MBSE Workshop

Mentor Graphics use of OSLC

IW2015 – Torrance, CA

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25th anniversary annual INCOSE international workshop
Los Angeles, CA
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The Background

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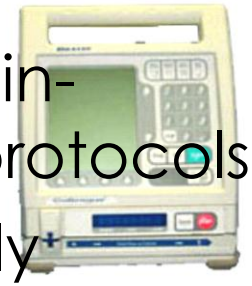
Why did Mentor Graphics use OSLC?

System Design Challenges

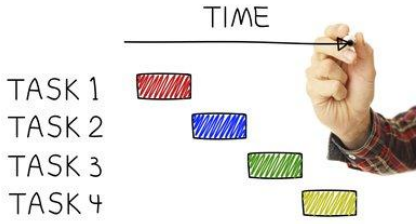
Dealing with Complexity and Change

- Design requirements are ever increasing and ever evolving
- Convergence of multiple disciplines in a single system from requirements through implementation
- Complicated communication due to domain-specific tools, file formats, databases, and protocols
- Inter-divisional or even multi-company supply (i.e., development) chain
- Literally millions of design artifacts for even a moderately sized project

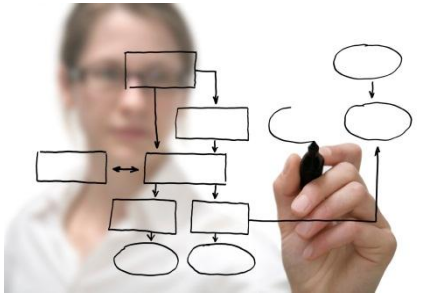


Addressing Product, Project, Process & People

- Product
  - Focus on the product / system /device / … under development
  - Associate all related artifacts with the right part of the product



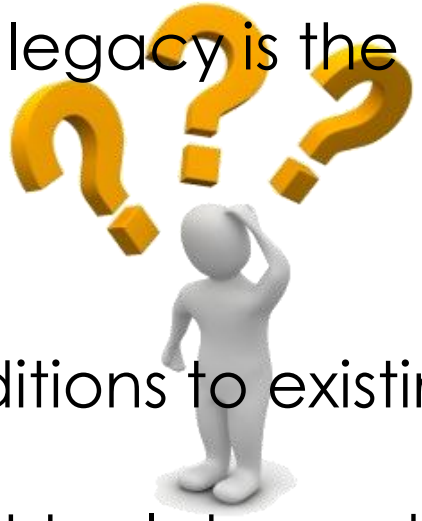
- Project
  - Work towards a set of goals, milestones and validations
  - Manage the time line and deliverables to the project plan



- Process
  - Apply the relevant process[es], procedures and standards
  - Track and trace all process steps and ensure consistent execution

- People
  - Enable the team to be, and work as, a team
  - Provide all the participants with relevant information

Getting there from here – with legacy



- And the biggest legacy is the people!
- Incremental additions to existing environment
- Augment current tools to enable communication
- Automate current processes to track activities
- Use standards to maximize consistent scalability

A Use Case

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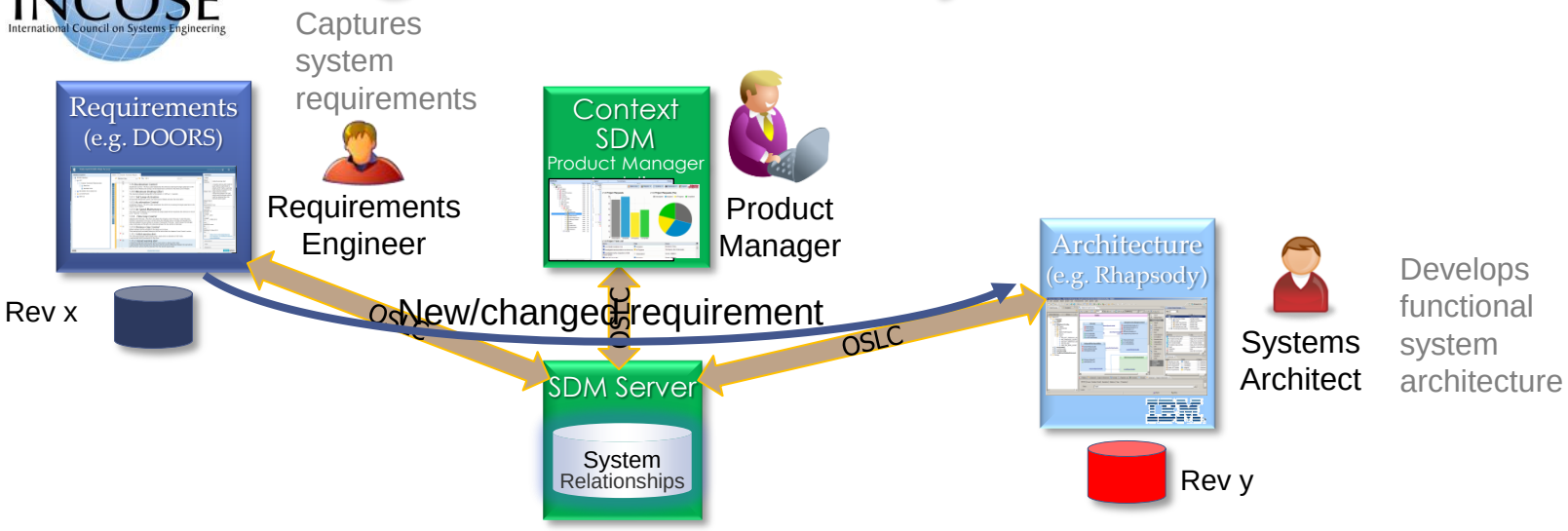
Information flow between typical stages in a design

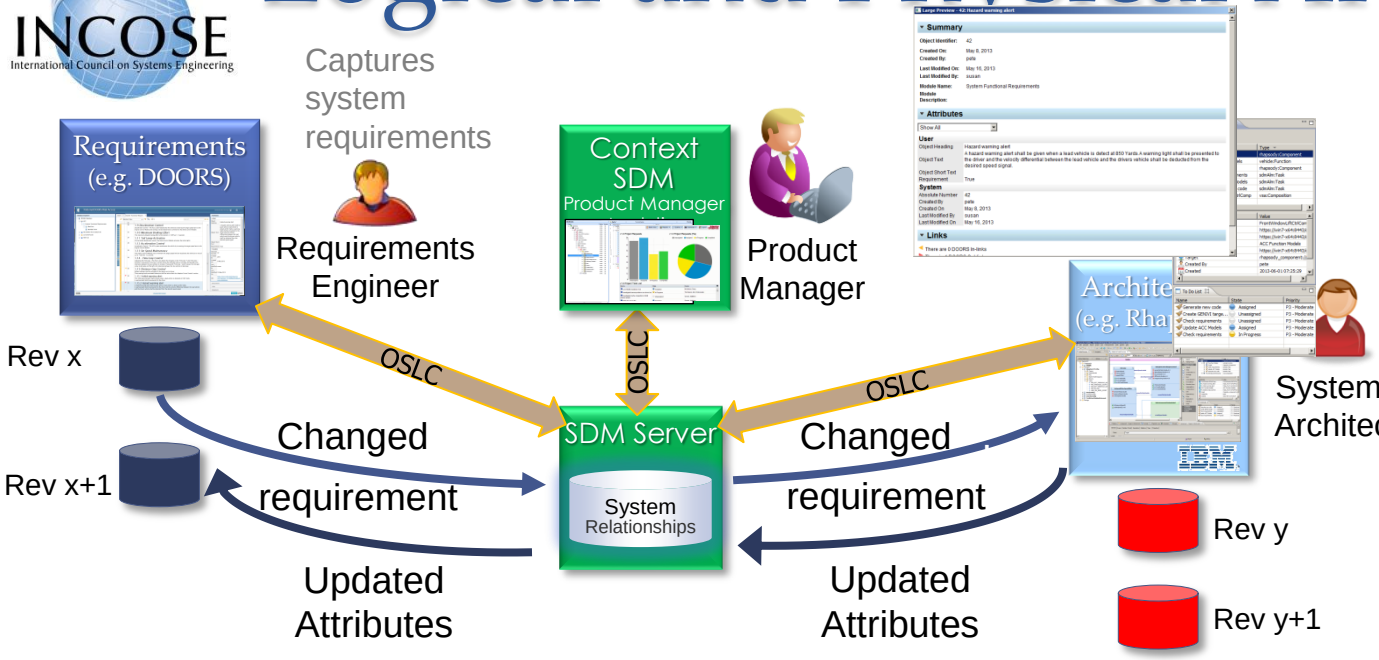
A flow-based Use Case Example

- Requirements
  - Typically in "Systems Engineering"
- System Architecture
  - Often not the same person[s] in "Systems"
- Structural Implementation
  - Logical Architecture[s]
- Physical Implementation
  - Many physical domains
- Change permeates throughout
  - Demands comprehension of variants across domains

