PTC® Live Global

PTC 211 - Smart, Connected Products (SCP) Need Electronics: How to Manage them with PTC Windchill

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June 9, 2015

Agenda

- The Smart Connected Product (SCP)

- Electronic CAD Data Management Best Practices

- ECAD Visualization

- ECAD-MCAD Collaboration

- Case Studies

- Roadmap

As seen at PTC LiveWorx 2015… The Santa Cruz V10

• Bike

• Bike's Digital Twin

• Digital Twin of Smart Bike enables Augmented Reality

• Smart Bike (IoT enabled)

• MCAD + Electrical(Sensors and Wires) + ECAD + Software = Smart Product

• MCAD + Electrical(Sensors and Wires) + ~~ECAD~~ + Software + IoT = SCP

Can a SCP exist without ECAD?

- Please give me an example that doesn't!
  - Your product (aka "a thing") is built to rely on your own sensor infrastructure or someone else's (think GPS)
  - Not all sensors relay data to Electronics (think a hydraulic pressure gauge)
    - For a hydraulic pressure gauge to be smart and connected we replace it with a transducer that feeds data to a PCB

- Build or Buy the Electronics?
  - Perhaps a Raspberry Pi or similar device can meet your products requirements
  - Custom product form factors
  - Customer requirements that can't be met

- Whether you build or buy, PLM is integral to managing the Product data

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- PLM is where your SCP Digital Twin lives
  - SCP data is fed back into the development cycle and linked directly to the CAD data
  - Single source of truth for all Product data
  - Manage Change
  - Manage Release to Manufacturing
  - Understand Product Revisions
    - Configuration Management of your product to know what was sent to Manufacturing
  - Where used of Parts
    - How many designs did we ship using Electronics assembly rev A.12 that now needs a firmware update?
  - Easy to access Viewables
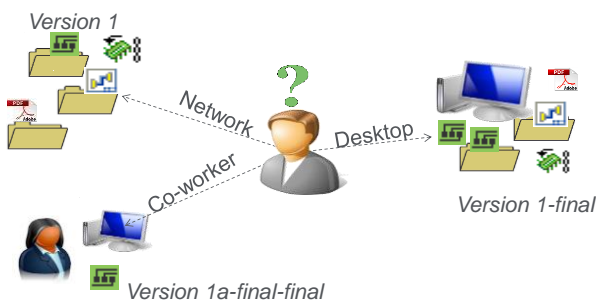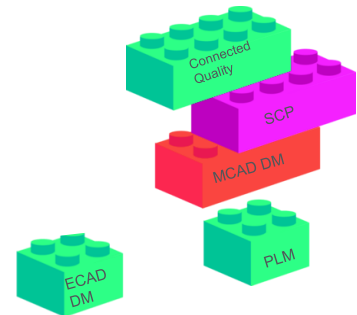 - Compliance, Quality, BOM Management, Etc. etc.
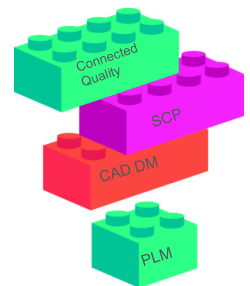
PLM for is a core building block enabling SCP's to connect back to their Digital Twins

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The current state of a many PTC customers…

- Product features are delivered to the marketplace through software and electronics, and less through mechanical means.
  - More cutting edge customers are delivering Smart Connected Products

- Yet…Many customers do not manage ECAD in PLM
  - ECAD seen as a lower priority for PLM adoption?
  - Software Issues?
  - User Adoption problems?
  - Lack of Understanding PLM's value to ECAD?

- Whatever the past Reason… now is a good time to Implement ECAD DM with PTC Windchill
  - Complete the Digital Twin
  - Enabler for SCP feedback to EE's

Connected Quality

SCP

MCAD DM

ECAD DM

PLM

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Version 1

Network

Co-worker

Desktop

Version 1-final

Version 1a-final-final

Challenges

Lack of ECAD Design Data Management

BOM is managed with spreadsheets

ECAD Library is out of sync with PLM Parts and/or between CAD

No single system of record for critical Manufacturing Output files

Negative Consequences

Lost productivity as engineers are unable to find information

Late changes make it difficult to analyze ECAD in 3D

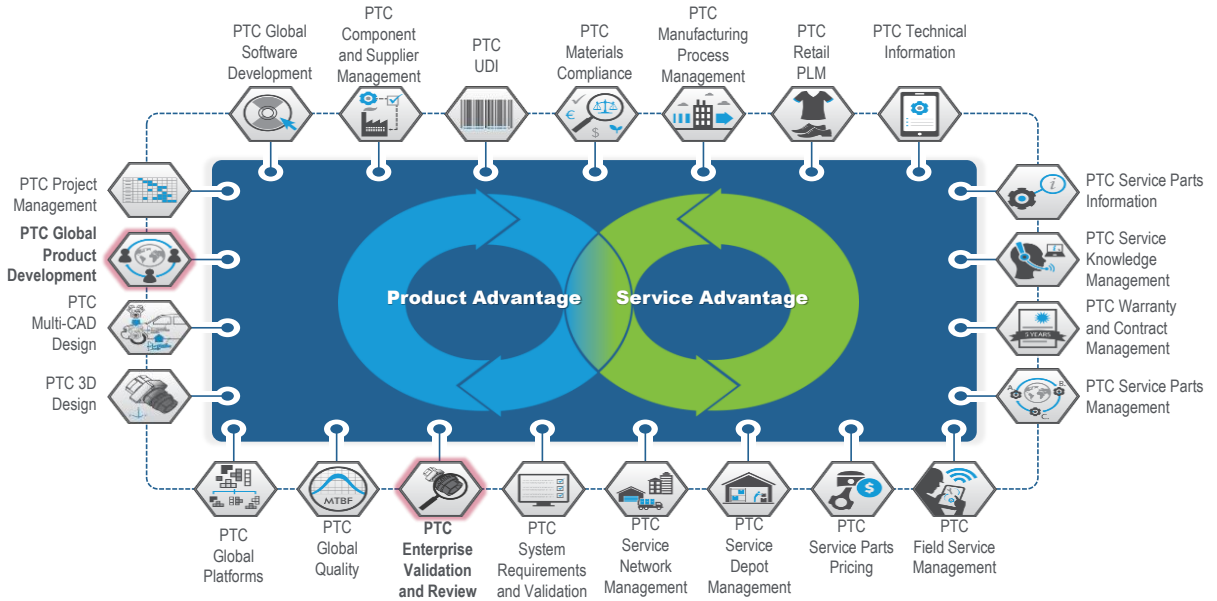**Expensive rework due to incorrect versions in Manufacturing and with Suppliers**

