



ptc

# LIVEWORX

A NEW ERA IN PRODUCT LIFECYCLE INNOVATION

SESSION ID: PL1403C

## HOW LOCKHEED MARTIN STREAMLINED THEIR DIGITAL THREAD WITH ZUKEN & PTC



**ZUKEN**<sup>®</sup>

### SPEAKER(s):

**Grant Denis**  
Lockheed Martin

**Joe Richlen**  
Zuken USA Inc.

May 17<sup>th</sup>, 2023

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# LOCKHEED MARTIN PROBLEM DEFINITION

**Grant Denis**  
*Lockheed Martin*

May 17<sup>th</sup>, 2023

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# ECAD DATA AT LOCKHEED MARTIN RMS

- Multiple sites of different heritage
- Located across the country
- Common ECAD toolset for PCB and Cable
- Workshare

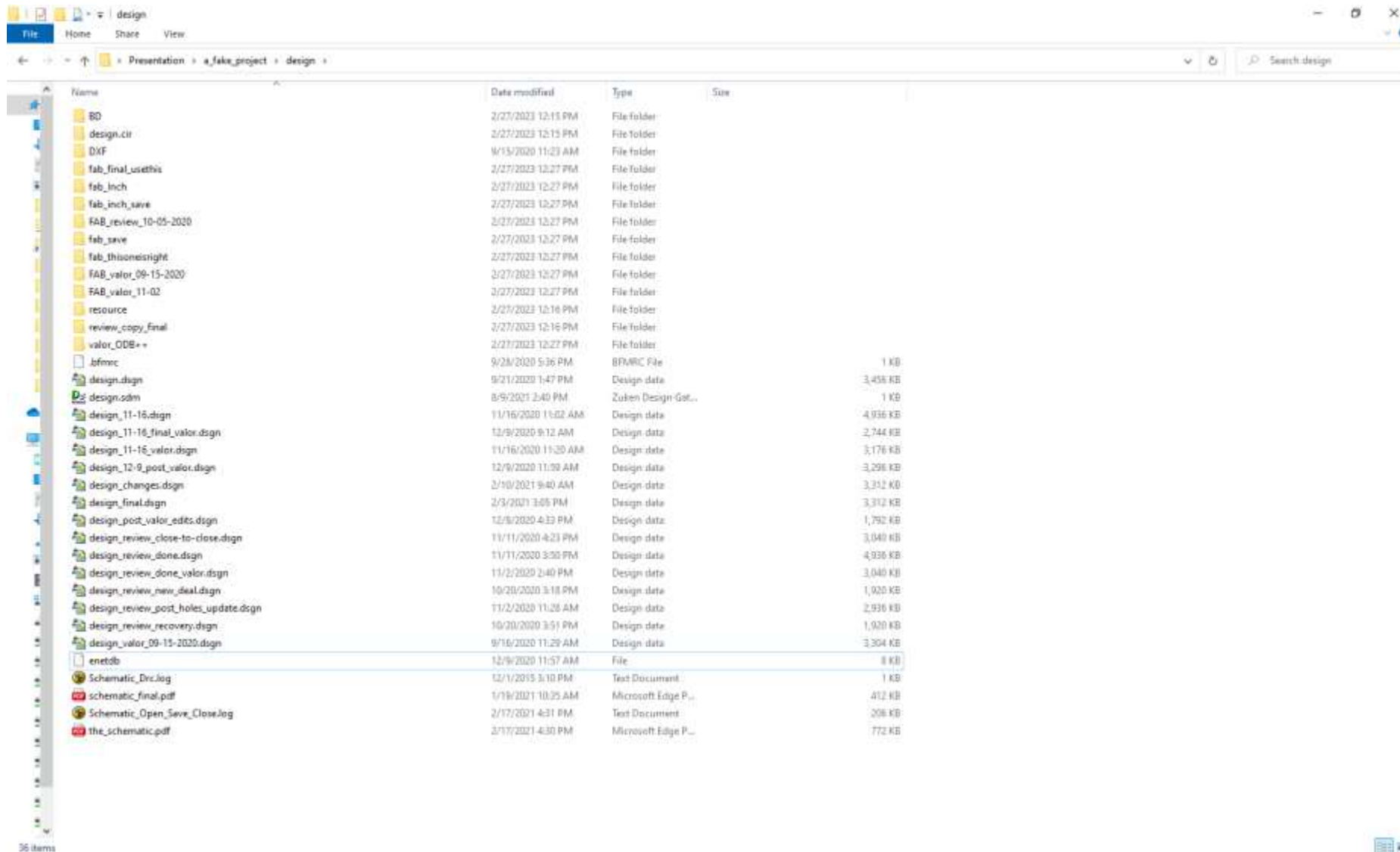
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# ECAD DATA MANAGEMENT

