PDES, Inc.

PDES, Inc. Presentation to the Product Data Functional Coordinating Group

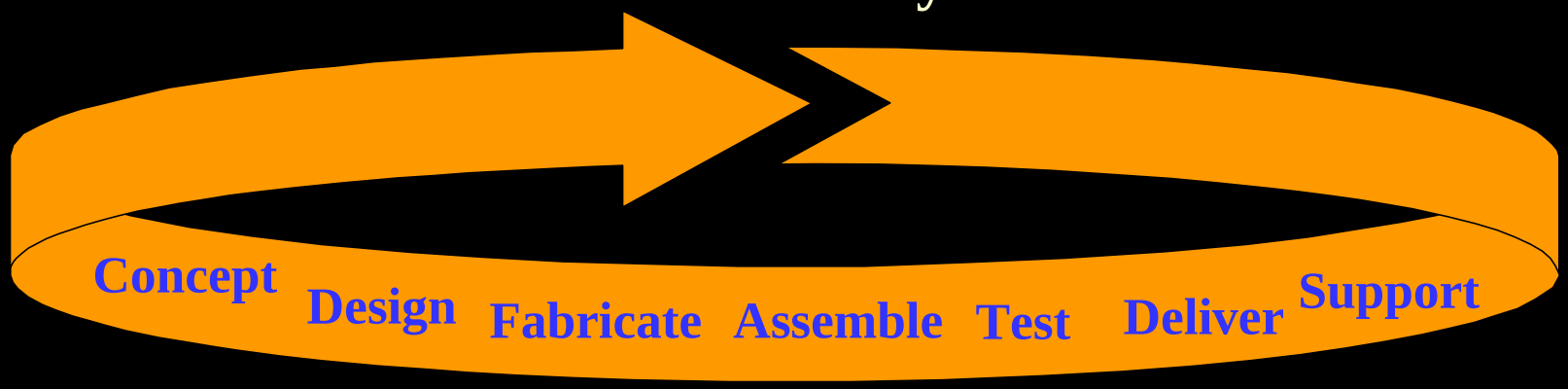
18 July 2000

Website Address:
http://pdesinc.aticorp.org/

What is STEP?

STEP is an international standard (ISO 10303) that provides an unambiguous, computer interpretable definition of the physical and functional characteristics of a product throughout its life cycle

Product Life Cycle



Product Data

As Designed Configurations	As Planned Configurations	As Built Configurations	As Maintained Configurations

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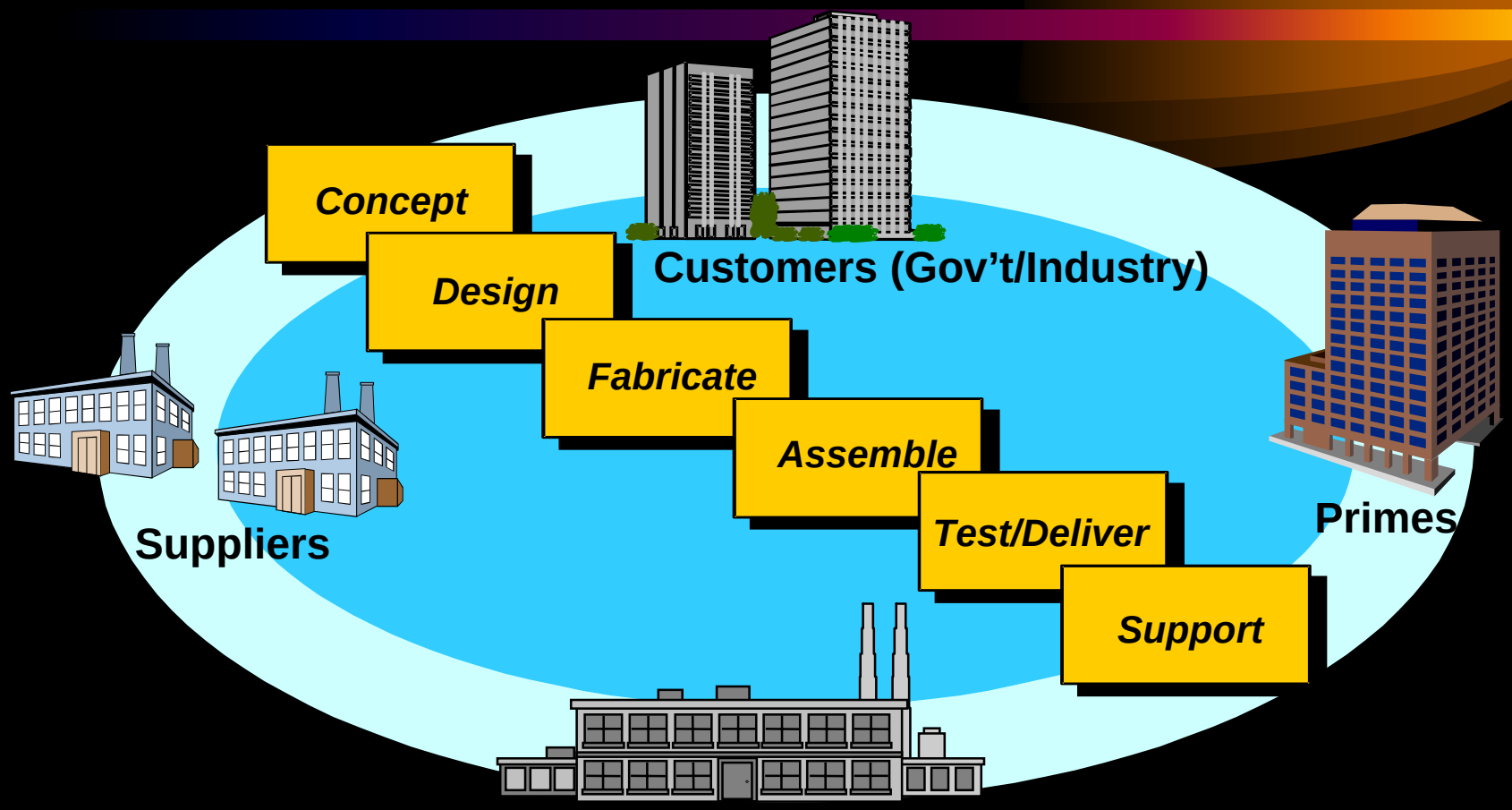
Role of STEP Between Organizations



