

Adaptive Vehicle Make

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Program Manager
DARPA TTO

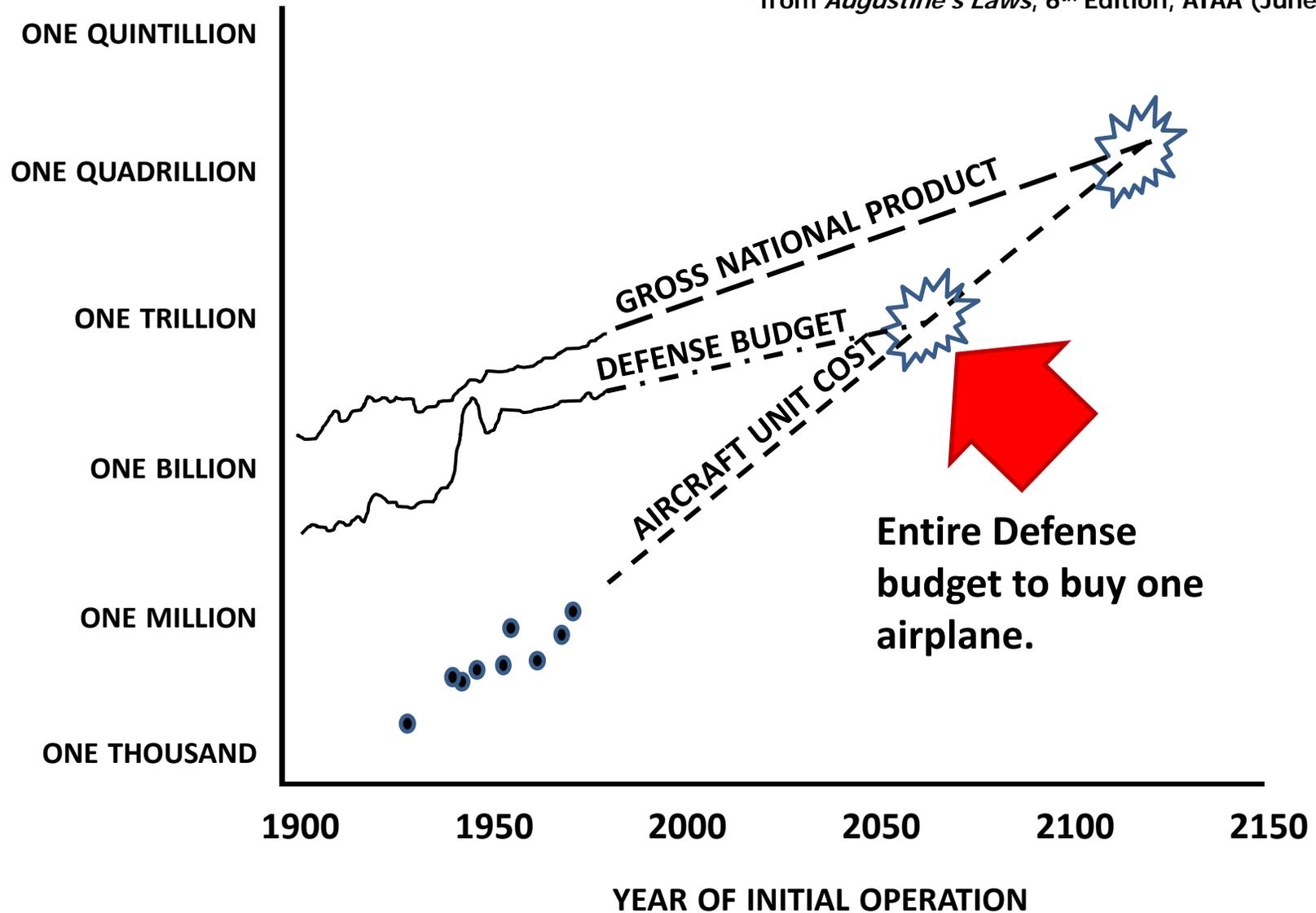
3 January 2013





The problem

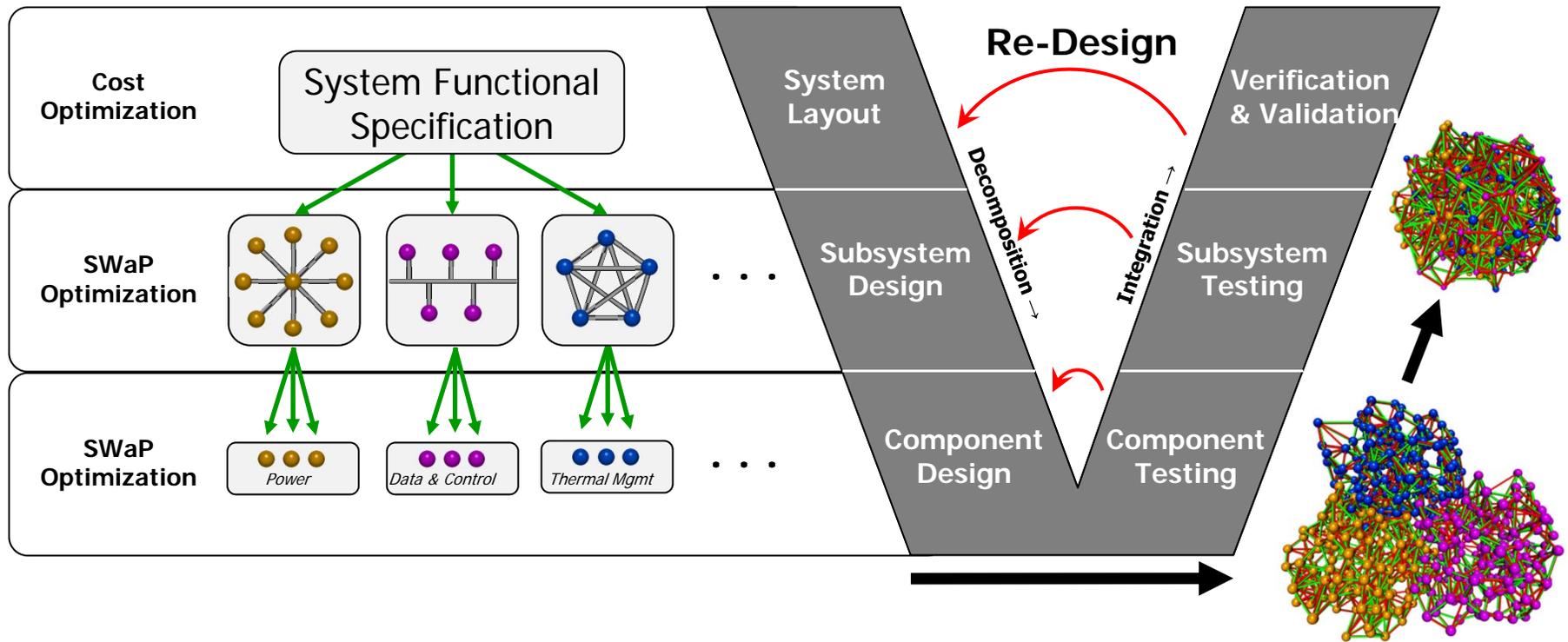
*from *Augustine's Laws*, 6th Edition, AIAA (June 1997)