- Electrical CAD data not managed well
  - PCB Data
  - Cable Harness Data
- Manual PLM Release, Inconsistent, Errors
  - Rework
  - Scrap
  - Confusion
- Design storage that looked like.....



# THE WAY THINGS WERE



The screenshot shows a Windows File Explorer window titled 'design'. The address bar indicates the path: 'Presentation > a\_fake\_project > design'. The main area displays a list of files and folders with columns for Name, Date modified, Type, and Size. The files are sorted by date modified, with the most recent at the top. The list includes various folders (e.g., 'BD', 'design\_cir', 'DXF') and individual files (e.g., 'design.dgn', 'enotdb', 'Schematic\_Drc.log'). The 'enotdb' file is currently selected.

Name	Date modified	Type	Size
BD	2/27/2023 12:15 PM	File folder	
design_cir	2/27/2023 12:15 PM	File folder	
DXF	9/15/2020 11:23 AM	File folder	
fab_final_usethis	2/27/2023 12:27 PM	File folder	
fab_inch	2/27/2023 12:27 PM	File folder	
fab_inch_save	2/27/2023 12:27 PM	File folder	
FAB_review_10-05-2020	2/27/2023 12:27 PM	File folder	
fab_save	2/27/2023 12:27 PM	File folder	
fab_thisoneright	2/27/2023 12:27 PM	File folder	
FAB_valor_09-15-2020	2/27/2023 12:27 PM	File folder	
FAB_valor_11-02	2/27/2023 12:27 PM	File folder	
resource	2/27/2023 12:16 PM	File folder	
review_copy_final	2/27/2023 12:16 PM	File folder	
valor_ODB++	2/27/2023 12:27 PM	File folder	
bfmcc	9/28/2020 5:36 PM	BPMRC File	1 KB
design.dgn	9/21/2020 1:47 PM	Design data	3,458 KB
design.sdm	8/9/2021 2:40 PM	Zuken Design-Got...	1 KB
design_11-16.dgn	11/16/2020 11:02 AM	Design data	4,936 KB
design_11-16_final_valor.dgn	12/9/2020 9:12 AM	Design data	2,744 KB
design_11-16_valor.dgn	11/16/2020 11:20 AM	Design data	5,176 KB
design_12-9_post_valor.dgn	12/9/2020 11:00 AM	Design data	3,296 KB
design_changes.dgn	2/10/2021 9:40 AM	Design data	3,312 KB
design_final.dgn	2/3/2021 3:05 PM	Design data	3,312 KB
design_post_valor_edits.dgn	12/9/2020 4:33 PM	Design data	1,792 KB
design_review_close-to-close.dgn	11/11/2020 4:23 PM	Design data	3,040 KB
design_review_done.dgn	11/11/2020 3:30 PM	Design data	4,936 KB
design_review_done_valor.dgn	11/2/2020 2:40 PM	Design data	3,040 KB
design_review_new_deal.dgn	10/20/2020 3:18 PM	Design data	1,920 KB
design_review_post_holes_update.dgn	11/2/2020 11:28 AM	Design data	2,936 KB
design_review_recovery.dgn	10/20/2020 3:51 PM	Design data	1,920 KB
design_valor_09-15-2020.dgn	9/16/2020 11:29 AM	Design data	3,304 KB
enotdb	12/9/2020 11:57 AM	File	8 KB
Schematic_Drc.log	12/1/2015 3:10 PM	Text Document	1 KB
schematic_final.pdf	1/19/2021 10:25 AM	Microsoft Edge P...	412 KB
Schematic_Open_Save_Close.log	2/17/2021 4:31 PM	Text Document	208 KB
the_schematic.pdf	2/17/2021 4:30 PM	Microsoft Edge P...	772 KB

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# WHY NOT CHANGE?