Logical and Physical Architectures



Logical and Physical Architectures



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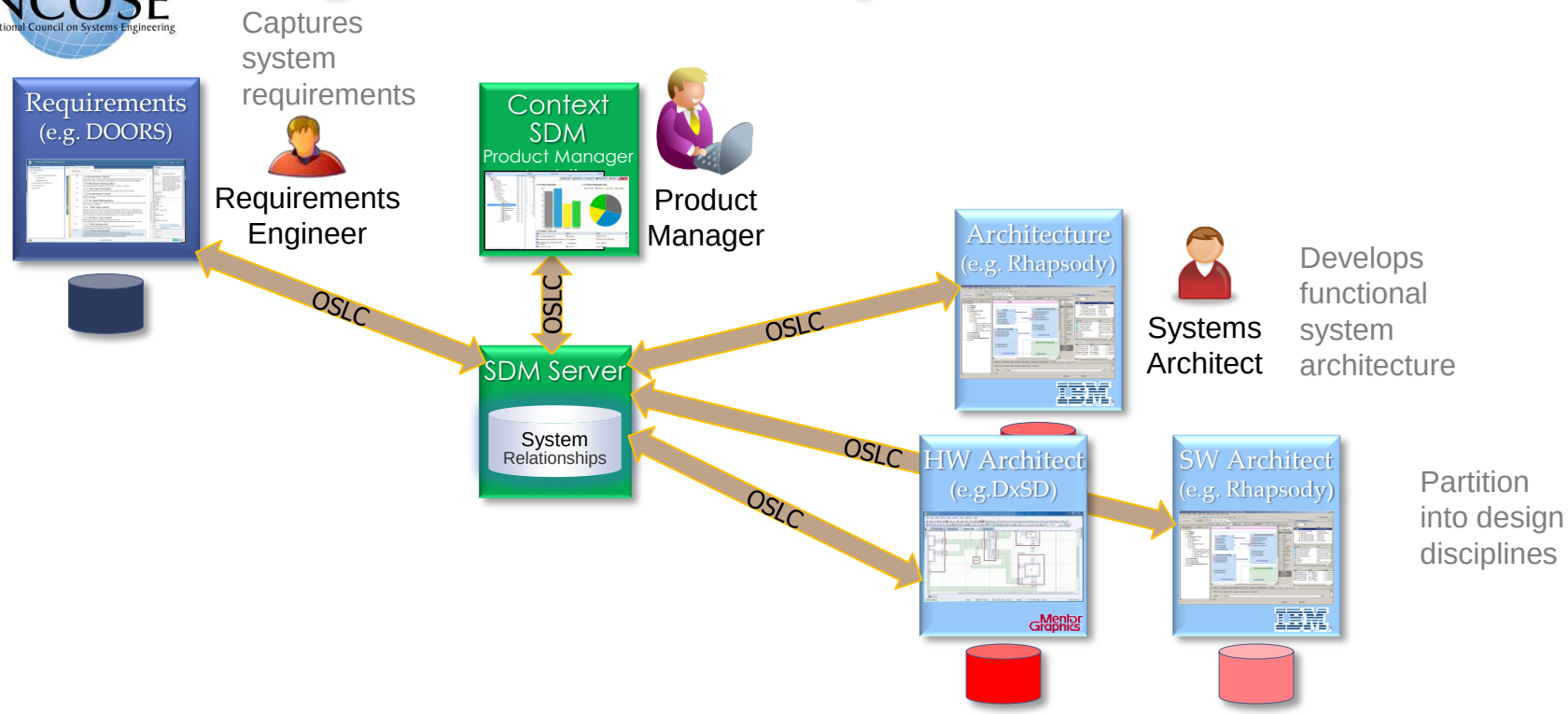
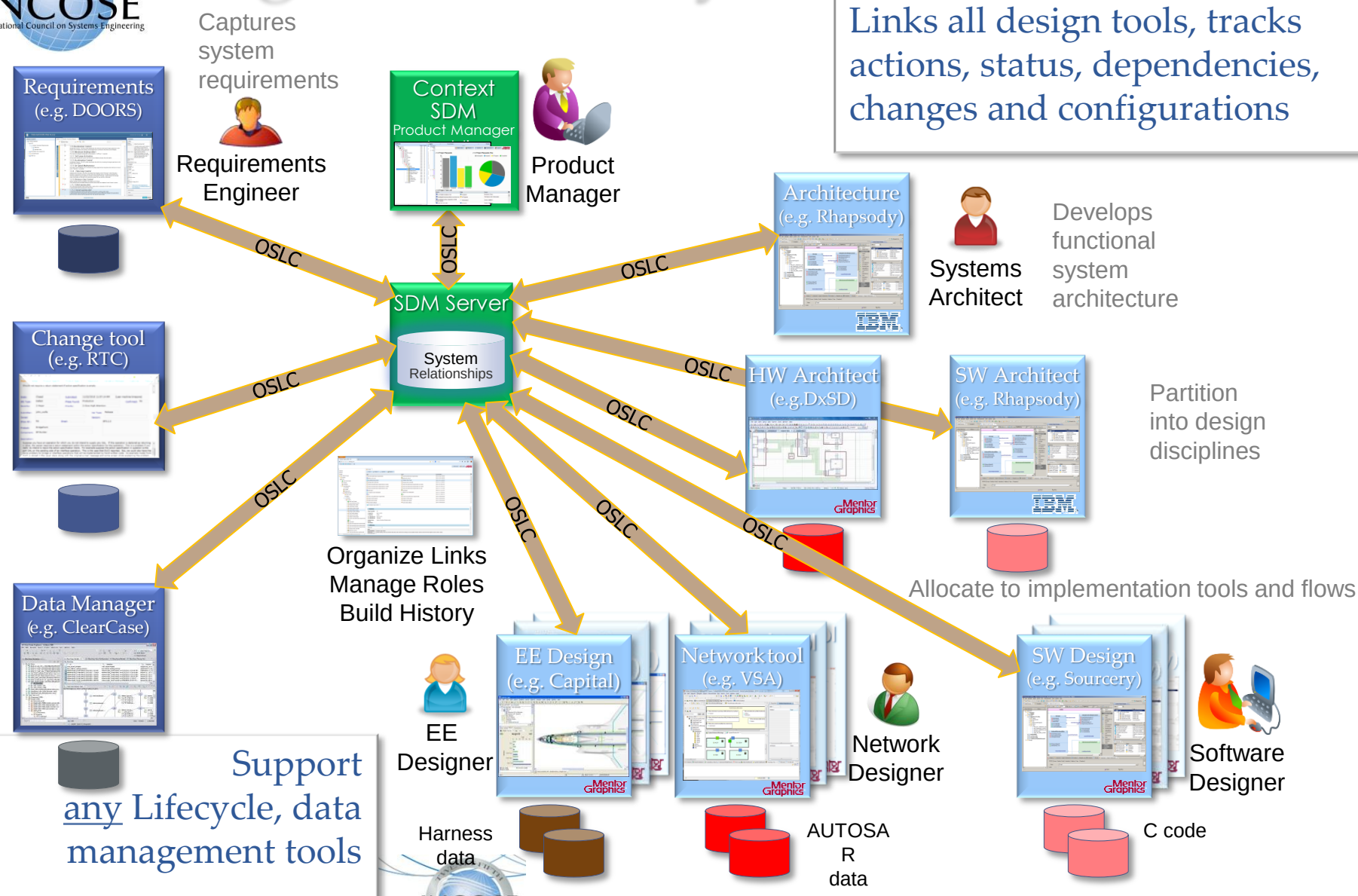


