Promoting Design Reuse with Geometric and Attributes Based Search Capabilities

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Design Reuse – Problem Statement

- **Engineers spend a significant amount of redundant effort in the development of CAD models resulting in excessive costs and inefficient product development cycle**
- **New parts ripple through the system, adding effort/cost in every lifecycle phase**
  - ***2008 DoD "Parts Standardization and Management Committee" estimated cost >$27K per part (government programs)[1]***
  - ***2011 study by the Aberdeen Group (costs between $4.5K - $23K)[2]***
- **Designers and Engineers have a hard time finding the correct mechanical CAD model to use in their design**

1. **Presentation: Parts Management Data Sharing XSB Interim Pilot Effort, Rich Rhyne, 12 April 2011**
2. **Whitepaper: Re-using data to improve productivity and reduce costs, Siemens Product Lifecycle Management Software Inc, 2011**

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Teamcenter Part Search, Selection and Insertion

Mission

- *Increase the use of standard parts from the approved Standard Parts List (SPL) and promote reuse of existing NGC design, by providing a capability to perform part search, selection and insertion, in the design environment, directly at the designer/engineer's "fingertips" .*

Scope

- *Implement a technology based on Teamcenter / aClass / Geolus to perform part search, selection and insertion (when possible), integrated with the Mechanical and Electrical (future) Computer Aided Design (CAD) tools , in the NGC(ES) Teamcenter environment.*

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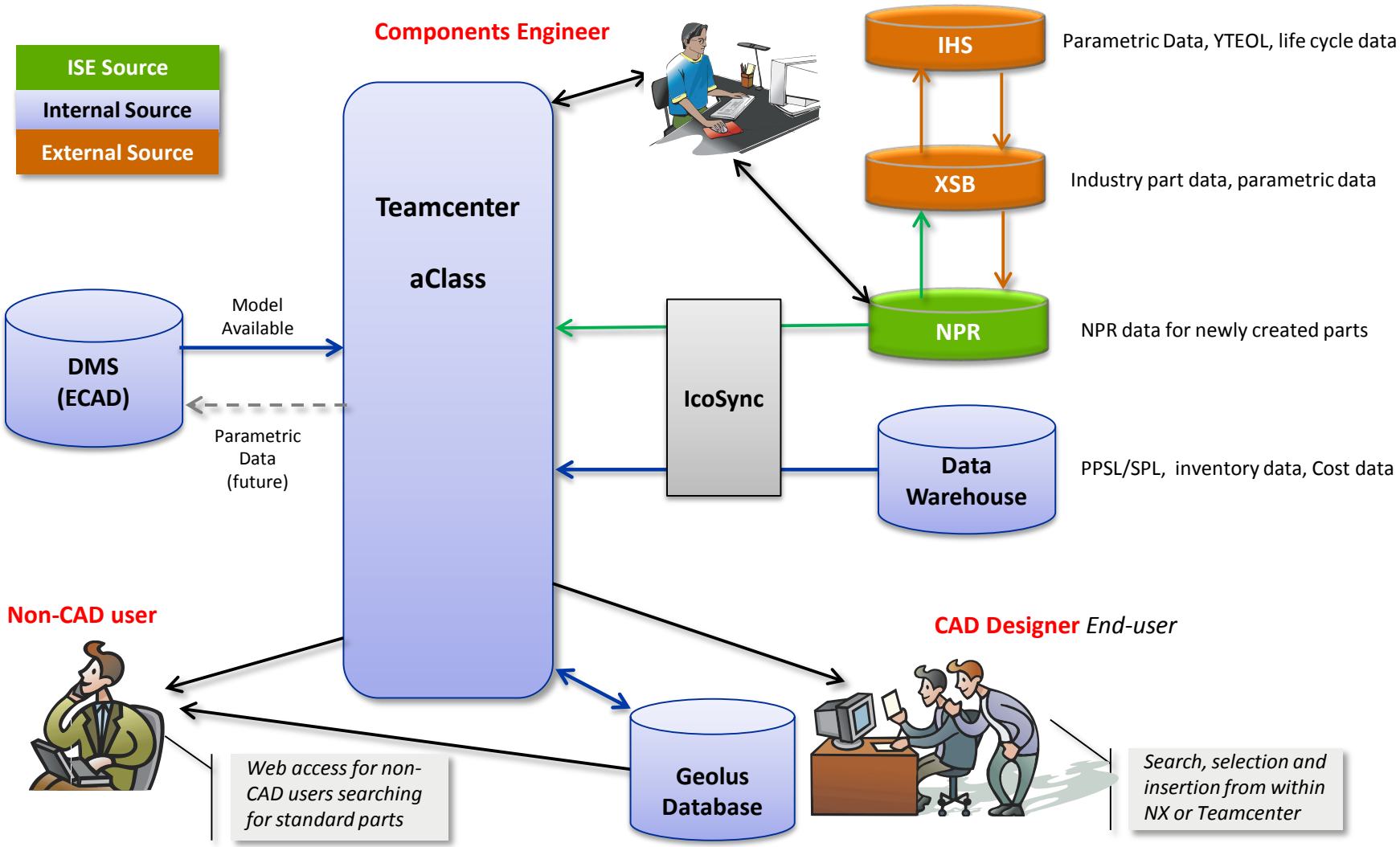
Overview: Standard Parts – Request, Search and Selection Data Flow



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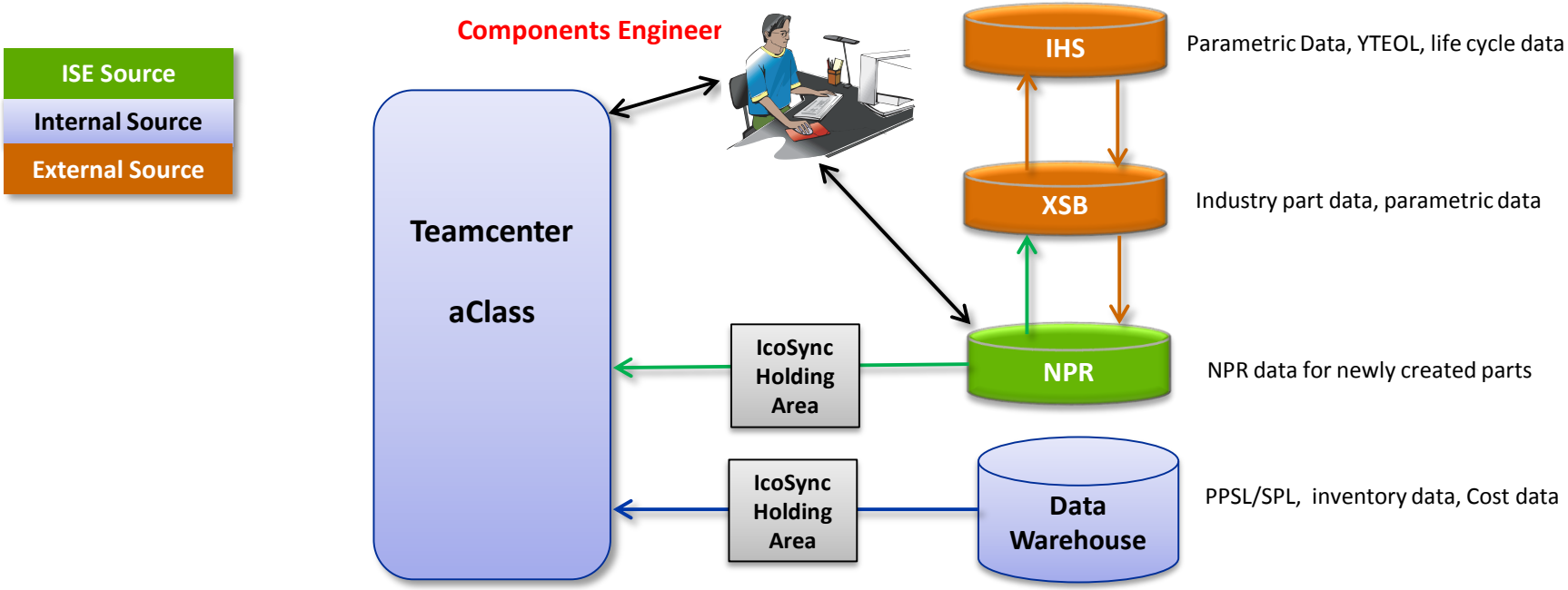
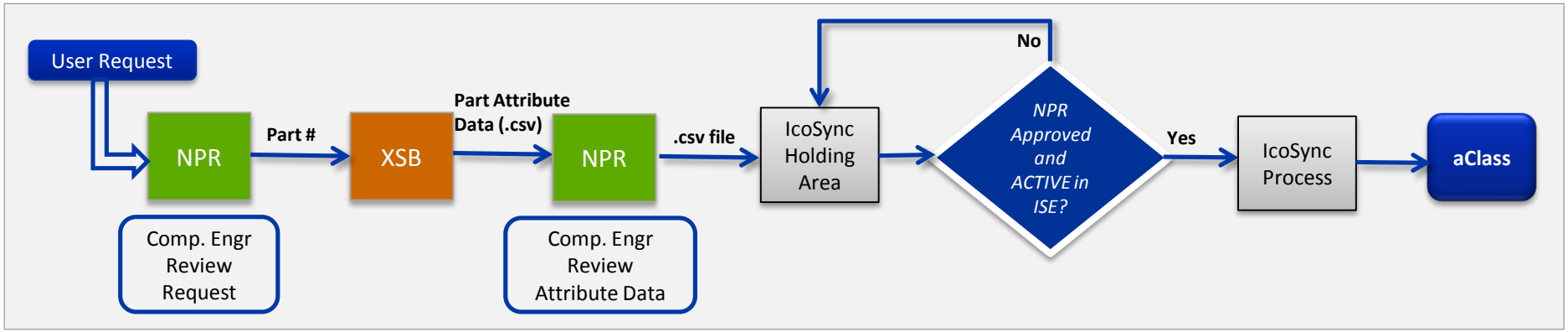
Components Engineer: Standard Parts Request