Metrics

Time spent manually managing versions

Time to create a complete EBOM and send to Procurement

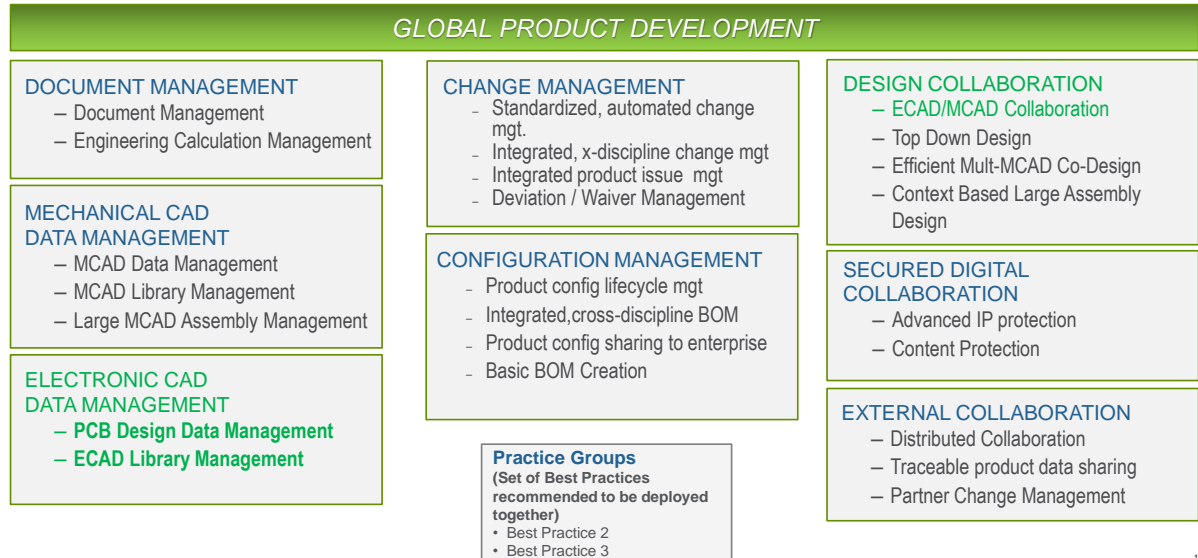**Increased cost due to poor re-use of parts already in the bin**

