Our journey into Semantics

How to contextualize the meaning of Semantics for your organization

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Global Director IT R&D / KM

FLUOR

10th - 13th of September 2018 in Vienna

SEMANTiCS

Where Machine Learning Meets Semantics

Agenda

- Corporate Overview
- A peek into an Engineering Project
- Challenges and Goals
- A Pivotal Concept: The Knowledge Assembly
- Three Proof Of Concepts
- Future Plans

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2018 CORPORATE OVERVIEW

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Differentiators

- **Executing work in challenging locations**
- Optimizing returns on Clients' capital investments
- **Developing innovative and cost-effective technical solutions**
- Meeting compressed schedules
- **Linking global engineering resources**
- Sourcing material globally
- Mobilizing diverse workforces
- Managing joint ventures and alliances worldwide
- **Providing global fabrication capabilities**
- Utilizing modular construction techniques
- **Optimizing assets' life cycle**

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Worldwide Office Locations

More than 100 Offices in 36 Countries on 6 Continents

Americas

Aliso Viejo, California, U.S.
Anchorage, Alaska, U.S.
Arlington, Virginia, U.S.
Baytown, Texas, U.S.
Bogotá, Colombia (2)
Buenos Aires, Argentina
Calgary, Alberta, Canada (3)
Corvallis, Oregon, U.S.
Dallas, Texas, U.S. (2)
Deer Park, Texas, U.S.
Edmonton, Alberta, Canada
Greenville, South Carolina, U.S. (3)
Houston, Texas, U.S. (4)
Idaho Falls, Idaho, U.S.
Ithaca, New York, U.S.
Kingston, Jamaica
Lima, Peru (2)
Long Beach, California, U.S.
Mexico City, Mexico (3)
Neiva, Colombia
North Charleston, South Carolina, U.S.
Pasadena, Texas, U.S.
Port of Spain, Trinidad and Tobago
Portland, Oregon, U.S.
Richland, Washington, U.S. (3)
Rockville, Maryland, U.S.
Salt Lake City, Utah, U.S.
San Francisco, California, U.S.
San Juan, Puerto Rico
Santiago, Chile
Tampico, Mexico
Texas City, Texas, U.S.
Vancouver, B.C., Canada
Washington, D.C., U.S.

Europe/Africa/Middle East

Aberdeen, Scotland (2)
Abu Dhabi, U.A.E. (2)
Al Ahmadi, Kuwait
Al Khobar, Saudi Arabia
Amsterdam, The Netherlands
Antwerp, Belgium
Asturias, Spain
Bergen-op-Zoom, The Netherlands
Birmingham, England
Doha, Qatar
Dubai, U.A.E.
Dublin, Ireland
Durban, South Africa (2)
Farnborough, England
Gaborone, Botswana
Gliwice, Poland
Hengelo, The Netherlands
Johannesburg, South Africa (2)
London, England (3)
Madrid, Spain (2)
Maputo, Mozambique
Moscow, Russia
Ritthem, The Netherlands
Rotterdam, The Netherlands (3)
Sakhalin Island, Russia
Secunda, South Africa
Sneek, The Netherlands
Tarragona, Spain
Utrecht, The Netherlands

Asia/Australia

Atyrau, Kazakhstan
Bangkok, Thailand
Beijing, China
Brisbane, Australia
Cebu, Philippines
Jakarta, Indonesia
Kuala Lumpur, Malaysia
Manila, Philippines
Melbourne, Australia
New Delhi, India (2)
Perth, Australia
Seoul, South Korea
Shanghai, China
Singapore (2)
Sydney, Australia (2)
Tokyo, Japan
Zhuhai, China

Fluor Years of Experience in Region

North America	South America	Europe	Africa	Middle East	Asia	Australia
106	81	70	58	71	67	68

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Detailed Engineering – Information (Docs & Data)

- Process Engineering
- Mechanical Engineering
- CSA Engineering
- Electrical Engineering
- Control Systems Engineering
- Piping Engineering & Design

