3D Technical Data in the DoD Supply Chain

A DLA perspective

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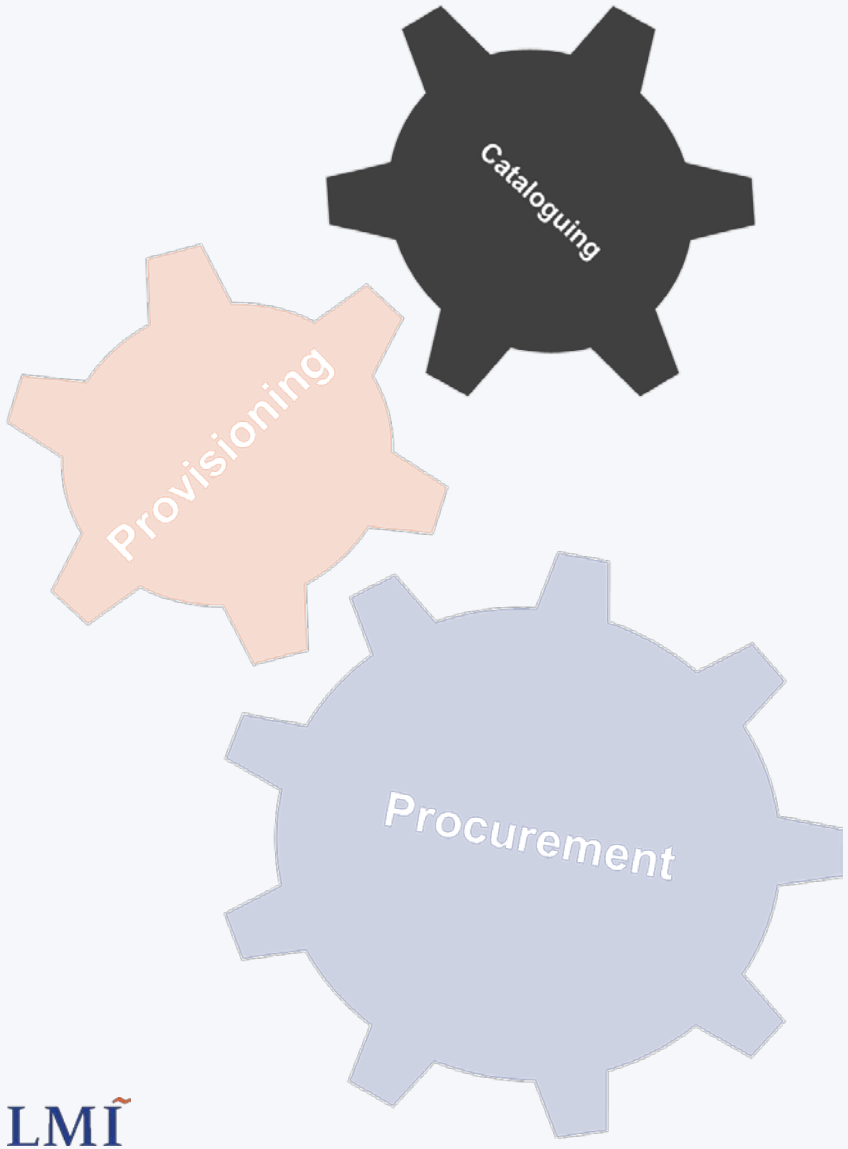
LMI

Sustainment Processes

… Catalouging



Cataloguing is the method by which the Defense Logistics Agency (DLA) creates and maintains a standardized record for products and parts that the Department of Defense (DoD) and other federal civilian agencies distribute, store, and procure on a recurring basis.

1. Evaluate the item's **form, fit, and function.**
2. A complete technical data package would allow the cataloguer to determine the spring's form, for example, as it would contain information on physical features such as material, wire size, length, wire type, load, etc.

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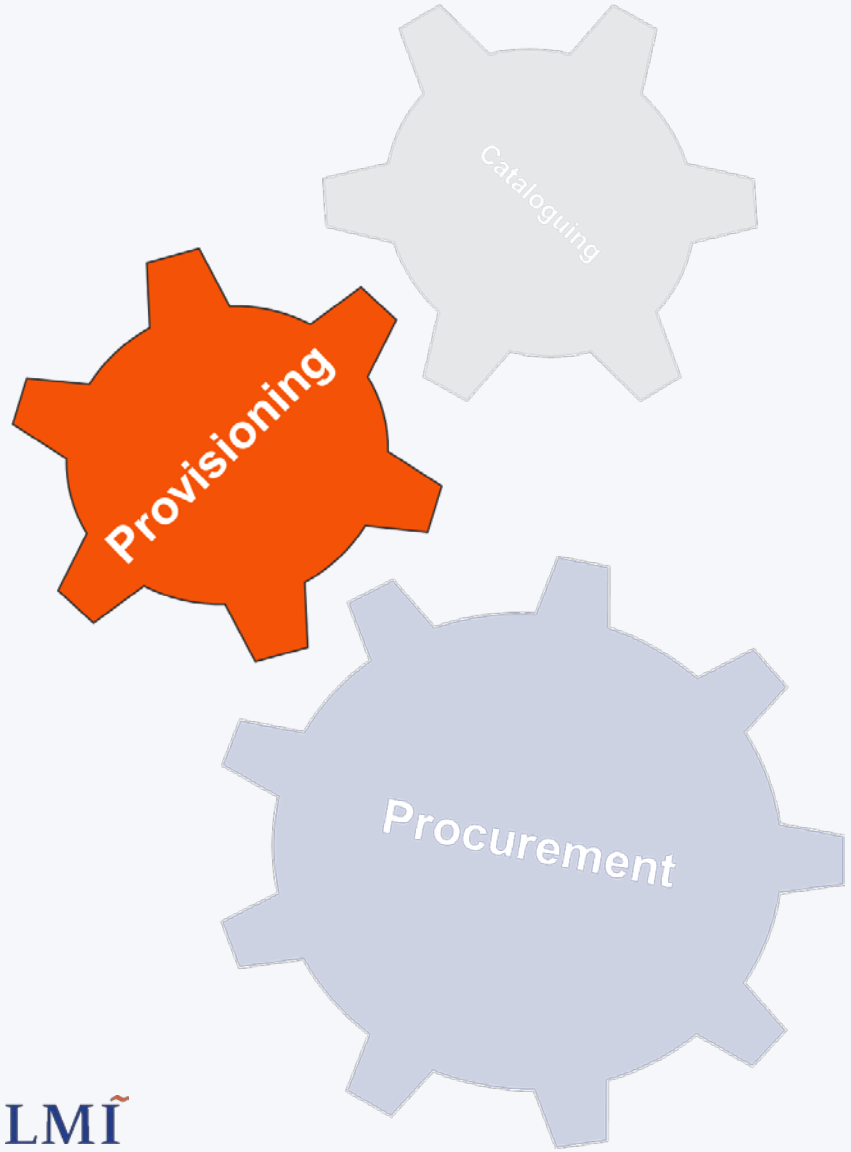
Sustainment Processes

… Provisioning



Provisioning is the process of determining and acquiring the range and quantity of spares and repair parts, and support and test equipment required to operate and maintain an end item of material for an initial period of service.

1. Is Technical Data available and complete?
2. Critical requirements?
3. Does Technical Data support parts requested for cataloguing?
4. Other considerations?