Enables Consistent and Timely Data Sharing by Participants

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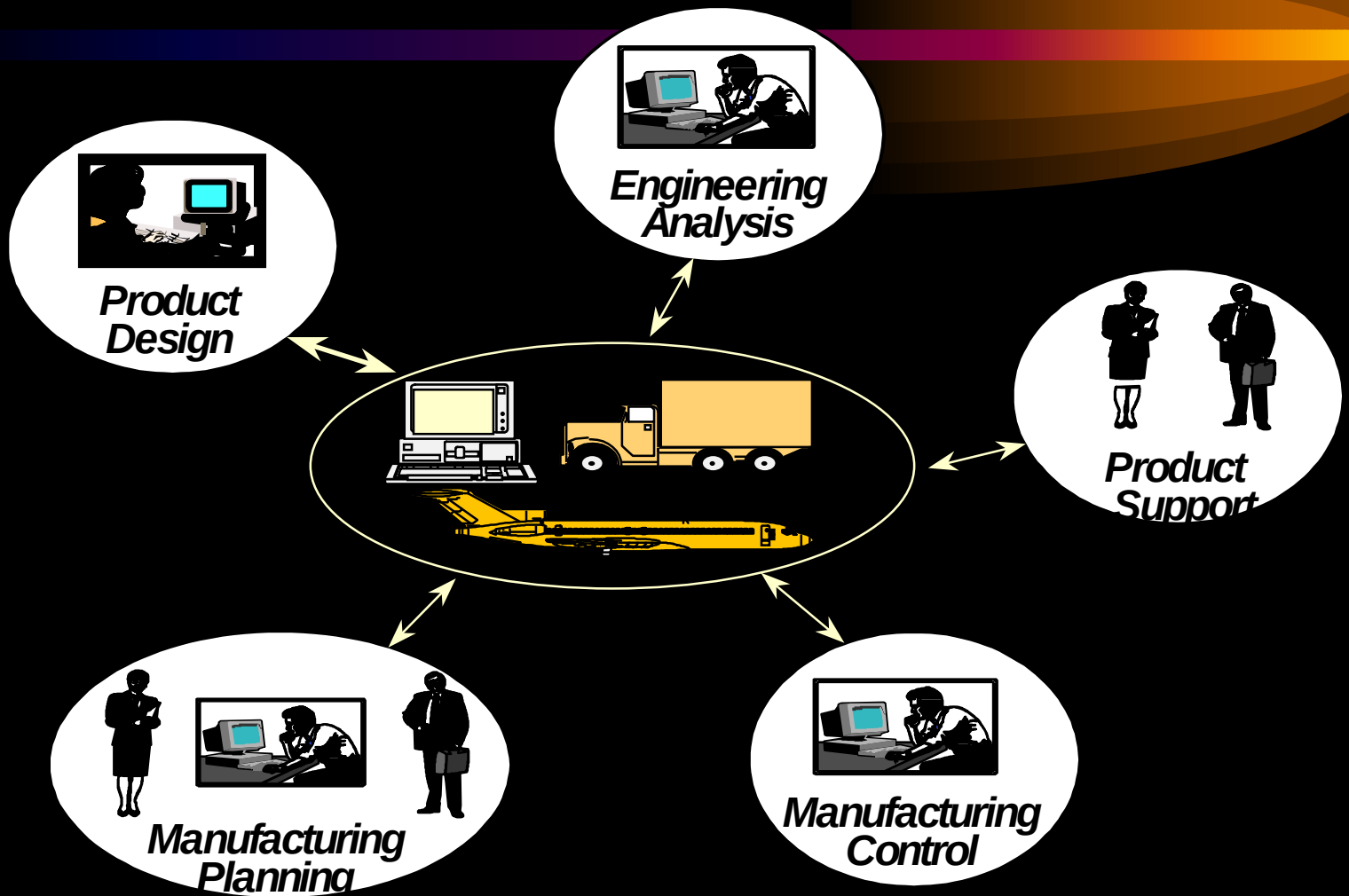
Role of STEP Between Functions