- Project Management & Controls
- Procurement & Subcontracting
- Logistics

- Construction

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CHALLENGES

- ***Data Integration*** *-- Aggregation of dispersed (silo-ed) data*
- *Data Completeness -- incomplete data sets & changing data set*
- *Disperse Data landscape -- changing source*
- *Data Volatility -- heavy reliance on document exchange with implicit data ownership definitions*
- ***Data Consistency*** *-- focus on (silo-ed) work process related data*
- ***Data Linking*** *-- Inability to link related knowledge assets at a cross-discipline level*
- **Data ReUse** – Inability to leverage what other engineers have done
- *Data Accessiblity/Analytics -- Not possible to answer the question "Which discipline knows about* x?"

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GOALS

Organizational Aspects

- Project Execution organization
- Information Technology organization
- Knowledge Management organization

Technical Aspects

- Aggregation of dispersed data sets
- Integration in support of optimized work flows
- Enterprise Search
- Analytics (Descriptive, Diagnostics, Predictive and Prescriptive)
- Data definition/manipulation flexibility
- Utilizing unstructured data
- Cognitive capabilities

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What is a Knowledge Assembly?

"Knowledge Assets" (petals of the flower) are combined based on the user and what they are working on (who, what, where) and are combined into "Knowledge Assemblies".

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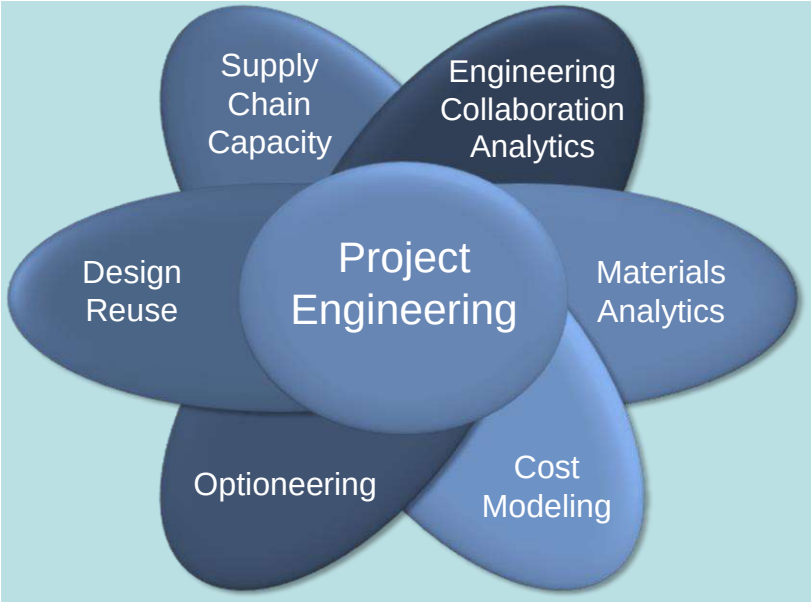
Illustrative Project Engineering Knowledge Assembly



Supply Chain Capacity

- Using analytics, determine supply chain capacity for various components needed in the construction and assembly of the cad/cam design being done.

Engineering Collaboration Analytics

- Using Text Analytics, searching through engineering discussion threads for latest leading practices.

Materials Analytics

- Using analytics, determine material options and costs to various parts.

Cost Modeling

- Utilizing costing models to run through various costing and pricing options with various supplier products.

Optioneering

- Running through a series of different design decisions and options

Design Reuse

- Access to “similar” assembly, sub-assembly, and pre-defined “leading” practice designs

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Illustrative Project Planning Knowledge Assembly

Project Planning

- Predictive Project Controls, Supply Chain Analytics, HSEC, Historical Project Plans and Look Backs, Legal / Regulatory, Economic Forecast, What-If planning, Human Capital Planning, Budget Forecast, Best Practices

Predictive Project Controls

- Using analytics, determine historical similar projects and actual costs associated, pre-determine Predicted costs of projects based on historical trends and current econometric conditions.

Supply Chain Analytics

- Optimized Supply Strategies based on Predicted/Actual project needs.