- Workgroup Manager methodology
  - Performance
  - Too tightly coupled to versions
  - Capabilities
  - Long term support
- Limited native ECAD data management tools
  - PLM based around MCAD
- Inertia



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# WHAT WAS NEEDED?


- Bring ECAD Engineering Data under controlled processes
  - Repeatable
  - Trackable
- Check in/out capabilities for WIP ECAD data
- Control of non-PLM artifacts
- Simple way to move data to PLM for Release





# THE ZUKEN SOLUTION: ENGINEERING DATA MANAGEMENT (EDM)

**Joe Richlen**  
*Zuken USA Inc.*



May 17<sup>th</sup> 2023

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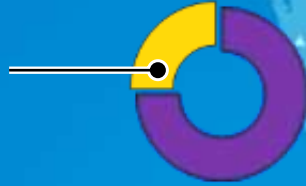
# ZUKEN BACKGROUND - GLOBAL PRESENCE

● Headquarters 
 ● Regional headquarters 
 ● Business locations 
 ■ Main R&D offices 
 ▲ Sales offices

Engineering Resources  
**82%**



R&D Investment  
**25%**  
Of Revenue



Founded	December 17, 1976
Corporate Headquarters	Yokohama, Japan
North American Headquarters	Westford, MA
European Headquarters	Munich, Germany
Operational Excellence	Profitable, no debt

## Japan & Asia



- Japan
  - ● ■ Global Headquarters/ R&D Center (Yokohama)
  - Shin-Yokohama Building (Yokohama)
  - Center Minami Building (Yokohama)
  - Nagoya Branch (Nagoya)
  - Kansai Branch (Osaka)
- Korea
  - Zuken Korea Inc.
- Singapore
  - Zuken Singapore Pte. Ltd.
- Taiwan
  - Zuken Taiwan Inc.
- China
  - Zuken Shanghai Technical Center
  - Zuken Inc. Shenzhen Representative Office
- India
  - Zuken India Private Limited

## Americas



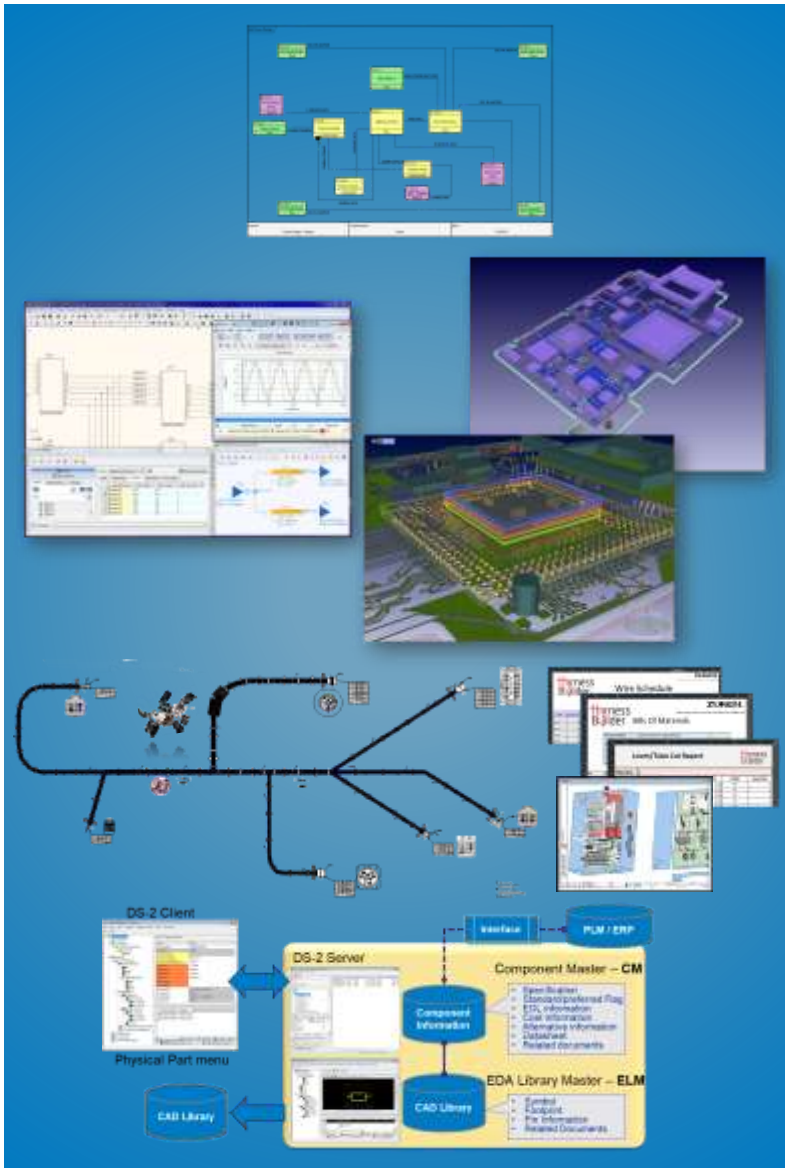
- USA
  - ● Zuken USA Inc. (American Headquarters)
  - ■ Zuken SOZO Center (Zuken Inc., US branch)