The process today

MIL-STD-499A (1969) Systems Engineering Process



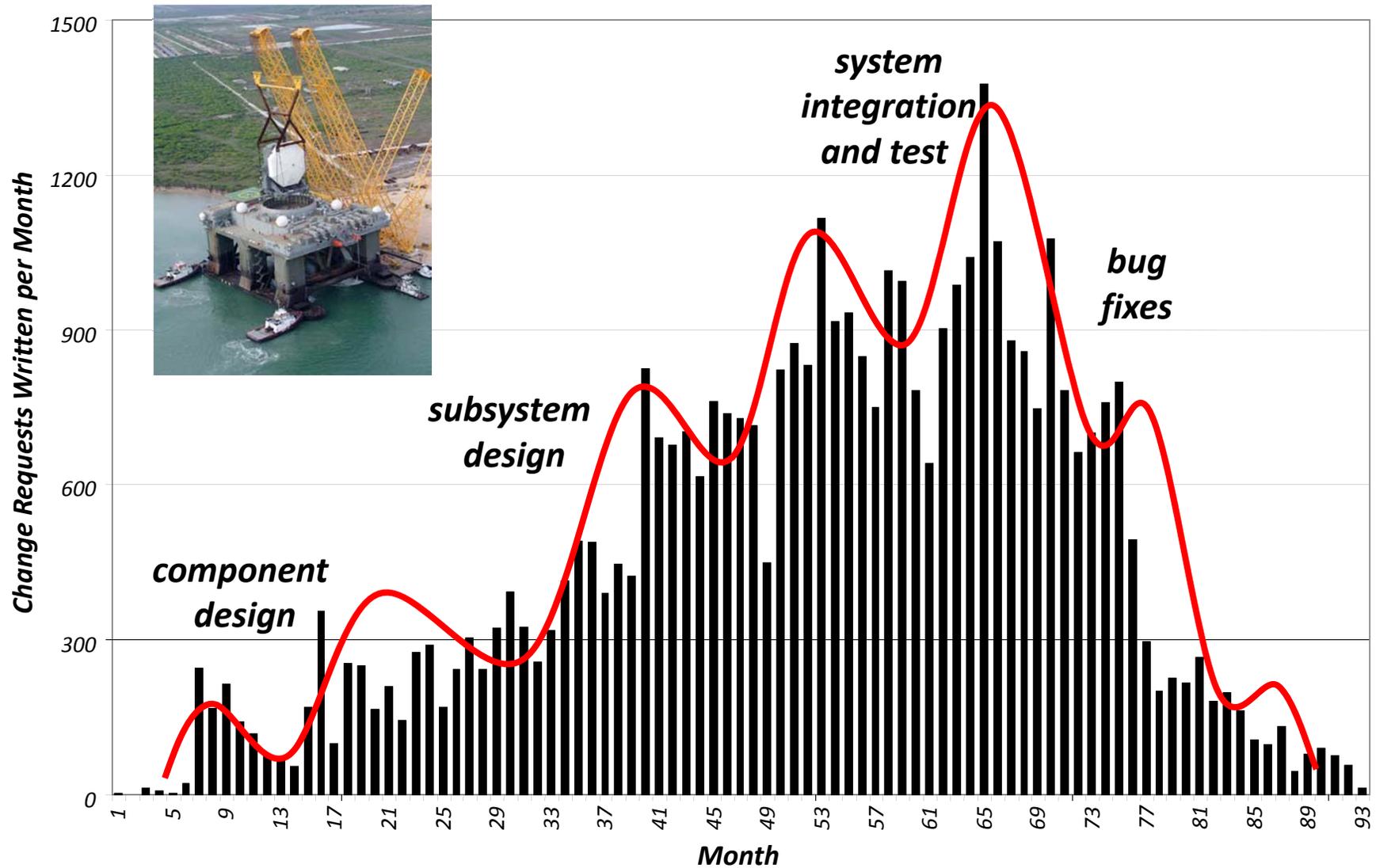
SWaP = Size, Weight, and Power
V&V = Verification & Validation

— *Desirable interactions (data, power, forces & torques)*
— *Undesirable interactions (thermal, vibrations, EMI)*



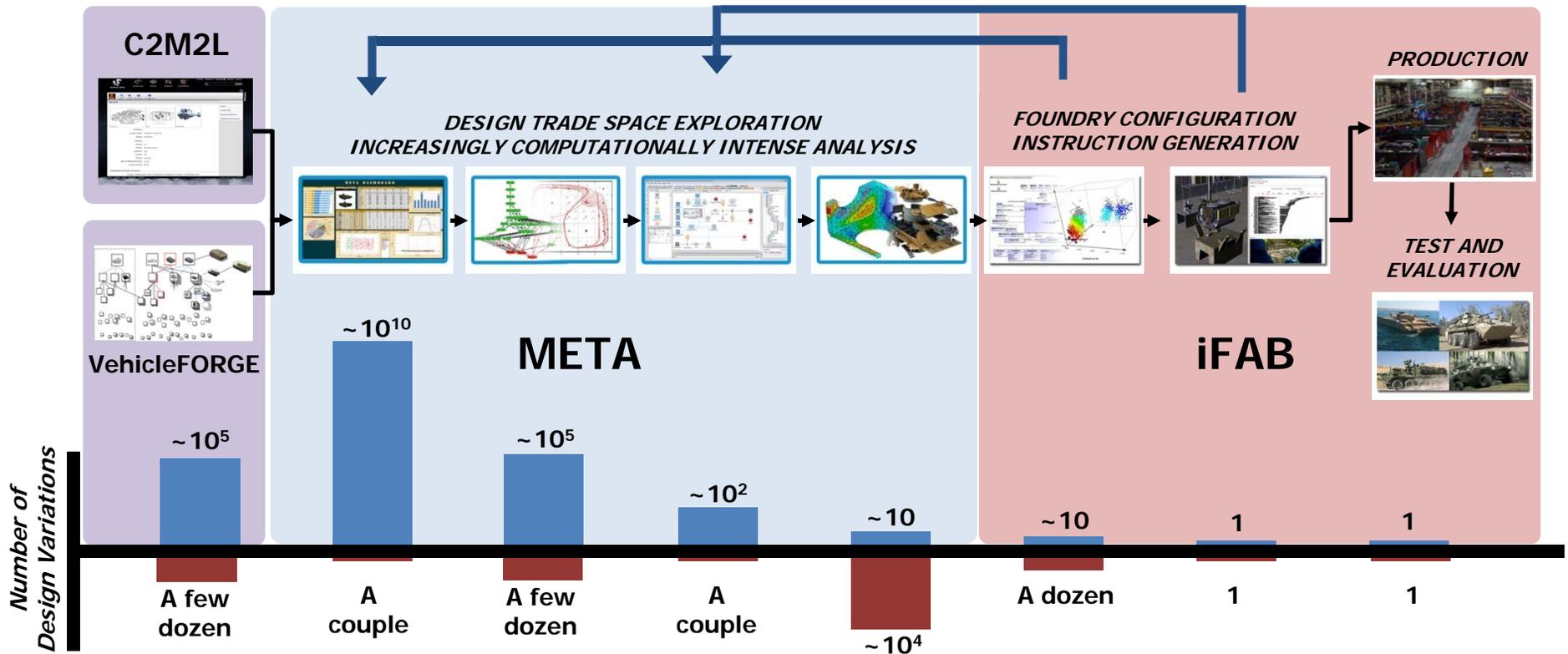
Complexity in a real system

Source: Giffin M., de Weck O., et al., *Change Propagation Analysis in Complex Technical Systems*, Journal of Mechanical Design, 131 (8), 081010, August 2009





