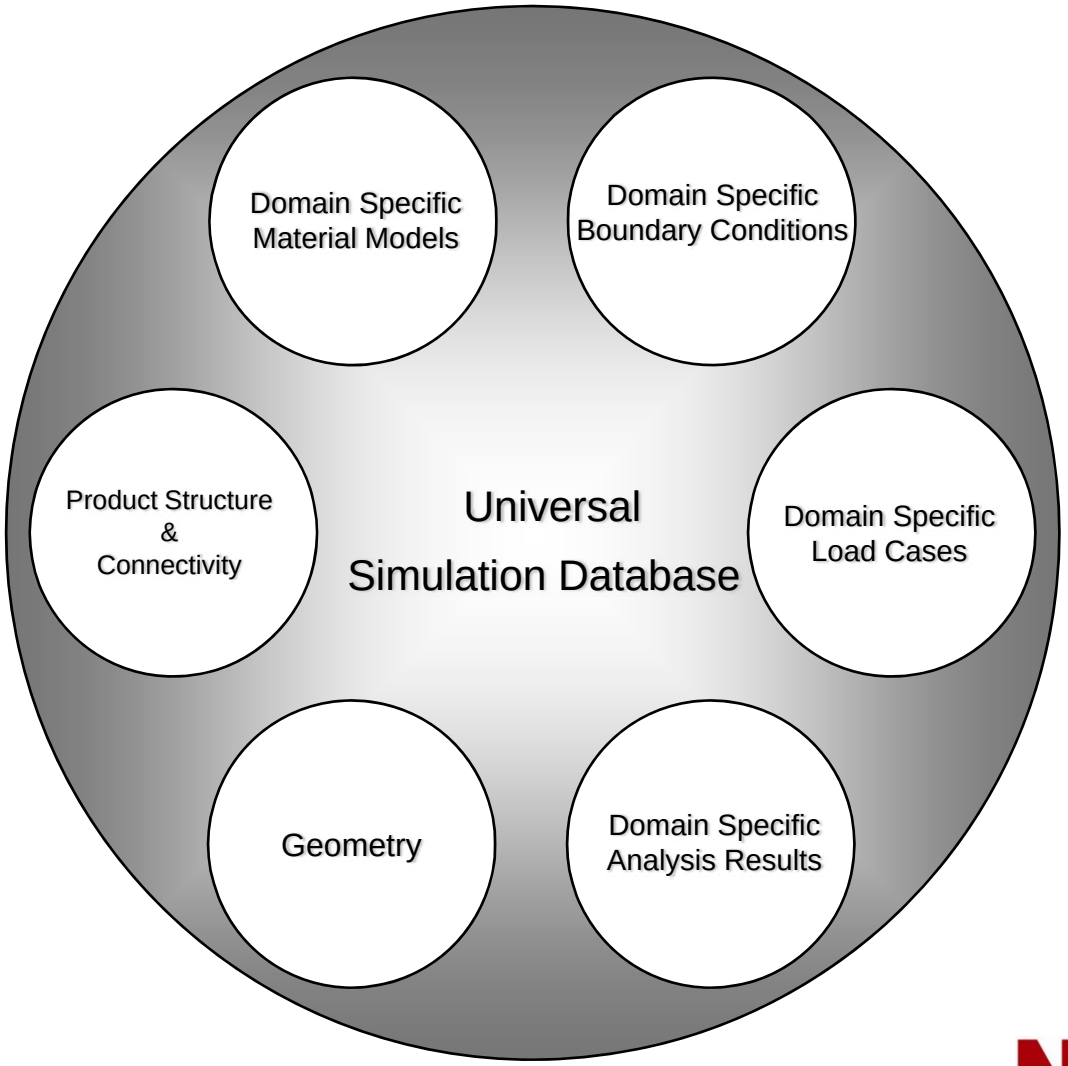
- All databases within the enterprise will provide standard **service oriented interfaces** making enterprise integration a reality.
- We will use a **common schema** for simulation and test data
- The data servers will be connected through SOA to enable **data access** from any domain within the company –
  1. Product data
  2. Material data
  3. Lab and Test data
  4. Simulation data
- We will have **Product Information Dashboards** that access and aggregate data from individual domain-specific database clusters that will provide real-time views of project progress