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What is aClass

- **A classification system for the structured storage and reuse of product data within Teamcenter**
- **A part selection tool used to perform Part Search Selection and Insertion of approved ES standard parts (Mechanical and Electrical) within the Teamcenter environment**
  - **Preform parametric (attribute based) searches**
  - **Access IHS specification data directly from the search results view**
  - **Can access NPR data in search results view.**
  - **Fully integrated with NX and allows NX users to search for standard parts from within the NX design environment and insert the 3D CAD model of the part directly into their assembly**
  - **Electrical parts can be accessed through DxDesigner/Expedition (future).**

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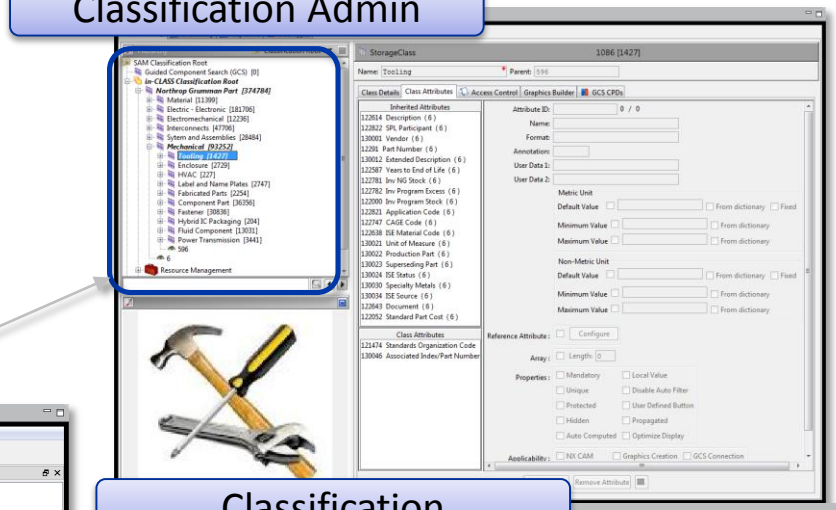
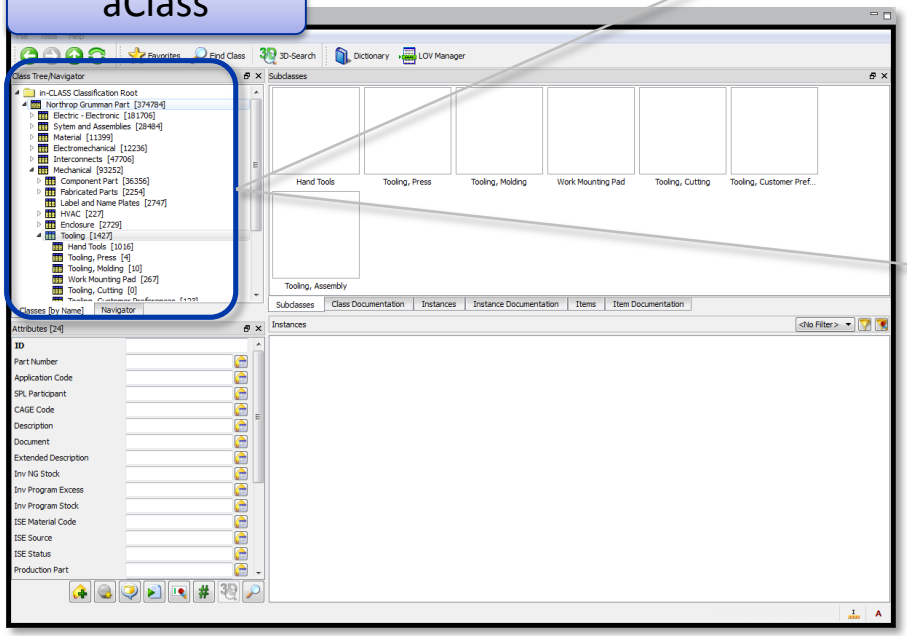
BCT aClass (Interface to Tc Classification)

- **Access and management of classification data**
  - **Search / display the classification hierarchy**
  - **Add classification objects (ICOs) to the classification hierarchy**
  - **Create and modify attribute values**