AVM: entire development cycle 5x faster





META TOOLS

Image courtesy of Dassault Systemes

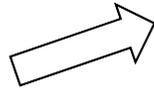


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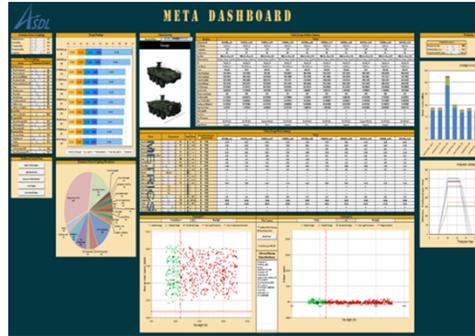


META Tools

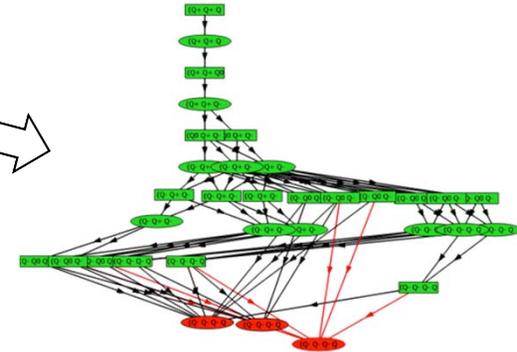
Component Models



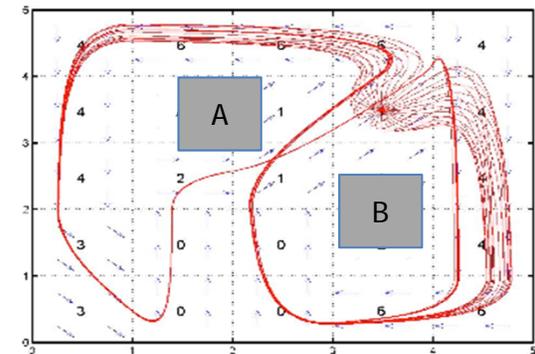
Static Trade Space Exploration



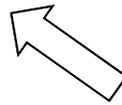
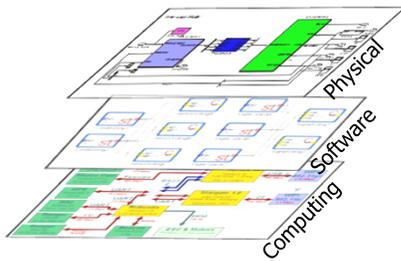
Qualitative Reasoning



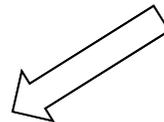
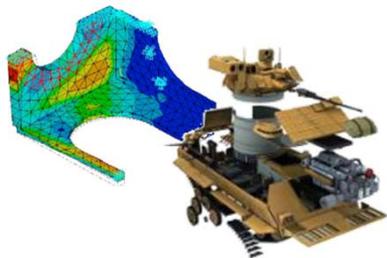
Relational Abstraction