Enables Complete and Accurate Data Exchange and Use

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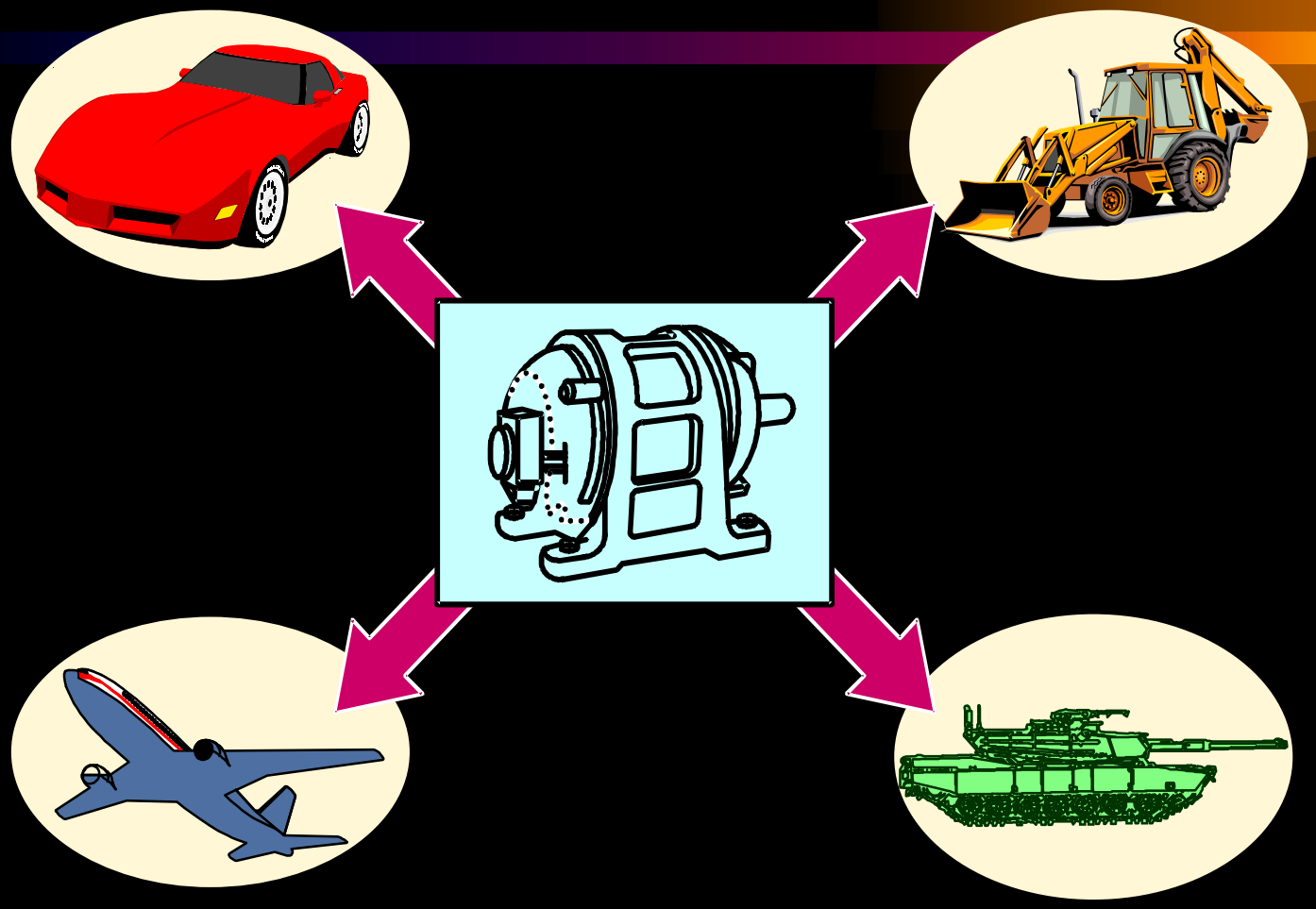
Role of STEP Between Designs



Enables Reuse of Design, Planning and Manufacturing Data

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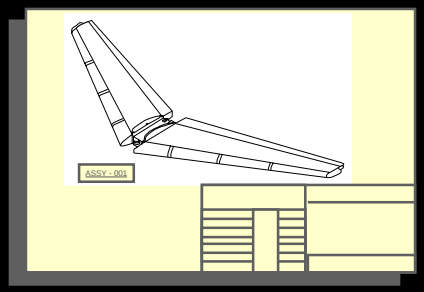
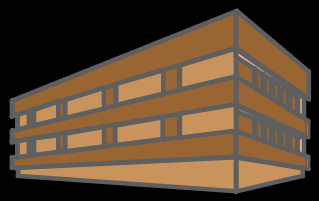
Role of STEP for Data Archival

Past → **Future**

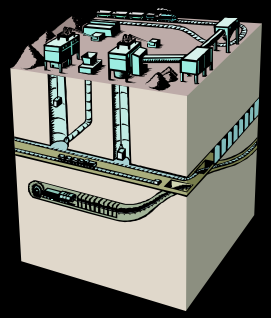
Drawings



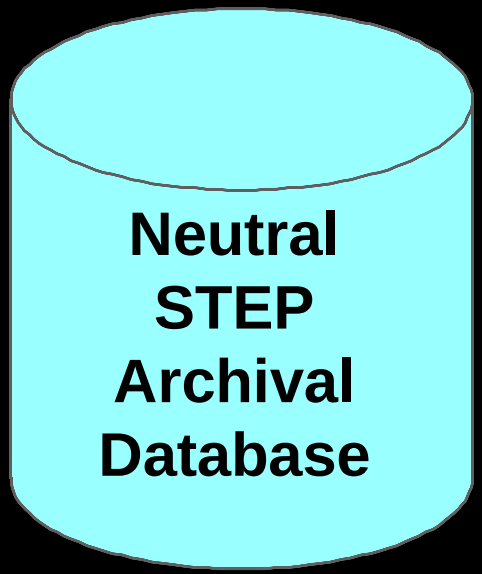
Tapes



Warehouses



Underground Mines



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PDES, Inc.'s Mission

Accelerate the <u>development</u> and <u>implementation</u> of product data exchange using STEP to improve product quality, increase flexibility, reduce product cycle time and reduce costs