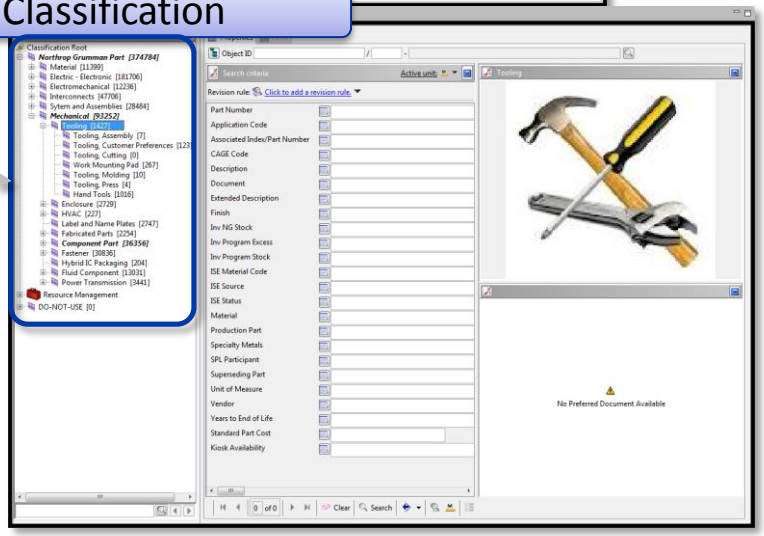
Classification Admin



aClass



Classification



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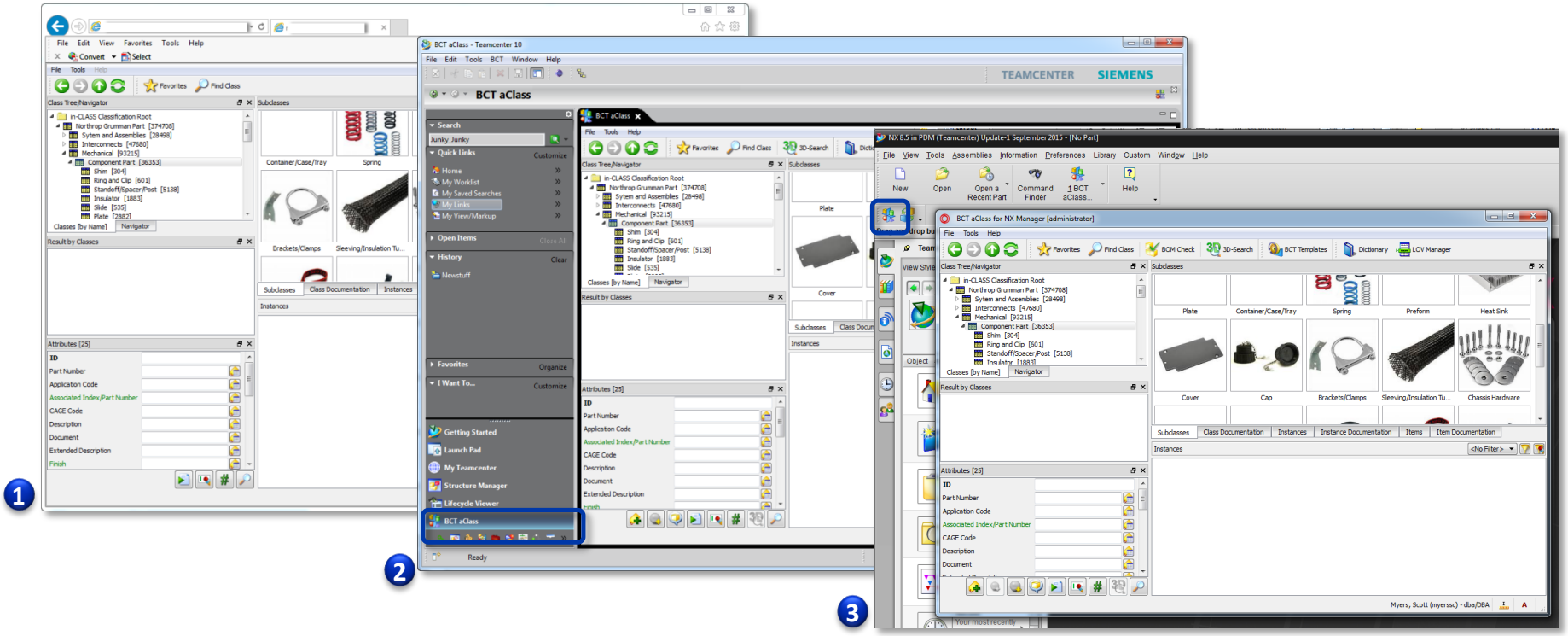
Accessing aClass - 3 User Interfaces:

User Interface	Search / View part specific data	Part Classification / Modification (ADMIN)	3D Search	Assembly Part Placement
1. aClass Web Client	✓			
2. Teamcenter Rich Client	✓	✓	✓	
3. Teamcenter managed NX Session	✓	✓	✓	✓



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Benefits of aClass

- **Provides users with the capability to search and select approved standard parts by the part number or by using a parametric based search (part attributes), without leaving their design environment.**
  - **Fully integrated with the Teamcenter in the OneVault environment**
  - **Fully integrated with NX mechanical design environment**
- **Contains data for over 400,000 parts (Electrical and Mechanical) available for reuse in ES designs.**
- **Quickly identifies Standard Parts List (SPL) items, which promotes design reuse and cost savings.**

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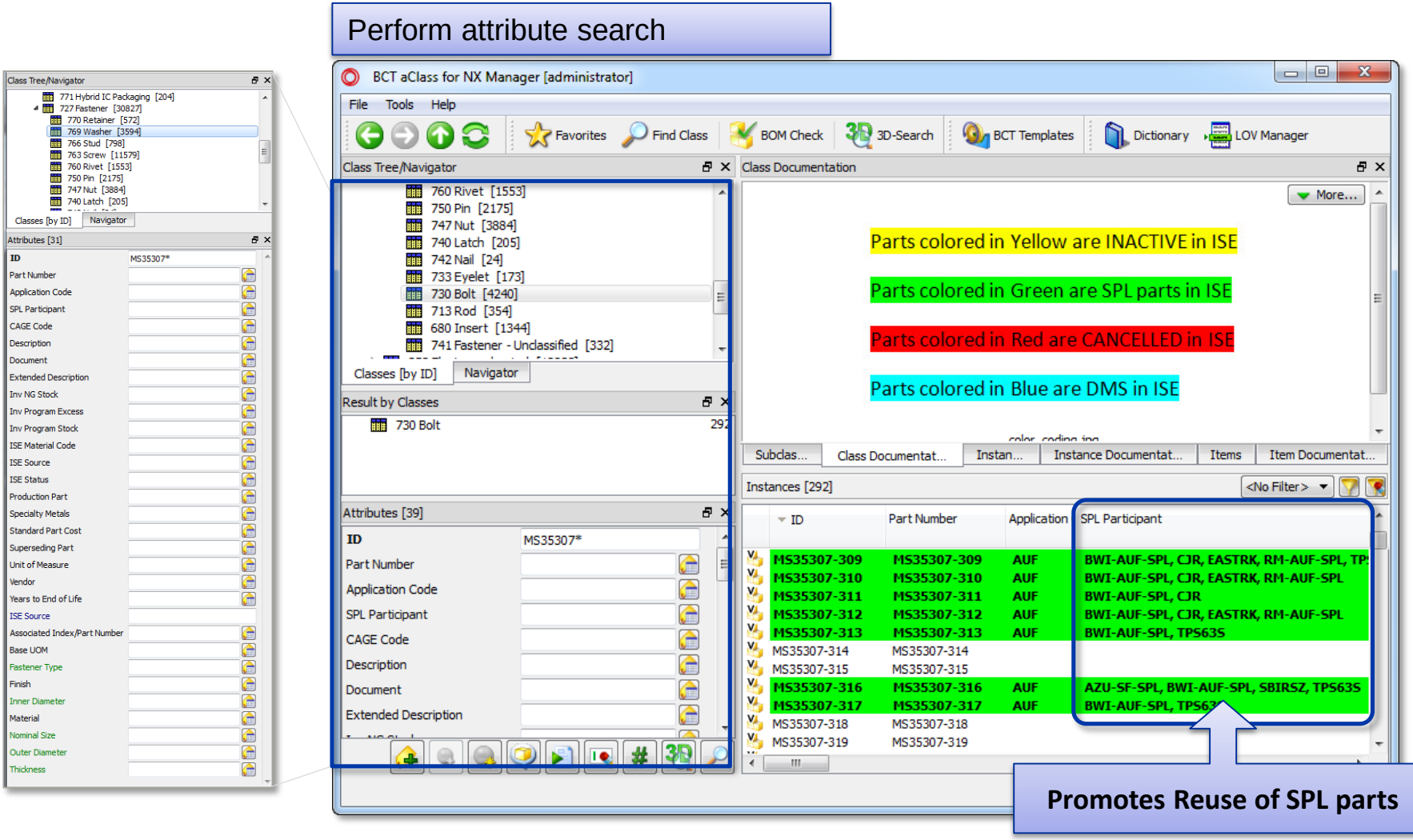
View of aClass Search Results