Electronic CAD Data Management Best Practices

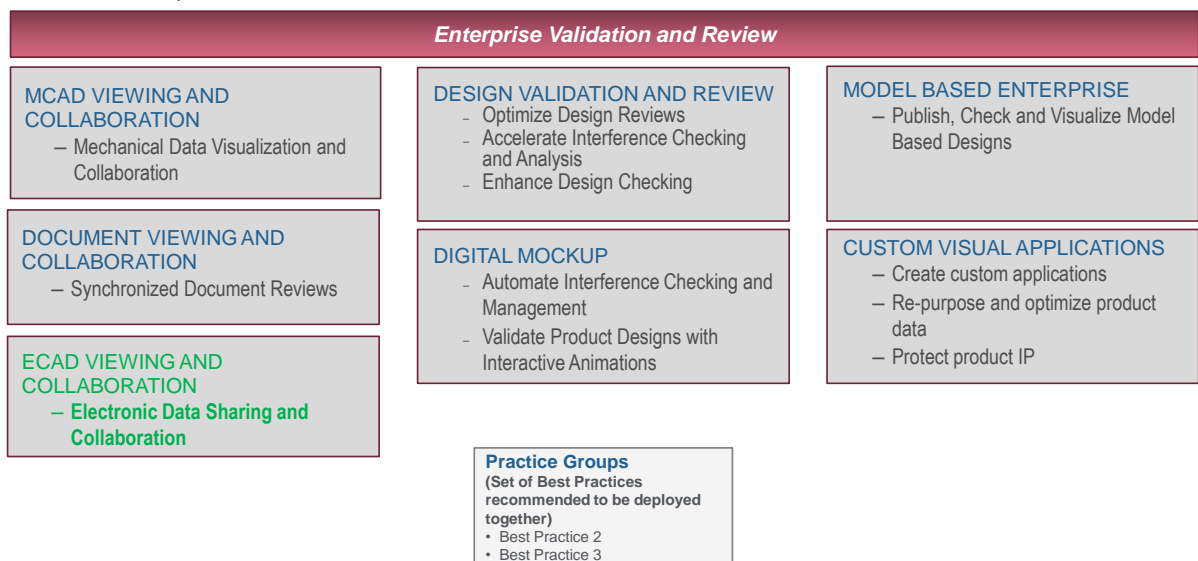
PTC System of Solutions

PTC Global Software Development

PTC Component and Supplier Management

PTC UDI

PTC Materials Compliance

PTC Manufacturing Process Management

PTC Retail PLM

PTC Technical Information

PTC Project Management

PTC Global Product Development

PTC Multi-CAD Design

PTC 3D Design

Product Advantage

Service Advantage

PTC Service Parts Information

PTC Service Knowledge Management

PTC Warranty and Contract Management

PTC Service Parts Management

PTC Global Platforms

PTC Global Quality

PTC Enterprise Validation and Review

PTC System Requirements and Validation

PTC Service Network Management

PTC Service Depot Management

PTC Service Parts Pricing

PTC Field Service Management

Global Product Development
Solution Scope

Practice Groups

GLOBAL PRODUCT DEVELOPMENT

DOCUMENT MANAGEMENT
– Document Management
– Engineering Calculation Management

MECHANICAL CAD DATA MANAGEMENT
– MCAD Data Management
– MCAD Library Management
– Large MCAD Assembly Management

ELECTRONIC CAD DATA MANAGEMENT
– **PCB Design Data Management**
– **ECAD Library Management**

CHANGE MANAGEMENT
- Standardized, automated change mgt.
- Integrated, x-discipline change mgt
- Integrated product issue mgt
- Deviation / Waiver Management

CONFIGURATION MANAGEMENT
- Product config lifecycle mgt
- Integrated,cross-discipline BOM
- Product config sharing to enterprise
- Basic BOM Creation

Practice Groups
(Set of Best Practices recommended to be deployed together)
• Best Practice 2
• Best Practice 3

DESIGN COLLABORATION
– ECAD/MCAD Collaboration
– Top Down Design
– Efficient Mult-MCAD Co-Design
– Context Based Large Assembly Design

SECURED DIGITAL COLLABORATION
– Advanced IP protection
– Content Protection

EXTERNAL COLLABORATION
– Distributed Collaboration
– Traceable product data sharing
– Partner Change Management

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Enterprise Visualization and Review
Solution Scope

Practice Groups

Enterprise Validation and Review

MCAD VIEWING AND COLLABORATION
– Mechanical Data Visualization and Collaboration

DOCUMENT VIEWING AND COLLABORATION
– Synchronized Document Reviews

ECAD VIEWING AND COLLABORATION
– **Electronic Data Sharing and Collaboration**

DESIGN VALIDATION AND REVIEW
- Optimize Design Reviews
- Accelerate Interference Checking and Analysis
- Enhance Design Checking

DIGITAL MOCKUP
- Automate Interference Checking and Management
- Validate Product Designs with Interactive Animations

Practice Groups
(Set of Best Practices recommended to be deployed together)
• Best Practice 2
• Best Practice 3

MODEL BASED ENTERPRISE
– Publish, Check and Visualize Model Based Designs

CUSTOM VISUAL APPLICATIONS
– Create custom applications
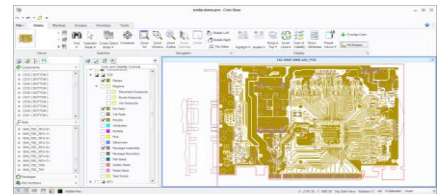– Re-purpose and optimize product data
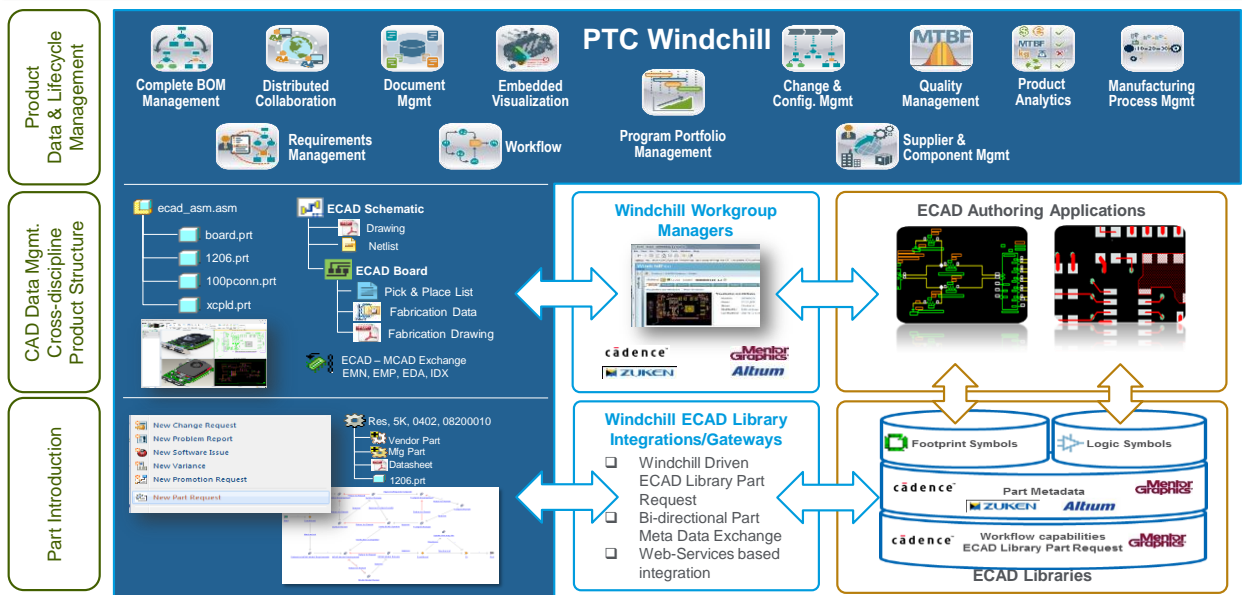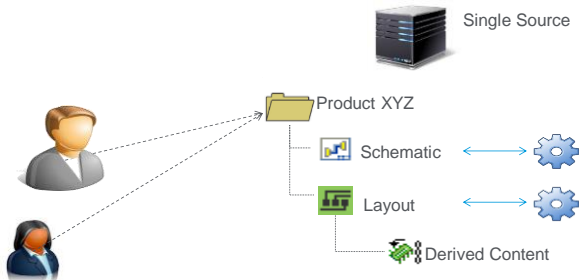– Protect product IP