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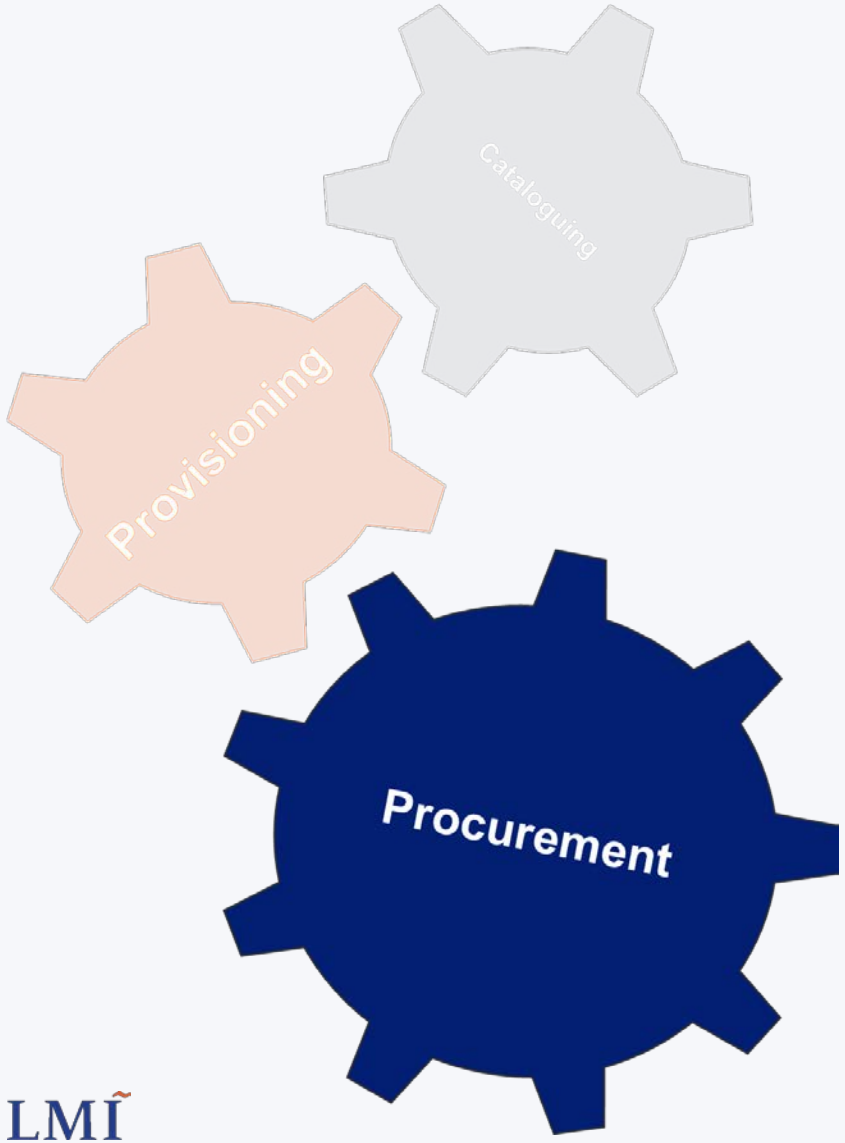
Sustainment Processes

… Procurement



Procurement is the act of buying goods and services for the government.

1. National Stock Number (NSN) is created and assigned as a "first time buy" in the Enterprise Buyer System (EBS).
2. Purchase request (PR) generated.
3. Product Specialist (PS) determined adequacy of technical data including tolerances, materials, and QA requirements.
4. If NSN is bought in accordance with technical data, the buyer publishes the PR.
5. Inspection using relevant tech data and contract requirements provided in cFolders.

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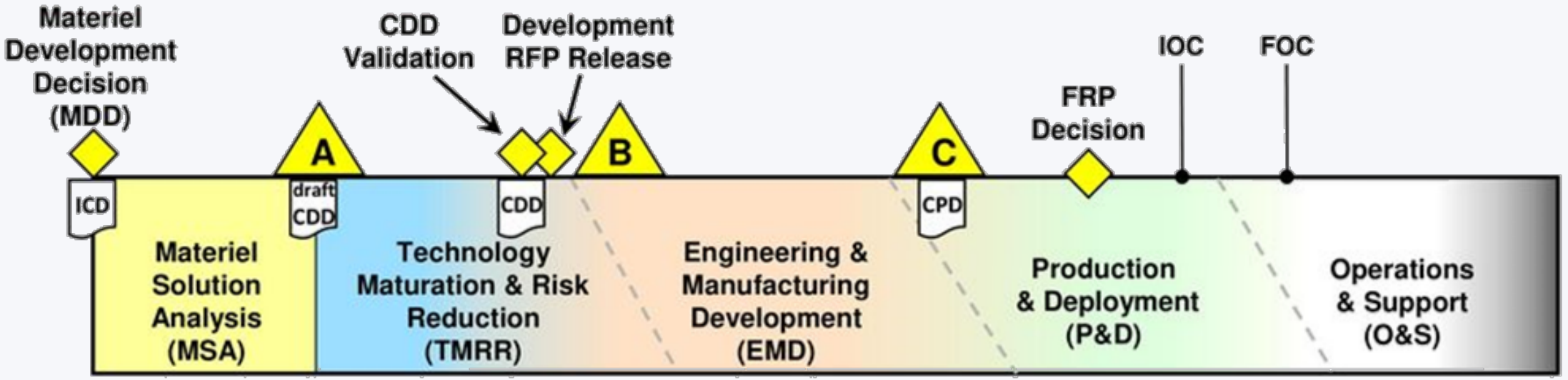
Digital Product Model Data

supports the entire life cycle of the product



- The focus has been on model-based systems engineering, product design, and manufacturing.
- Sustainment can no longer be neglected.
- Was a “nice to have,” but with emerging technologies it is becoming a fundamental requirement.
- Extensibility is necessary as data is added through the products life cycle.
- The authoritative source.

The Bottom Line

the right data to the right place at the right time

The vast majority of the product data required to perform a downstream function probably exists in electronic form. The problem is to find, trust it, translate it, and USE it.

FINDING THE DATA : The case for an Integrated Product Data Environment
TRUSTING THE DATA : The case for Accreditation
VISUALIZING THE DATA : The case for the 3D Technical Data Package
TRANSLATING THE DATA : The case for STEP

We need to make sure that we acquire and manage the product data commensurate with the level of the data rights to which we are entitled.

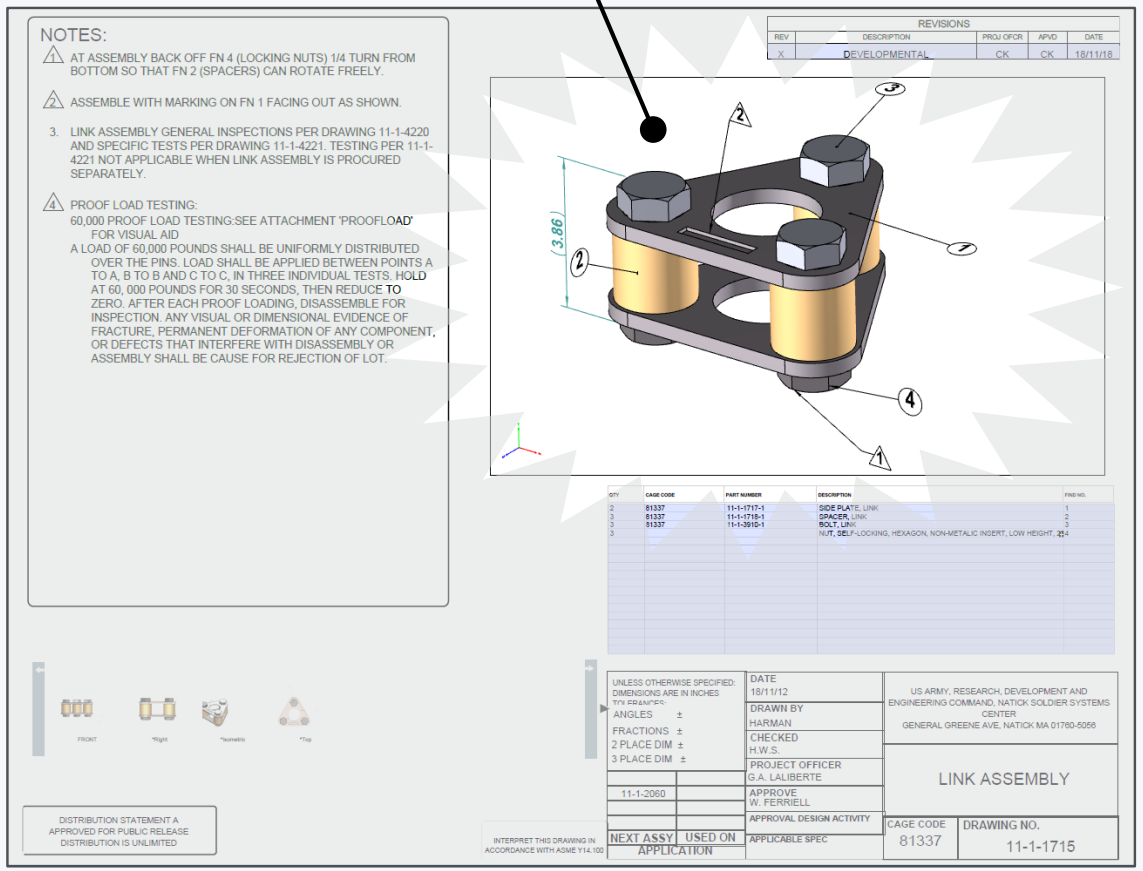
- Form, fit, and function in the cases where the governments rights are limited.
- All OMIT data (operation, maintenance, installation, training).
- Detailed manufacturing data in the cases where the government has the appropriate rights.

