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CUST114: Creating STEP Files as Part of Official Product Definition

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**Sandia
National
Laboratories**

PTC Live Global: Boston, MA
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Sandia National Laboratories:

(Corporate)

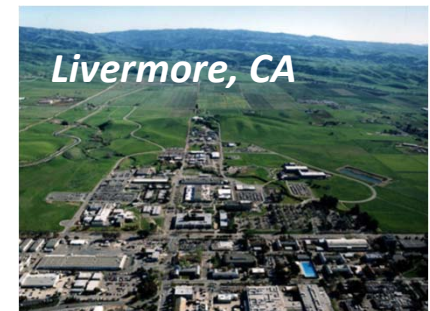
- Warhead systems engineering and integration



- Design agency for nonnuclear components



- Defense, Energy, and Security



(Department)

- **Plan and Execute Engineering Design Services**
CAD Engineering, Design, Analysis, & Configuration Management
- **Manage Engineering Product Data**
Product Data Management Solutions, Stockpile Characterization



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Overview:



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Agenda:

- Business changes
- Process development
- Process definitions
- Process requirements
- Discussion/questions



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Business changes:

- Computer Integrated Manufacturing standards (1987-2003)
 - Piece-part CAD definitions
 - Numerical control machining
 - Exchange of CAD data
 - Drawing practices
- Design Definition Set standards (2003-present)
 - Pro/E (to Creo) modeling and drawing practices
 - Multiple-uses for 3D model

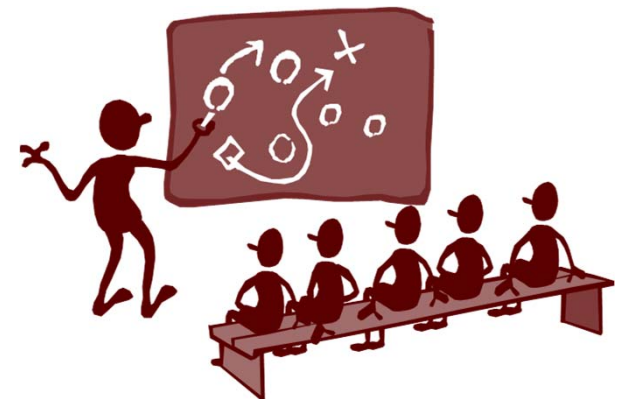


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Process development:

- Future-state planning
- Long-term data and documentation requirements
- Pull from manufacturing partners
- Customer and industry indicators

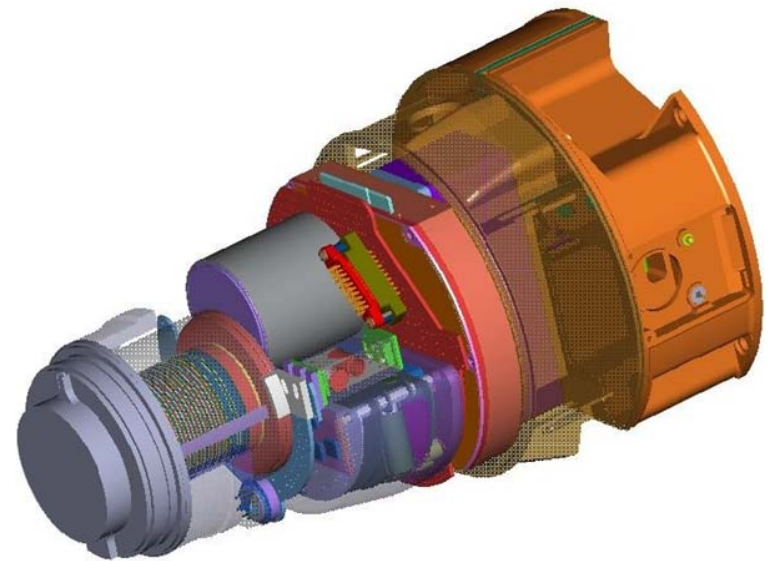


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Product definition:

- Information set
- Specifies acceptance requirements
- Processes



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STEP:

- **S**Tandard for the **E**xchange of **P**roduct model data (.stp)
- ISO 10303 contains complete set of STEP documents (parts)
- Application Protocols (APs) are the implementable parts
- AP203, Configuration Controlled 3D Design of Mechanical Parts and Assemblies, is default used in Creo at Sandia



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Business case for STEP:

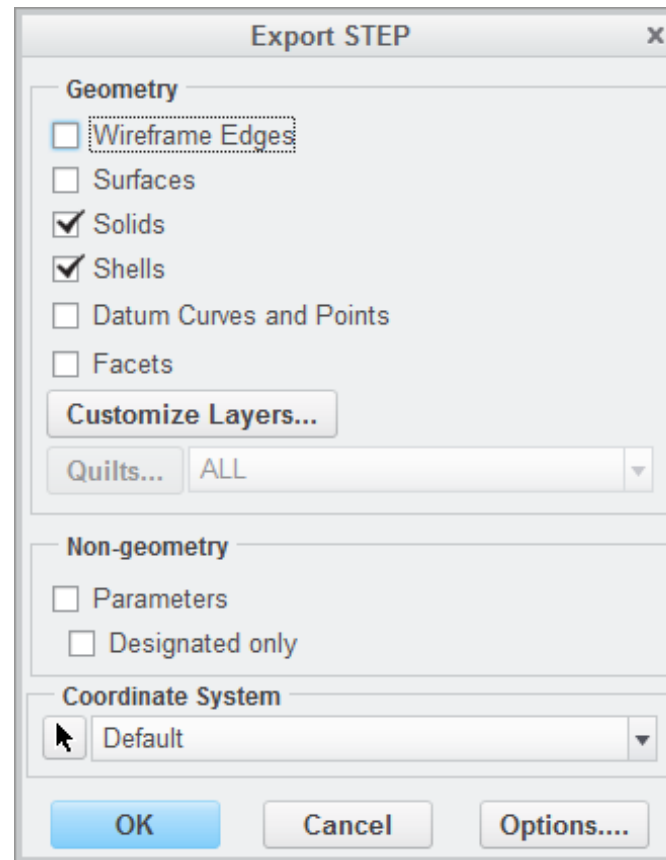
- Enables use of 3D geometry by manufacturing
- Enables control of sensitive or proprietary information
- Enables long-term retention of 3D model geometry



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Example:



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Example:

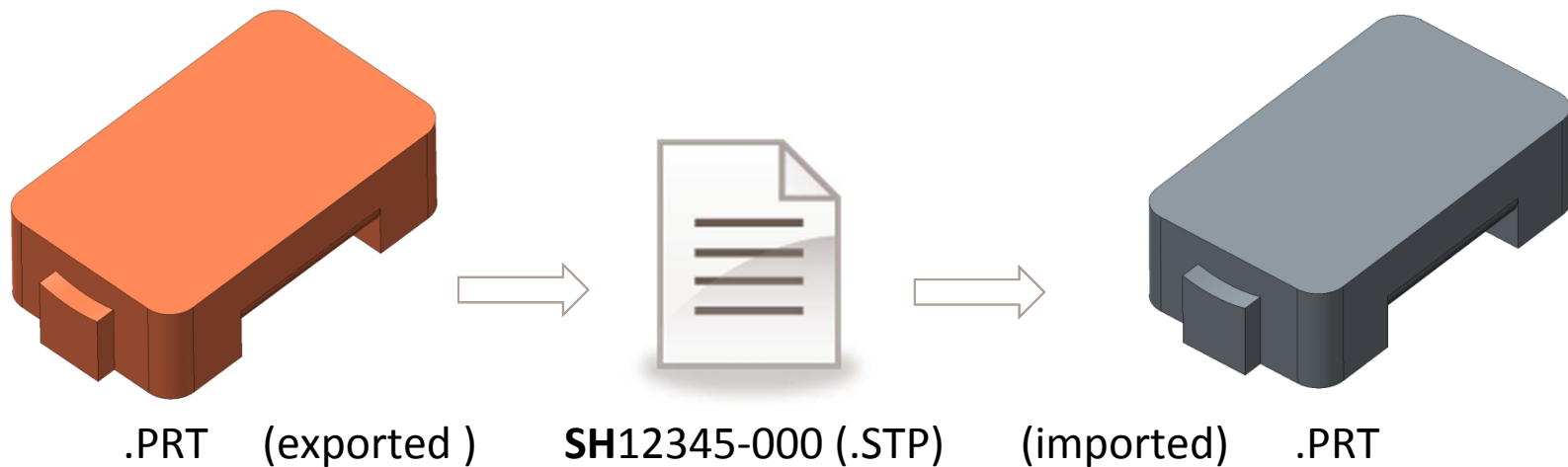
```
ISO-10303-21;  
HEADER;  
FILE_DESCRIPTION(('','2;1');  
FILE_NAME('12345-000-UNC','2014-03-27T','MCAD_user'),(  
'Sandia National laboratories'),  
'PRO/ENGINEER BY PARAMETRIC TECHNOLOGY CORPORATION, 2013410',  
'PRO/ENGINEER BY PARAMETRIC TECHNOLOGY CORPORATION, 2013410','');  
FILE_SCHEMA(('CONFIG_CONTROL_DESIGN'));  
ENDSEC;  
DATA;  
#2=CARTESIAN_POINT('',(2.E-1,0.E0,5.5E-1));  
#3=DIRECTION('',(0.E0,-1.E0,0.E0));  
#4=DIRECTION('',(0.E0,0.E0,1.E0));  
#5=AXIS2_PLACEMENT_3D('','#2,#3,#4);
```

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Support model:

- STEP file verified as equivalent to CAD part's geometry
- Serves as a recognized method of definition
- Identified with an "SH" prefix



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Process document:

IDENTIFICATION, SUPPORT MODEL (SH), 3D CAD PART

<u>DOCUMENT NUMBER</u>	<u>ISSUE</u>	<u>RELEASE/CHANGE NO.</u>	<u>DATE</u>
SPRT-MOD-ID	A	10112013SNL	10/11/13

Callout:

SUPPORT MODEL, (1), REPRESENTS (2) GEOMETRY PER SPRT-MOD-ID.

(1) INSERT SUPPORT MODEL'S CONTROL NUMBER. (Example: SH12345-000)

(2) INSERT "MEAN" or "NOMINAL".

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Benefits of process:

- Establishes requirements for consistency in Support Models
- Authorized use eliminates assumptions regarding intended use
- Provides long-term traceable record to retrievable 3D data



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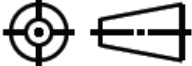
Process requirement:

```
ISO-10303-21;  
HEADER;  
/*  
TITLE: SUPPORT MODEL, MECHANICAL PART  
CONTROL NUMBER: SH12345-000  
ISSUE: A  
NATIVE FILE USED TO GENERATE STEP: 12345-000-UNC  
CAGE CODE: 14213  
DEFINITION RELEASE: 03272014SNL  
MODEL CLASSIFICATION: UNCLASSIFIED  
NOTE: SUPPORT MODEL, SH12345-000, REPRESENTS MEAN GEOMETRY  
PER SPRT-MOD-ID.  
*/  
FILE_DESCRIPTION(('','2;1');  
FILE_NAME('12345-000-UNC','2014-03-27T','MCAD_user'),(  
'Sandia National laboratories'),
```