H.S.E.C

- Health, Safety, Environment and Community. Pulls relevant and latest data surrounding project being worked based on geographic conditions and local social context

Historical Project Plans and Look Backs

- Risk Reports, Project Plans, Look Backs and all other relevant project data from historical similar projects.

Legal/Regulatory Info

- Compliance and all other pertinent legal issues pertaining to a project

Economic Forecast

- Materials, Labor, and Environmental forecasts meant to predict future costs to better plan for projects.

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SEMANTIC SEARCH PROOF OF CONCEPT (PoC)

How can we create an Enterprise Search function (which works with Knowledge Assemblies**)?**

- Want to use RDF to be able to express relationships in a contextual manner
- Will use Virtuoso as our triple store
- Focus on one application first : IBM Connections (Fluor's social and knowledge environment)

The Big Picture: A Journey towards easier access of information

- Regular Search
- Semantic Search
- Persistent Search
- (Federated) Enterprise Search
- Cognitive Information Presentation

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SEMANTIC SEARCH PROOF OF CONCEPT (PoC)

Current IT environment

- traditional structured data requirements (relational world + lots of spreadsheets/docs)
- additional security requirements → quad store
- IT Governance requirements → IBM Websphere vs Apache Tomcat

3-step Approach

- Content retrieval
- Content indexing
- Content search & presentation

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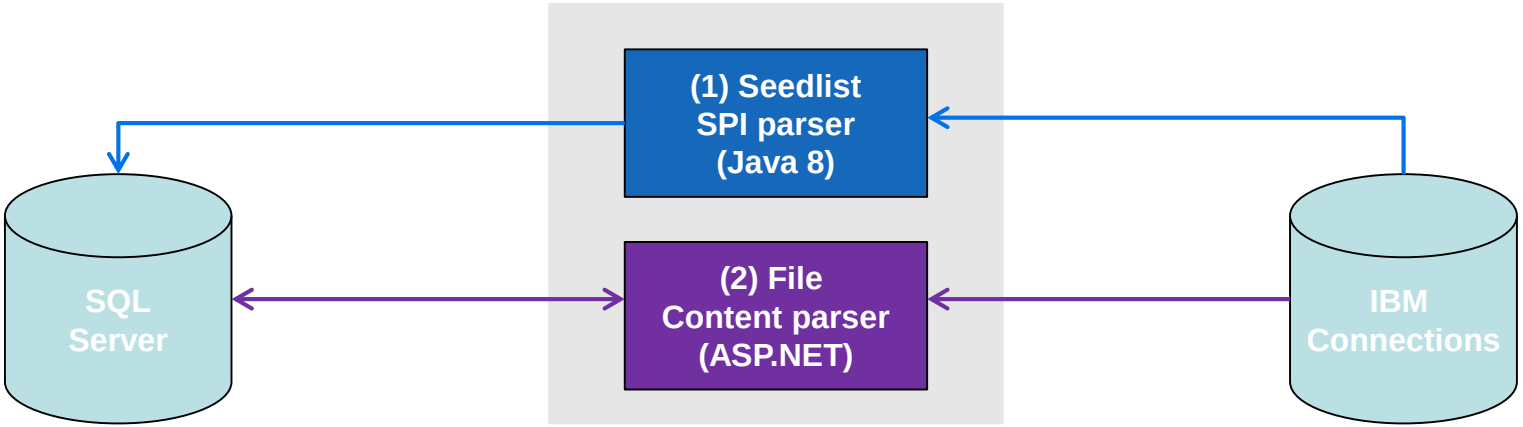
Components: Content retrieval

- Parse Connections Seedlist SPI and Connections community memberships, and store in SQL (can process deltas)
- Retrieve file content and store back to SQL