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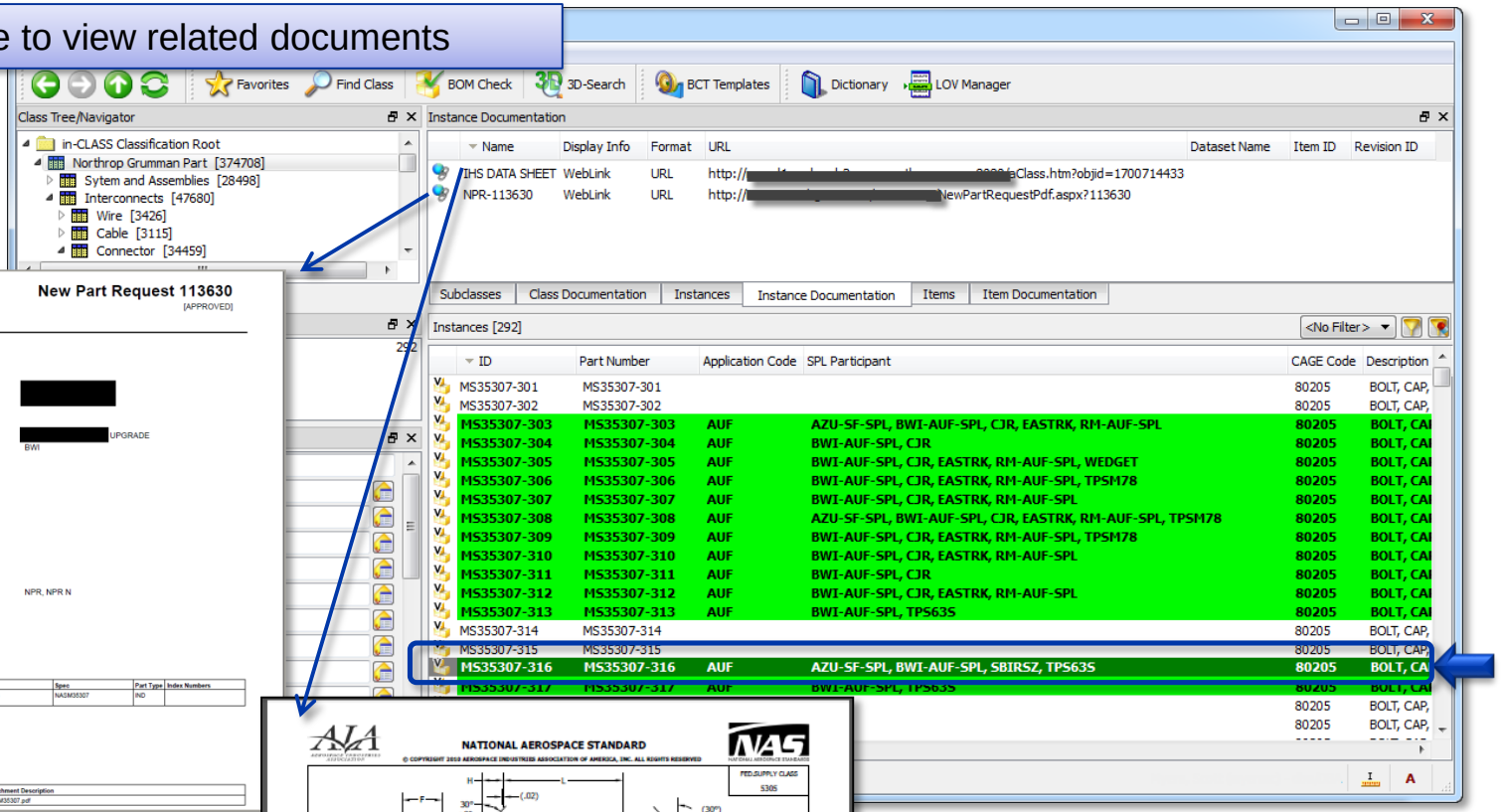
Viewing aClass Documentation

Select part in table to view related documents



ES New Part Request (NPR)

IHS online documentation

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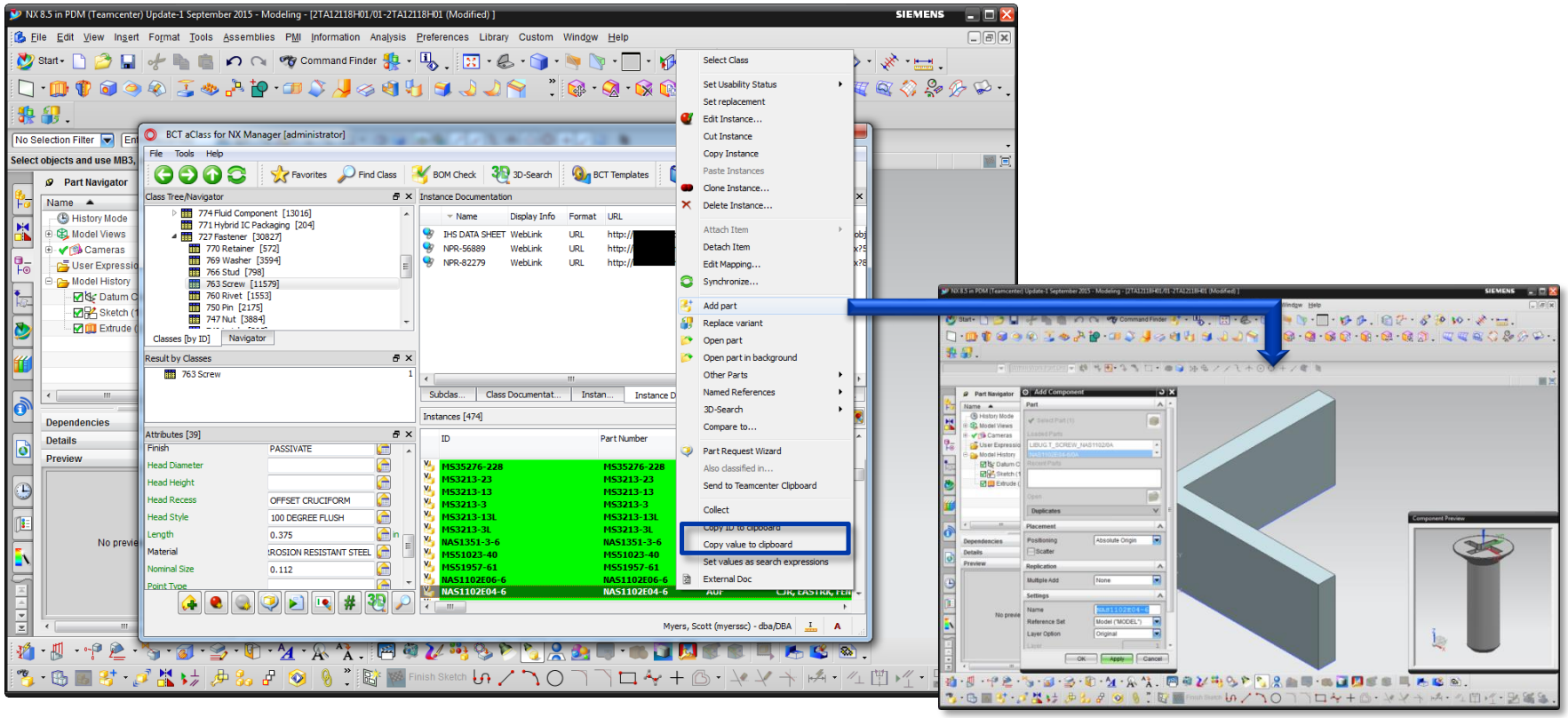
NX Designer Interaction

- **Search and Navigate Part Data**
- **Part Evaluation and Comparison**
- **Insertion of CAD Model in Open Session (Multi-Cad Support)**
- **Access to Associated Data (Specs, Notes, etc)**
- **New Part Request**