## Europe



- United Kingdom
  - ■ Zuken Ltd. (Zuken Technology Center)
  - Zuken Group Ltd.
  - Zuken UK Ltd.
- Germany
  - ● Zuken GmbH (European Headquarters)
  - ■ Zuken E3 GmbH
  - Zuken E3 GmbH
  - ■ Zuken GmbH (EMC Technology Center)
  - Zuken E3 GmbH Office Nord
  - ■ Zuken E3 GmbH (Global Automotive and Transportation Competence Center)
- Poland
  - Zuken E3 GmbH Sp.z o.o
- Switzerland
  - Zuken E3 GmbH, Zweigniederlassung
- France
  - Zuken S.A.
- Italy
  - Zuken Srl
- Netherlands
  - Zuken GmbH, Sales Office Benelux

# ZUKEN BACKGROUND - SYSTEMS DESIGN PLATFORMS



**Vitech** Model-Based Systems Engineering  
A Zuken Company



- Hardware Architecture Design
- System Partitioning
- 3D Printed Circuit, Multi-board Layout
- ECAD/MCAD Co-design
- Chip/Package/Board Co-design

- Electrical Wire Harness Engineering
- Fluid Controls Engineering
- Cabinet, Panel, Wire Harness and Formboard Layout
- Manufacturing and Documentation

CR-8000™

Electronic Design



Electrical Design

Library & Design Data Management for Electronic and Electrical Engineering

DS-2™



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# WHY EDM? FILE MANAGEMENT

- Native ECAD Data
- Shared Mechanical Data
- Analysis and Simulation Data
- Engineering Notes
- Component Parametric Data
- Design Rules/Guidelines
- Manufacturing Rules/Guidelines