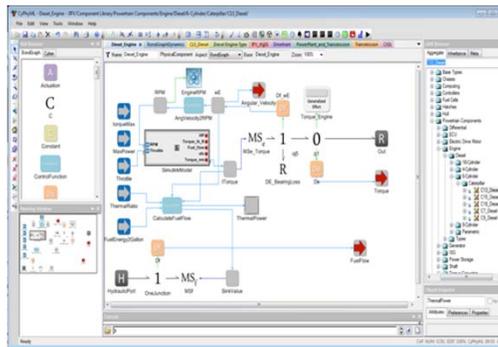
Embedded Software Synthesis



CAD & Partial Differential Equation Models



Ordinary Differential Equation Models



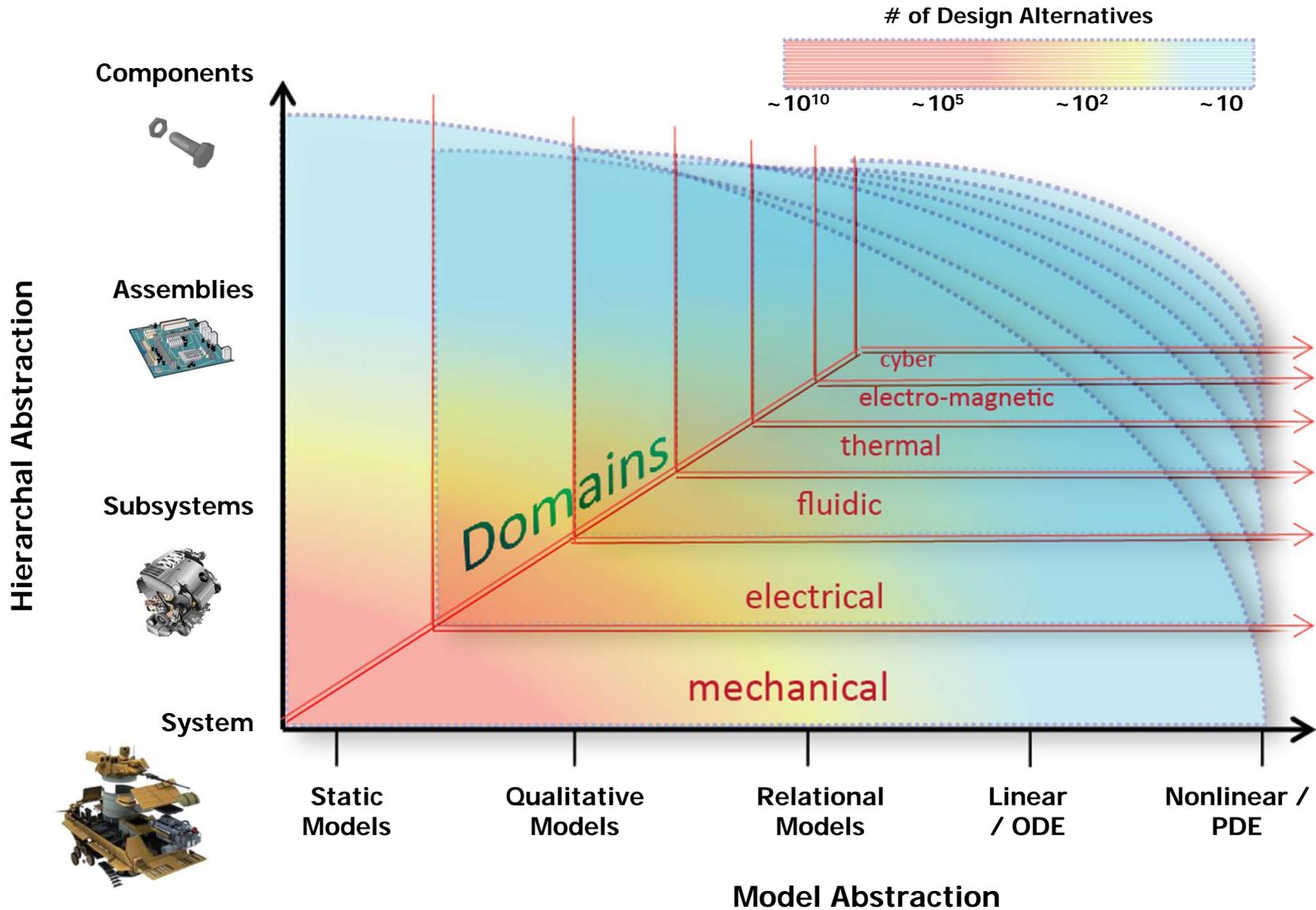


C2M2L

Component, Context, Manufacturing Model Libraries

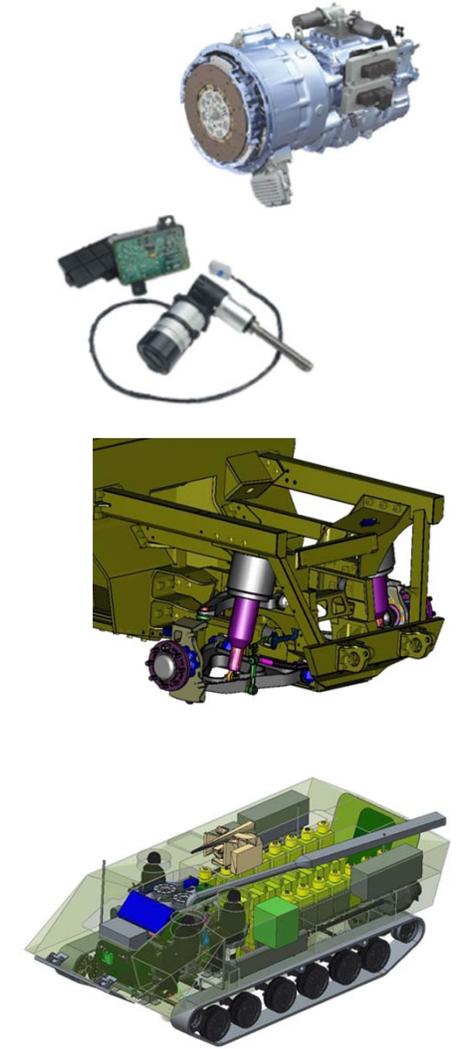
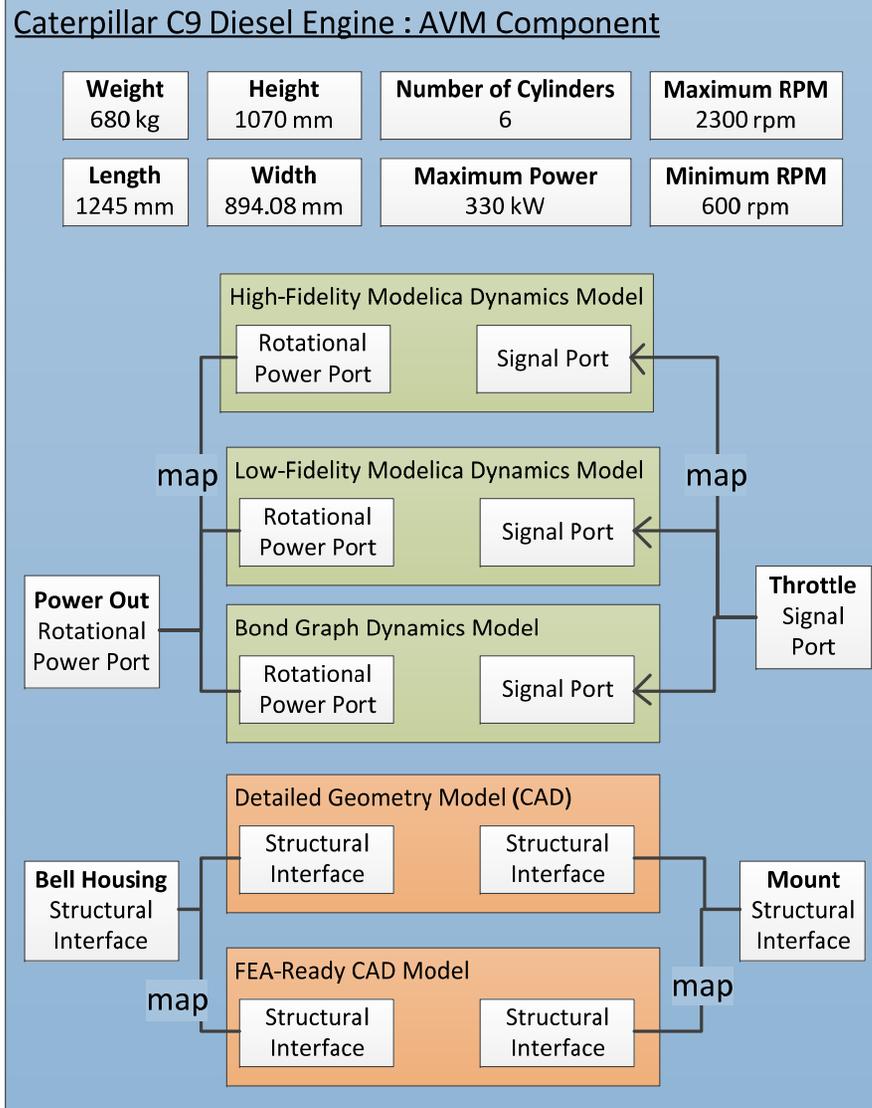


Improving designer productivity through abstraction





Elements of a component model





iFAB

Instant Foundry, Adaptive through Bits



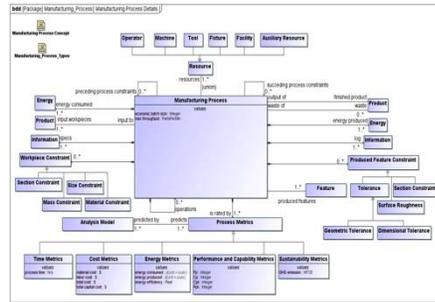
iFAB Distributed, Digitally-Programmable Foundry