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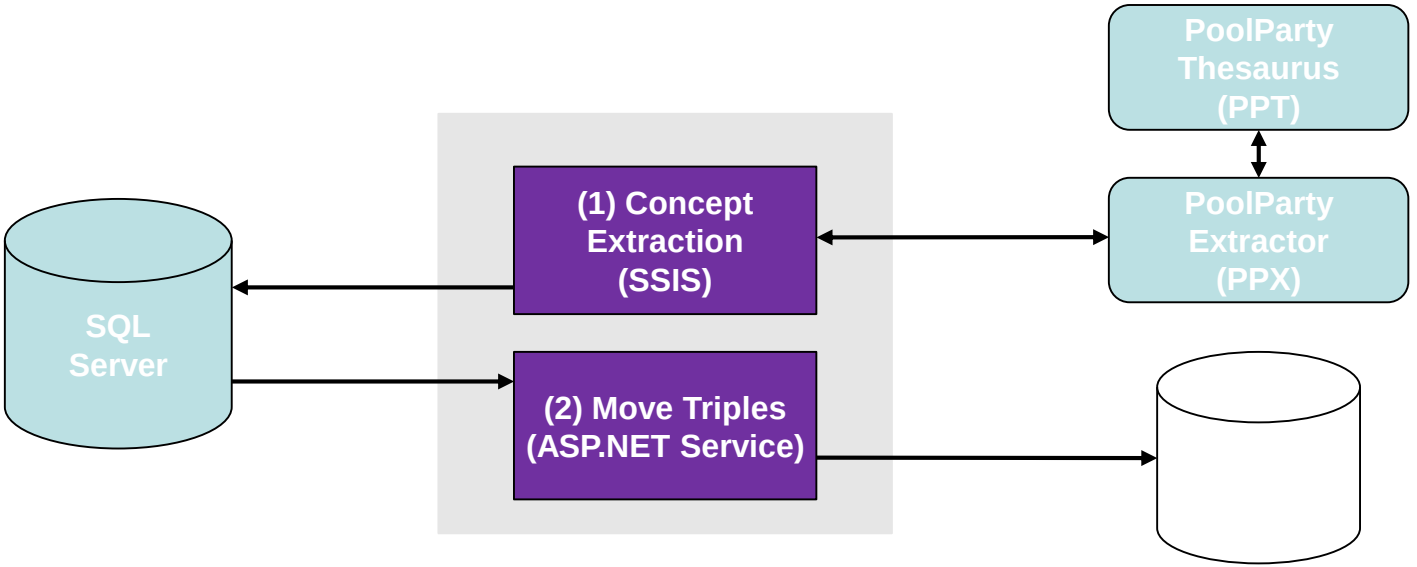
Components: Content indexing

- Process data with PoolParty to identify matching concepts from the Thesaurus, create Triples, store back in SQL
- Move Triples to Virtuoso