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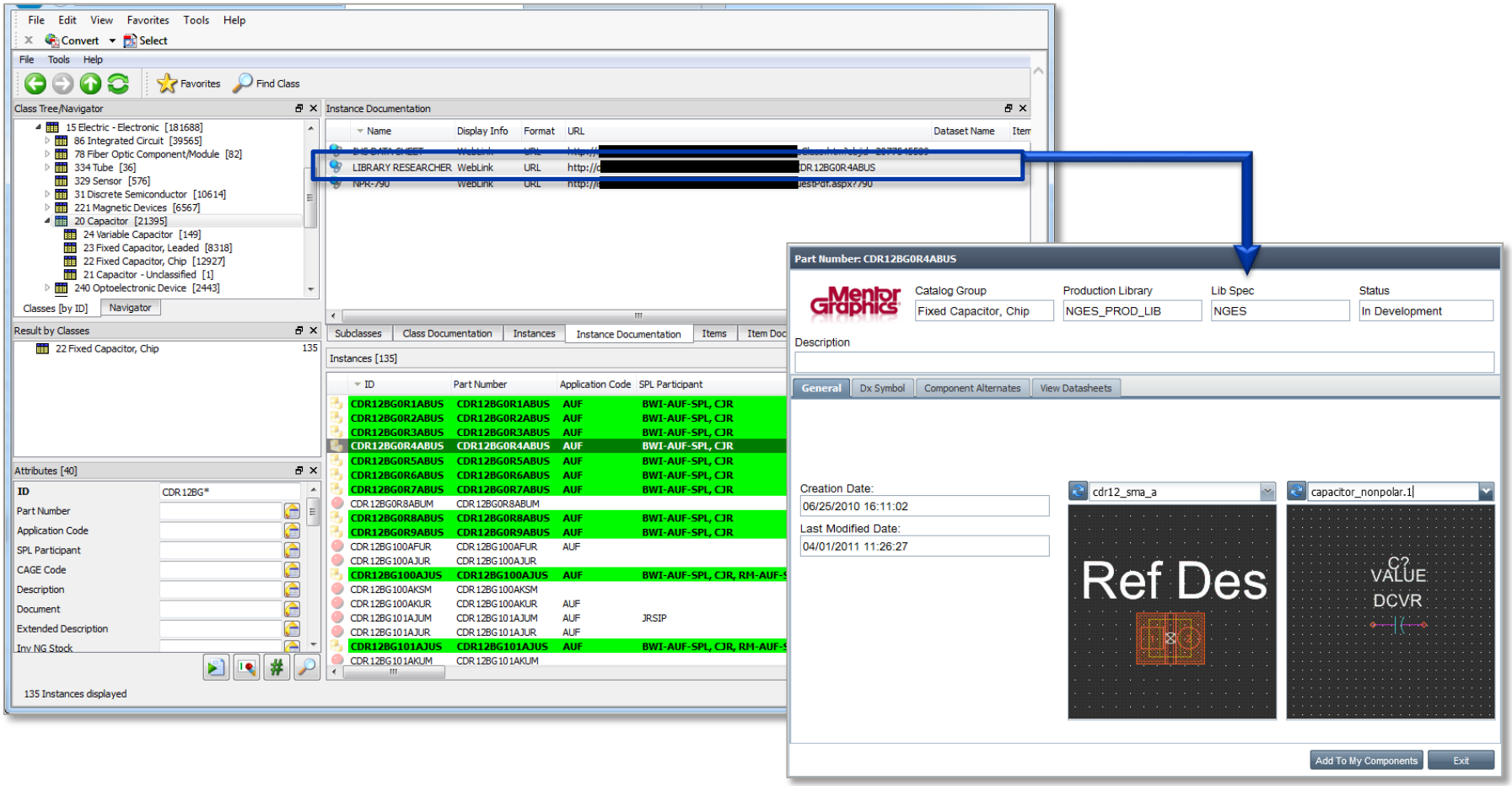
Electrical Interaction – DxDesigner/Expedition

DMS Library Researcher - Show the ECAD geometry view



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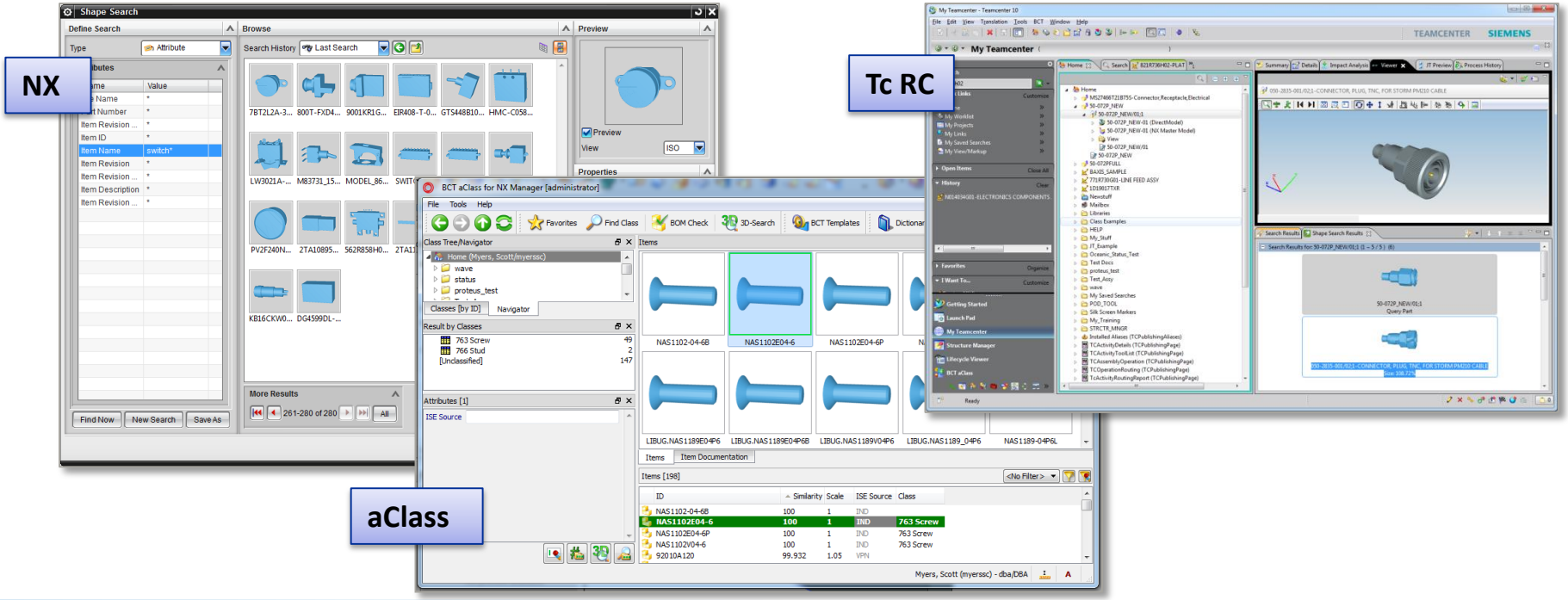
What is 3D Shape Search

- **Tool for searching for existing parts and designs based on geometry**
  - **Searches for similar solids in Geolus database**
  - **Database is created from Item Revision Attribute data and JT files stored in Teamcenter**
- **Accessed/Used from:**
  - **NX**
  - **aClass**
  - **Teamcenter Rich Client**
  - **Web interface (Coming soon. Requires separate login account)**



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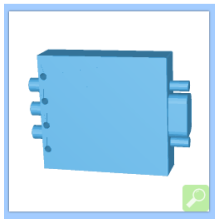
The Geolus Database