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- ## PCB Design Data Management (GPD)
  - *PTC Windchill Workgroup Managers for ECAD*
  - How to get your CAD data under control, BOMs, and viewable data stored into Windchill

- ## ECAD Design Review (EVR)
  - *PTC Creo View*
  - ECAD Visualization and Comparison for the Enterprise

- ## ECAD Library Management (GPD)
  - *Windchill Gateway for Cadence ADW*
  - Synchronize part metadata between ECAD Library tools and Windchill parts.

- ## ECAD/MCAD Collaboration (GPD)
  - *Creo ECAD-MCAD Collaboration Extension (ECX)*
  - Transfer of IDX file data between CAD domains during WIP

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PTC Windchill

Product Data & Lifecycle Management

- Complete BOM Management
- Distributed Collaboration
- Document Mgmt
- Embedded Visualization
- Change & Config. Mgmt
- Quality Management
- Product Analytics
- Manufacturing Process Mgmt
- Requirements Management
- Workflow
- Program Portfolio Management
- Supplier & Component Mgmt

CAD Data Mgmt. Cross-discipline Product Structure

- ecad_asm.asm
  - board.prt
  - 1206.prt
  - 100pconn.prt
  - xcpld.prt
- ECAD Schematic
  - Drawing
  - Netlist
- ECAD Board
  - Pick & Place List
  - Fabrication Data
  - Fabrication Drawing
- ECAD – MCAD Exchange EMN, EMP, EDA, IDX

Windchill Workgroup Managers

cadence Mentor Graphics ZUKEN Altium

ECAD Authoring Applications

Part Introduction

- New Change Request
- New Problem Report
- New Software Issue
- New Variance
- New Promotion Request
- New Part Request

Res, 5K, 0402, 08200010
- Vendor Part
- Mfg Part
- Datasheet
- 1206.prt

Windchill ECAD Library Integrations/Gateways
- ❑ Windchill Driven ECAD Library Part Request
- ❑ Bi-directional Part Meta Data Exchange
- ❑ Web-Services based integration

- Footprint Symbols
- Logic Symbols
- Part Metadata: cadence, Mentor Graphics, ZUKEN, Altium
- Workflow capabilities ECAD Library Part Request: cadence, Mentor Graphics

ECAD Libraries

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Electronic CAD Data Management Transformed Customer

Single Source

Product XYZ

Schematic

Layout

Derived Content

After Scenario

Single source for ECAD design data and its output files
among disparate teams

Fully Managed BOM
with relationships to ECAD data

ECAD Libraries Synchronized
with PLM Parts and with MCAD models

Positive Outcomes

Designers easily find and work on correct data

Automated BOM generation enables where-used reports on ECAD components

An ECAD-MCAD library that can be trusted for design collaboration and manufacturing

Justification

ECAD data is just a single aspect of a product which could also have MCAD and software components to it. Having all of these components inside a single versioned source of truth adds clarity to the design process.

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ELECTRONIC CAD
DATA MANAGEMENT
– **PCB Design Data Management**
– ECAD Library Management

Practice - PCB Design Data Management
Product - PTC Windchill Workgroup Manager for ECAD

PTC Windchill Workgroup Manager for ECAD

Connecting the Desktop to the Workspace

- The WWGM is a client application used to manage CAD data between the CAD application user's local working environment and the Windchill server.
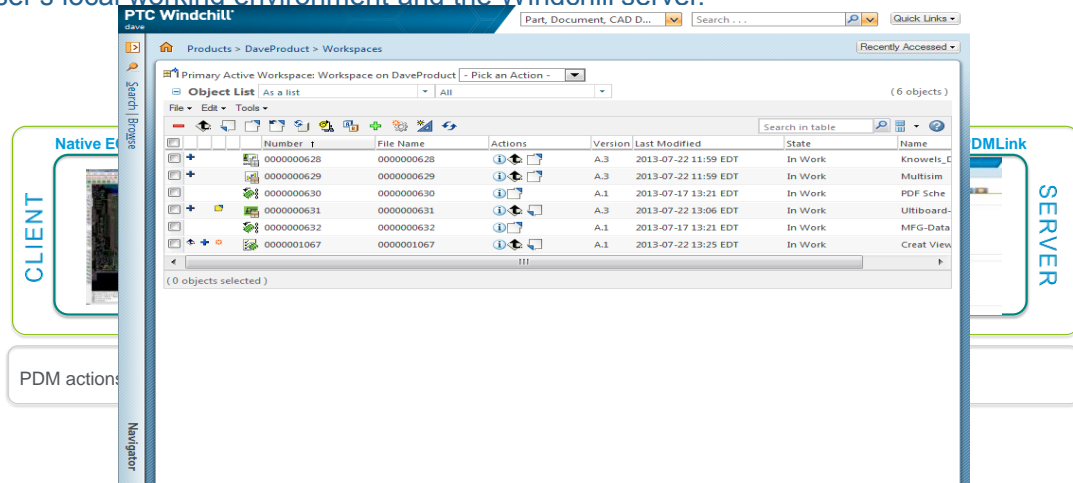
Windchill Workgroup Manager for ECAD

Integral product data management

- Manage version-specific Cadence, Mentor Graphics, Zuken or Altium to facilitate search and retrieval:
  - Design data
  - Specifications
  - Other product-related information

- Organize and Manage derived design information
  - Artwork, drawings, and IDX files within PTC Windchill

- Uploads BOM part structure to PTC Windchill
  - Eliminate manual errors allowing for reports and "where-used" searches

- Generate Creo View ECAD Visualization data
  - Enable non-ECAD application users to access, mark up and collaborate on critical electrical design data.