- Links data, tracks dependencies, changes and configurations

Logical and Physical Architectures

Links all design tools, tracks actions, status, dependencies, changes and configurations



Lifecycle Management for 'Work in Progress'

- Managing Change
  - Changing Requirements, dependencies, configurations
- Coordinating disciplines
  - Differing schedules, steps, terminology, progress
- Finding information
  - Standards, processes, requirements, dependencies
- Meeting Standards
  - Regulatory, process and corporate needs
- Proving process and traceability
  - Required by most standards and regulatory bodies
- Reporting status, standards, results, …
  - Extracting, abstracting and organizing information
- Handoff to Production
  - Version & Configuration management and tracking

Put this into Context

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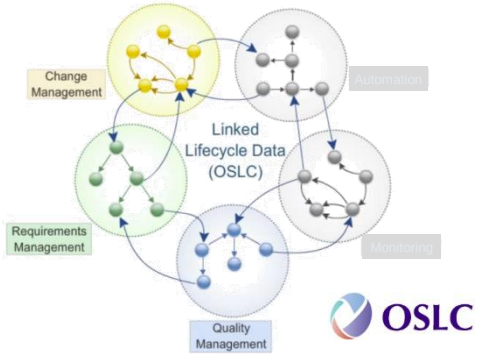
How OSLC enables our Solution

What is Context?

- The context in which the work is being done
  - It's place in the overall system being built
  - The other related parts of the design
  - Relevant dependencies and constraints
- The team working on the system
  - The immediate work group
  - System engineering
  - Project management
  - Test and production
- The technical infrastructure
  - The tools in use today
  - The roadmap for new additions
  - Data, databases, reports, analysis
  - Communication

What Context™ is

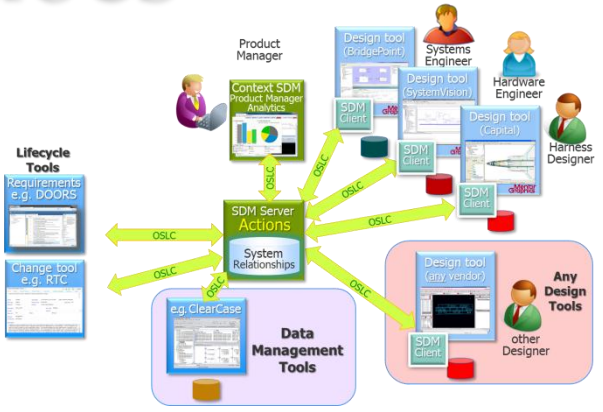


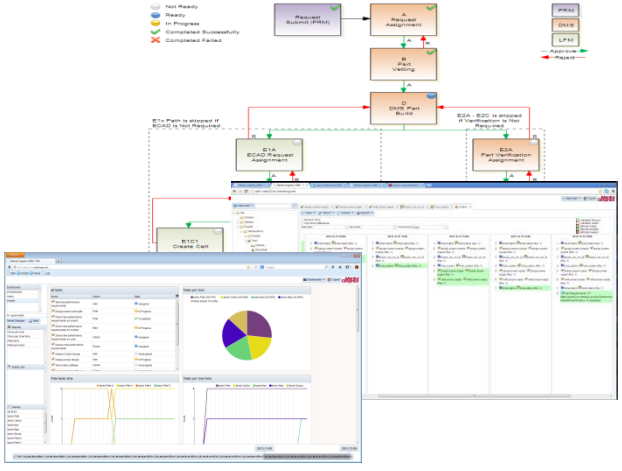
- **Management** of linked data
- Tool to tool **integration**
- Standards-based **communication**

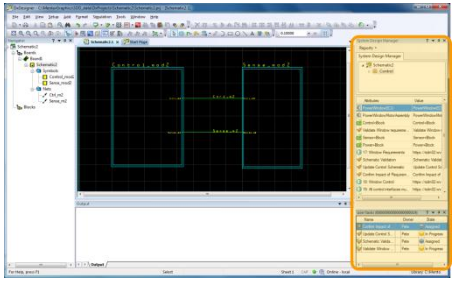
- **Context™ Server** stores and manages the links
  - Builds history, enables traceability and reporting
  - Original data remains with original tools and repositories
- **Context™ SDM plugins** augment design tools
  - Integration can be available for any Mentor tool
  - Can also support other vendors' or internal design tools
- Web-based Product Manager accesses data and analytics
- OSLC standard connects to other tools
- Supports any "Lifecycle" tools (native or with plugin)

What Context™ does

- Associates information across disciplines
  - Links original data and track relationships
  - Augments current design tools
- Tracks and manages dependencies
  - Impacts of changes, tools and history
  - Direct interactivity in real time
- Supports workflows, task management
  - Sorts and presents information concisely with built-in displays and analytics
  - Report and export in industry-standard styles
- Brings relevant data directly to users where it can be used
  - Users interact with dependencies, tasks and product directly
  - Information is seamlessly sourced from any original repositories



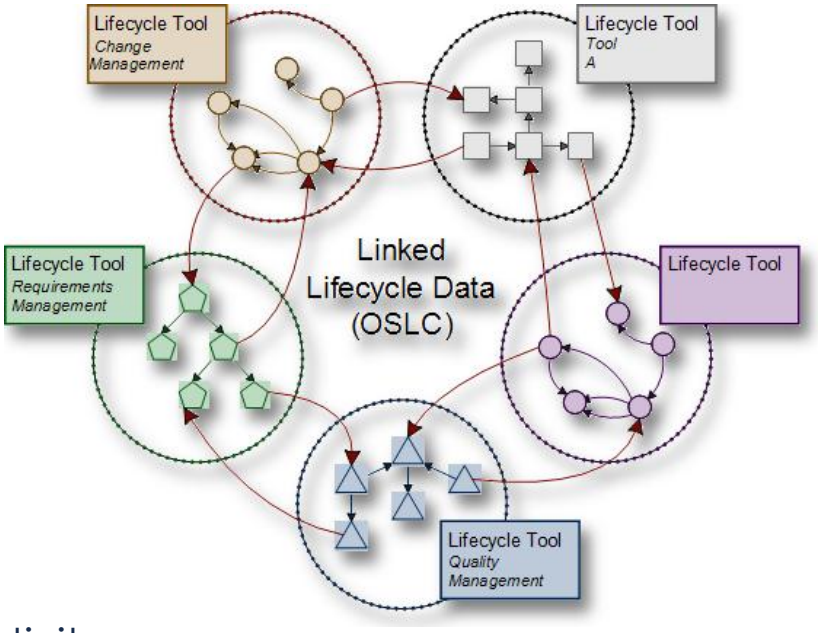




Application Federation & OSLC

Solves Integration, Allows Best In Class

- No single tool vendor has expertise or product capabilities in all domains
  - Data modeling
  - Software functionality
  - Deployment expertise