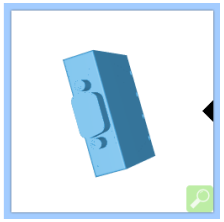
Initial Population (Geolus Teamcenter Indexer)

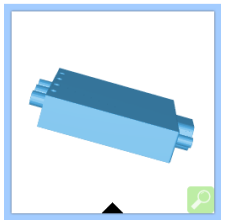
- **Initial mode – queries Teamcenter server**
  - **Generate list of Item Revisions matching the given criteria**
  - **Extract JT and PLMXML file**
  - **Convert JT and PLMXML file to Geolus XML files**
  - **Upload to Geolus Server**

Updates

- **Based on JT (Direct Model) created in Teamcenter by:**
  - **Nightly batch process that creates JT file for all NX piece part designs modified during the day (no Assembly JT)**
  - **NX Save when "Save JT" option is turned ON**
- **Nightly - Geolus "indexing" process creates "fingerprint" of the geometry and metadata from Teamcenter**
- **Generation of Smart Thumbnails**

ISO 

LEFT 

BOTTOM 

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Use Cases of Shape Search

- **Design phase:**
  - **Search for similar parts to use as "start parts"**
  - **Search for similar parts to use in assembly**
- **Analysis phase:**
  - **Search for similar parts for similar analysis methodology**
- **Manufacturing and NC Programming**
  - **Reuse of NC tool path from similar parts**
  - **Reuse of tooling and fixtures**
  - **Promote group technology (similar geometry -> similar manufacturing process)**

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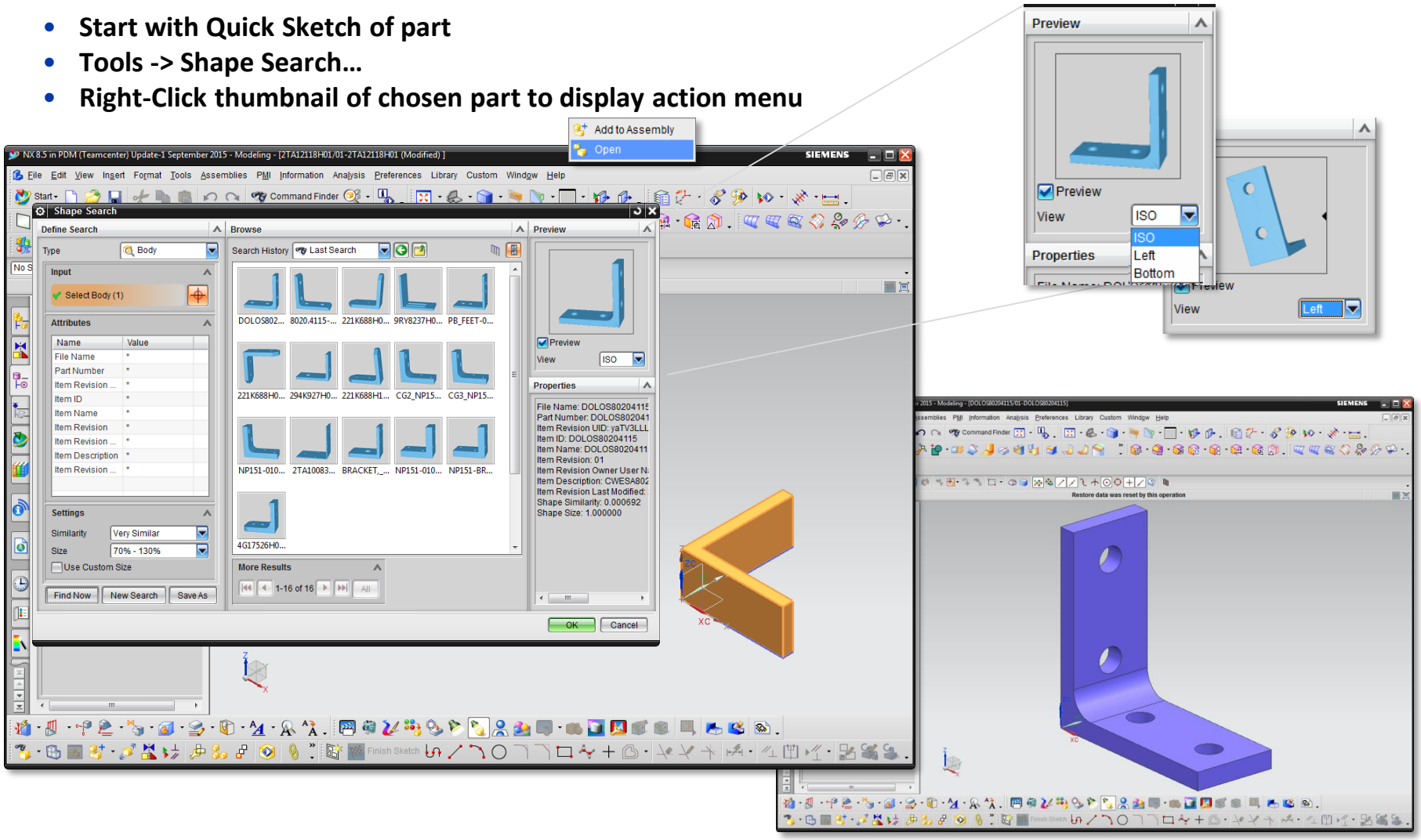
Search for similar parts to use as “start parts”

- **Start with Quick Sketch of part**
- **Tools -> Shape Search…**
- **Right-Click thumbnail of chosen part to display action menu**