*Manufacturing Constraint Feedback to META Design

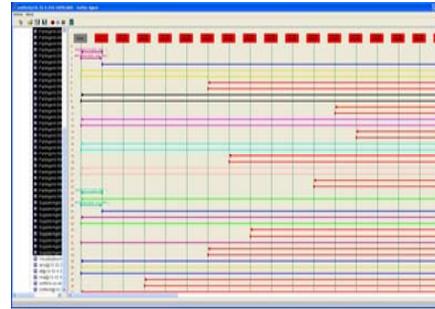
META Design



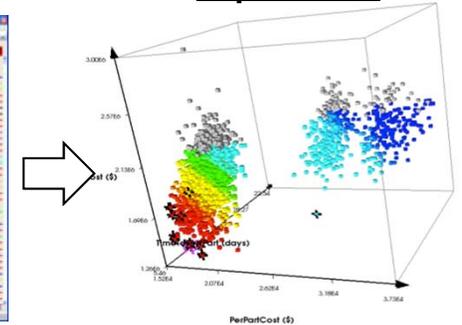
Static Process Mapping



Sequencing



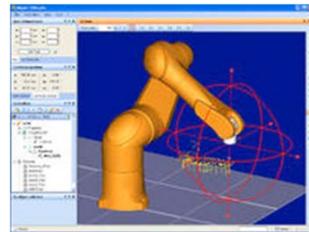
Foundry Trade Space Exploration



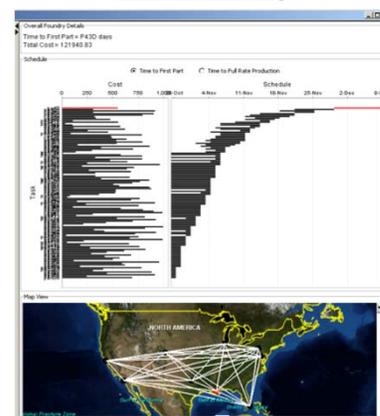
Constraints from Selected Configuration

Manufacturing Process Model Library

Kinematic Machine Mapping



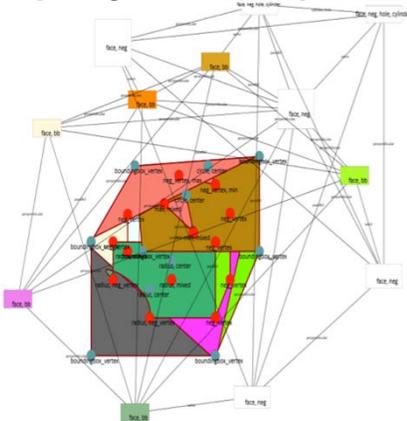
Scheduling



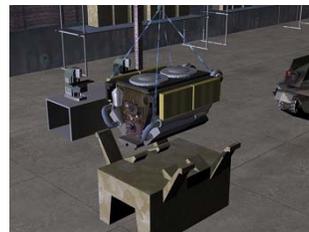
CNC Instructions



Topological Decomposition