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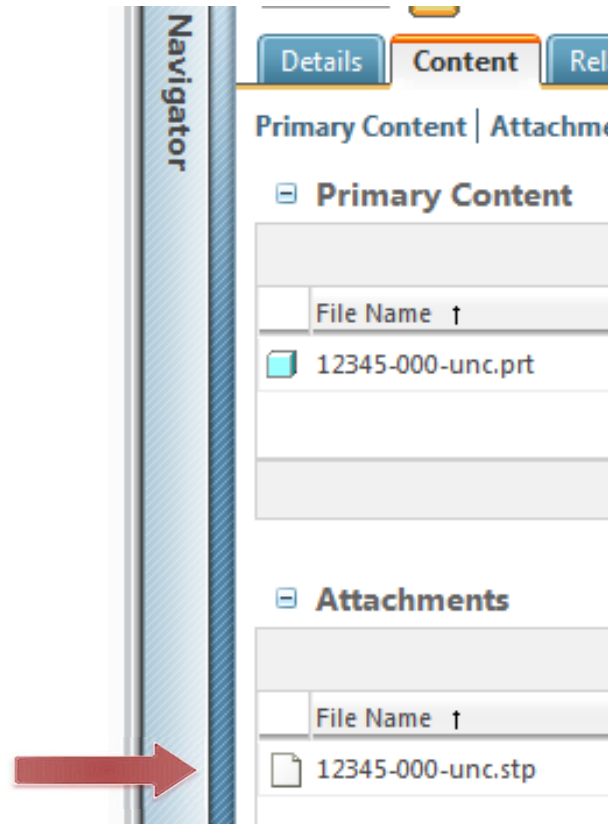
Process requirement:

AR	SH12345-000	SUPPORT MODEL, MECHANICAL PART			
ARS	CCCCC	MATERIAL			
NA	SPRT-MOD-ID	IDENTIFICATION, SUPPORT MODEL, 3D CAD PART			
NA	BBBBB	MARKING REQUIREMENTS			
NA	AAAAA	GENERAL PRODUCT DEFINITION REQUIREMENTS			
NO REQD	PART/CONTROL NO	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE	ITEM
PART NO. 12345-000	QUANTITY NA = NO QUANTITY FOR DOCUMENTS PM = PROCESS MATERIAL AR = AS REQUIRED ABBREVIATIONS: ALT = ALTERNATE EM = EXPENSE MATERIAL ARS = AS REQUIRED FOR ASSEMBLY				
	 SANDIA NATIONAL LABORATORIES P.O. BOX 5800 ALBUQUERQUE, NM 87185		TITLE MECHANICAL PART		
	ENGLISH		PART CLASSIFICATION UNCLASSIFIED		
	THIRD ANGLE PROJECTION 		DRAWING CLASSIFICATION UNCLASSIFIED		
			SIZE C	DRAWING NUMBER 12345	ISSUE A
			CAGE 14213	SCALE 1/1	SHEET 1 OF 1
ORIGIN CREO 2.0		STATUS SA - REL - 27-MAR-2014			
2		UNCLASSIFIED 1			

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Process requirement:



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Process requirement:

- Support model and graphic drawing form a compatible set
- Compatible set is maintained at same issues
- Changes are driven by the associated native part and drawing files



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Process requirement:

- Authorize the Support Model for use by a Definition Release
- Place Definition Release and product definition into configuration and/or records management system



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Example:

<u>Number</u>	<u>Issue</u>	<u>Title</u>
12345	A	MECHANICAL PART
SH12345	A	SUPPORT MODEL, MECHANICAL PART

AUTHORIZATION DETAILS

1. Definition release authorizes use of drawing 12345 and support model SH12345 in support of manufacturing and product acceptance activities.
2. MCAD files (part model, drawing, and support model) reside in PDMLink.
3. Record copy of drawing 12345 and Support Model reside in the corporate records management system.

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Discussion/Questions:

- Similar methods in your industry?
- Explore how such methods can be made more streamlined?