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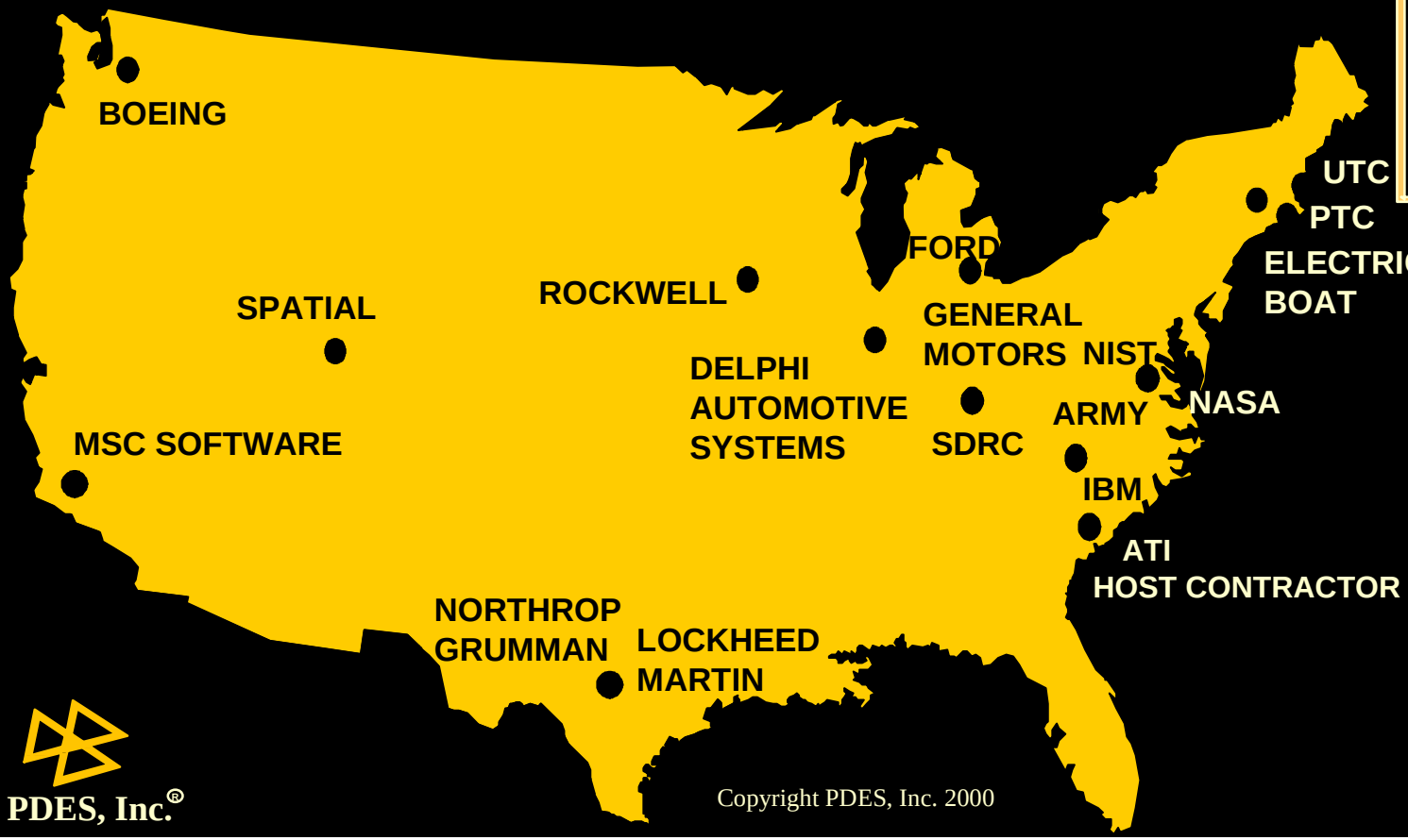
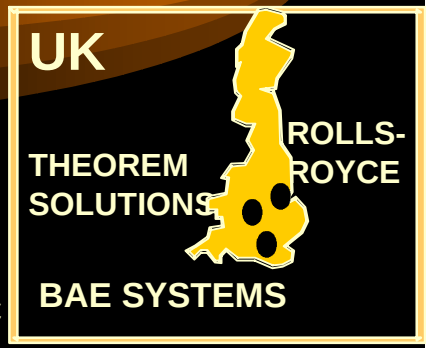
PDES, Inc. Members