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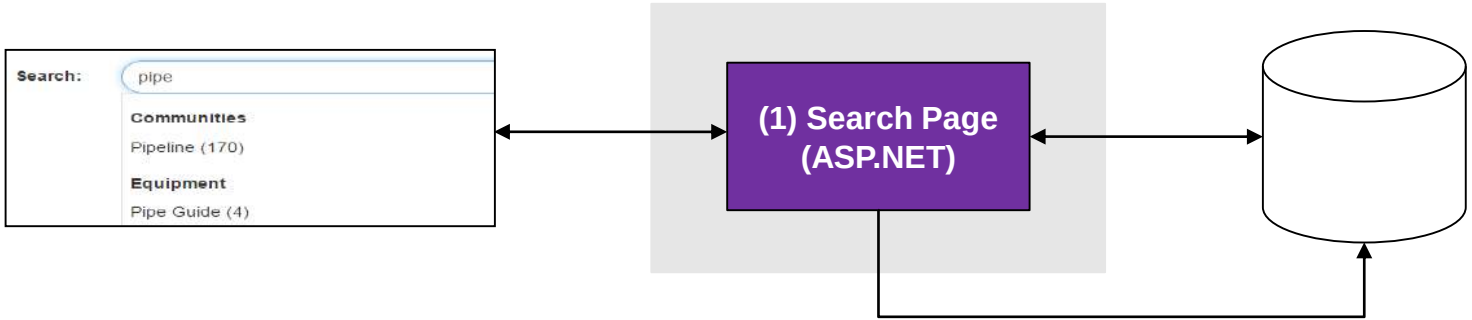
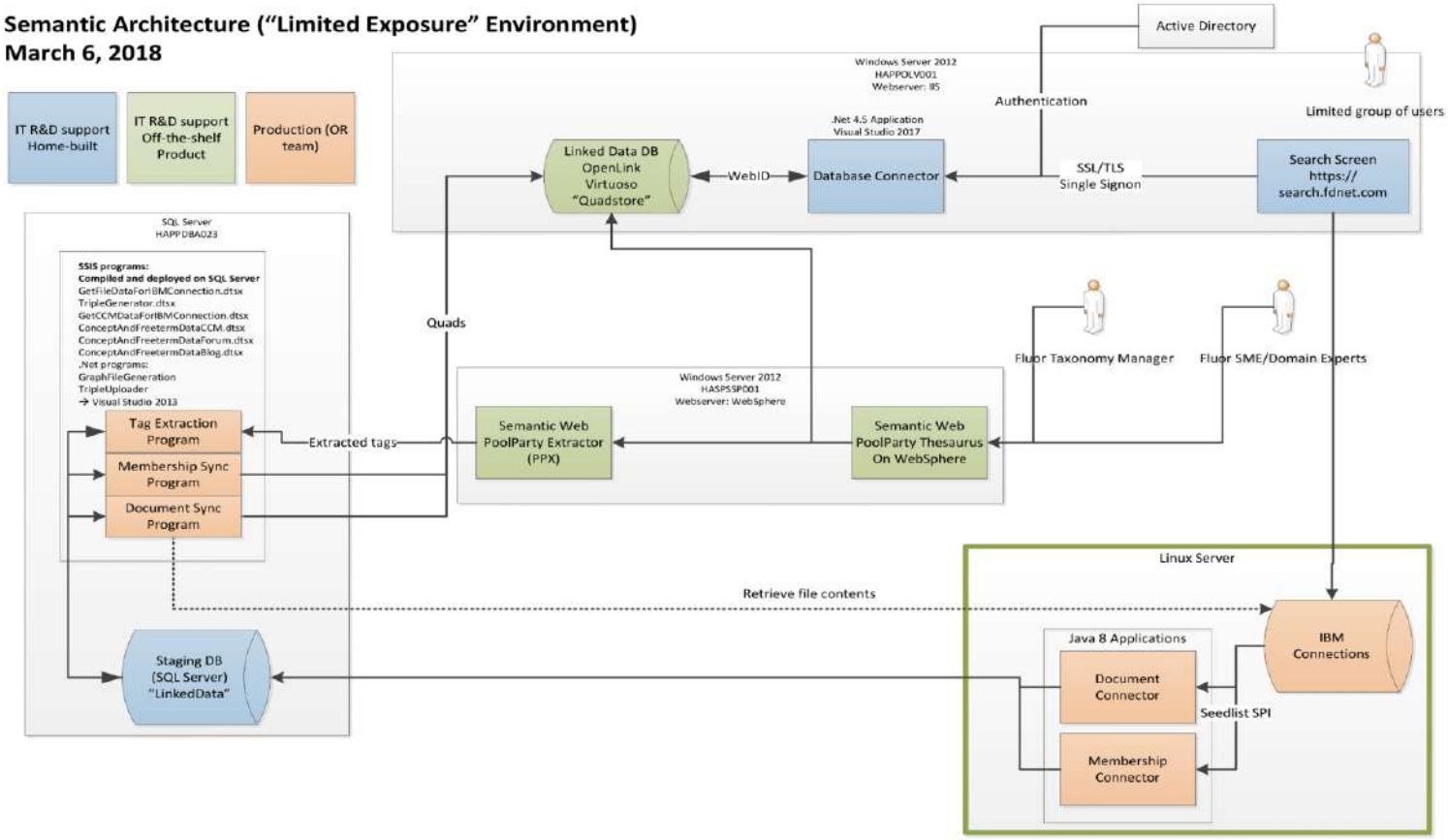
Components: Content search & Presentation