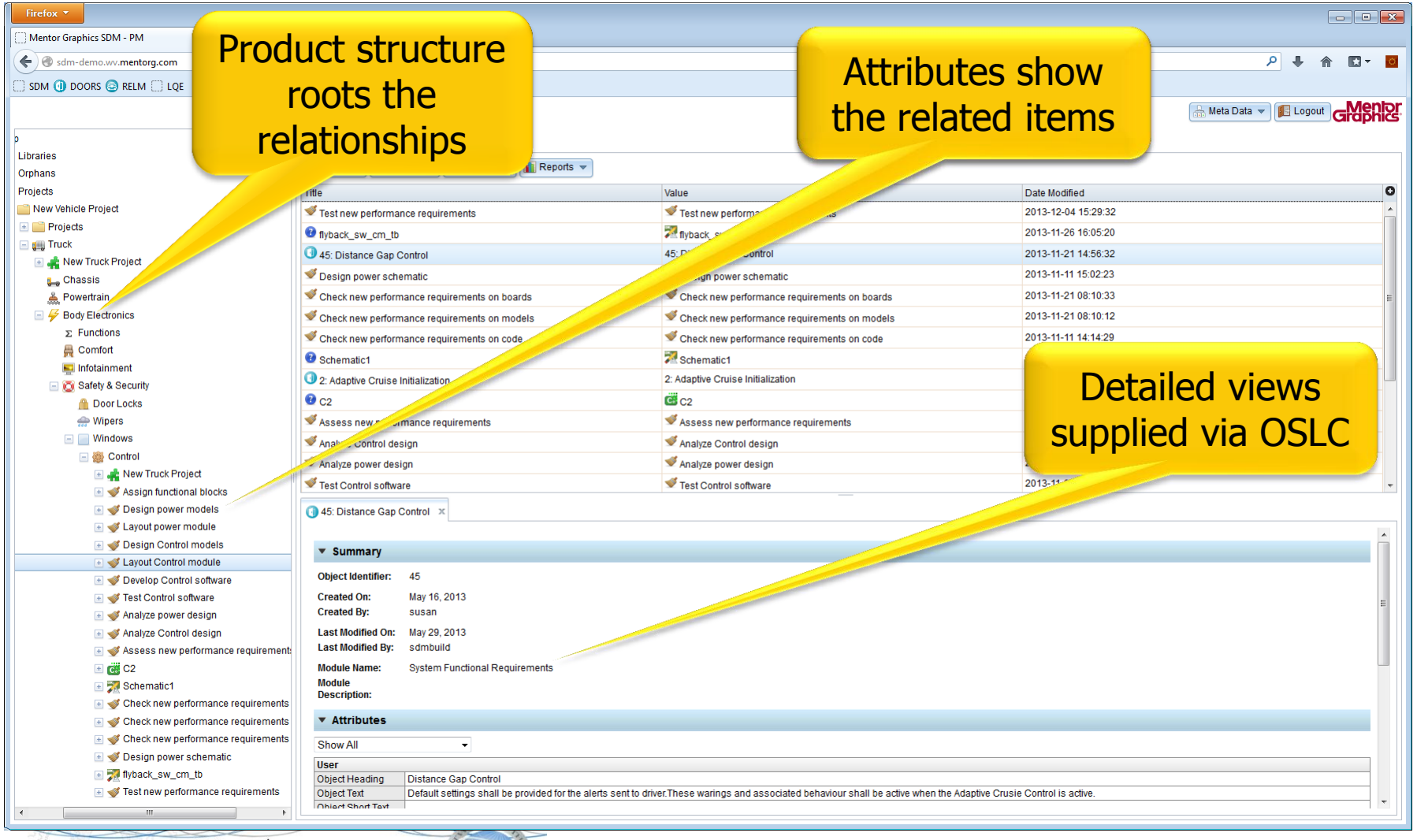


- Open Services For Lifecycle Collaboration (OSLC*) solves traditional tool integration challenges
  - Resilient, standards based approach minimizes IT maintenance
  - Seamless experience maximizes user productivity
  - Tool vendor IP protection maximizes commercial appeal

** See http://open-services.net*

- Mentor Graphics is a founder member of OASIS OSLC section

Building Relationships around the Product



Scenarios and Use Cases

- The Project Manager needs …
  - Visibility and status

- Each Designer needs …
  - Access to relevant information

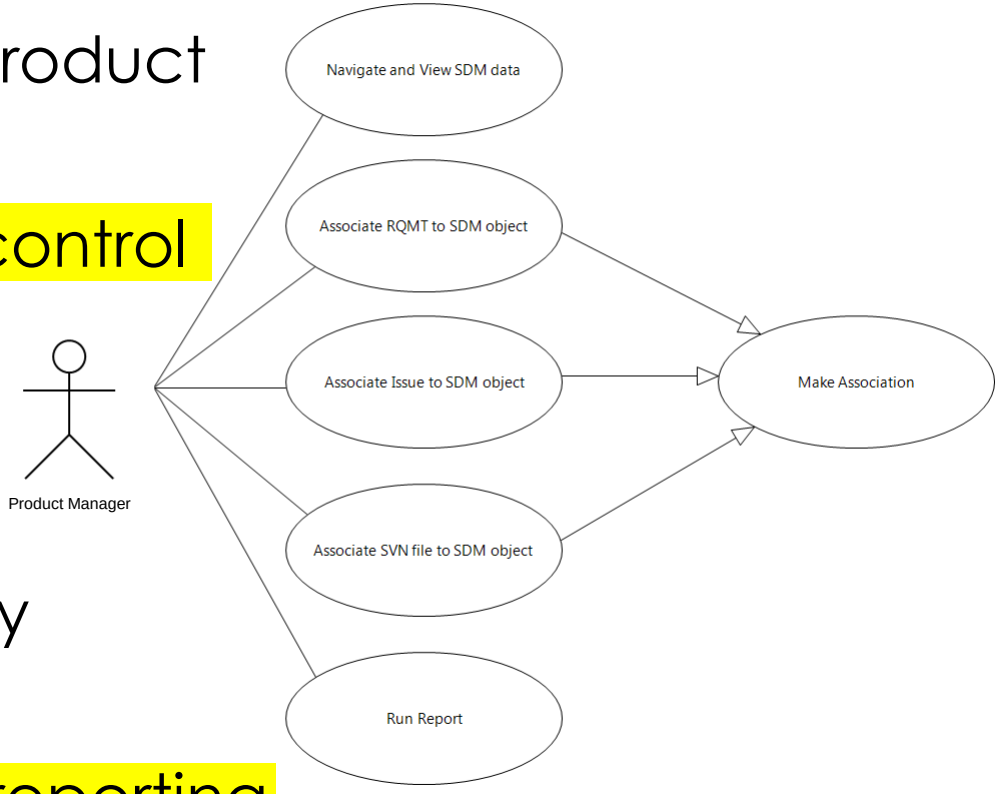
- The Safety Analyst needs …
  - Traceability and audit