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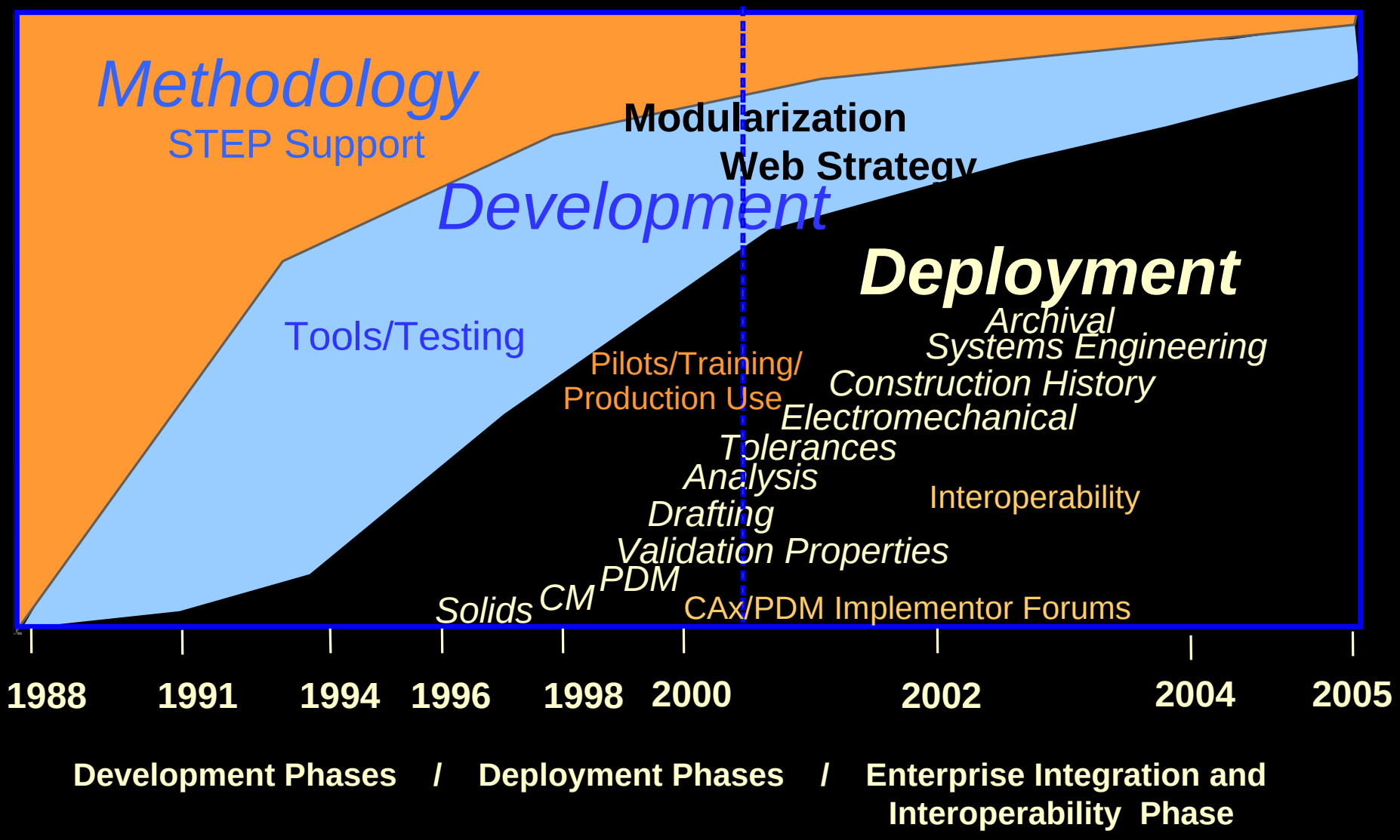
PDES, Inc. Roadmap



Membership Advantages

Work together to leverage collective efforts

- Comprehensive vendor test bed (major CAD and PDM systems)
- Focused pilot projects in high pay-off areas
- STEP product testing in a dynamic environment over the Internet
- Extensive lessons learned from STEP deployments in industry
- Training/Education from world-leading experts in STEP
- Insight into industry Enterprise Integration strategies
- Hands-on experience in using STEP tools and technology

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Membership Advantages (cont.)

- Ready access to STEP expertise
- Direct influence on setting the standard
- Up to date awareness of vendor product capabilities and plans
- Focused cost sharing and cross industry collaboration on STEP
- Ability to work closely with your customers/suppliers
- Support for internal STEP implementations
- Leveraging requirements on vendors
- Membership in the International Industry STEP Centers (ISC)

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LabWorks Development Resources

- **CAx Systems**
  - Mechanical DeskTop
  - Inventor
  - CATIA
  - CADDS
  - IDEAS
  - STEP/Works
  - ProEngineer
  - Unigraphics
  - IntraVision
- **PDM Software**
  - Sherpa
  - Insync
  - Product Manager
- **Development Tools**
  - C/C++ Compilers
  - ITI PDE/Lib
  - Purify
  - ST-DEVELOPER
  - EDM Supervisor (EPM)
  - EXPRESSO

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PDES, Inc. Approach

- Develop and implement member company-defined work tasks
- Organize the work into projects with deliverables and schedules
- Use contributed company personnel
- Work with the established National and International standards structure
- Establish formal relationships with other significant organizations, programs and consortia
- Pursue funding for complementary projects

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Sampling of Deliverables over the last six months

- Recommended Practices/Usage Guides for various STEP Application Protocols (APs) and Modules
- Training/Education:
  - STEP Modularization overview
  - STEP AP210 overview and tutorial
- CAx and PDM Implementor Forum testing results
- Offsite Briefings/Workshop Materials
- 1999 Annual Report and Monthly Status Reports
- STEP and OMG PDM Specifications -- A Guide for Decision Makers
- ISO Technical Specifications for Shape Appearance and Layers modules
- Benchmark Testing Results from ProSTEP

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PDES, Inc. Success Stories

- Company Implementations resulting from PDES, Inc. Pilots:
  - Boeing PowerSTEP/AEROSTEP
  - Delphi Automotive Systems
  - CSTAR (Boeing's McDonnell Douglas unit)
  - Lockheed Martin

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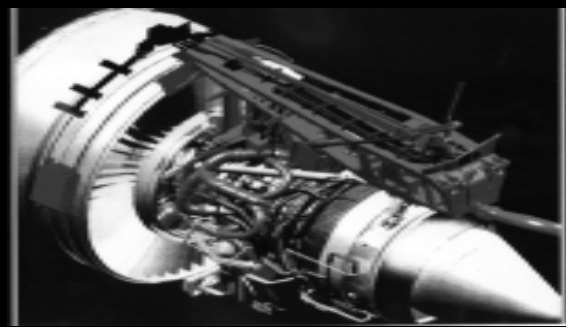
Success Story: AeroSTEP/PowerSTEP

Show viability of STEP as an exchange mechanism supporting Digital Pre-Assembly (DPA) of engine/strut interface.