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Geolus - Similar Parts

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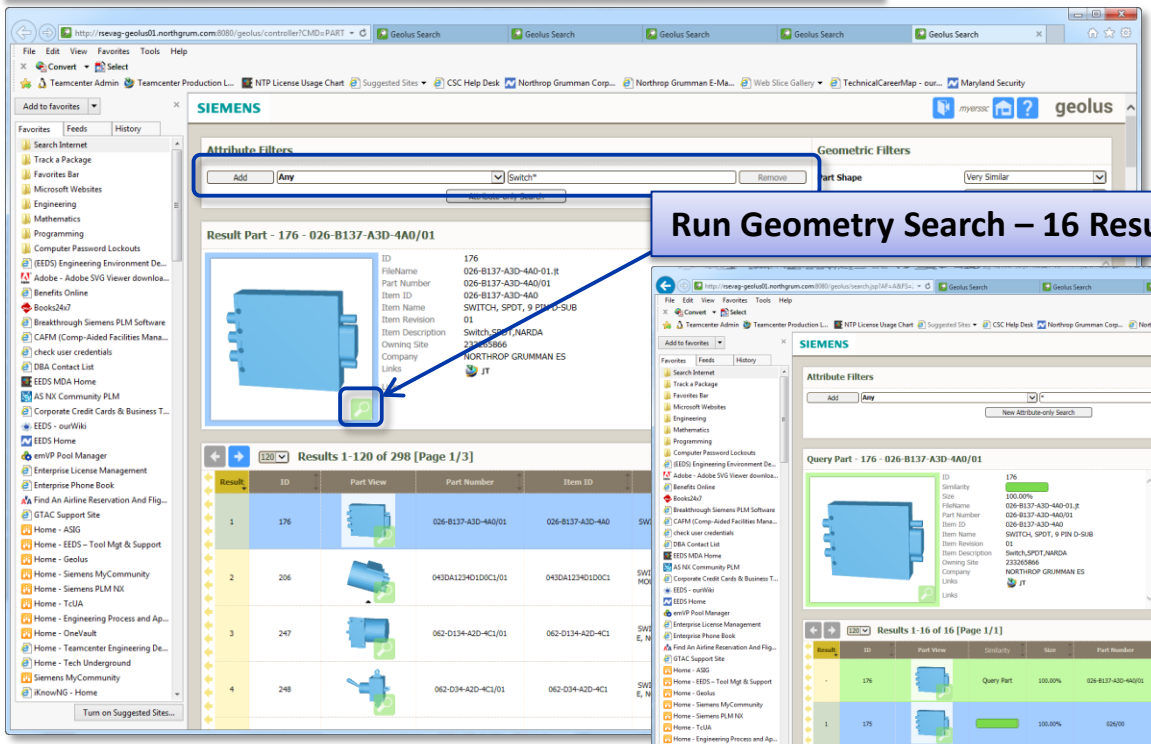
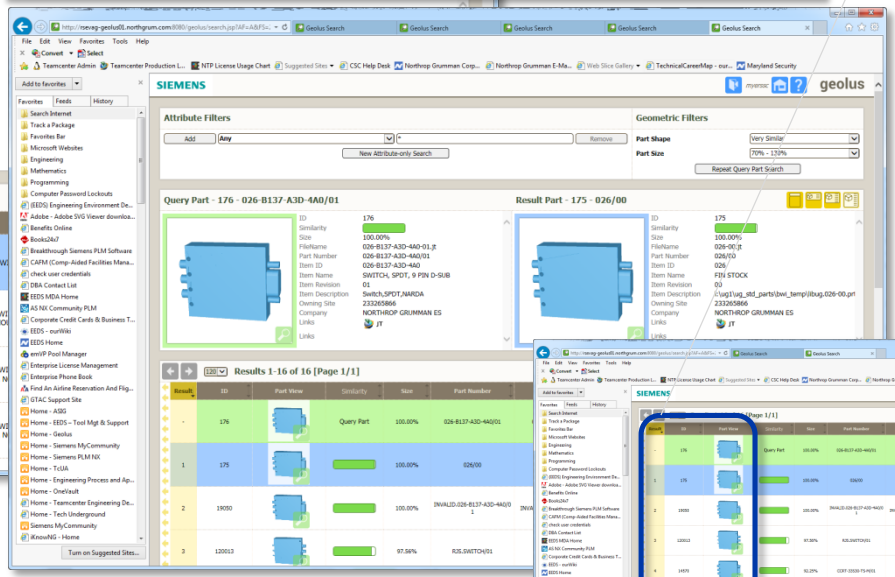
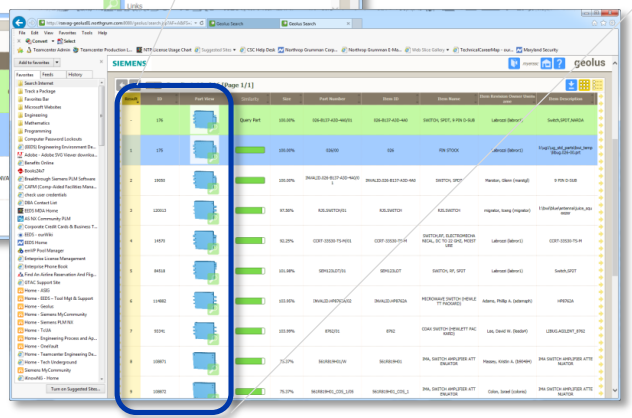
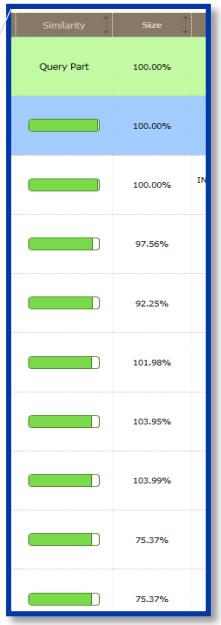
Start with Attribute Search – 120 Results



Run Geometry Search – 16 Results







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Geolus – Duplicate Parts

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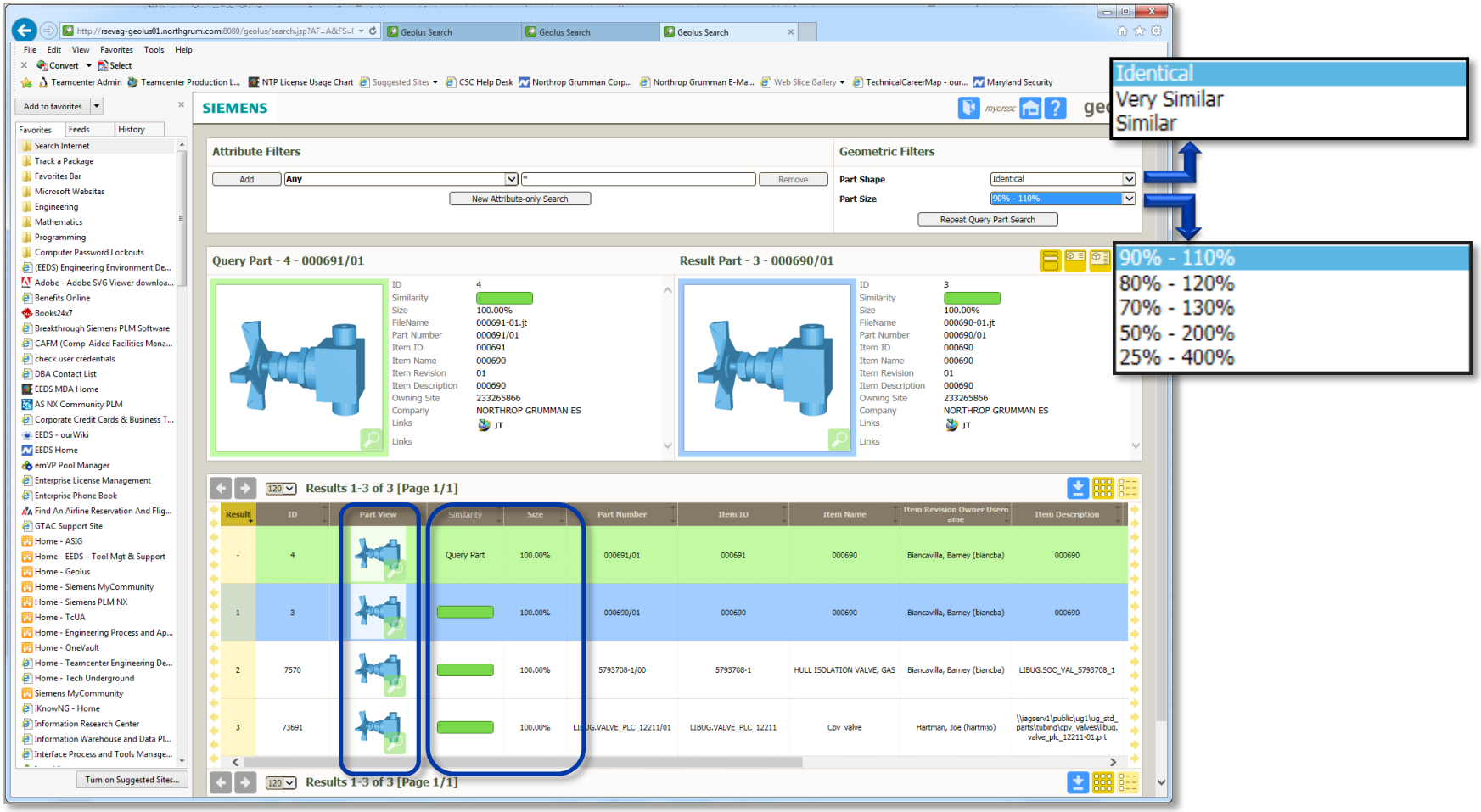

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Benefits of 3D Shape Search

- **Promotes reuse of NGC Designs**
- **Promotes reuse of existing standard parts**
- **Saves design cycle time by finding existing parts with similar geometry that can be modified for reuse**
- **No need to know part numbers to find existing designs/parts**
  - **Company acquisitions (legacy PDM, nomenclature)**
  - **Programs using different naming conventions**
- **Eliminate time and expense related to the redesign or purchasing of duplicate parts.**
- **Find similar NGC Designs for Classification**