- The Requirements Engineer needs …
  - Complete and current data

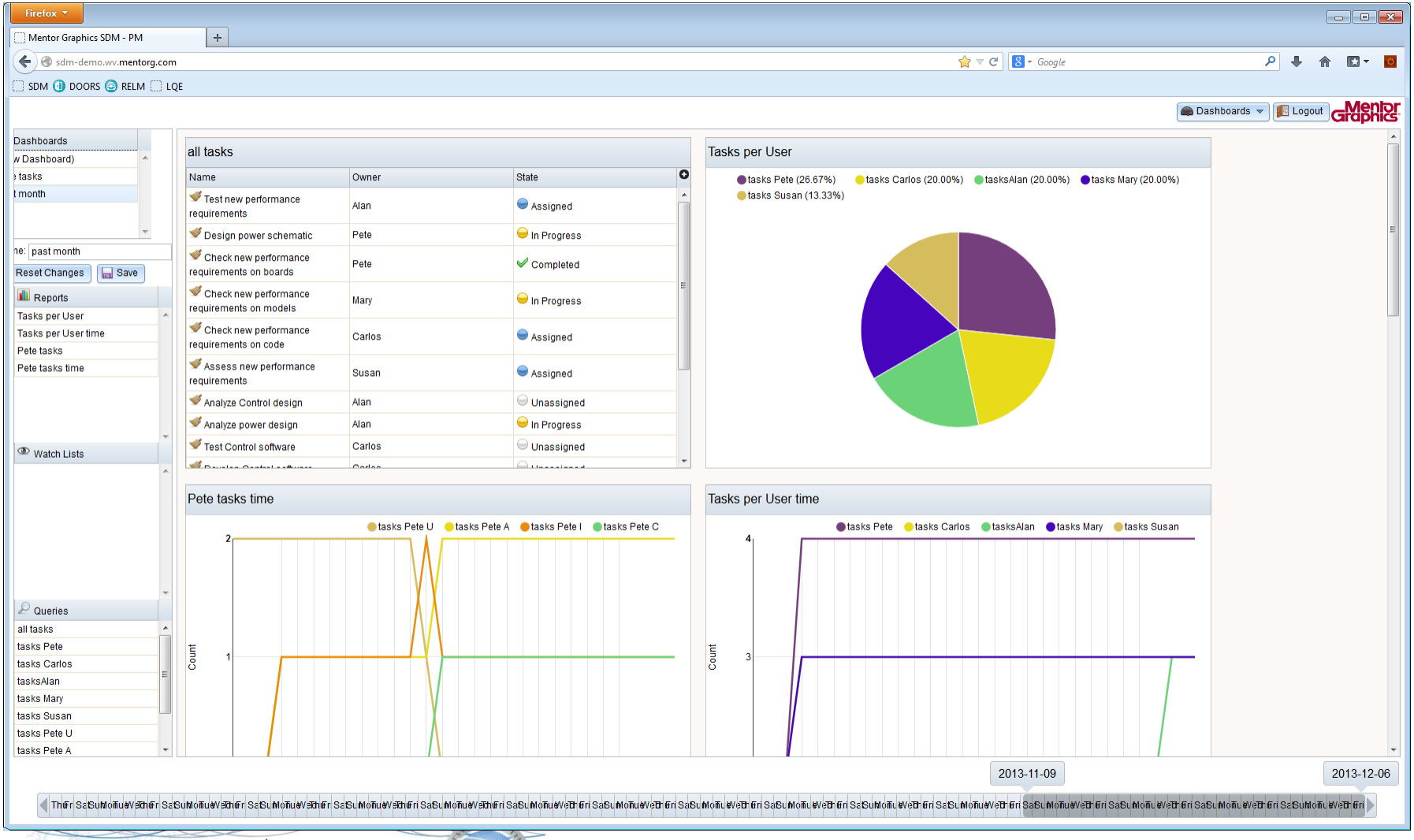
- The System Designer needs …
  - The right product, at the right time

Product Manager Use Cases

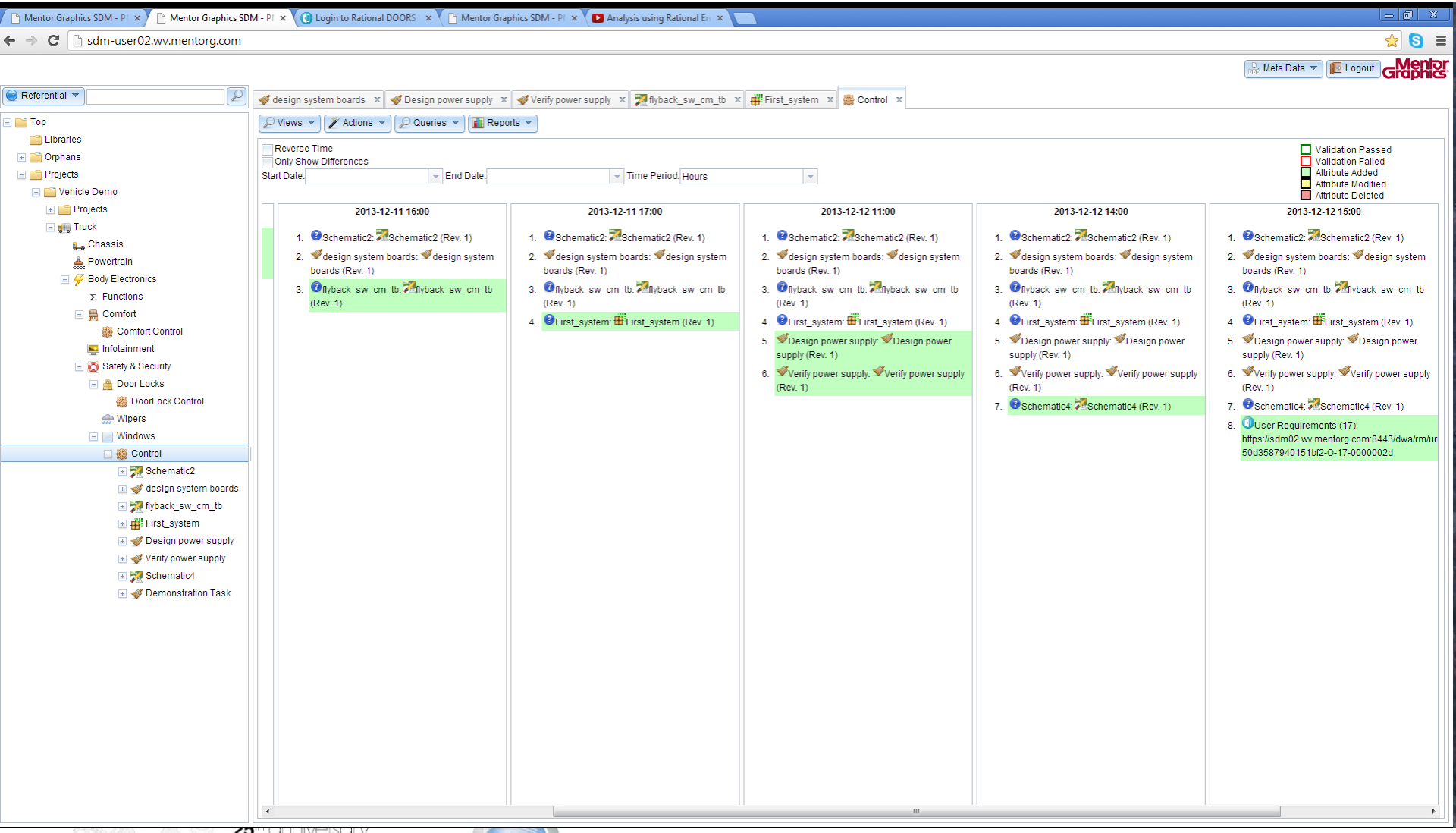
- Visibility of the entire product
- Product and Process control
- Project Management
- Immediate Interactivity
- Extraction of data for reporting