Windchill Workgroup Manager for ECAD

PTC Live Global
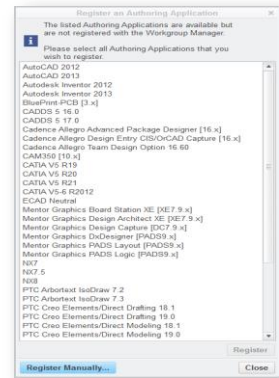
Configuration management

- Access ECAD design directly from PTC Windchill WGM while providing versioning and iteration management

- Enable check-in and check-out of latest configurations

- Share electrical data from PTC Windchill *Products* to *Projects* for true collaboration in an access-controlled environment

- Leverage PTC Windchill workflow engine for ECAD data
  - Change Management
  - Product Release Processes

- Launch native ECAD tool directly from design data managed in PTC Windchill

Electronic CAD Data Management Demonstration

PTC Live Global
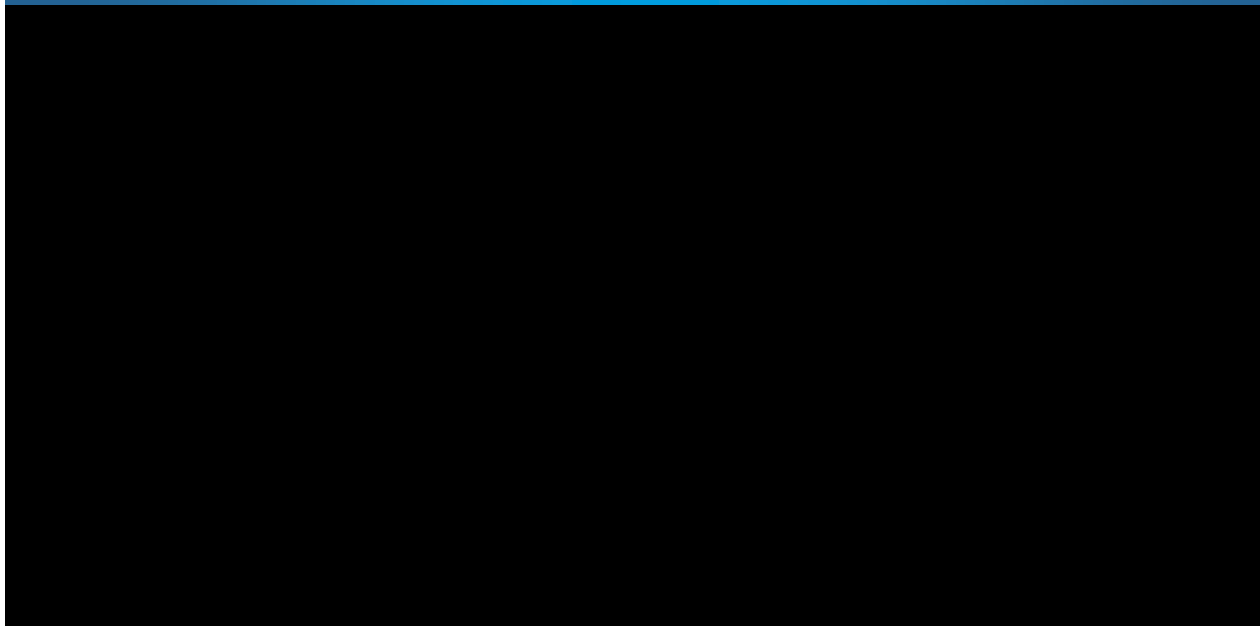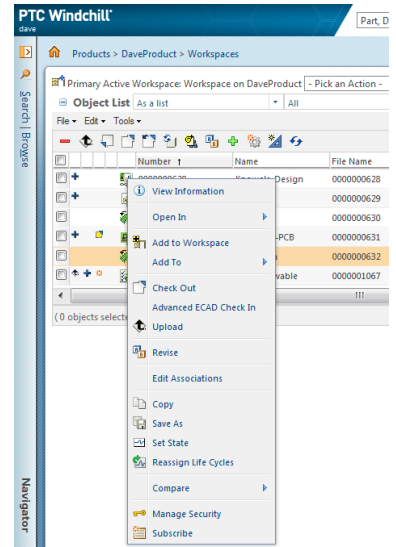
Usability and Productivity was our customer focus for the 10.2 WWGM.

- **Improved User Experience**
  - ECAD collector
  - BOM generation enhancements
  - Advanced ECAD Check In.

