# CAD/CAE Integration Enhanced by New CAD Services Standard

A Government-industry team led by the NASA Glenn Research Center has developed a computer interface standard for accessing data from computer-aided design (CAD) systems. The Object Management Group, an international computer standards organization, has adopted this CAD services standard. The new standard allows software (e.g., computer-aided engineering (CAE) and computer-aided manufacturing software to access multiple CAD systems through one programming interface. The interface is built on top of a distributed computing system called the Common Object Request Broker Architecture (CORBA). CORBA allows the CAD services software to operate in a distributed, heterogeneous computing environment.

The CAD services interface provides geometry and topology data to engineering analysis and manufacturing applications and tools. It is designed around a series of high-level engineering interfaces that do not require low-level data structures to answer mechanical engineering queries. To avoid many of the problems associated with data translation, this standard provides CORBA interfaces with consistent functionality across native CAD implementations.
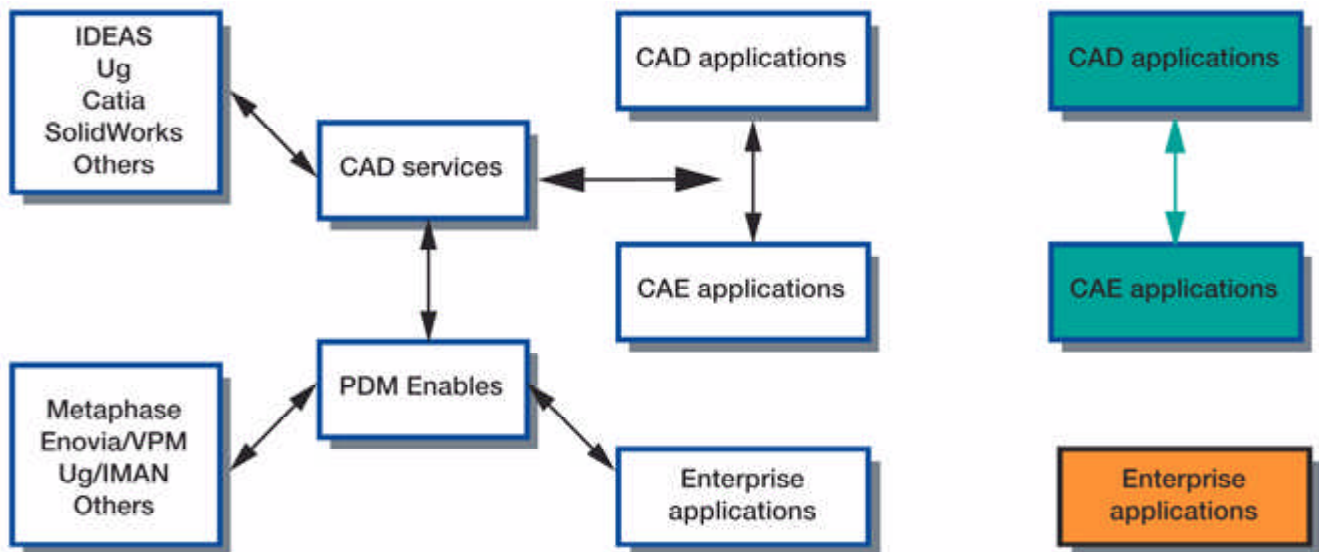
CAD systems and CAE applications link through industry standard services.
Long description Diagram shows CAD services yielding IDEAS, Ug, Catia, SolidWorks, and Others, as well as CAD and CAE applications. Diagram also shows that PDM enables Metaphase, Enovia/VPM, Ug/IMAN, and others, as well as enterprise applications

All queries use native CAD system geometry kernels and associated software as illustrated in the preceding figure. The figure shows that this new standard provides a neutral

interface across many CAD systems and also enables integration with product data manager (PDM) systems.

Some of the services provided by the CAD services interface include

1. Geometry and topology queries for both manifold and nonmanifold geometries

2. Parametric regeneration of solid models

3. Tagging geometric entities with application-specific information

4. Geometry creation

The geometry and topology queries provide precise three-dimensional location information for parts and surfaces. Parametric regeneration allows an optimization algorithm to reshape a CAD part to optimize the performance based on some engineering analysis. The geometric tagging capability allows engineering applications to tag geometry with relevant design information (for example, cost). Finally, the geometry creation capability permits system-level analyses to define detailed geometry that can be analyzed.

The primary value of the CAD services interface is that CAE applications, such as computational fluid dynamics (CFD), can access geometry in a variety of native formats without "custom" software development. All applications can use the same geometry information without translation or laborious wrapper development. This was demonstrated by using the CAD geometry illustrated in the following figure to generate a CFD analysis grid. This CAD/CFD integration was estimated to save several weeks in analysis development time.
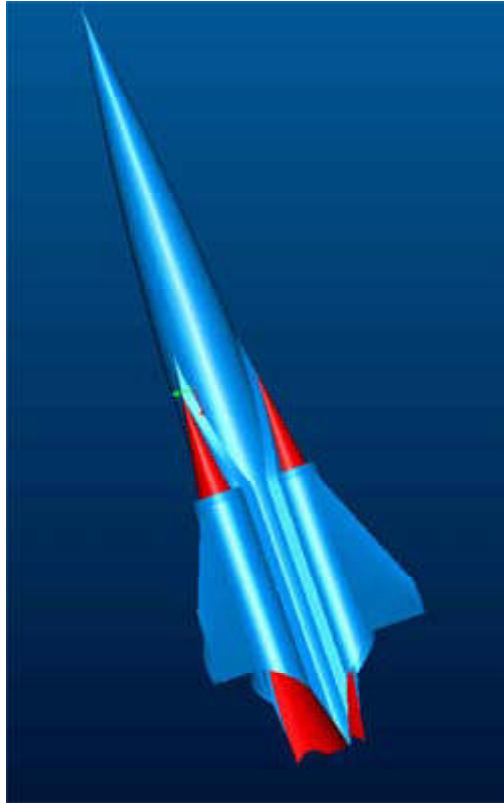
Reusable launch vehicle geometry used to demonstrate CAD services.

Find out more about this research. http://mfg.omg.org/mfgcadv1ftf.htm

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