Unified Analyses & Tests Classification

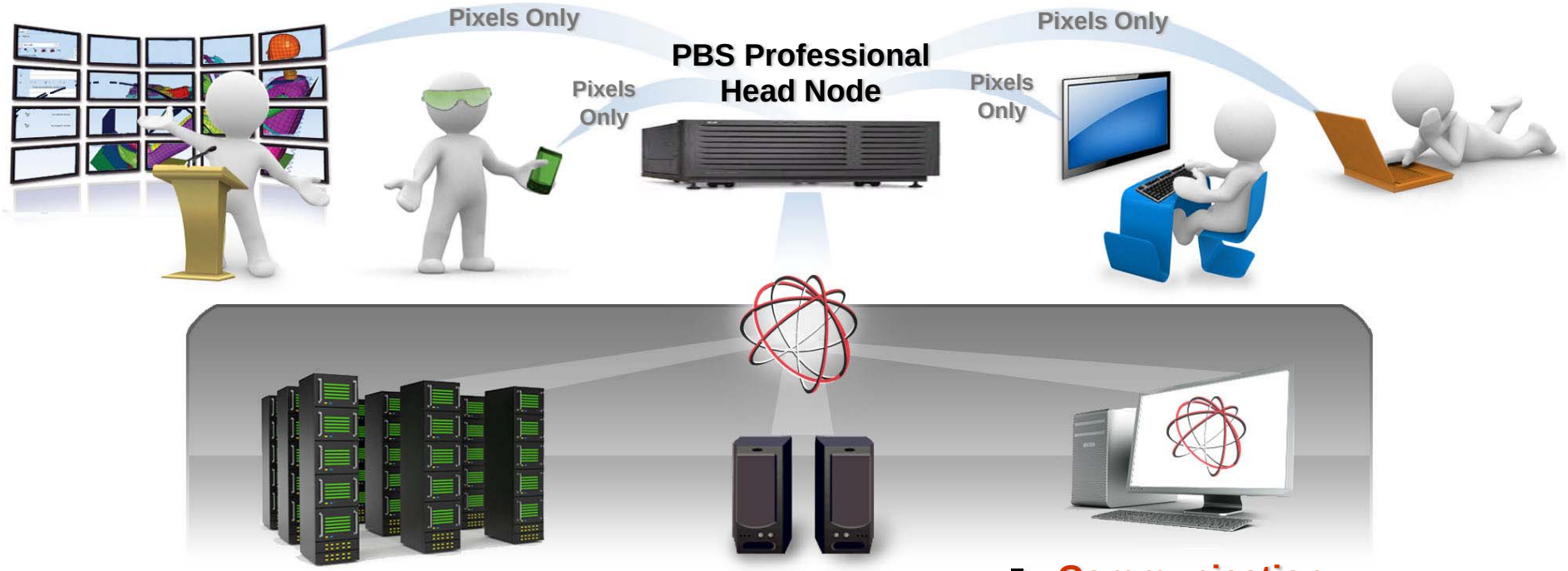


Enabling Seamless Multi-Disciplinary Data Exchange

- **High granularity** to the data to allow more parameters available for optimization
- Part changes can be evaluated in **near real time**
  - Material
  - Geometry
  - Loads
  - Connectivity



Computing Infrastructure



- **Multi-domain** analysis
- Sub-domain analysis **run in parallel**
- **Seamless communication** between submodels (i.e. loads, BC's)

- **Communication between** disciplines and models
- Pay for what you use **software licensing** and hardware
- **Automatic** Job Distribution