- **Data management and Integration**
  - ECAD Generic Non-Separable Design Type
  - Manage Design Directory

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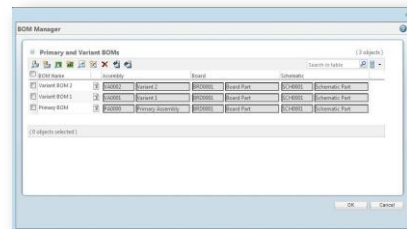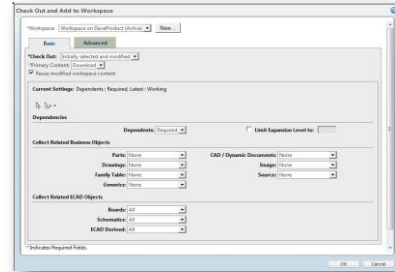
ECAD specific collection rules

- **Reason for Feature:**
  - The 10.1 Collector had a generalized approach and ECAD content was not recognized within Windchill

- **Solution:**
  - The Windchill collector now has ECAD specific collection rules
    - Collection of Schematic, Board, or Derived objects
  - Collector preferences have been added to control the new ECAD collection rules
    - Modify Default objects collected
  - No longer collects design object dependencies:
    - Content Definition files
    - Source Image Links
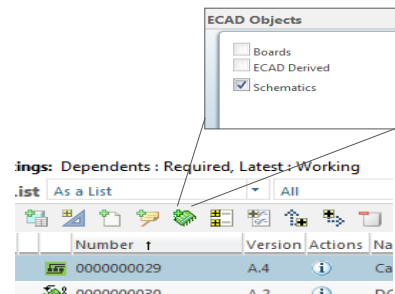
Settings in the *Revise* Collector Preferences

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ECAD Check In – 10.2 M010

- New workflow provides the user with more up front information prior to check-in

- Functionality:
  - A new check-in action "*ECAD Check In*"
  - Summary BOM Report
  - Ability to abort the check-in mid stream
  - Auto associations always on
  - Preference driven part structure source
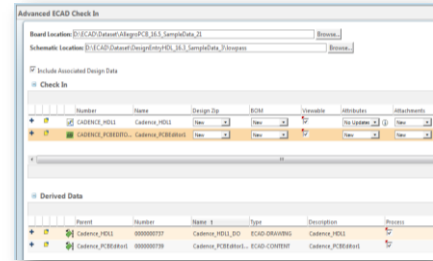
- Usability Improvements:
  - One Simplified Set-Up screen to generate deliverables and Check in
    - Eliminated the "*Import Data*" and "*Generate Data*" actions
  - Progress screen with multi-colored heads-up display and process bars
  - New BOM features incorporated in Check In process
    - BOM Report
    - Integrated BOM Manager

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Manage Design Directory – 10.2 M010

DLD, Integrate the ECAD Design directories

- Option to provided a User Defined Design Directory path location as opposed to the WGM defining this location for you

- Solution:
  - Allow the user the option to set the location of design directory
    - Shared Drive/Network Drives Supported
  - This directory will be used with all WGM actions
    - Open In Cad Tool, check out, check in, etc…
  - Allows data to stay in native CAD tools directory structure
    - Cadence design Tool Suite, Aligns design data to Project Manager & ADW design environments
    - Mentor Graphics Tool Suite; Aligns design data to ICDB design environment

$PTC_WLD_ROOT

D:\MyDesigns
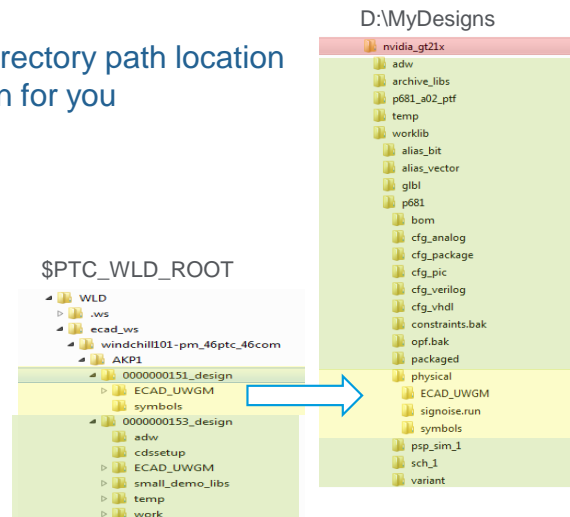
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- Internet Explorer 11 Supported

- "Advanced ECAD Check In" name change to "ECAD Check In"

- User has the ability to change location of design data during ECAD Check-in at any
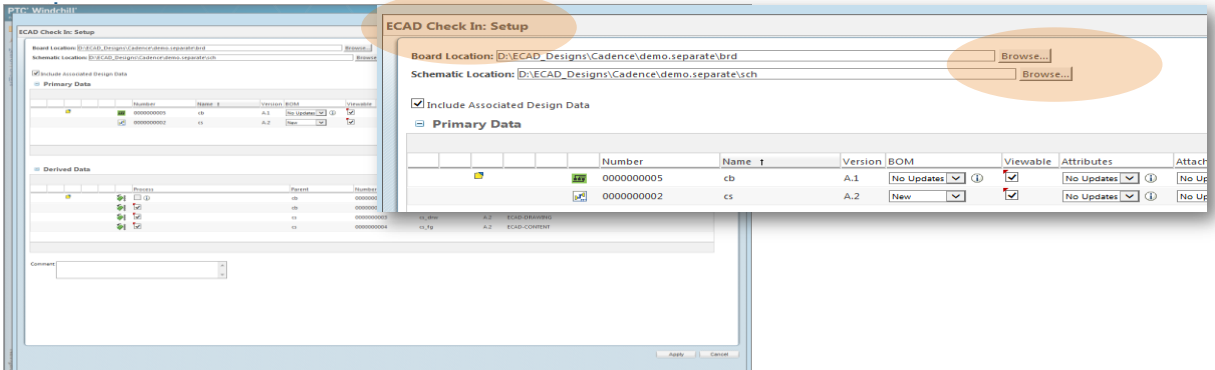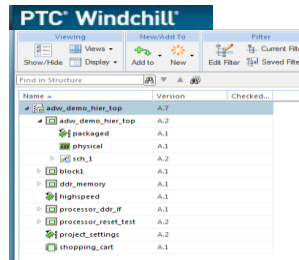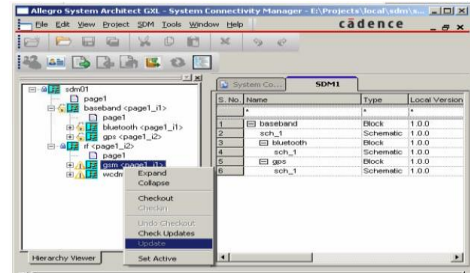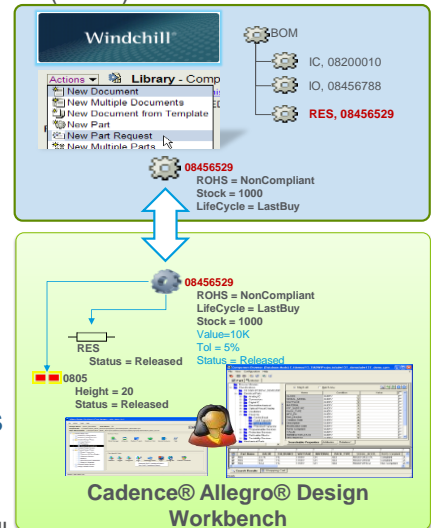
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ELECTRONIC CAD
DATA MANAGEMENT
  – **PCB Design Data Management**
  – ECAD Library Management