Kinematic Assembly Mapping



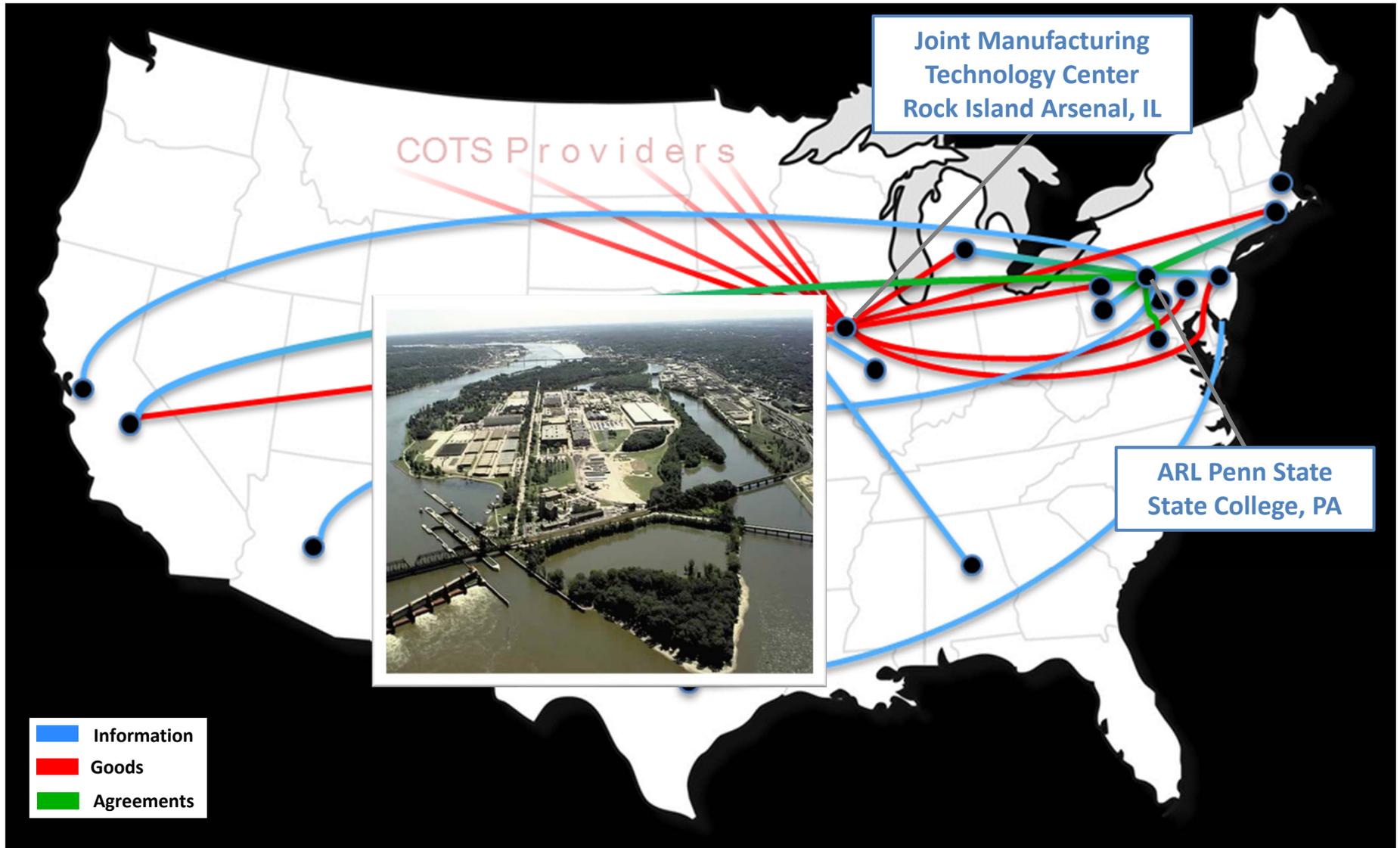
Human Instructions



Rock Island Arsenal Bldg 299 Final Assembly



The iFAB Foundry





FANG

Fast, Adaptable, Next-Generation ground vehicle

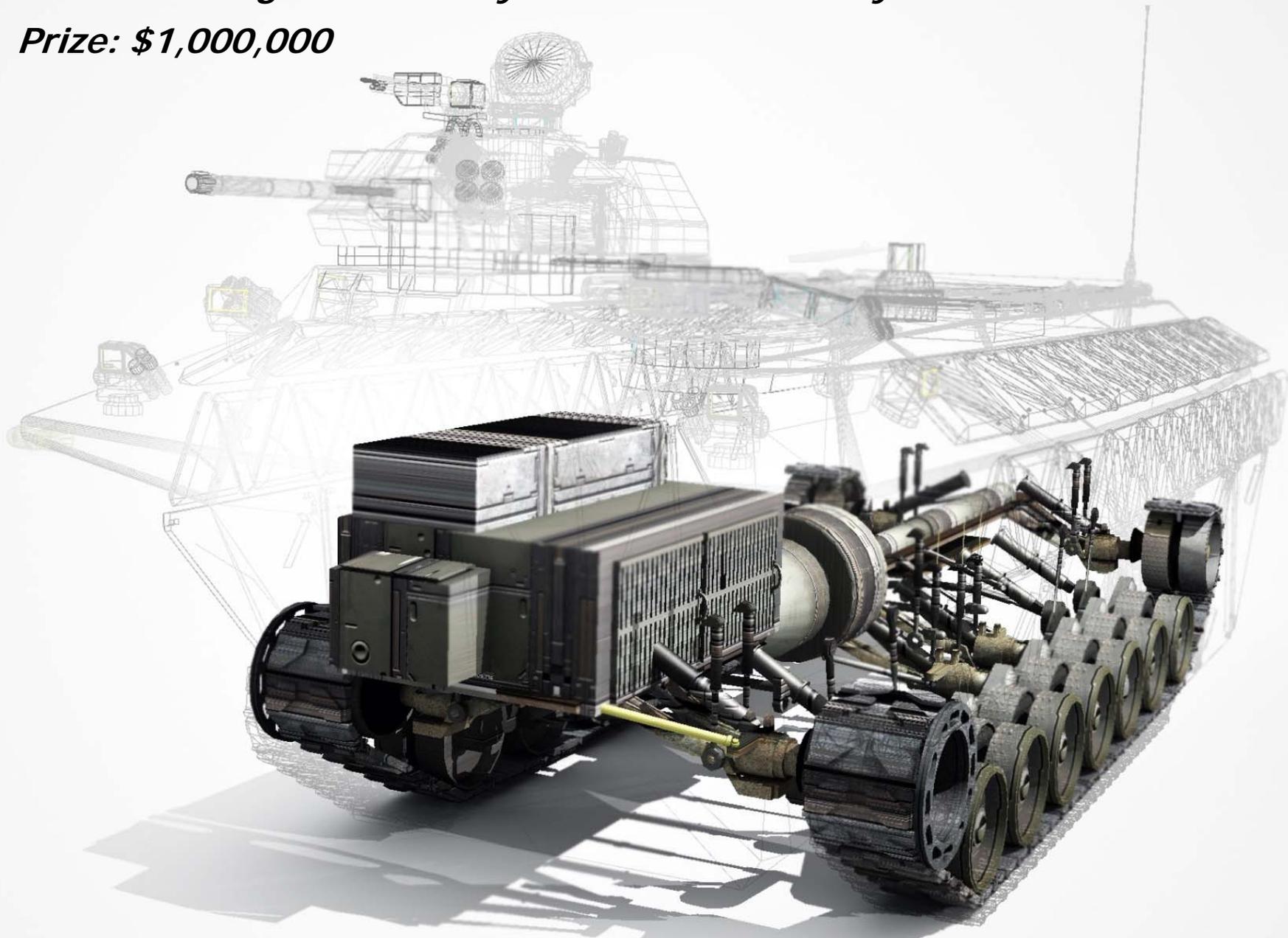
FANG™

DESIGN CHALLENGES

FAST • ADAPTABLE • NEXT-GENERATION • GROUND VEHICLE

FANG Challenge 1 – Mobility and Drivetrain subsystems

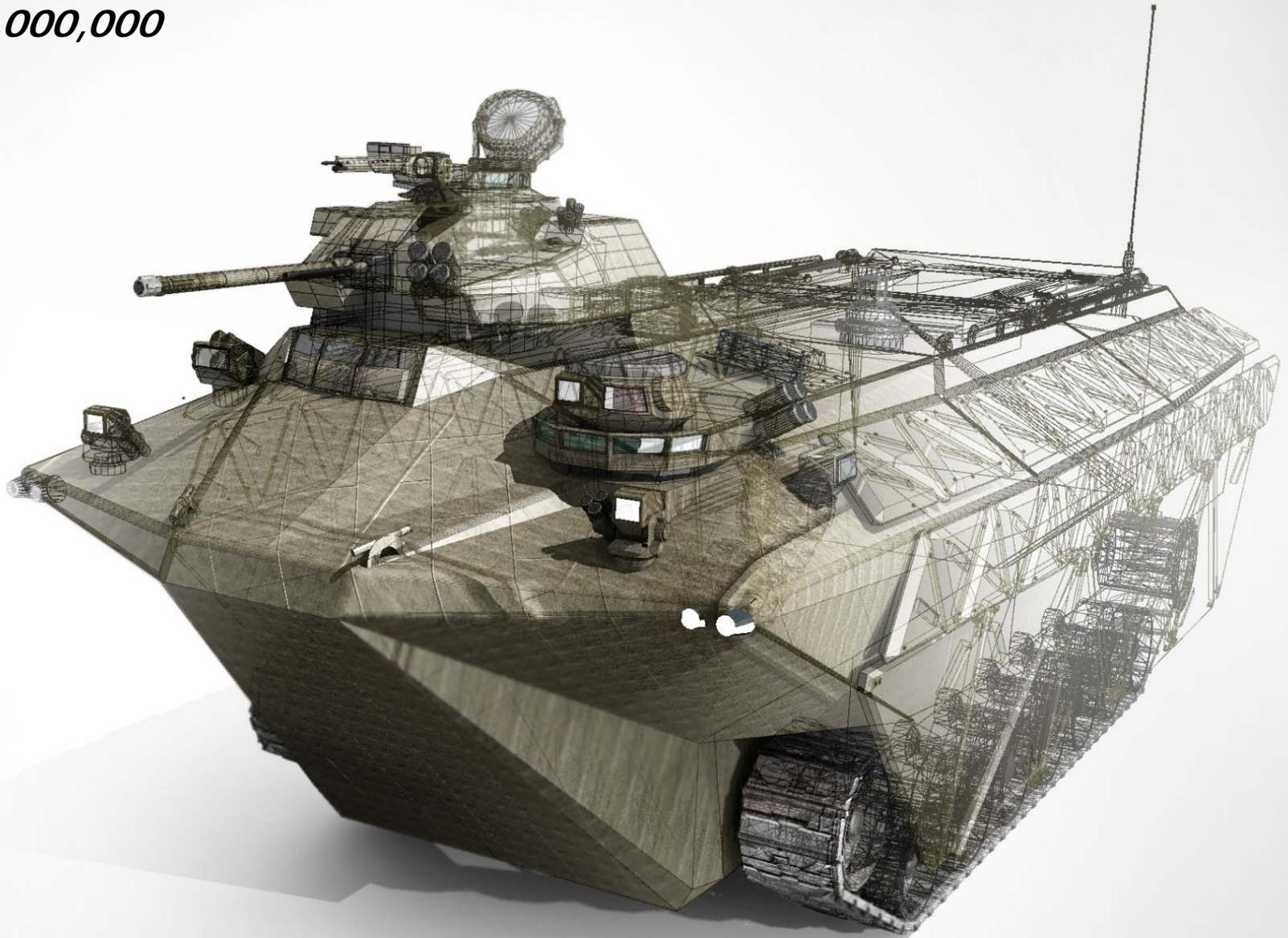
Prize: \$1,000,000



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FANG Challenge 2 – Chassis and Structural subsystems