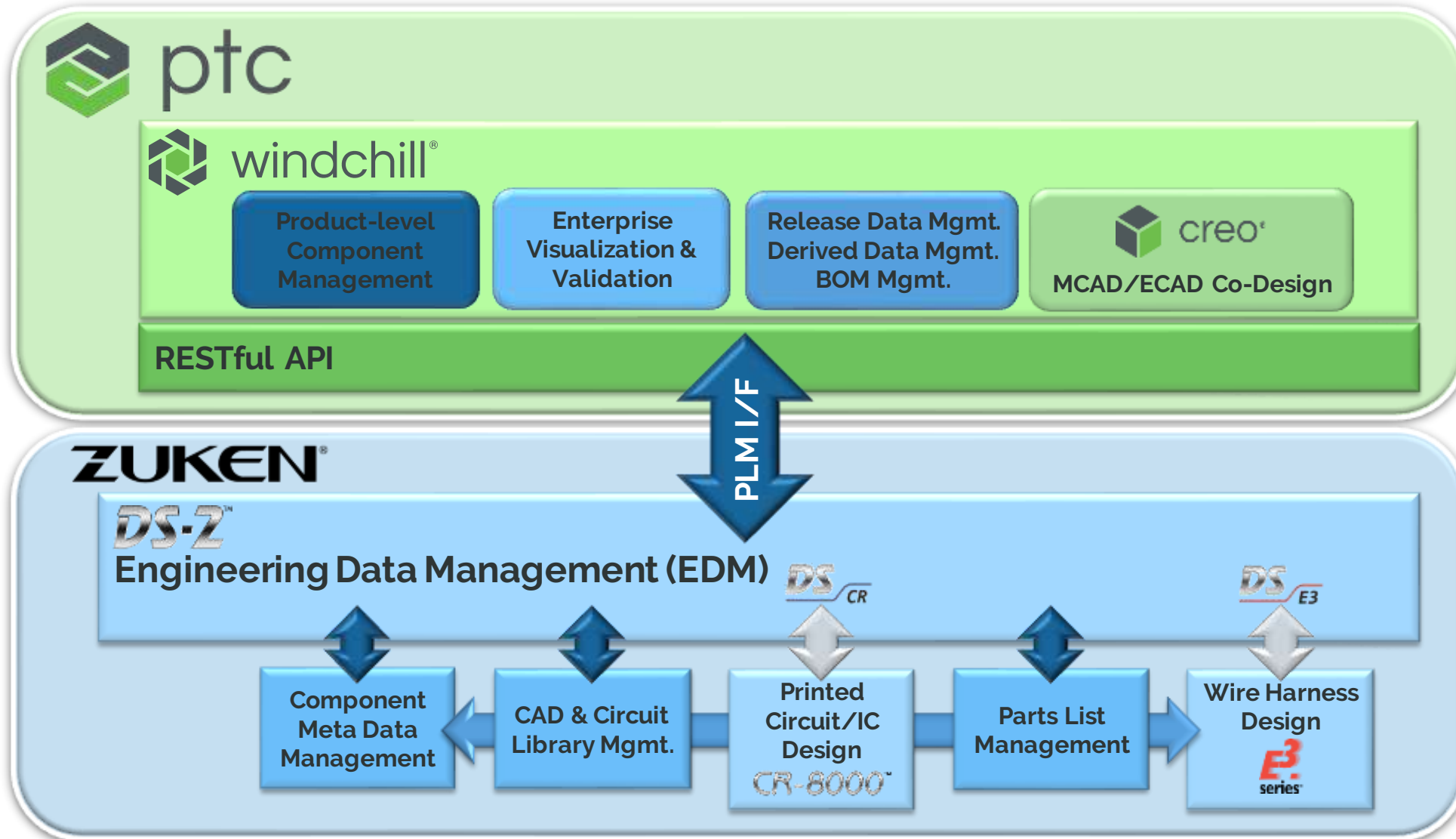


# WHY EDM? CONSISTENT PROCESS

- A collaborative environment
- Accountability
- Accessibility
- Workflows
- Auto-generation of design outputs:
  - Assembly/Manufacturing Data
  - Design Review/Test Data
  - Bill-of-Materials
- Interface to PTC Windchill



# PTC & ZUKEN JOINT SOLUTION



- EDM**
- Work In Process
  - Access Control
  - Collaboration
  - Revisioning
  - Versioning
  - Modular Design
  - Design Reuse
  - Design Variants
  - Article Mgmt.
  - Document Mgmt.
  - BOM Mgmt.