Product Manager Access

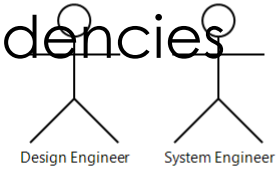


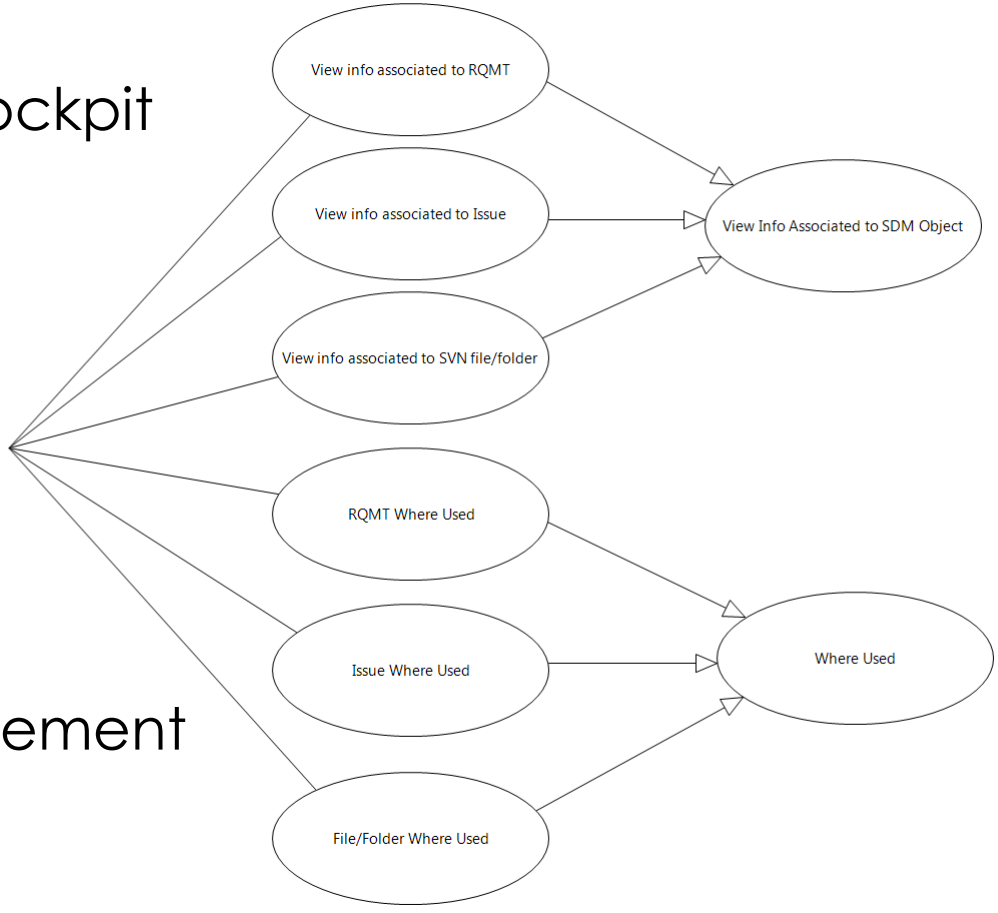
History Tracks all Changes



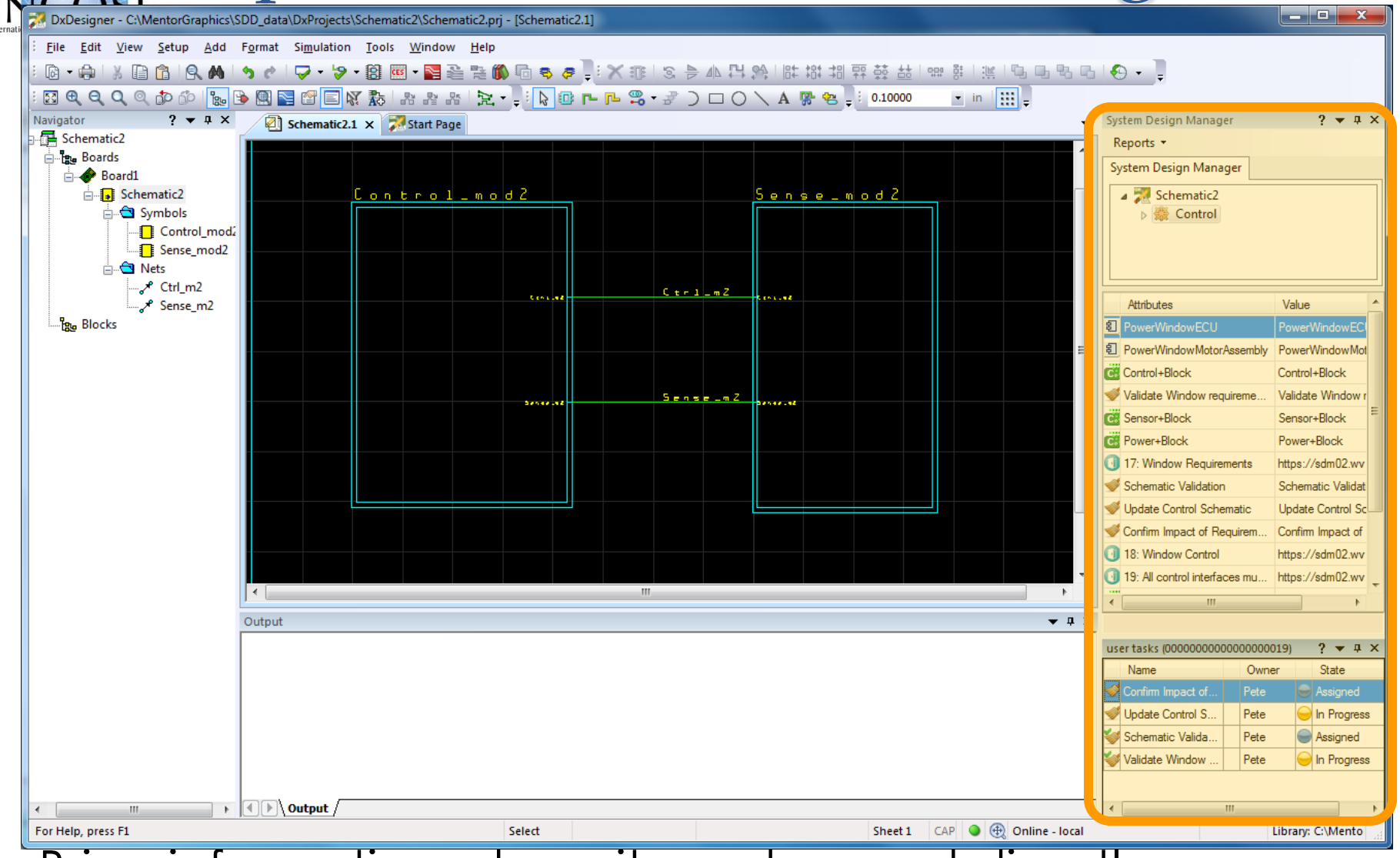
Design Tool Use Cases

- Remain in the familiar cockpit
  - Perform usual activities
  - "Link as you think"
- Access to all design dependencies
- Interactivity with System Lifecycle Management
- Immediate status and issue visibility