- STEP is being used in production between Boeing and their three engine manufacturers for the DPA process on the 777 and 767-400 Extended Range Programs
- PowerSTEP continues today within Boeing
- STEP will be the preferred process for future Boeing programs
- Participants:
  - Boeing
  - Rolls-Royce
  - Dassault Systems
  - Unigraphics
  - GE
  - Pratt & Whitney
  - Computervision



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Boeing Position on STEP

- STEP is identified as The Boeing Company Standard for product data exchange.

- Boeing will only consider purchase of products that comply with STEP.

- It is Boeing's intent that our partners and suppliers comply with STEP as a requirement for maintaining business with Boeing.

Success Story: Delphi Automotive Systems

STEP is being used in support of climate control systems for two major OEM customers.

- **All mechanical design at Delphi Delco Electronics Systems is accomplished using EDS/Unigraphics; the two OEMs require Dassault Systemes' CATIA**
- **Previously used IGES and recreation of solid models took three to five days per component**
- **A recent example showed 12 files translated via STEP; approximately 50 hours were saved by eliminating virtually all manual intervention**

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DELPHI Automotive Systems

Success Story: CSTAR

Development of electronic data exchange capabilities between C-17 facilities in Long Beach and St. Louis using STEP . Boeing's McDonnell Douglas unit is now using STEP in production to exchange C-17 configuration management data on a daily basis.

- Significant Cost and Schedule Improvements -- manual method was error prone, slow (3 weeks to 2 months; now overnight), and people intensive (3 people full time; now zero)
- Expanded capability to exchange solid models
- Participants:
  - Boeing's McDonnell Douglas unit
  - Northrop Grumman - IBM - ITI

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Success Story: Lockheed Martin

STEP is being used to support the F-16, F-22, Joint Strike Fighter, F-2 and KTX-2 programs at Lockheed Martin

- **Lockheed Martin is pioneering the STEP standard with smaller businesses that are its supply base**
- **STEP has realized significant savings and process improvements**
  - **Within engineering design, pilots show a 10% improvement in reliability of data exchange, 10% process savings for non-composite parts, and 50% process savings for composites**
  - **For manufacturing, projected savings for tool design on CAD/CAM systems is 27% and 38% for NC CAM systems due to elimination of data re-entry**

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LOCKHEED MARTIN
Tactical Aircraft Systems

Press Release: NASA adopts ISO 10303 for data exchange

- NASA-STD-2817 now includes the requirement for CAE/CAD/CAM systems used by NASA to have interchange tools that support STEP
- Preferred standards include APs 203, 209, 210, 225, and 227 for exchanging data among PDM, mechanical and electronic CAD/CAM, civil and facilities CAD, and CAE/analysis systems
- Tools that enable data interchange, compliant with these standards, must be available to all CAE/CAD/CAM users at each NASA Center

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STEP Vendor Certification

- Several STEP vendors have successfully completed AP203 certification testing
  - Dassault CATIA Version 4.2.0 and 4.2.2
  - Unigraphics Version 16
  - Theorem CADDS5 Version 4.0
  - Autodesk Mechanical Desktop Version 4.1
  - SolidWorks 2000
- US Pro and GOSET (in France) are merging their certification programs resulting in a single international certificate with multiple test labs

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Enterprise Integration and Interoperability Phase

August 2000 - July 2002

Objectives of Enterprise Integration and Interoperability Phase

Enable Enterprise Integration and Interoperability for Member Companies by:

- Implementing STEP using Web-based technologies
- Enabling integrated supply chains through pilot projects
- Increasing modular STEP applications to support product data throughout the lifecycle
- Increasing interoperability among CAD/PDM, PDM/PDM, and ECAD/MCAD systems
- Enabling faster and more efficient development of STEP products and services

PDES, Inc. Will Increase Functionality, User Confidence, Universal Acceptance, and Ease of Use of STEP

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Organizational Chart

General Manager

R. Kiggans
Chief Technology Officer - D. Briggs
Operations Manager - M. Nicholson

Systems Integration Board

Modules Development
R. Barra

- PDM
- Engineering Analysis
- Construction History
- Systems Engineering

STEP for the Web
D. Price

- Infrastructure
- Standardization on the Web
- Support of Web Implementations

Pilot Projects
G. Graves

- PDM
- Electro-mechanical
- Supply Chain
- Aerospace Engine Alliance
- Engineering Analysis
- Systems Engineering

Implementation Support
P. Rosche

- Pilot Support
- Interoperability Testing
- Demos and Lab Support

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Module Development

Work Tasks:

- Executing the STEP Modularization Strategy
- Focus areas:
  - Product Data Management
  - Engineering Analysis
  - Construction History
  - Systems Engineering

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STEP for the Web

Work Tasks:

- Understanding, influencing, and using XML-based information technology standards in implementing ISO TC184/SC4 standards
- Publishing STEP data models in XML form for Web implementors
- Assisting Web implementors in using STEP in Web applications

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STEPml Home Page - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Stop

SCRA_intraweb ATI Web ATI IntraWeb Search Engine I Supplies/FedEx Search Computers/Inter Directories

Bookmarks Netsite: http://www.stepml.org/ What's Relate

STEPml

STEPml Logo

SOLUTION FOR BETTER CONTENT

- Home
- What is STEPml ?
- Why STEPml ?
- Who We Are
- Specifications
- FAQ
- Links

Do you need to **share information about your products** with your **supply chain** or customers?