Prize: \$1,000,000



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FANG Challenge 3 – Full Vehicle Design

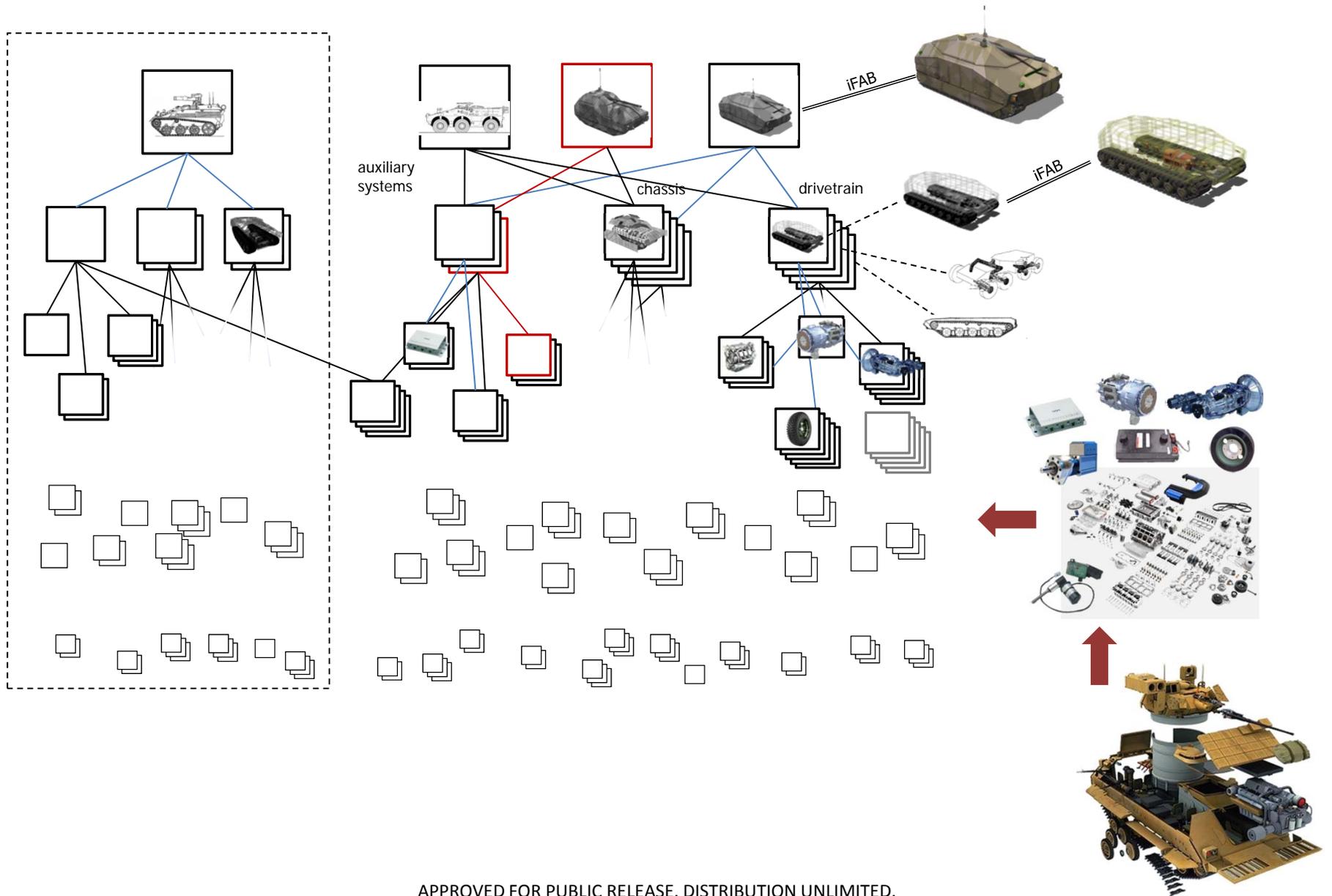
Prize: \$2,000,000



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VehicleFORGE – Collaboration Platform





The FANG Design Challenges. Think it. Share it. WIN IT. Build It.

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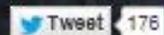
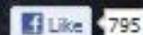


REGISTER NOW

Registration for the **Mobility/Drivetrain Challenge**, the first of three planned FANG Challenges set to launch in early 2013, is officially open. [Read the official rules](#) and [register now](#).

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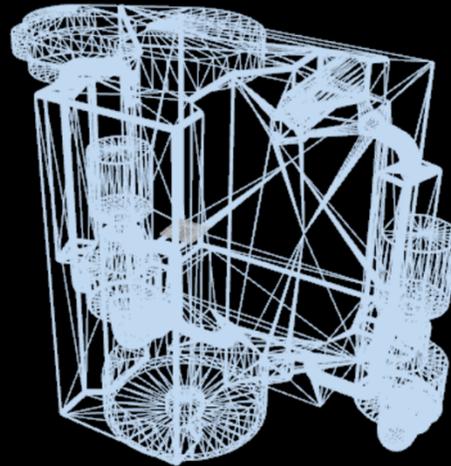


Team up with students, web developers & auto enthusiasts for the [#DARPAFANG](#) Challenges. Registration open at <http://t.co/YyQ3N3li>

CI_Engine_TT: CAD / 50_deutz_1015m_1_a.stp

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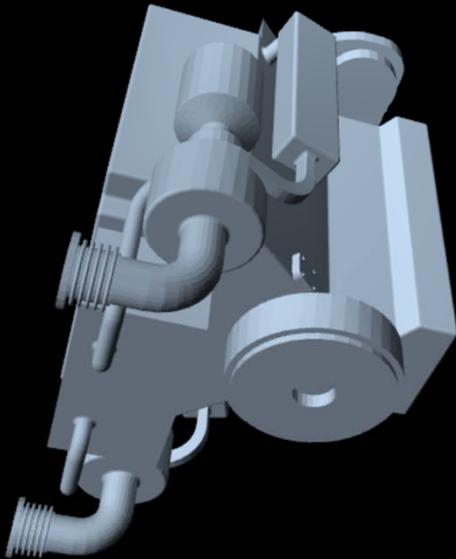
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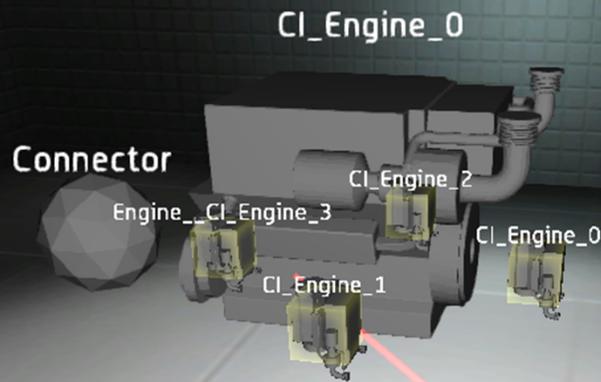