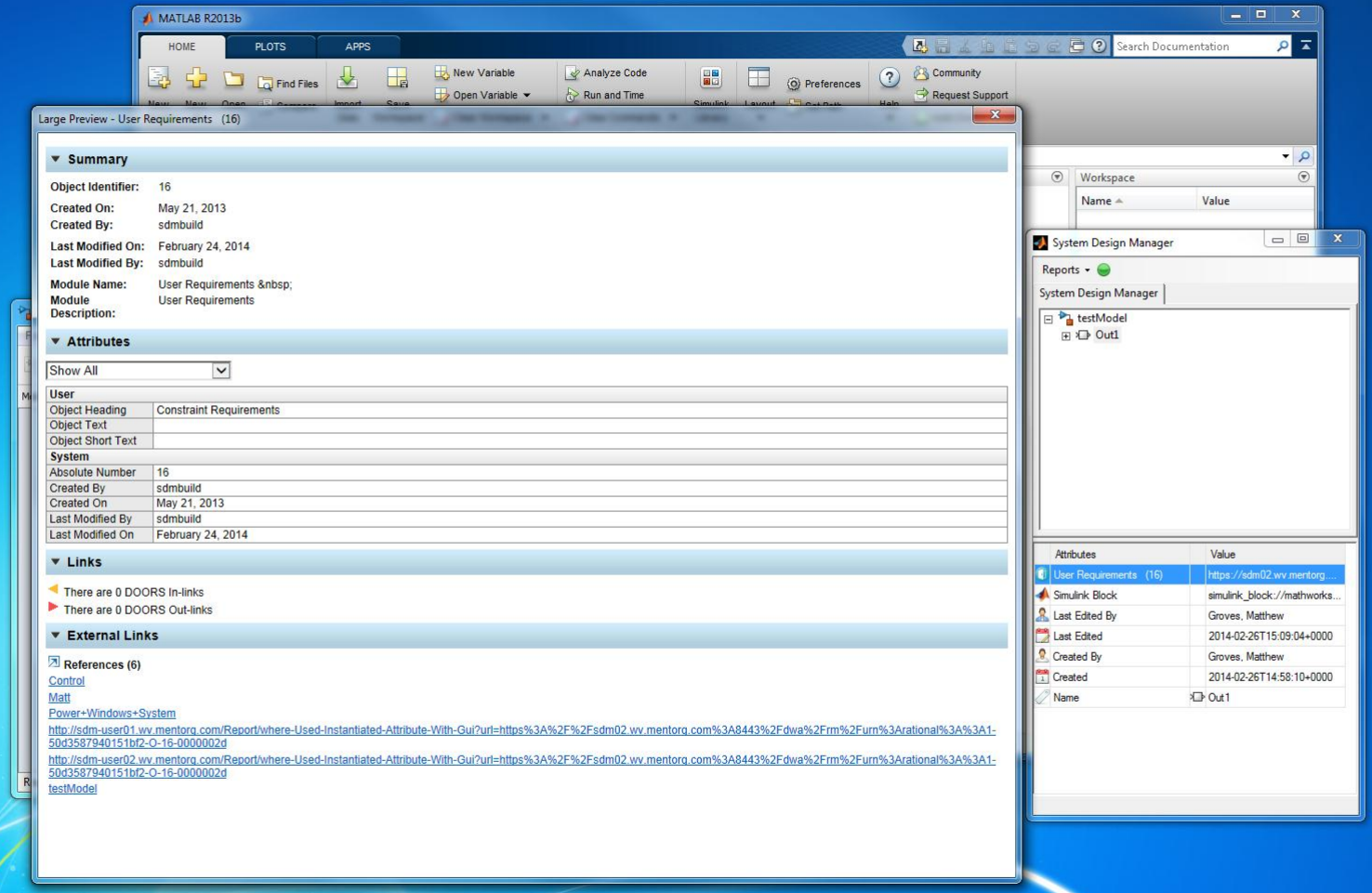


Operation inside the Design Tools



- Bring information where it can be used directly

DOORS Access (illustrated in Simulink)



Design Tool OSLC Integration

- Context makes that tool "OSLC-enabled"
- Specifically it talks OSLC to the Context SDM server
  - Single point of contact for all System Lifecycle Management
- A Context tool integration presents the relevant information directly to the user of the recipient tool
  - Focus the right information where it can be useful, and acted upon
  - The place in the target Product that this piece of the design belongs
  - Useful related attributes of that part of the design
  - Other items, such as pending tasks, dependencies, status, etc.
- The Context integration enables interactivity
  - Providing the user with all the capabilities needed to respond to a new request, act upon it, derive new relationships or dependencies, and report status. All point-and-click. Right there in the original design tool.
- All of that was tracked in the Context SDM server, lives in the history, and thus helps to document the actual process followed and create an effective audit trail to aid in meeting compliance needs

Integration of a Design Tool

- **Base Communication**
  - OSLC (core), registering the tool, catalog of functional capabilities, underlying standard communication
  - Context augments the OSLC capabilities in some aspects, and does not implement them in other aspects to provide the communication needed for the features of the integration
- **User Interface**
  - Tool-specific GUI extension to offer standard UI features
    - Connection to Product hierarchy
    - Associated Attributes
    - Selected Report (e.g. To Do task list)
- **Data Association**
  - Every tool has its own domain-specific data
  - Context integration allows point-and-click association between appropriate data objects and the Product environment
- To create this integration involves applying our library of functionality in the implementation of the target tool, e.g. Eclipse, Java Swing, TCL, C#/.Net, etc.
- The integration is essentially the same for any tool

Summarizing the Value

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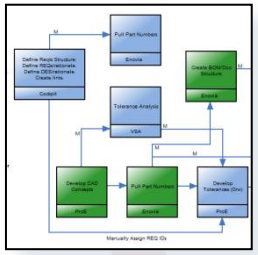
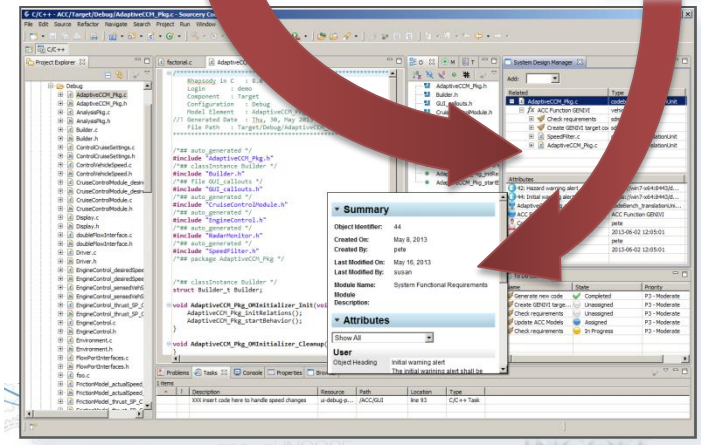
How this helps todays design process

Context Supports the Users' Daily Tasks

No walking to the bookshelf
(or heaven forbid - the library) to find the spec,
going to the next status meeting to raise the red flag,
and then coming back to the design to try to remember where she was





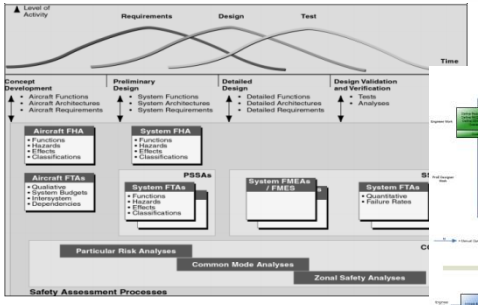
- This really works to make the designer's daily tasks easier, and supports better product management
- It plugs in to what they do today, into the tools they use today, without requiring methodology change

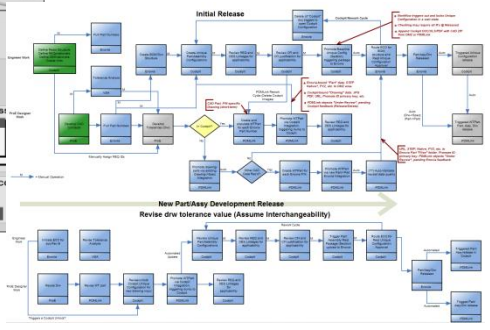
Process Definition, Tracking and Control

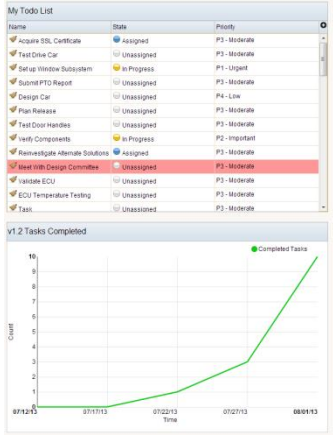
- Establish the level of process rigor
  - Specification and enforcement of development process (Integrated, Unified, Agile)
  - Objective-based activities for both independent and dependent functions
- Auditability of what was done, by whom, when, and how validated
- Full history to interrogate faults

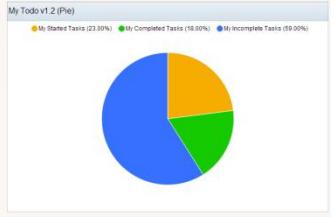
Compliance

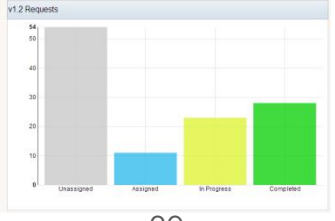
- ARP4754A
  Use of an Integrated Development Process with proper assignment of Development Assurance Level and Design Assurance Level











Summarizing the Impact of an OSLC-enabled Infrastructure

- Linked Data keeps current tools and repositories
- Interoperability of disparate tools and flows enabled
- Track changes and dependencies in real time
- Traceability supports review, audit and reporting
- Incremental inclusion gets there from here!