The data developed to support design and manufacturing is valuable
Additional data is required to support the product post delivery

3D Technical Data Package

acceptable to DLA

3D PDF view
ISO 14739-1:2014



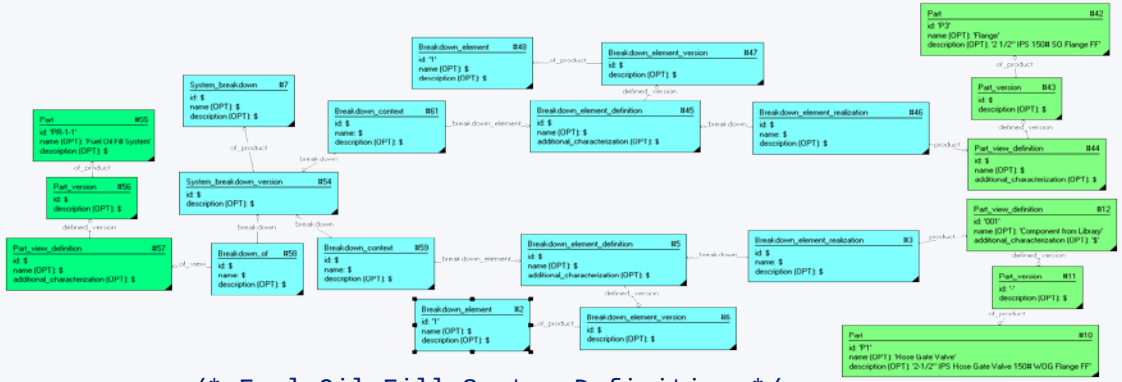
Other acceptable 3D formats

- ISO 14306:2017 Industrial automation systems and integration -- JT file format specification for 3D visualization
- HTML 5.2 World Wide Web: the Hypertext Markup Language (HTML)
- ISO 10303-242:2014 Industrial automation systems and integration -- Product data representation and exchange -- Part 242: Application protocol: Managed model-based 3D engineering
- ISO/IEC 19775-1:2013 Information technology — Computer graphics, image processing and environmental data representation — Extensible 3D (X3D) — Part 1: Architecture and base components

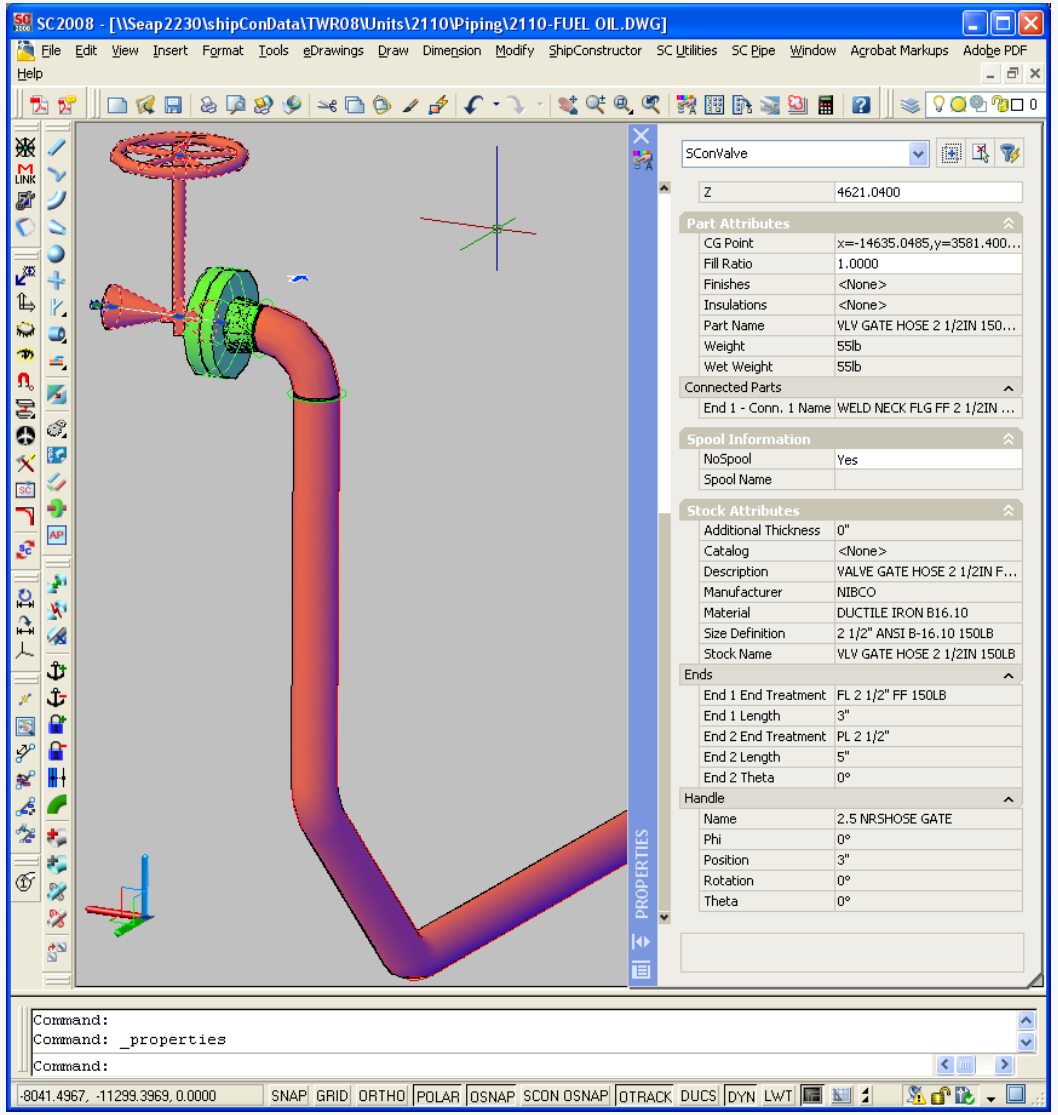
PDF may not be the preferred approach for every program.
DLA is looking at other formats.

Neutral is Nice

but native is not nasty



```
/* Fuel Oil Fill System Definition */
#58 = BREAKDOWN_OF($,$,$,#54,#57);
#54 = SYSTEM_BREAKDOWN_VERSION($,$,#7);
#7 = SYSTEM_BREAKDOWN($,$,$);
/* Hose Gate Valve as member of Fuel Oil Fill System */
#59 = BREAKDOWN_CONTEXT($,$,$,#54,#5);
#5 = BREAKDOWN_ELEMENT_DEFINITION($,$,$,$,(),#6);
#6 = BREAKDOWN_ELEMENT_VERSION($,$,#2);
#2 = BREAKDOWN_ELEMENT('1',$,$);
#3 = BREAKDOWN_ELEMENT_REALIZATION($,$,$,#5,#12);
/* Flange as member of Fuel Oil Fill System */
#61 = BREAKDOWN_CONTEXT($,$,$,#54,#45);
#45 = BREAKDOWN_ELEMENT_DEFINITION($,$,$,$,(),#47);
#47 = BREAKDOWN_ELEMENT_VERSION($,$,#48);
#48 = BREAKDOWN_ELEMENT('1',$,$);
#46 = BREAKDOWN_ELEMENT_REALIZATION($,$,$,#45,#44);
/* Connection between hose gate valve and flange */
#66 = INTERFACE_CONNECTION($,$,'bolted',#63,#64);
#65 = INTERFACE_CONNECTOR_DEFINITION($,$,'1/8" gasket,
4 - 3/8 - 16UNC" x 2" bolt ',$,(),$,$);
#64 = INTERFACE_CONNECTOR_OCCURRENCE($,$,$,#65,#44);
#63 = INTERFACE_CONNECTOR_OCCURRENCE($,$,$,#65,#12);
ENDSEC;
END-ISO-10303-21;
```