# LOCKHEED MARTIN RESULTS AND BENEFITS

**Grant Denis**  
*Lockheed Martin*

May 17<sup>th</sup>, 2023

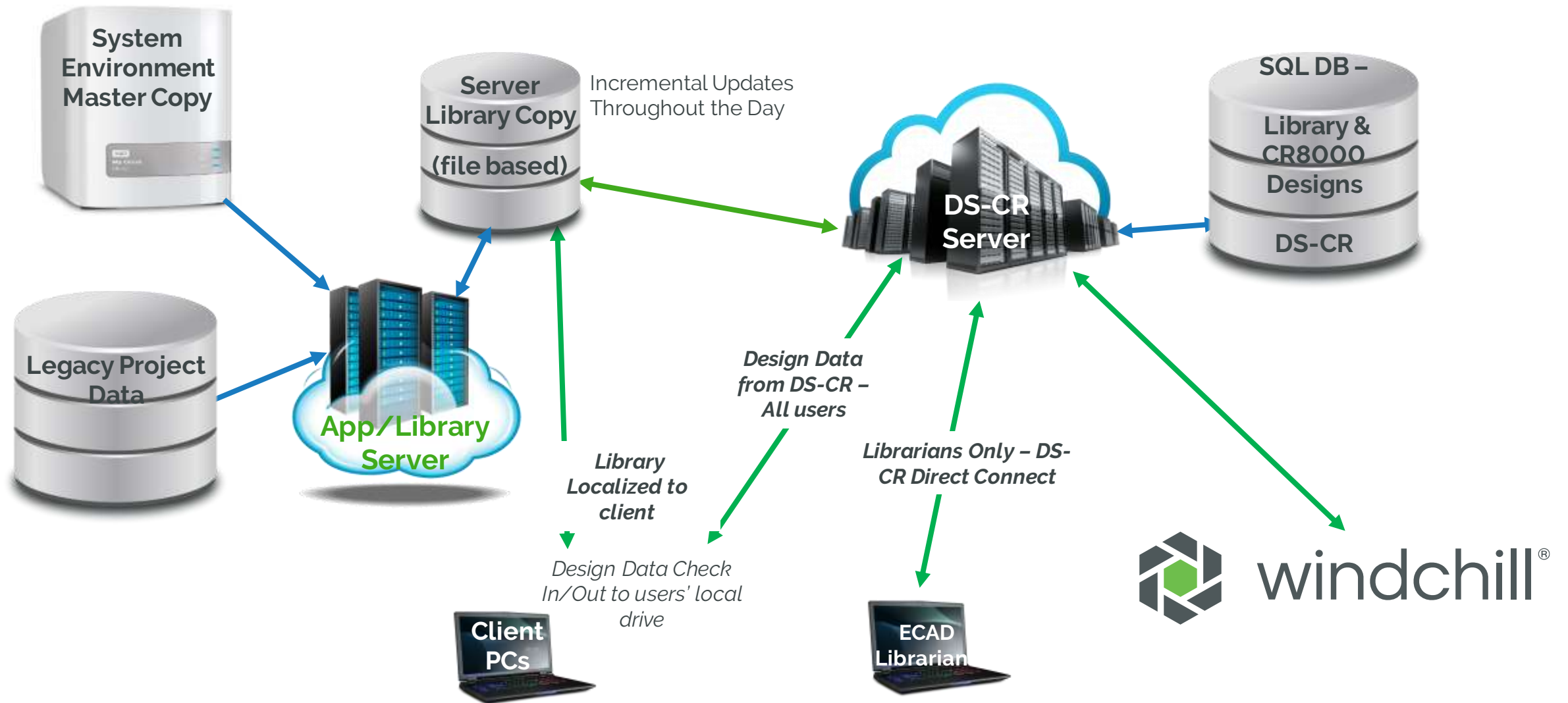
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# WHAT WAS IMPLEMENTED?

- DS-2 in production use for both PCB and Cable Harness
- Organized creation / management of data
  - Pushbutton transmission to Windchill
- Board & Schematic Data publishes as a viewable
  - No need for downstream users to have CAD tool
- Roughly 1 year from planning to production
  - Some code changes needed to support requirements

# Zuken CR-8000/DS-CR Architecture





# ZUKEN & WINDCHILL OBJECTS & LINKS

## Zuken

Zuken Schematic

MFG Files

Zuken Board

## Windchill

123100  
ECAD Schematic

123101-TYPE  
Releasable Document

123101\_BOARD  
ECAD Board

123100-DWG  
Schematic (Doc Part)

123101-1  
PWB (Hardware Part)

123101-DWG  
PWB (Doc Part)

123102-1  
CCA (Hardware Part)  
PWB (Hardware Part)  
Cap - C1  
Resistor - R1, R2

123102-DWG  
CCA (Doc Part)

123101  
Creo Dwg PWB

123102  
Creo Dwg CCA

Content

Dyn Ref Spec

Dyn Ref Spec

Dyn Ref Spec

Content

Content

Content

Content

← Described By Link (Content)

← Reference Link (Dynamic Reference Specs RMS custom)