Do you need to **integrate your engineering, manufacturing and life cycle support processes**?

Do you need the agility to **collaborate with external organizations** with little or no setup time?

If the answer to any of the above questions is "YES!", then you need to find out about **STEPml**.

STEPml is Product Data for the Web. Product data is a key enabler for process integration, supply chain management, collaborative engineering, analysis, manufacturing and customer support. Virtual enterprises using the Web need STEPml as the standard for product data schemas.

STEPml is a library of XML specifications that are based on the content models from the STEP standard. It combines the semantically rich, international standard data models from STEP (ISO 10303) with the widespread infrastructure of XML and the Web.

Implementing STEPml specifications enables companies to communicate information about products within their organization and with their business partners using the Web.

PDES, Inc. Participants

- IBM
- Boeing
- Electric Boat
- Northrop Grumman
- Lockheed Martin
- Spatial
- NASA
- Rockwell
- NIST

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Pilot Projects

- Eurofighter PDM Pilot
- Aerospace Engine Alliance Pilot
- Engineering Analysis Pilot
- Electromechanical Pilot
- STEPwise Pilot
- International STEP Automotive Project

Details in Back-Up Slides

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Implementation Support

- Supporting Pilot Projects
- Facilitating Interoperability Testing
  - CAx Implementor Forum
  - PDM Implementor Forum
- Conducting Lab Demonstrations

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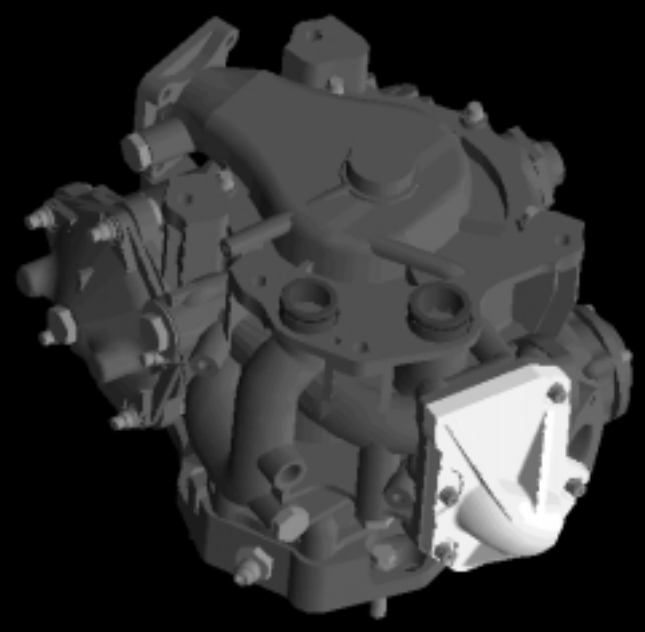
CAx Implementor Forum

- **The CAx Implementor Forum is a joint interoperability testing activity between PDES, Inc. and ProSTEP**
- **The objective of the forum is to accelerate CAx translator development and ensure that user's requirements are satisfied**



Participants:
UG Solutions
CATIA
SDRC
PTC
Theorem Solutions
AutoDesk
STEP Tools, Inc.
Bentley Systems
Entity Systems
debis

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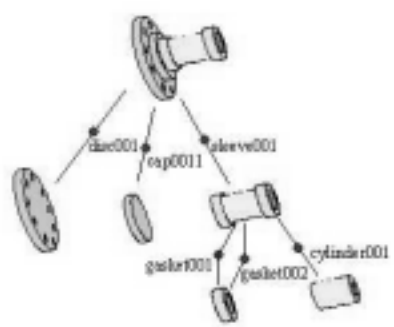
PDM Implementor Forum

- **The PDM Implementor Forum is the STEP interoperability test bed for PDM systems**

- **The PDM Implementor Forum is a part of a comprehensive infrastructure where STEP developers and users conduct interoperability testing over the internet**

Part List	Quantity
• h1(A) : hub assembly	
– d1(B) : disc with holes d1-1 : disc001	1
– ca1(B) : cap ca1-1 : cap001	1
– s1(A) : sleeve assembly s1-1 : sleeve001	1
• cy1(B) : cylinder cy1-1 : cylinder001	1
• g1(B) : gasket g1-1 : gasket001 g1-2 : gasket002	2



Participants:

BAE SYSTEMS
BMW
Contact Software
Daimler Chrysler/debis
DASA
Eigner & Partner
ENOVIA/Dassault Systemes/IBM
ISS
Matrix One
Metaphase/SDRC
ProSTEP
SAP
STAMP/Sherpa
UG Solutions
VW
PTC

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Summary

- STEP should be fundamental to meeting your business goals
- PDES, Inc. Members:
  - Get a head start in implementing STEP
    - Training
    - Hands-on experience
    - Dedicated team assistance
    - Software Tools/LabWorks
  - Get the additive effect of leveraged resources
    - Cost sharing
    - Influence on vendors/users
    - Influence on standard