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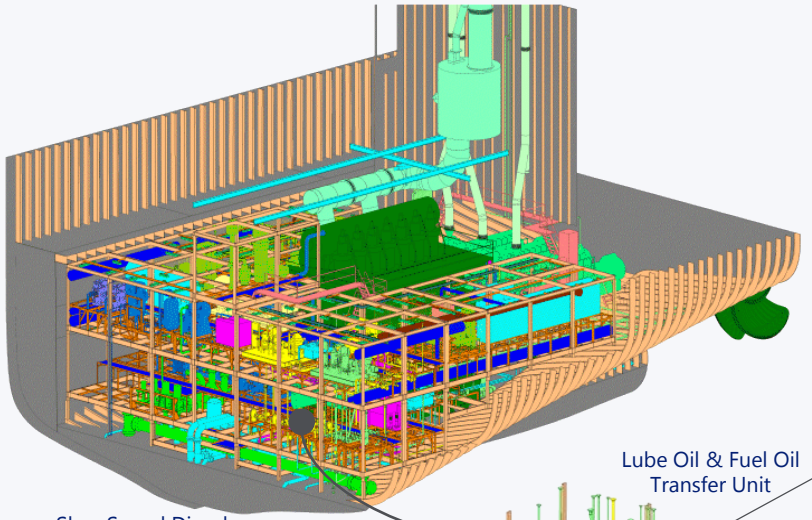
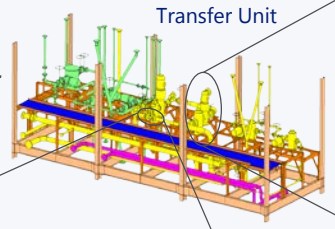
3D Technical Data Package

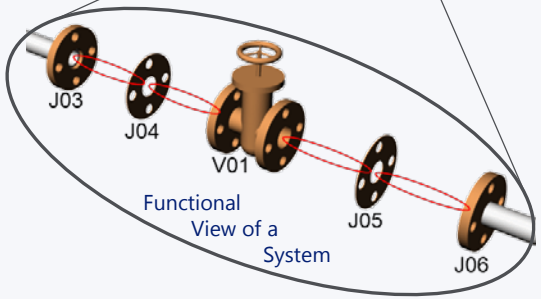
where System Engineering meets Product Design



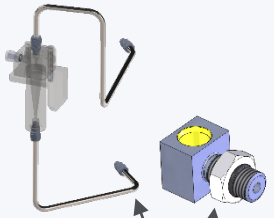
Slow Speed Diesel Engine Room

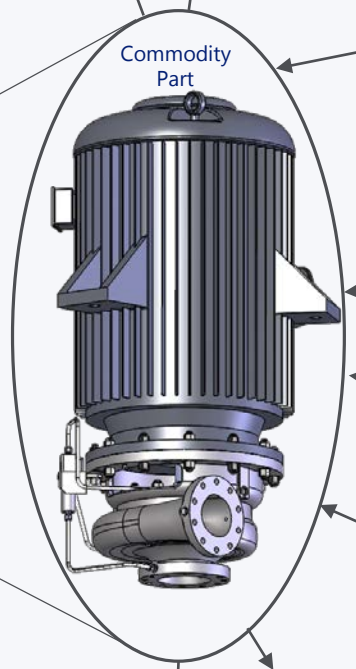


Lube Oil & Fuel Oil Transfer Unit

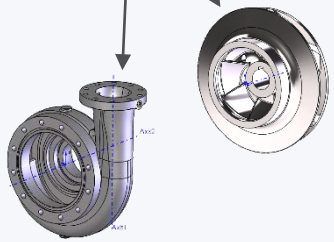


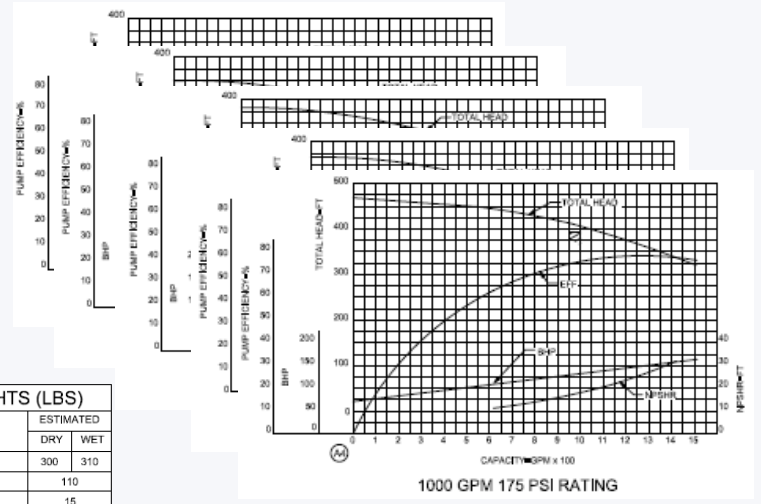
Functional View of a System





Commodity Part





1000 GPM 175 PSI RATING

WEIGHTS (LBS)		
DESCRIPTION	ESTIMATED	
	DRY	WET
PUMP	300	310
CASING	110	
IMPELLER	15	
SEAL HEAD	106	
MOTOR	2195	
UNIT COMPLETE	2495	2505
MOTOR ROTOR ASSY	305	

PUMP DATA						
RATING	125 PSI 750 GPM	150 PSI 750 GPM	125 PSI 900 GPM	125 PSI 1000 GPM	150 PSI 1000 GPM	175 PSI 1000 GPM
LIQUID PUMPED	SEA WATER	SEA WATER	SEA WATER	SEA WATER	SEA WATER	SEA WATER
SPECIFIC GRAVITY	1,03	1,03	1,03	1,03	1,03	1,03
LIQUID TEMPERATURE	85°C MAX	85°C MAX	85°C MAX	85°C MAX	85°C MAX	85°C MAX
SPEED AT CAPACITY	3585	3585	3585	3585	3585	3585
EFFICIENCY AT CAPACITY	70,3%	71,5%	74%	75%	75%	76%
RATED INPUT CAPACITY	78 BHP	92 BHP	89 BHP	97 BHP	117 BHP	134 BHP
MAXIMUM INPUT AT ANY CONDITION	95 BHP	116 BHP	101 BHP	115 BHP	134 BHP	167 BHP
ACTUAL SHUTOFF HEAD	147 PSI	170 PSI	154 PSI	161 PSI	183 PSI	207 PSI
HYDROSTATIC TEST PRESSURE	315 PSIG	315 PSIG	315 PSIG	315 PSIG	315 PSIG	315 PSIG
NPSHR	13 FT	13 FT	16,5 FT	18,5 FT	18,5 FT	18,5 FT
NPSHA, MAX	55 FT	55 FT	55 FT	55 FT	55 FT	55 FT
CRITICAL SPEED	6533 RPM	6533 RPM	6533 RPM	6533 RPM	6533 RPM	6533 RPM
MAXIMUM AXIAL THRUST LOAD (TOWARD SUCTION)	31,3 LBS	31,3 LBS	31,3 LBS	31,3 LBS	31,3 LBS	31,3 LBS

MOTOR DATA	
DESIGN SPEC	MIL-M-17060
TYPE	SQUIRREL CAGE INDUCTION
RPM (SYN.)	3600
RATED HP	150 NOM. 170 MAX.
AMBIENT TEMPERATURE	50 °C
ENCLOSURE	TEFC
BEARINGS	BALL, QUIET PER MIL-B-17931
INSULATION CL	B OR F - SEALED INSULATION SYSTEM
DUTY	CONTINUOUS
DESIGN	B
SPEED CLASS	CONSTANT
OPER. VOLTAGE	3/60/440
FRAME	505Z
NAVY SERVICE	A
IMBALANCE	0,34 OZ-IN MAX.
RATED LOAD CURRENTS	180 AMPS NORM. 200 AMPS MAX.