# DS-CR EXAMPLE

DS-CR / MS2\_Common

File View Tool Window Help

- DesignProjectList
  - Working\_Site
    - A\_Project
    - TEST
  - Sandbox
    - DOCGEN
    - EPDM\_TEST
      - PLMIF\_100
        - Report
          - 123A100.cir {SCM} (EPDM Rev: 1.18) [5] <WIP>
          - 123a101-1 {BRD} (EPDM Rev: -.15) [2] <WIP>
          - 123a101 {PL} (EPDM Rev:1.2 (Design)) <WIP>
          - csv\_import\_call.pdf {FILE} (EPDM Rev: [1] <WIP>
          - Document Folder
        - PLMIF\_110
          - Report
            - ReportLog
            - DocGenOut
              - BLPXREPORTS.zip {FILE} (EPDM Rev: [1] <WIP>
              - DXFOUT.zip {FILE} (EPDM Rev: [1] <WIP>
              - IPC2581.zip {FILE} (EPDM Rev:A.2) [1] <Review Complete>
              - FABOUT.zip {FILE} (EPDM Rev:A.2) [1] <Review Complete>
              - ODB.zip {FILE} (EPDM Rev:A.14) [5] <WIP>
            - design\_GRD.cir {SCM} (EPDM Rev: 1.3) [2] <Approved>
            - PL2 {PL} (EPDM Rev: <Approved>
            - Document
              - 123a111\_GRD {BRD} (EPDM Rev: 1.2) [1] <Approved>
            - PLMIF\_120
            - PLMIF\_130
            - PNumTest
            - Publisher\_Test
          - IPC2581 Testing
          - DX Demo
- Objects in Work
  - Objects Requested for Approval (0)
  - Objects being Requested for Approval (2)
  - Checked-Out Objects (0)

Name	Comment	Register	CreatedDate	ModifyUser	ModifiedDate
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View History

Name	EP...	App...	VersionNumber	CheckinVersionNumber	Register	CreatedDate	CheckinComment	Replace
ODB.zip	A.14	4	8	5	Denis, Grant	5/27/2022 9:40:26 AM		
ODB_WHYallthenames.zip	A.14	4	7	4	Denis, Grant	9/1/2021 4:36:50 PM		
ODB_ANOTHERNEWNAME.zip	A.13	4	6	3	Denis, Grant	9/1/2021 4:24:51 PM		
ODB_NEWNAME.zip	A.9	4	5	2	Denis, Grant	9/1/2021 4:07:27 PM		
ODB.zip	A.8	4	4	1	Denis, Grant	9/1/2021 4:07:15 PM		
ODB.zip	A.8	3	3	1	Grant Denis (admin)	4/28/2021 8:48:26 AM		
ODB.zip	A.1	2	2	1	Grant Denis (admin)	2/26/2021 11:02:09 AM		
ODB.zip		1	1	1	Grant Denis (admin)	2/26/2021 10:54:48 AM		

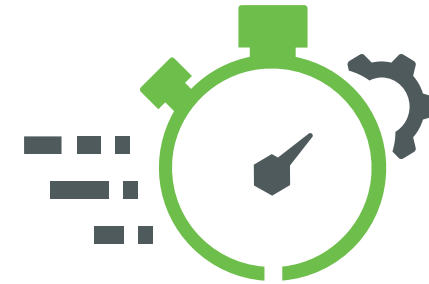
Show the history before releasing the released version.

Download ... Close

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# IMPACTS

- Common Process
  - Release process the same as MCAD once in Windchill
- Repeatable Process
- Control of Engineering Data



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# WHAT COMES NEXT?

- Retrieving Library parametric data from Windchill
- Automation / Linking of workflow status changes
- Single Sign On



# KEY TAKEAWAY SUMMARY

Grant Denis / Joe Richlen

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# KEY TAKEAWAY SUMMARY

1. Implementing an Engineering Data Management data framework with access controls and protections in conjunction with the Windchill REST API product release system integration.
2. Institute a consistent, repeatable, configuration-controlled design and manufacturing data flow through process and data automation.
3. Streamline the design and manufacture of electronic products, while providing easy access to accurate, timely product data throughout the products' development lifecycle to all stakeholders.

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# QUESTIONS?

- [Grant.denis@lmco.com](mailto:Grant.denis@lmco.com)
- Joe.richlen@zukenusa.com



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Your feedback provides us with valuable information on how to shape future content strategy for the event!





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# THANK YOU

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