Practice - PCB Design Data Management
Product - PTC Windchill Workgroup Manager for Cadence Team Design Option

Windchill Integration for Cadence® Allegro® Team Design Option

- **Cadence® Allegro® Team Design Option (TDO)**
  - Team based ECAD Design Environment
  - System level design approach
  - Complex hierarchical design projects
  - Block level IP reuse
  - Available in SPB 16.6

- **Data managed directly in PTC Windchill enables**
  - Enables global team design for ECAD
  - Early visibility to ECAD design modules
  - Earlier & easier creation of consolidated BOM
  - Robust and secure management of IP
  - Handoff of Derived Content to MFG (IPC-2581)
  - Available in PTC Windchill 10.2 M010

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ELECTRONIC CAD
DATA MANAGEMENT
  – PCB Design Data Management
  – **ECAD Library Management**

Practice – ECAD Library Management
Product - PTC Windchill Gateway for Cadence Allegro Design Workbench

Windchill – Cadence ECAD Library Integrations

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PTC Windchill Gateway for Cadence® Allegro® Design Workbench (ADW)

- **Synchronize Part attributes between PTC Windchill and ADW**
  - Create Windchill Part records in ADW
  - Create ADW Part records in PTC Windchill

- **Synchronized metadata exchange enables:**
  - EE visibility into *all* part data from within ADW
    - Sourcing, compliance, lead-time, availability - at their fingertips!
  - Accurate part data for BOM and/or Where-Used analysis across all Products and Projects

- **PTC Windchill "New Part Request" Workflow supports the creation and library management of OEM components**
  - New part creation process can begin either in ADW or PTC Windchill

Cadence® Allegro® Design Workbench

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10.2 M030 ECAD Updates

- From the Cadence Variant Editor the *Generate Reports* action is used to launch BOM-HDL
  - Each variant is exported to a CSV format with a *.rpt extension

- Automatic collection of multiple BOMs occurs during TDO check-in
  - BOMS are collected from a fixed location in the design container defined by the Cadence policy file
  - BOM report is shown for each Variant

- These BOMs can be Iterated independently from the Schematic or PCB.
  - Allows for check-in of a new Variant or alteration of an existing one without needing to iterate the schematic
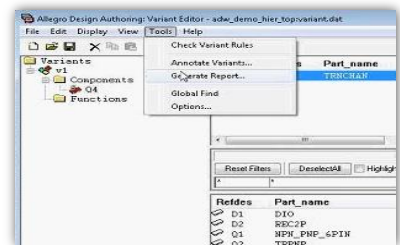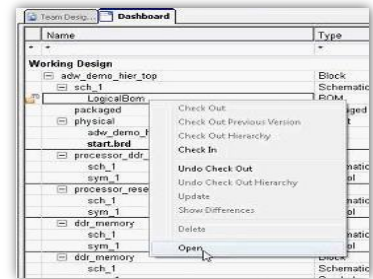
Base and Variant BOMs linked to the LogicalBom CAD document
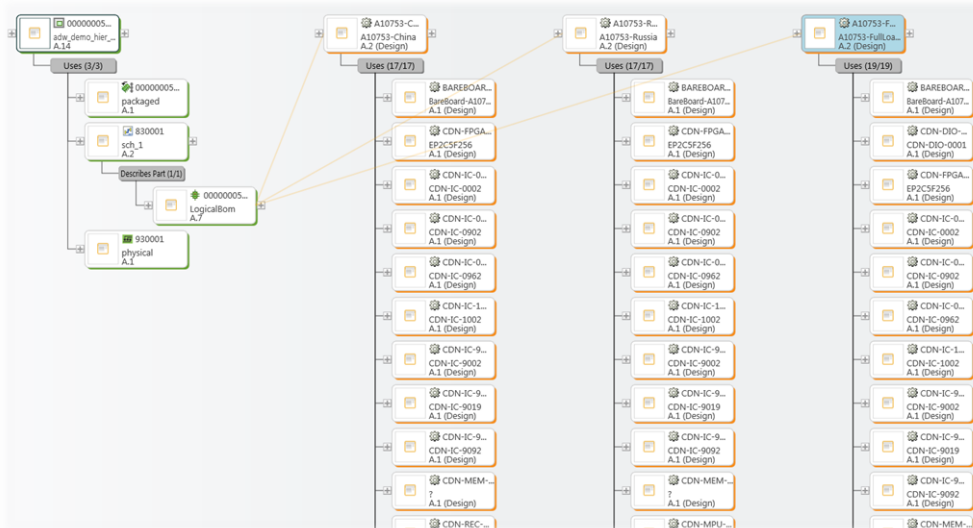
ECAD VIEWING AND
COLLABORATION
  – **Electronic Data Sharing and
  Collaboration**