Component Name	Instance	Node	Node Unique ID	xPart	yPart	zPart	xModel	yModel	zModel
Flange, 150lb, FF, 1in	J03	J03 Port 1	distPort_20	0	0	0	106.88	30	3
Flange, 150lb, FF, 1in	J03	J03 Port 2	distPort_21	0.26	0	0	106.62	30	3
Gasket 1/16in, 150lb, 1in	J04	J04 Port 1	distPort_22	0	0	0	106.943	30	3
Gasket 1/16in, 150lb, 1in	J04	J04 Port 2	distPort_23	0.0625	0	0	106.8805	30	3
Gasket 1/16in, 150lb, 1in	J05	J05 Port 1	distPort_24	0	0	0	110.883	30	3
Gasket 1/16in, 150lb, 1in	J05	J05 Port 2	distPort_25	0.0625	0	0	110.9455	30	3
Flange, 150lb, FF, 1in	J06	J06 Port 1	distPort_26	0	0	0	110.945	30	3
Flange, 150lb, FF, 1in	J06	J06 Port 2	distPort_27	0.26	0	0	111.205	30	3
Valve Gate, 150lb, 1in, FF	V01	V01 Port 1	distPort_62	0	0	0	106.943	30	3
Valve Gate, 150lb, 1in, FF	V01	V01 Port 2	distPort_63	3.94	0	0	110.883	30	3

Cleared for Release

Data Elements and Attributes

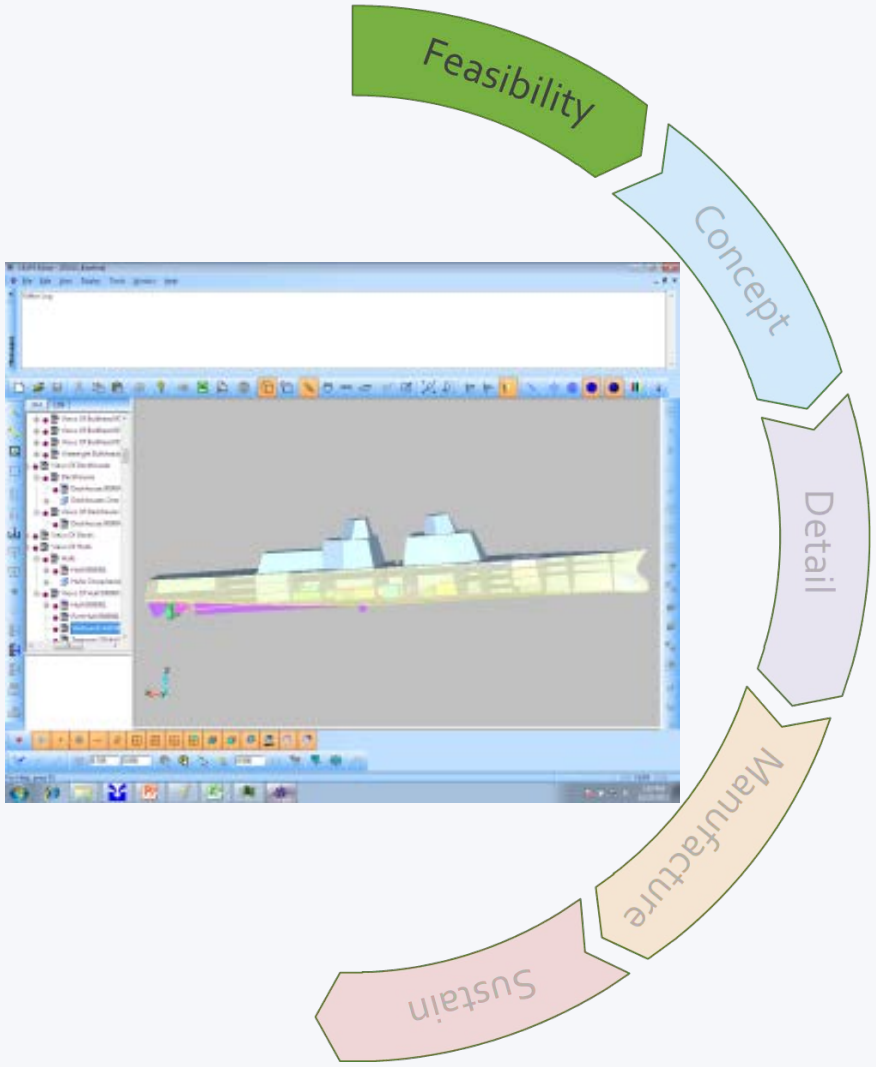
requested by DLA as part of a 3D TDP for procurement

- Specifications
- Dimensions
- Tolerances
- Welding requirements
- Materials (ballistics)
- Temper
- Heat treatments
- Finishes
- Rights in Data
- License Agreement
- Distribution Statement
- Document Type
- Assurance Provision, etc.
- Security code
- Tech data availability code
- Foreign secure
- Nuclear
- Subsafe
- Control code
- Legibility
- Completeness
- Restrictions
- Document approval
- Document title
- Document number
- Revision and date
- Revision type
- Expiration date
- Document data code
- Size of drawing
- Call outs
- Sources
- First Article Test requirements
- Inspection requirements
- Higher level contract quality requirements
- Part number
- NSN
- Export control
- CAGE code

Digital Product Model Data

feasibility

images either developed by NSWCCD or obtained from various public websites



Author

- The source of technical data used to describe a concept and determine the feasibility is often developed by the government.
- Predominantly specifications and requirements, but the government is increasing its use of models and simulations earlier in the program.

Consume

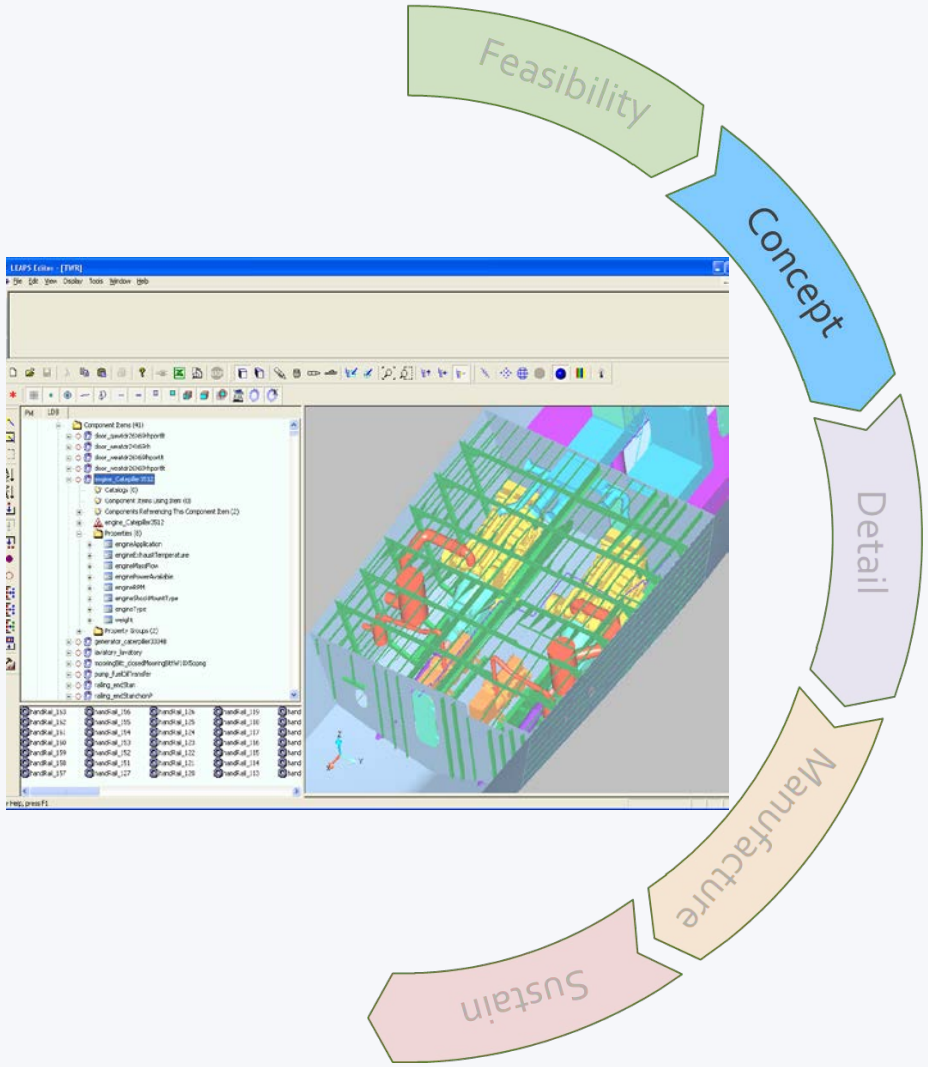
- Commonly shared within the government.
- Visualization, source data for other engineering analyses, and simulations.
- This technical data may be shared with industry and other partners developing the concept.