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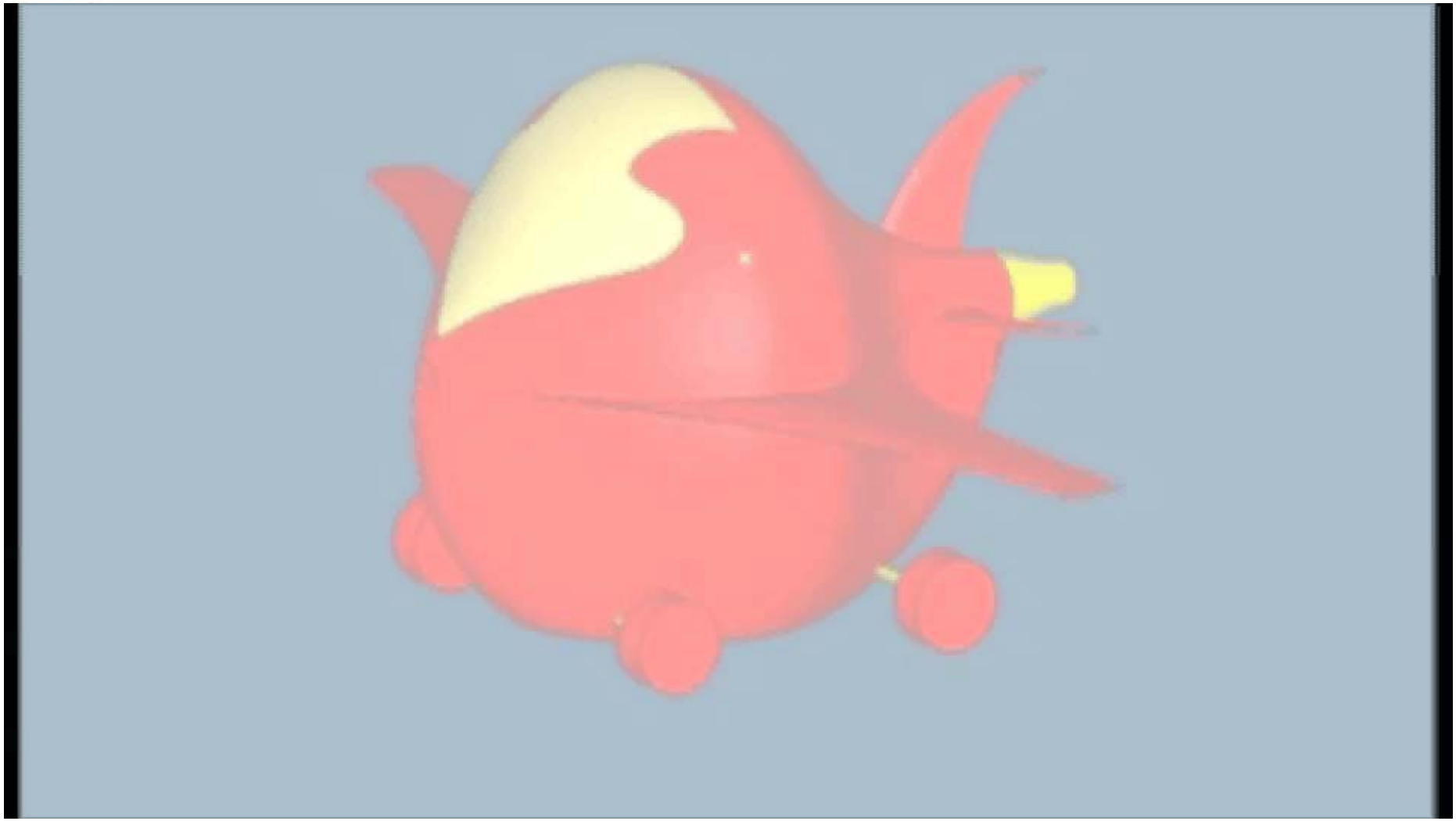
Altair PLASVEE Model 2020



Custom Designed for You!