Repository



VCDE

Conference call: 1-888-715-3200



dfishman

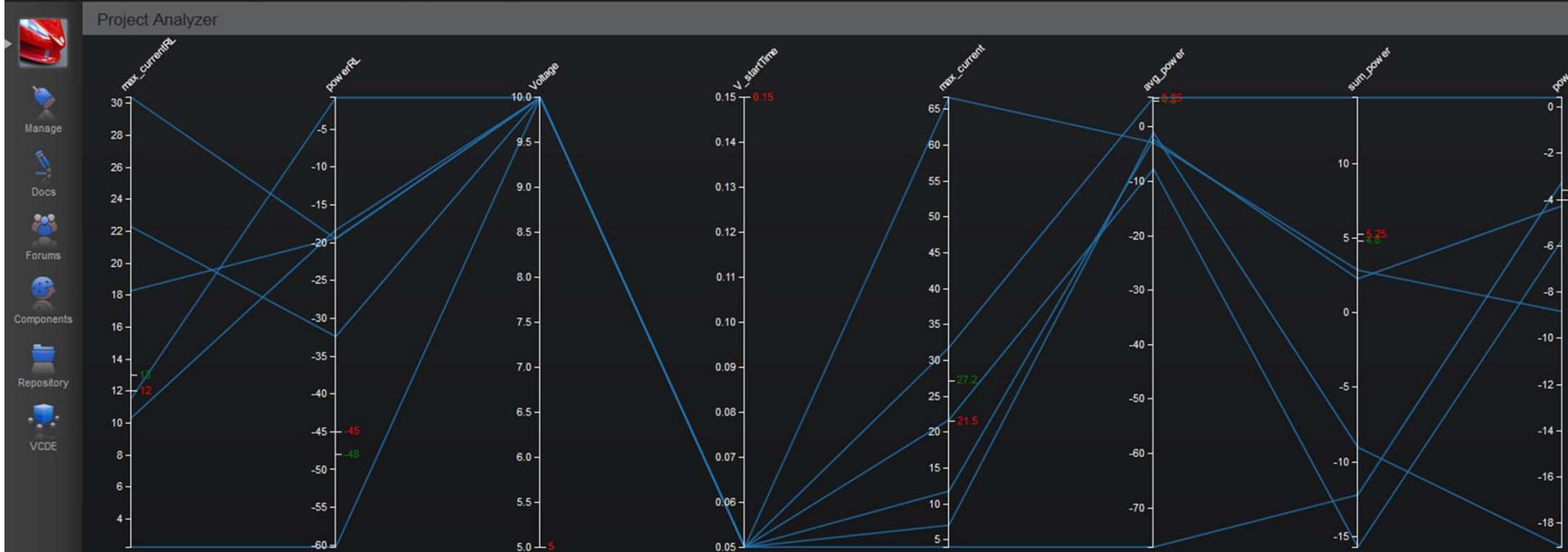


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Whole View | Exploded View

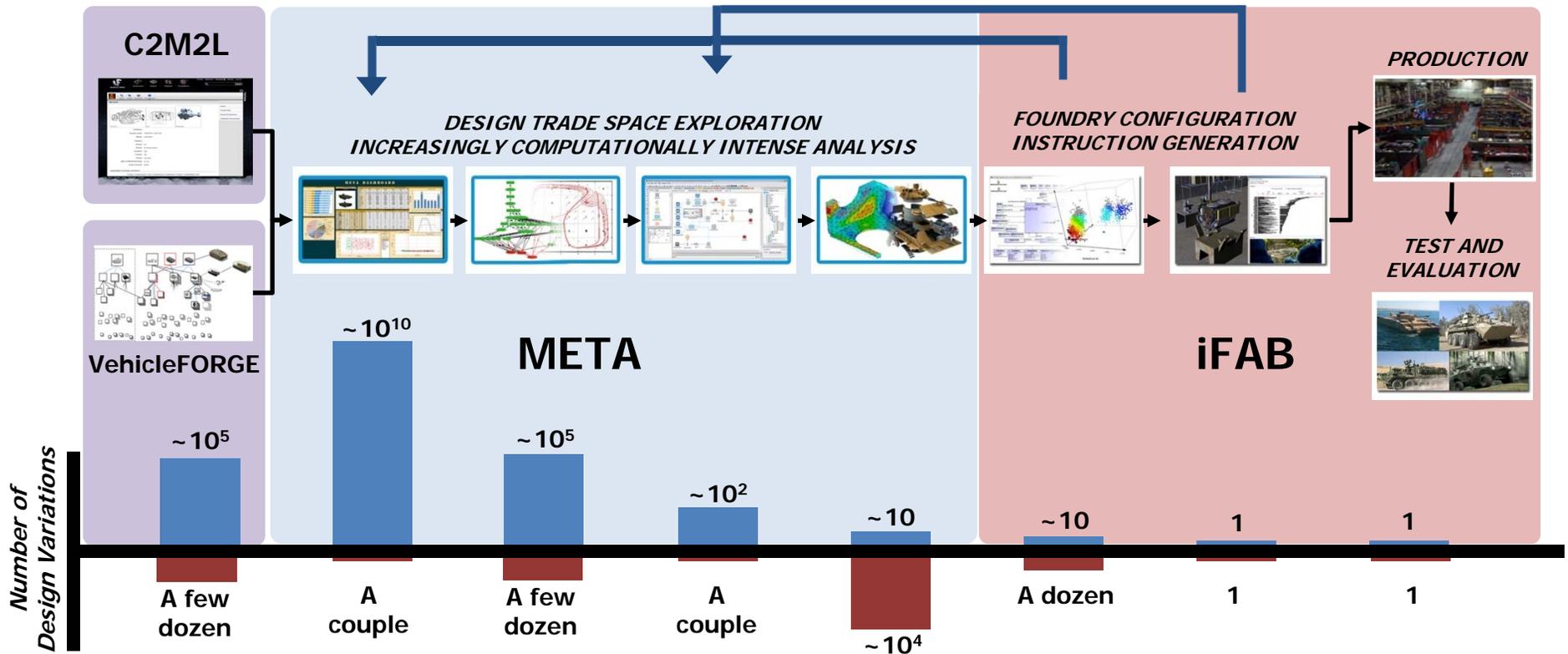
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Create Component





AVM: entire development cycle 5x faster





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