Archive

- Not uncommon for this technical data and models to be used to synthesize a variant or next generation system.

Digital Product Model Data

concept development



Author

- Government or industry may be principally involved with refining the concept to the point where it becomes a feasible.
- Different organizations may be responsible for refining different sub systems.

Consume

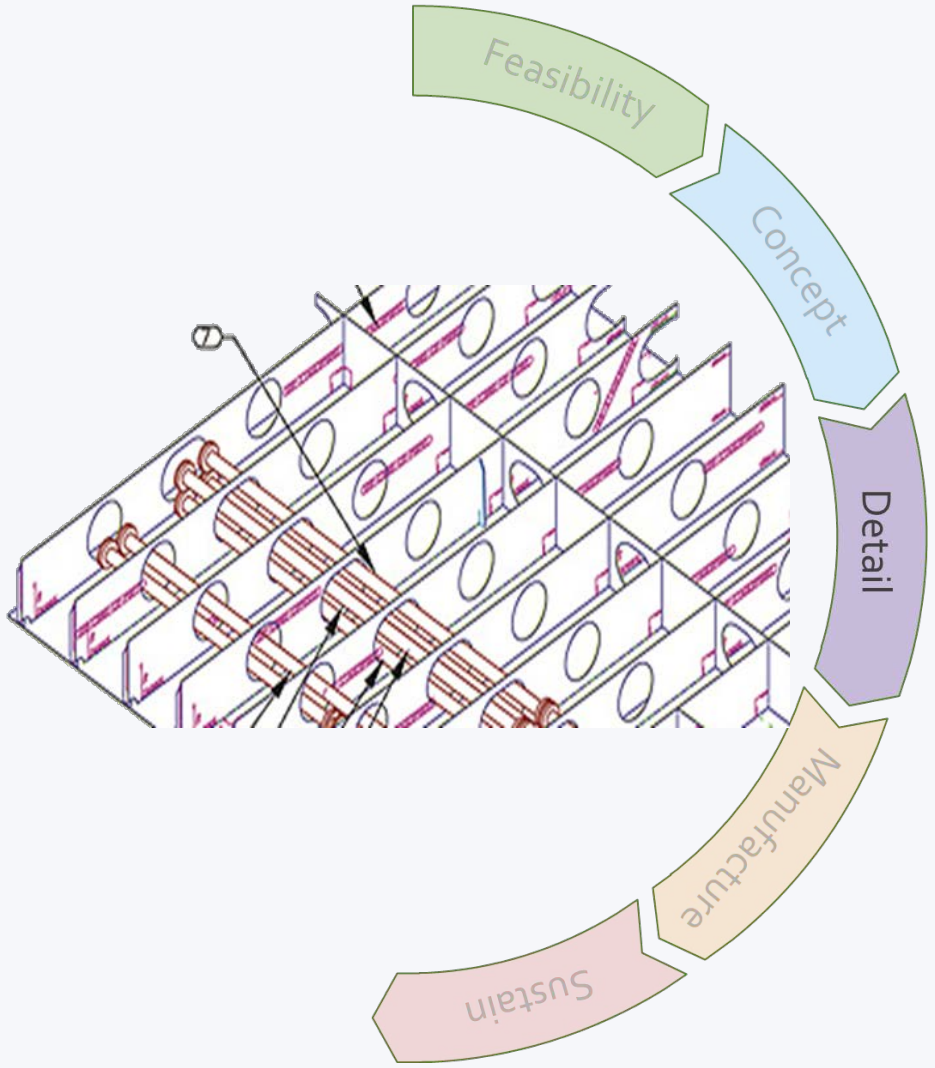
- Commonly shared across the virtual enterprise.
- Visualization, source data for other engineering analyses, and simulations.
- The earliest stage where authoritative source of truth becomes significant.

Archive

- This data is often used to synthesize the detail design and to generate output products to support milestone decisions.
- The first significant source for design intent.

Digital Product Model Data

detail design



Author

- Industry principally involved with preparing the technical data and documentation necessary to deliver the product.
- Different enterprises may be responsible for delivering different sub systems.
- Rights in Technical Data become an issue.

Consume

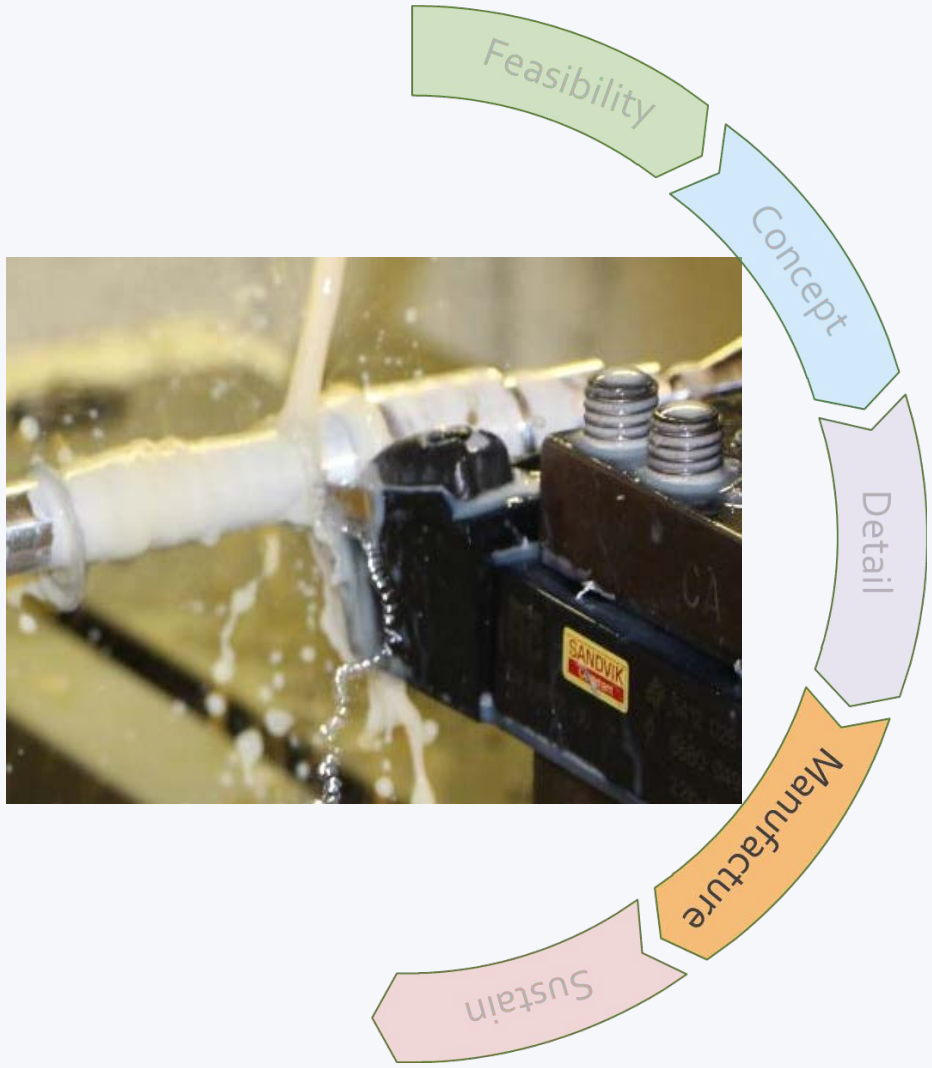
- Commonly shared across the virtual enterprise.
- Output products may be required for Government review and comment.
- Access to the primary PLM by the government.
- Significant and formal configuration management emerge.

Archive

- The complete virtual definition of the product. Source for many downstream applications.

Digital Product Model Data

manufacture, assemble, and deliver



Author

- Industry principally involved with preparing the technical data and documentation necessary to manufacture the product.
- Different enterprises may be responsible for delivering different sub systems.
- Rights in Technical Data for COTS parts becomes an issue.

Consume

- Commonly shared across the virtual enterprise.
- Output products may be required for Government review and comment.
- Access to the primary PLM by the government.
- Significant and formal configuration management emerge.

