3D Data Exchange Project
PMA-261, Anark, ITI, Razorleaf Govt Solutions

April 3, 2018 | NIST MBE Summit 2018
Agenda

• Project Participants
• CH-53K Program Introduction
• 3D Data Exchange Project Introduction
• Solution
• Key Points
• Next Steps
• Acknowledgements
Project Participants

• NAVAIR PMA-261
  – Customer and end user
• Anark Corporation
  – 3D PDF and DLA package publisher
• ITI – International TechneGroup Inc
  – CAD enhancement, STEP generation, and validation/verification
• Razorleaf Government Solutions
  – Process and ENOVIA integration
• Naval Shipbuilding and Advanced Manufacturing Center of Excellence
  – Project Management for ONR
• CH-53K is the DoD’s most powerful helicopter ever
  – Designed as a new-build helicopter
  – Will expand the fleet’s ability to move more material, more rapidly throughout the area of responsibility
  – Designed using proven and mature technologies
  – Designed to lift nearly 14 tons at a mission radius of 110 nautical miles in high/hot environments
  – Designed to lift triple the baseline CH-53E lift capability
  – Designed for equivalent logistics shipboard footprint
  – Designed for lower operating costs per aircraft
  – Designed for less direct maintenance man hours per flight hour
CH-53K will be able to get more fighters into the air.
3D Data Exchange Project Introduction

- **3D Model to 3D PDF conversion capability provides production-quality model-based documents and Technical Data Packages (TDP) for down-stream users**
  - Single configuration controlled data set, thereby accelerating response times, reducing cost, increasing aircraft availability and safety of flight
  - Verifying/validating thousands of complex 3D models in a short time period
- **Benefits of a secure 3D Data Exchange system (3DDE) are numerous**
  - Reduce the Amount of Reverse Engineering Requirements
  - Reduce Labor for Translation and Healing of CAD Data
  - Reduce the Amount of Rework Due to Incorrect Technical Data
  - Reduce Requirements for TDP DLA 339s Caused by Programs Using Full Model Based Definition In Lieu of 2D Drawing
  - NAVSUP/DLA ability to provision using 3D PDFs in lieu of native CAD Models in up to 15 different software sets
3D Data Exchange Project Introduction

- **3DDE Project Start**: October 2017
- **Architecture Defined**: January 2018
- **3D PDF Template Ready**: March 2018
- **Testing Complete**: May 2018
- **Final Report**: August 2018
- **Software Installation Began**: September 2017
- **Configuration & Integration Complete**: February 2018
- **Production Rollout**: August 2018
Solution: Tech Data Profile

• Technical data package overview
  – CATIA V5 MBD + associated lists in TIF & PDF
  – Ambiguous Engineering BOMs in Excel
  – Heterogeneous standards/norms
  – Many data domains (sheet metal, composite, tubing, etc.)
  – Many observable “patterns”
  – Data set not “PLM-ready”
Solution: Tech Data Structure

Drawing Prints:
PL = Parts List
AL = Application List
FS = Field Sheet (2D Dwg)
DS = Data Sheet (Text Dwg)

* Some of the related documents shown may not be present or required
Solution: 3DDE Micro Processes

• The 3DDE system is broken down into a group of 5 sequential micro-processes
  – CATIA Preprocessing & Verification
  – STEP Generation and Validation
  – 3D PDF Generation
  – 3D PDF Validation
  – DLA Package Assembly & Publishing

• This allows individual micro-processes developed, managed, and maintained independently of one another

• Process Interface and Data Schema control are critical
Solution: 3DDE Micro Processes

Preprocess = Extract Statements & Optimize Model for Publishing

3DEXPERIENCE

Make Preprocess & Verify CAD Request

Update Native CAD & Store Statements & Report

Defined Interface

Anark Core

DEXcenter

Generate Verification Report

Preprocess CAD File

CADIQ / CADScript
Solution: Preprocessing & Verification

- Native CATIA preprocessing for optimized publishing
  - Rights Statements extraction
  - Visibility management

- Verification of native CATIA models
  - Geometry, PMI, Attributes, Structure, Views
Solution: STEP Generation / Validation

- Generation of STEP AP242 file from native CATIA (AP203 Currently)
- Validation of STEP models relative to native CATIA models
  - Geometry
  - PMI
  - Assembly Structure
  - Model Views
Solution: 3DDE Micro Processes

- Make 3DPDF Request
- Add 3DPDF Item
- Define Interface
- Generate 3DPDF
- Anark Core
- 3DEXPERIENCE
- DEXcenter
- CADIQ / CADScript
Solution: 3DDE Micro Processes

3DEXPERIENCE

Make 3DPDF Validation Request
Store Validation Report

Defined Interface

Anark Core

DEXcenter

CADIQ / CADScript

Validate 3DPDF
Solution: Anark 3D PDF / Validation

• Validation of 3D PDF documents relative to native CATIA models
  – Geometry
  – PMI
  – Assembly Structure
  – Model Views
Solution: 3DDE Micro Processes

DLA Package = Attaching validated STEP File / adding Approval

- 3DEXPERIENCE
  - Make DLA Package Request
  - Add DLA Package Item

- Defined Interface

- DEXcenter

- Anark Core
  - Publish DLA Package

- CADIQ / CADScript

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Anark Core automated mapping of CATIA V5 MBD content along with BOM, Part/Application Lists, Field and Text Sheets – Sheet 1 of N

### PART LIST

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<th>PART OR IDENTIFICATION NUMBER</th>
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<th>MATERIAL</th>
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</table>

**PARTS LIST**

**SPECIFICATION**

**BOM**

**CATIA**

**Distribution Statement:** Distribution unlimited as this is not a real product with real data.

Notes & Statements (Lists appear in Sheets 3 and higher as needed)
Solution: MBD 3D PDF Information Layout

Anark Core automated mapping of CATIA V5 MBD with selectable BOM List driving a dynamic 3D PDF MBD View – Sheet 2 of N

Title Block

Selectable BOM

CATIA V5 MBD Views

3D MBD View of CATIA V5 Backplate Assy Selected
The 3DDE Solution

3DEXPERIENCE

- Make 3DPDF Request
- Add 3DPDF Item
- DLA Package Request
- Add DLA Package Item
- Enhance & Verify Producibility
- Update Native CAD & Store Report
- STEP Request
- Add STEP & Store Report
- 3DPDF Validation Request
- Validation Registration

Defined Interface

Anark Core

- Make 3DPDF
- Make DLA Package

CADIQ / CADScript

- Enhance CAD File
- Generate Producibility Report
- Make STEP
- Validate STEP
- Validate 3DPDF
Key Points

• PMA-261
  – Solution available for non-CAD users to consume MBD content

• Anark
  – Automated generation of validated standards-based 3D-PDF-based MIL-STD-31000 documents and Technical Data Packages (TDPs), with lifecycle-appropriate document markings, is a repeatable process from any PLM system
Key Points

• ITI
  – Manipulate data for optimum publishing
  – Provide validated derivative data for trusted content publishing

• Razorleaf Government Solutions
  – Develop an architecture for a broad information delivery solution applicable to any PLM or CAD system
  – In a model-based world, 3D PDFs are great “fit-for-purpose” communication tools, but the volume of supporting data has to be managed
Next Steps

• Groom Pilot Project for Production Deployment PAX Data Center on NMCI
  – Perform work to prepare for production
  – Deploy into production in Q2 and Q3 of 2018
  – Explore modularizing solution for application to other PLMs and CADs
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3D Digital Data Exchange Team

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• Questions?