Starting from "Last Time"

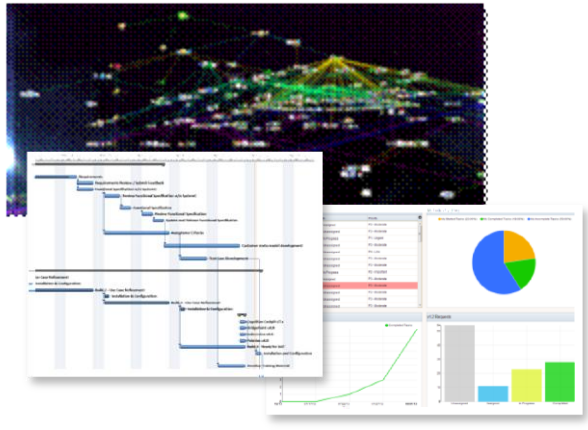
- Legacy data
  - There is always something left from an earlier project
- Previous version
  - This new product is often a derivate from the last model
- Legacy process – or not
  - A formal process may not have been in use, or a change is needed
- New requirements
  - This product will have its own unique requirements
- New standards
  - Safety-critical products are increasingly standards-driven
- New tools
  - Or continuing with the existing toolset
- New timetable
  - Of course!

Key Benefits to the Enterprise

- **Help Support Standards** (DO-178B/C, ISO26262, ARP4754A)
  - Managed process helps drive compliance goals
  - Trace of all dependencies, requirements, throughout
  - Integrated generation of required reports
  - Especially relevant in safety critical systems

- **Reduce development costs** – increase productivity
  - Incremental introduction into existing flows
  - "We have to move from 'who do I ask?' to 'I know where to find'"
  - Bring information to the right user, where and when they can use it

- **Immediate visual Analytics**
  - Create, visualize and export summary and detailed project views
  - Enable estimation of future cost/duration based on tracked history



INCOSE
International Council on Systems Engineering

Thank you

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Lifecycle Management for 'Work in Progress'

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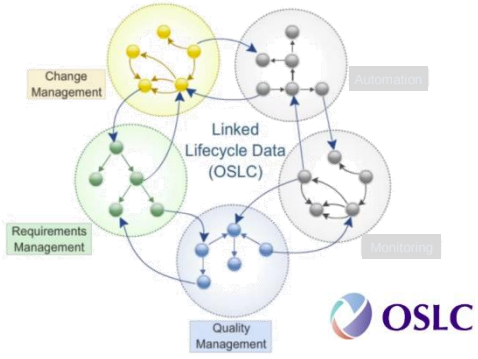

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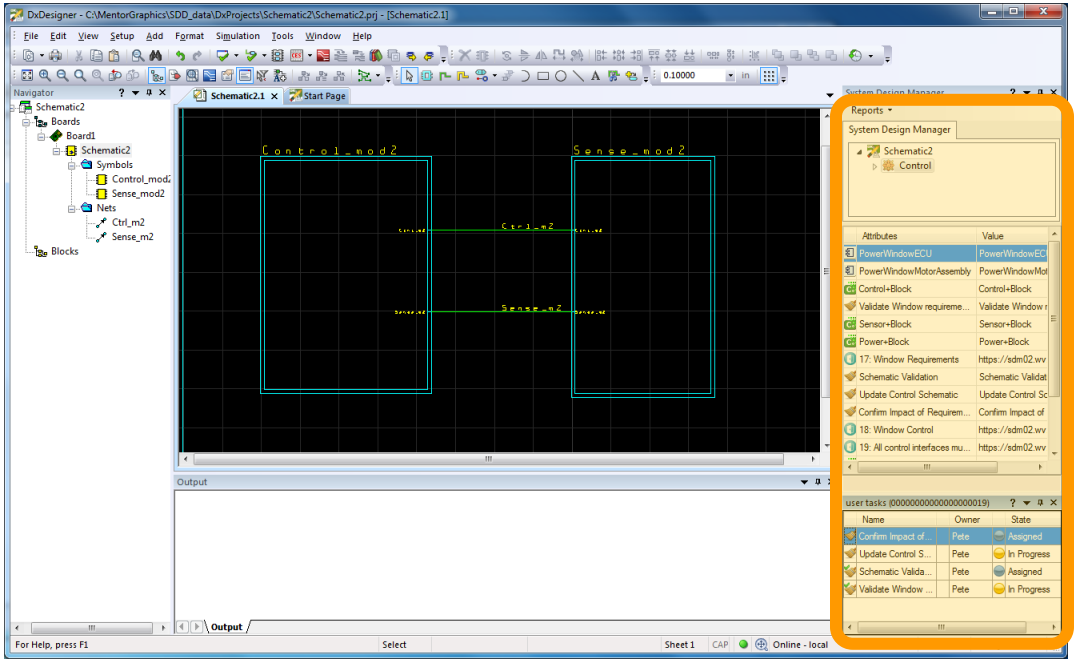
Operation inside the Design Tools

- OSLC base communication
- Tool-specific GUI extension
- Data Association
- Point and Click linking

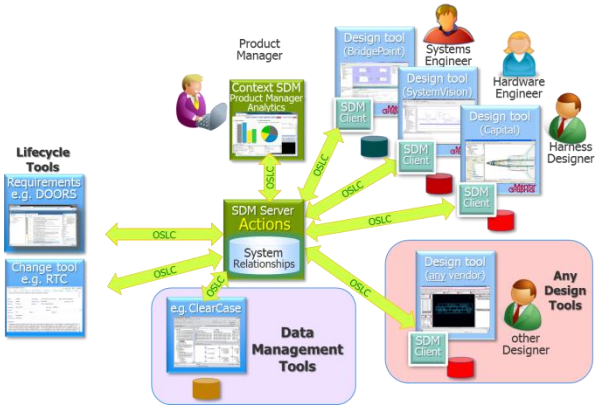


- Plugins for many tools from various vendors

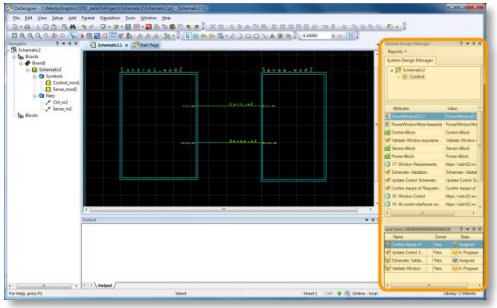
- Bring information where it can be used directly
- Maximize users' time in the primary task

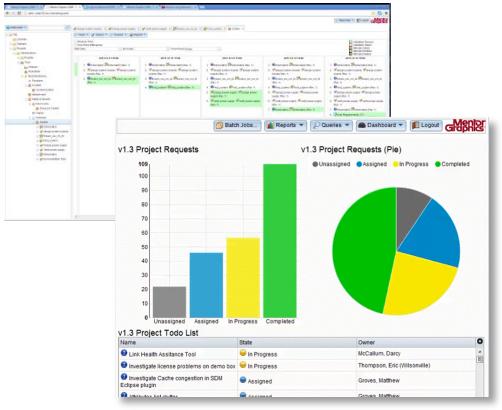
Mentor Graphics Context™ SDM

- Manage relationships between tools across design disciplines
  - Coordinate changes, dependencies and impacts
  - Integrate with **current** tools and flows



- Bring information and interaction to the users where it can be applied directly
  - Sourced from any original repositories
  - Interactive in appropriate design tools
  - Maximize usability and efficiency





- Enable product management, tracing, analytics and reporting
  - Dynamic data views, & export capability
  - Support standards compliance needs