Archive

- The complete virtual definition of the product. Source for many downstream applications.

Digital Product Model Data

sustain

Author

- Prime, Subcontractors, OEM, government, and who knows who else.
- Be prepared to provide the government with unlimited rights in technical data.

Consume

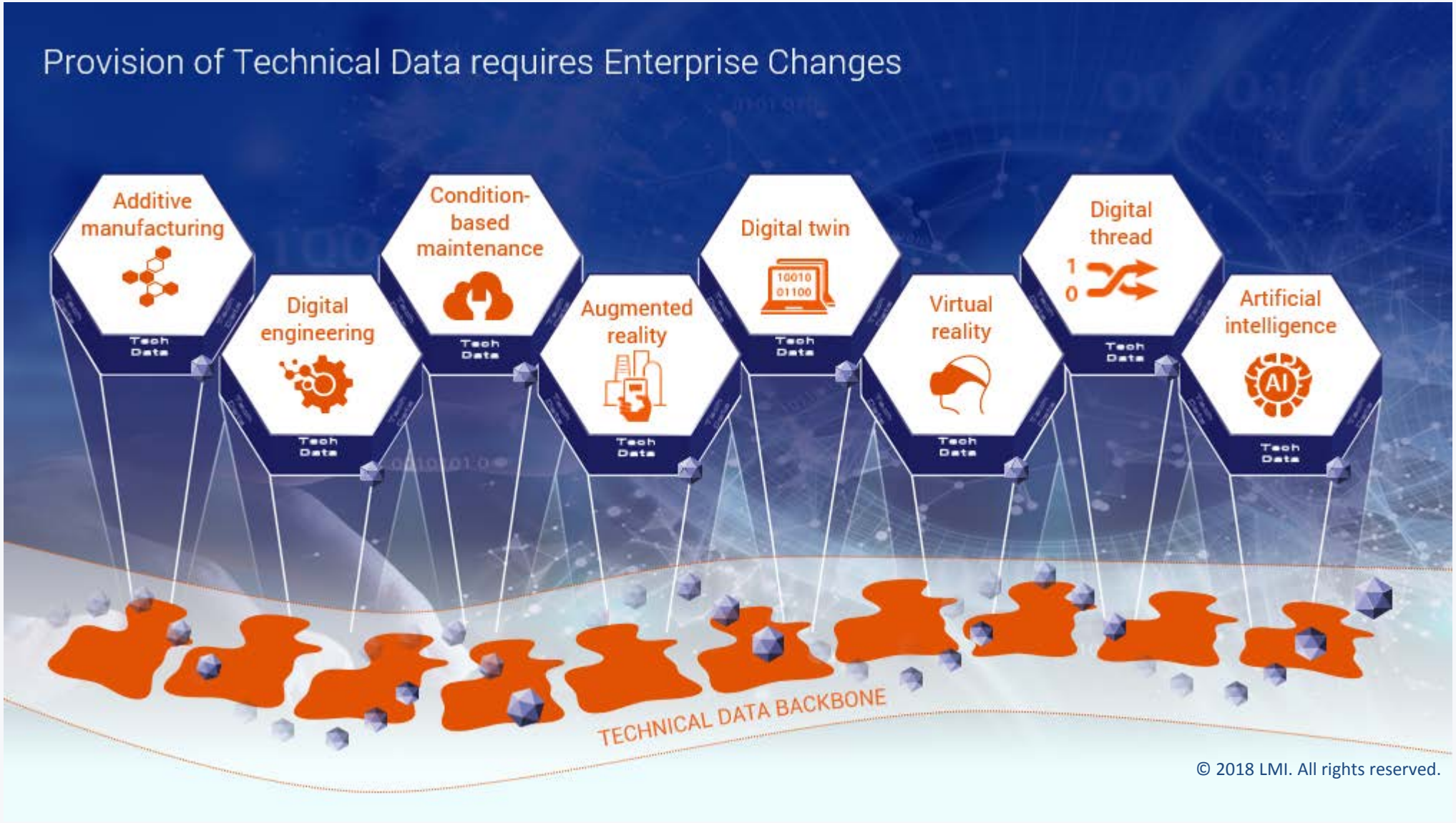
- Authors may be consumers
- Massive mix of low end and high technology.
- Configuration management and authoritative source of truth are critical.

Archive

- The complete virtual definition of the product. Source for many downstream applications.
- Consumers may be actively accessing the archive.