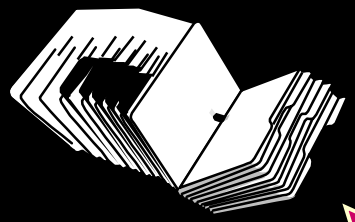
The Army can gain and add significant value from PDES, Inc. membership

Back-Up Slides

Web-based Modules Repository

Catalogue

Catalogue - a complete list of Modules, with notes giving details of scope and content



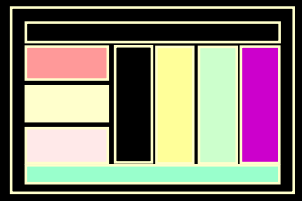
Library

Library - the set of Modules (and modular APs) published as a series in a similar format

Tools

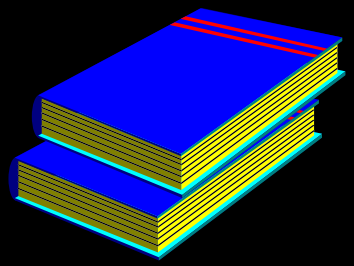
Framework

Framework - structural plan and method of categorising the Modules



Methods

Methods - the guidelines and process for developing the STEP Modules that go into the Library



PDES, Inc. Pilots: TEP Web Integrated Supplier Exchange (STEPwise)

- Participants: Lockheed Martin, Northrop Grumman, ISS, Spatial
- Integrating PDM systems using AP232/PDM Schema for ISS-InSync and SDRC/Metaphase
- Moved STEPwise into Production at Lockheed Martin Tactical Aircraft Systems (LMTAS)
  - 11 Suppliers (RFQ process)
- Planning for deployment of STEPwise beyond LMTAS Airframe Procurement

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PDES, Inc. Pilots:
Eurofighter PDM Pilot

- Participants: BAE SYSTEMS, ALENIA (Italy), CASA (Spain), DASA (Germany), Product Manager, Metaphase, CV/PTC Optegra
- Implementing a net change based PDM data exchange between the Eurofighter partners based on the Unified PDM schema
- Finalized PDM Schema harmonized interpretation
- Will deploy initial Phase in 2000

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PDES, Inc. Pilots: International STEP Automotive Project (ISAP)

- Participants: Ford, GM, Isuzu, Visteon, Delphi, Metaphase, UG IMAN, SDRC IDEAS
- Goal is to accelerate production use of STEP by the international automotive industry
- Established Metaphase STEP test facility at Ford
  - Will test PDM to PDM, PDM to CAE, PDM to CAD, and PDM to STEP for data retention
- Tested/Testing 21 CAD system combinations
  - Success range: 45%-100% (testing complex parts/assemblies with file sizes > 30 Meg and 100s to 1000s of faces)

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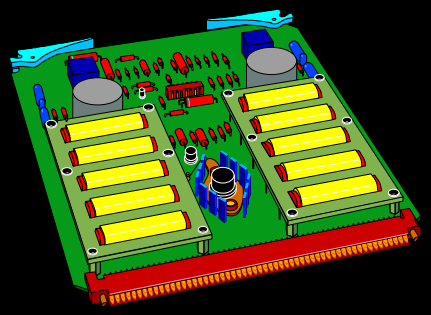

PDES, Inc. Pilots:
Electromechanical

- Participants: Boeing, IBM, Rockwell, NASA, Delphi Automotive Systems
- Implementing STEP for integrated electronic exchange of PCA designs as well as their mounting hardware and enclosures
- Translator availability of MCAD to/from AP210 is key to continued pilot activity
  - Mentor Graphics to AP210 translator in test
- Developed draft AP210 Concept of Operations and Recommended Practices documents

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PDES, Inc. Pilots: Aerospace Engine Alliance (AEA)

- Participants
  - Users: Pratt and Whitney, Airbus/Aerospatiale, and GE
  - Vendors: UG, PRO/E, and Theorem/CADDS 5
  - PDES, Inc. and GOSET (French STEP Center)
- Objectives:
  - To improve the exchange of solid model geometries between CAD systems in use at Pratt & Whitney, GE, and Airbus
  - To support the development of a new aircraft, model checking will be performed using the *Validation Properties modular extension*

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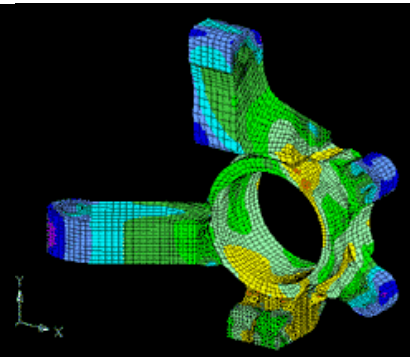

PDES, Inc. Pilots:
Engineering Analysis

- Participants:
  - Users: Boeing, Lockheed Martin, Electric Boat, Rolls-Royce (potentially BAE SYSTEMS, Northrop Grumman)
  - Vendors: MSC Software, SDRC/FEMAP (potentially PTC and Dassault)
  - Supporters: Ford, NIST, NASA, NAFEMS
- Objectives:
  - Accelerate the deployment of STEP support for EA applications in member companies
  - Further validate AP209 capabilities in an industry setting
  - Establish a pilot framework for extending STEP capabilities in EA leading to an EA testing forum

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