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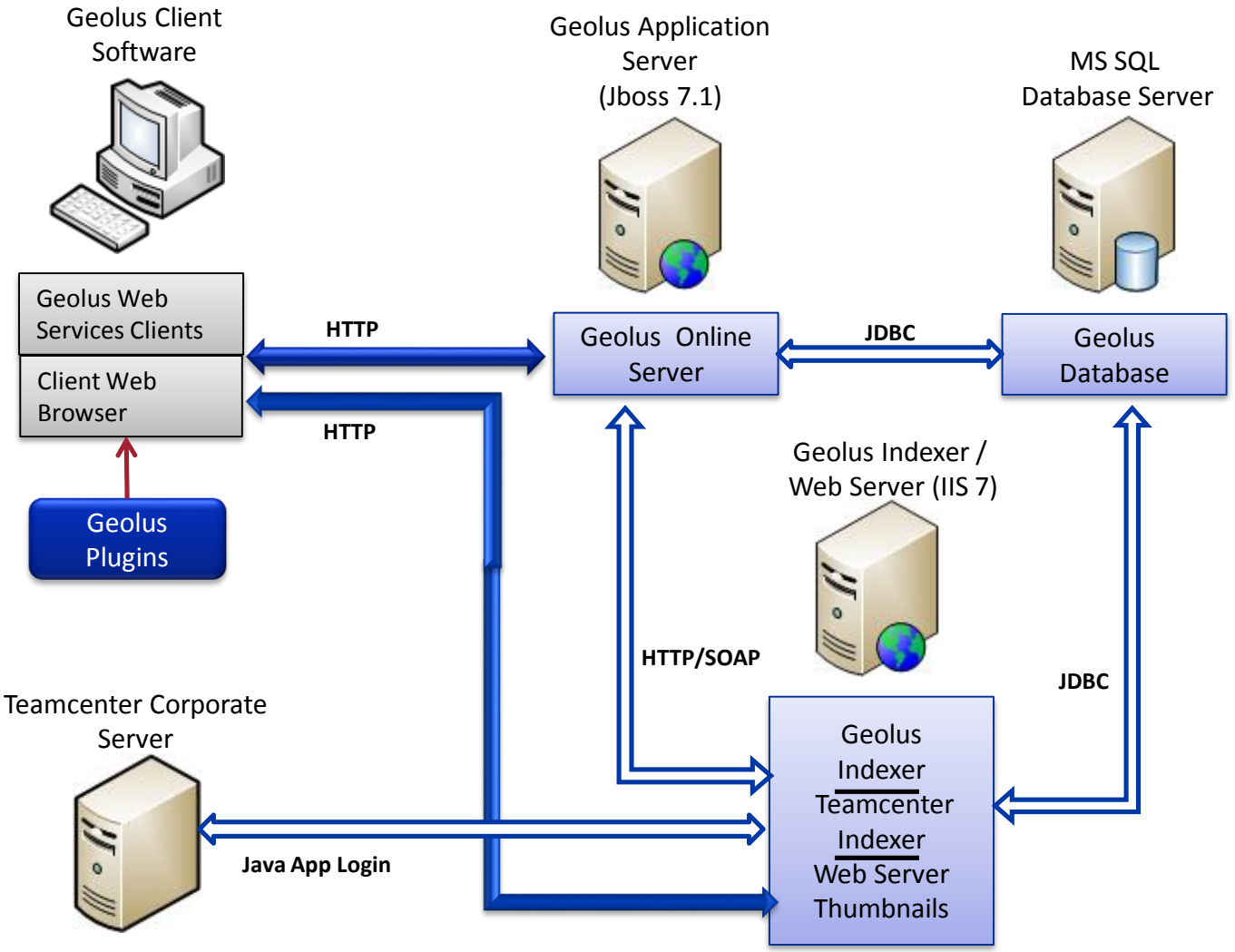
Geolus v8.0 Architecture Diagram



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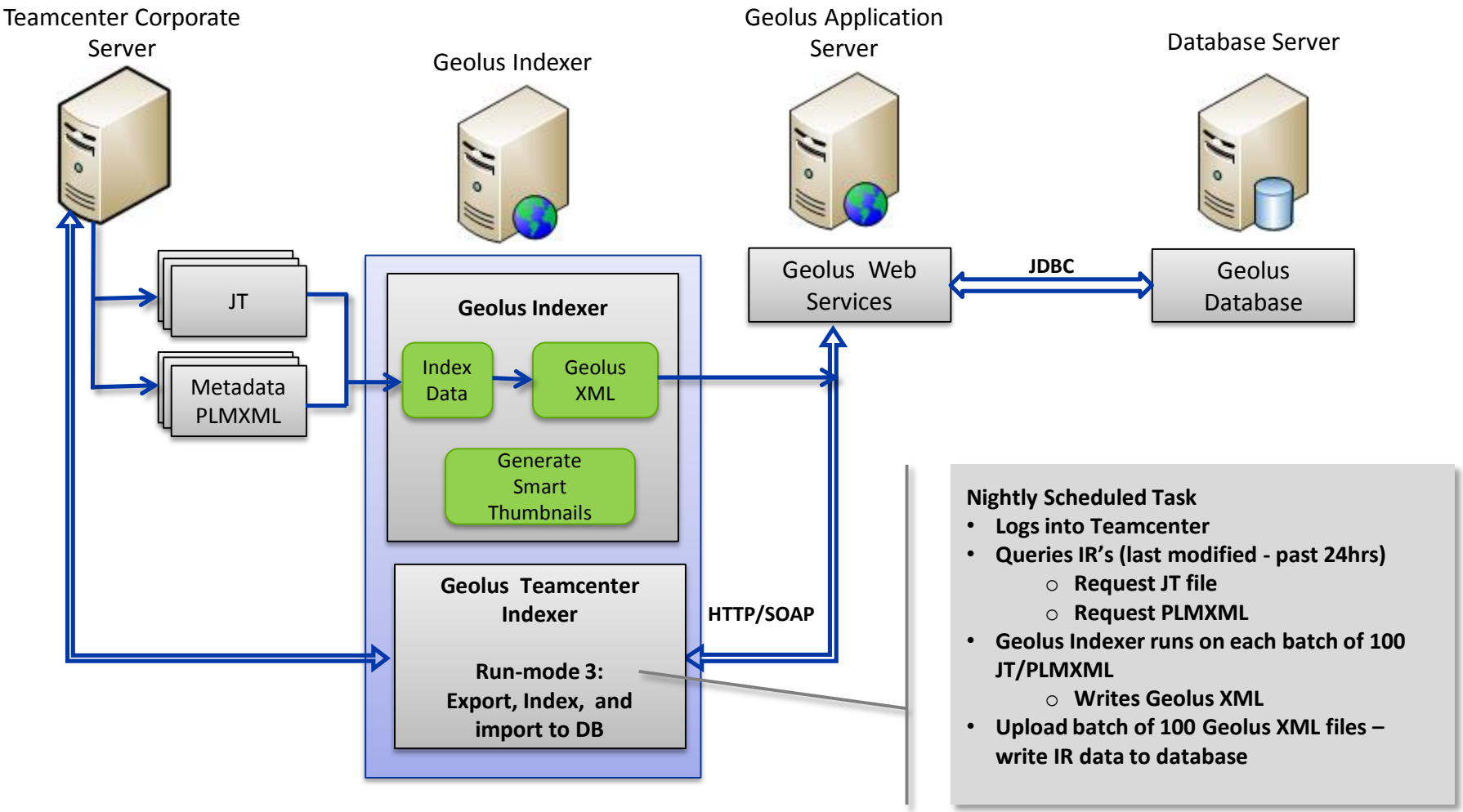
Geolus Daily Indexing Process Flow



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