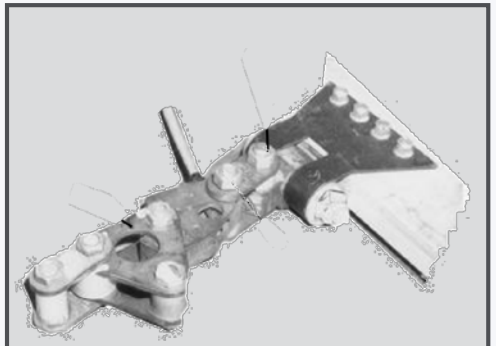
Technical Data

the new backbone of the enterprise



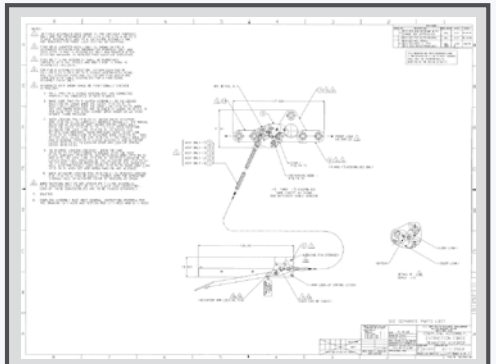
Potential R & D Topics

Legacy and Missing data



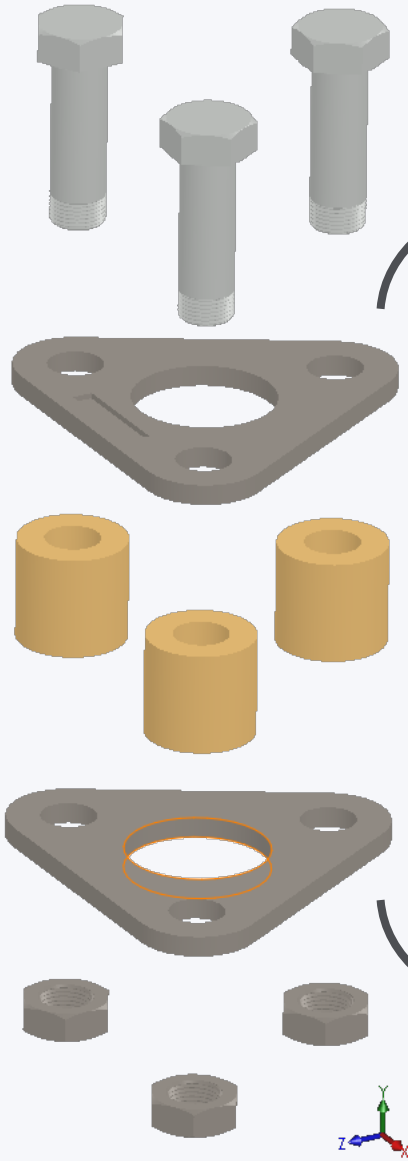
The only data is the part

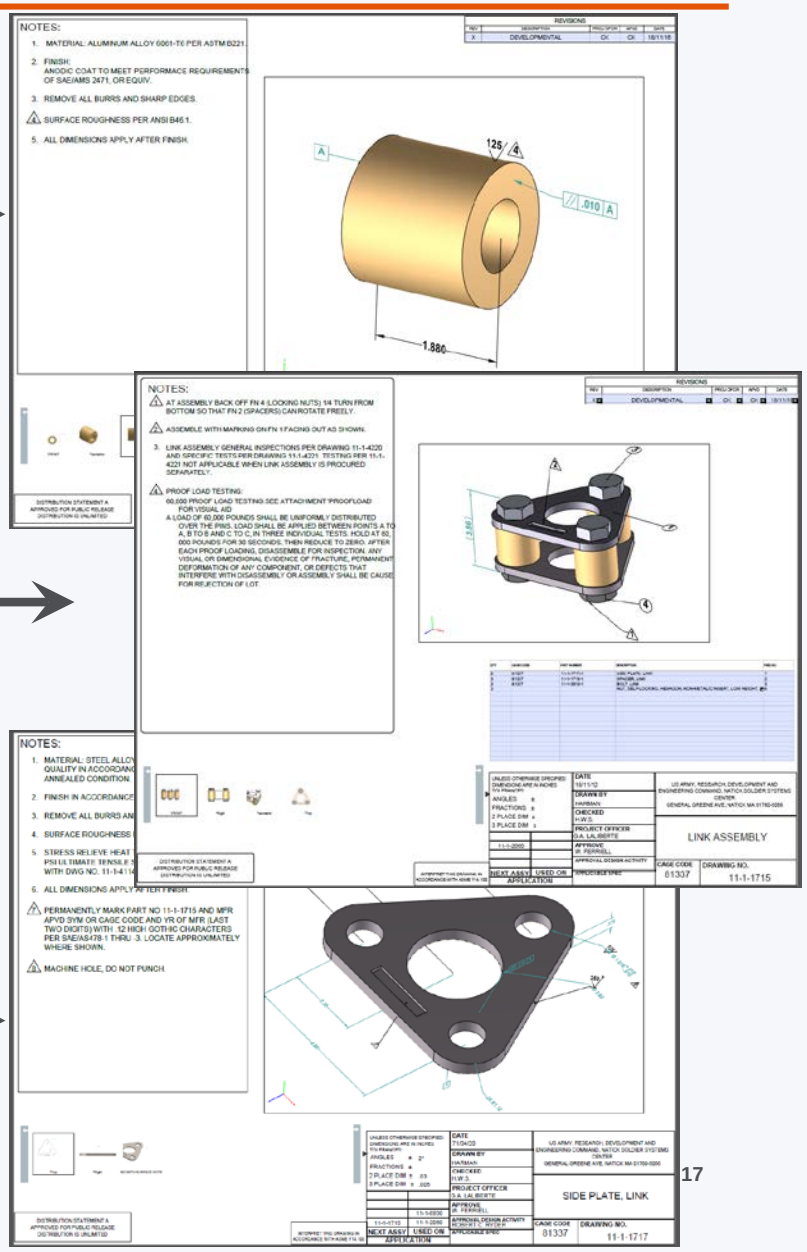
Scanned point cloud
Manual measurements
Non destructive testing
Destructive testing
Document research
Contextual intuition



Legacy Data

Manual modeling
Raster trace
Design intent from notes
2D to 3D conversion
GD&T interpretation
Contextual intuition





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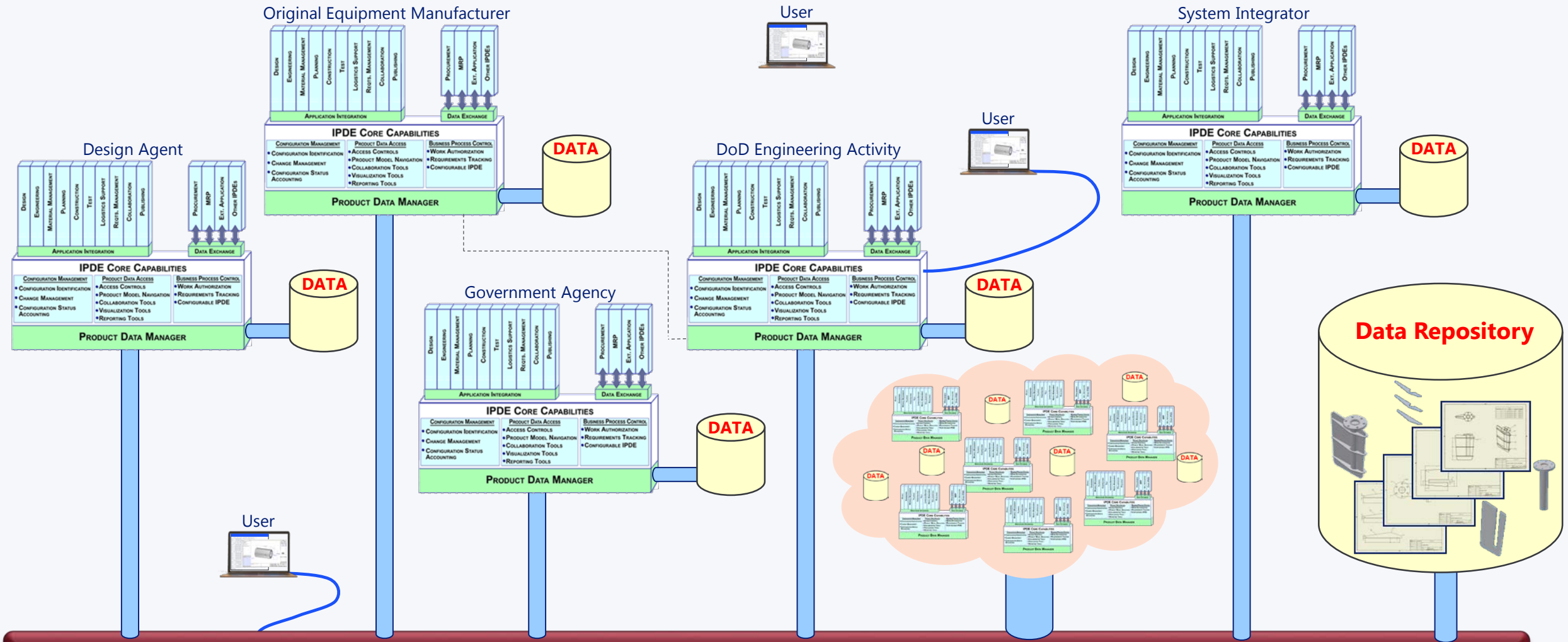
Potential R & D Topics

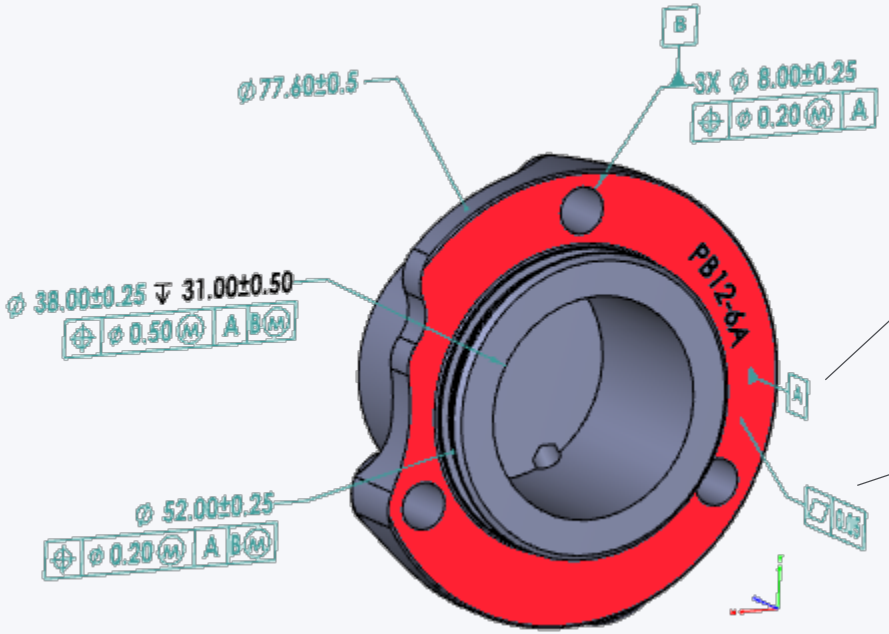
Connecting the Model Based Environment



Potential R & D Topics

Semantic with Visual

- Most 3D Technical Data Packages convey the non geometric data as text. This is referred to as Visual Product Manufacturing Information.
- A 3D Technical Data Package contains 3D geometric data.
- A Technical Data Package that contains spreadsheets, drawings, images, pages of text, and a single simple part formatted in “3D PDF” without any annotation is a 3D Technical Data Package.
- A Technical Data Package that contains nothing but 3D geometric data with all of the annotation defined semantically is a 3D Technical Data Package.



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Geometric characteristic	Flatness
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Tolerance Value	0.050000
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- **Data interoperability and exchange of data between systems**
- **Legacy data conversion**
- **Digital rights management techniques**
- **Modernization of the federal catalog**