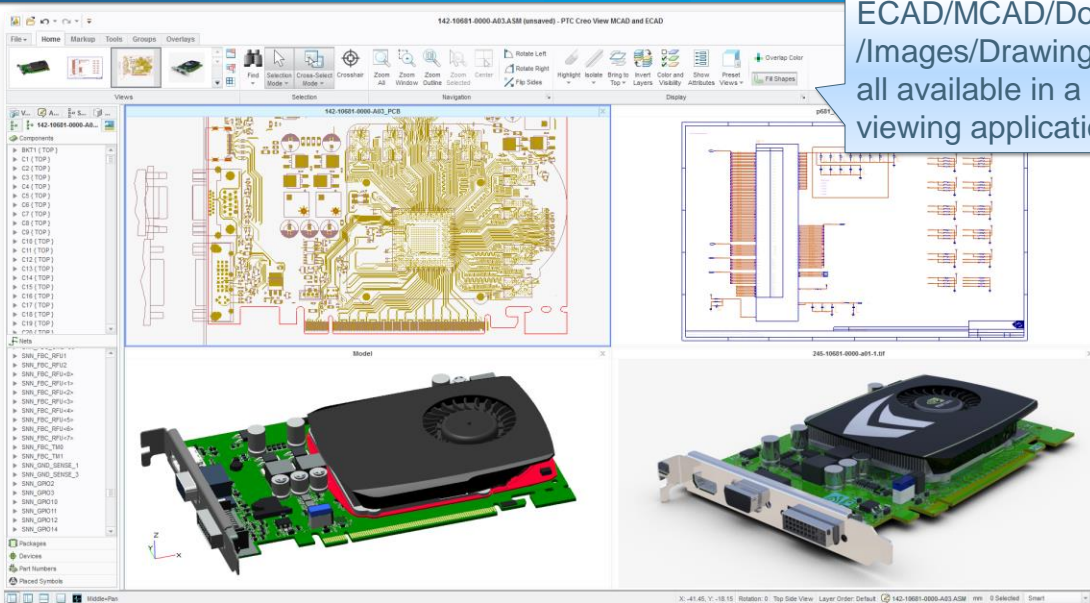# Practice – Electronic Data Sharing and Collaboration

Product - PTC Creo View ECAD

Creo View ECAD
Cross-domain visualization

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Global

ECAD/MCAD/Documents
/Images/Drawing views
all available in a single
viewing application.

Cadence Constraint Report Cross-Selection

Pin graphic in Schematic can be turned off

Search for Attributes that do not exist or have no values

Dynamic ECAD Search Groups based on a pre-defined Search Query

ECAD-MCAD Collaboration

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A phrase with many meanings

- IDX or IDF file format sharing between ECAD and MCAD tools

- Both ECAD and MCAD teams storing their CAD data in PTC Windchill
  - Consolidated BOM
  - Single source of truth

- ECAD and MCAD librarians collaborating during the NPI process to ensure quality part models/footprints/symbols are created

- The EE's and ME's saying "Hello" as they pass in the hallway

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Customer Case Studies and Roadmap

Founded in 1990 by Massachusetts Institute of Technology roboticists, iRobot designs and builds some of the world's most important robots. With applications ranging from combat-proven defense to public safety to household cleaning, iRobot is committed to building robots that improve quality of life and safety standards worldwide.

"We are excited that we no longer have to manually upload various zip and PDF files. This tool will save us hours per design in the ECAD documentation process."

- Chris Lyons
Electrical Engineering Manager
iRobot Corp

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The mission of the Collider-Accelerator Department at BNL is to develop, improve and operate the suite of particle / heavy ion accelerators used to carry out the program of accelerator-based experiments at BNL; to support the experimental program including design, construction and operation of the beam transports to the experiments plus support of detector and research needs of the experiments; to design and construct new accelerator facilities in support of the BNL and national missions. The C-A Department supports an international user community of over 1500 scientists. The department performs all these functions in an environmentally responsible and safe manner under a rigorous conduct of operations approach.

"We had an initiative to have all of our ECAD and MCAD design data managed in Windchill by Dec. 2014. By deploying the PTC ECAD Workgroup Manager for Mentor Graphics, we will now be able to meet that goal and ensure we have a 'single source of truth' for all of that data. This will enable us to provide broader visibility of our design files both between design authors and extended team members and ensure the right information is always accessible."

Steven Bugros
Senior Mechanical Designer/Windchill Administrator
Brookhaven National Laboratory
Collider-Accelerator Department

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- ECAD WGM Create New Design Wizard
  - Simplify creation of New ECAD designs for end users and admins
    - Work started but won't be completed for X-26

- Links between ECAD Docs and Parts preserved during Revise

- Support for Cadence 17.0 as well as TDO with page level check-in/out

- New WGM for Zuken CR8000

- Support Zuken's API for design collection with Zuken CR5000 and CR8000

- Making PTC Creo View ECAD Compare easier to use and adopt

- Your feedback is valuable

- Don't miss out on the chance to provide your feedback

- Gain a chance to win an instant prize!

- Complete your session evaluation now