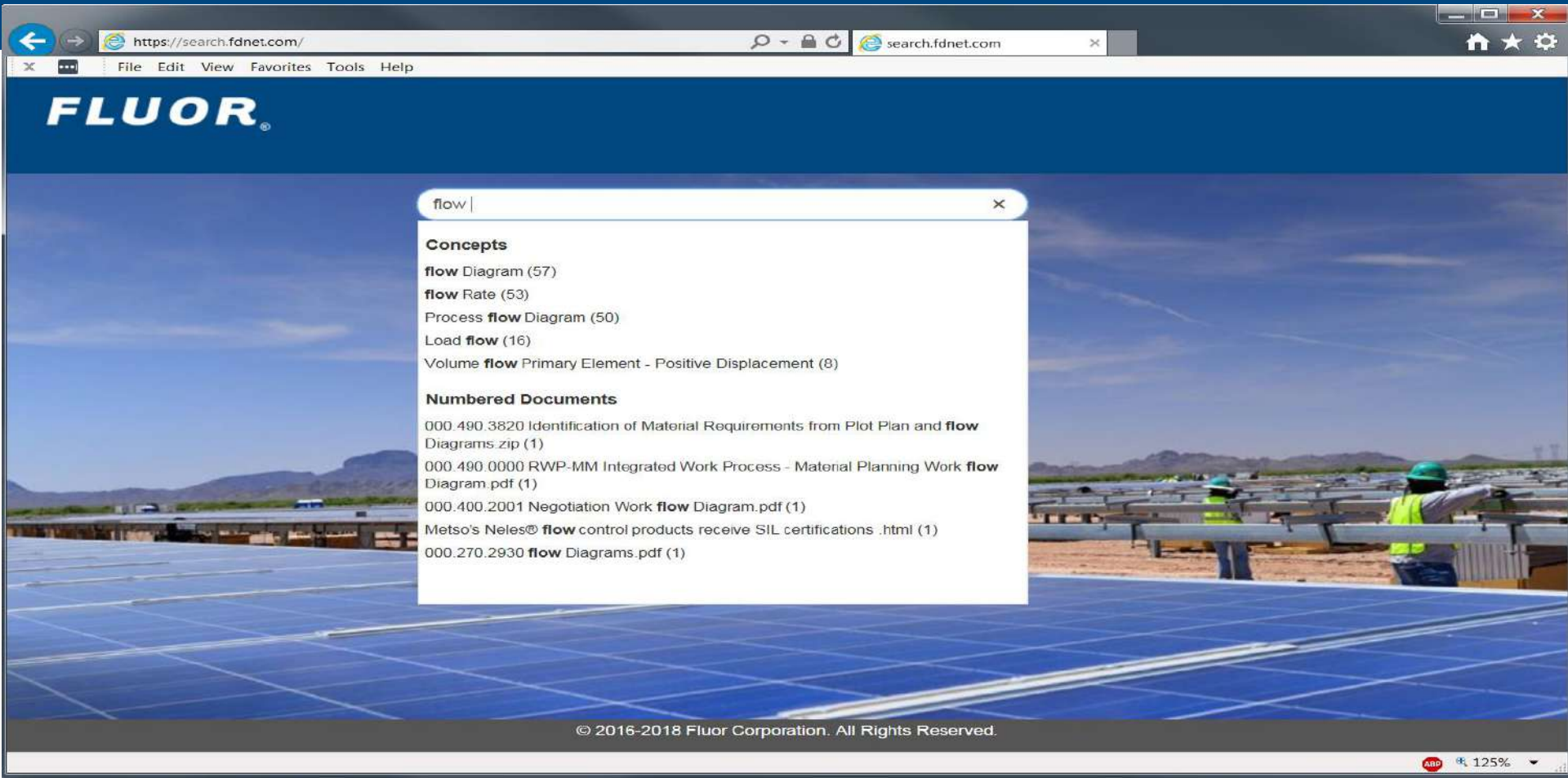
- User single sign on to Search page using Windows credentials
- Search page builds SPARQL, queries Virtuoso on behalf of user and returns results
- Search query logged in Virtuoso



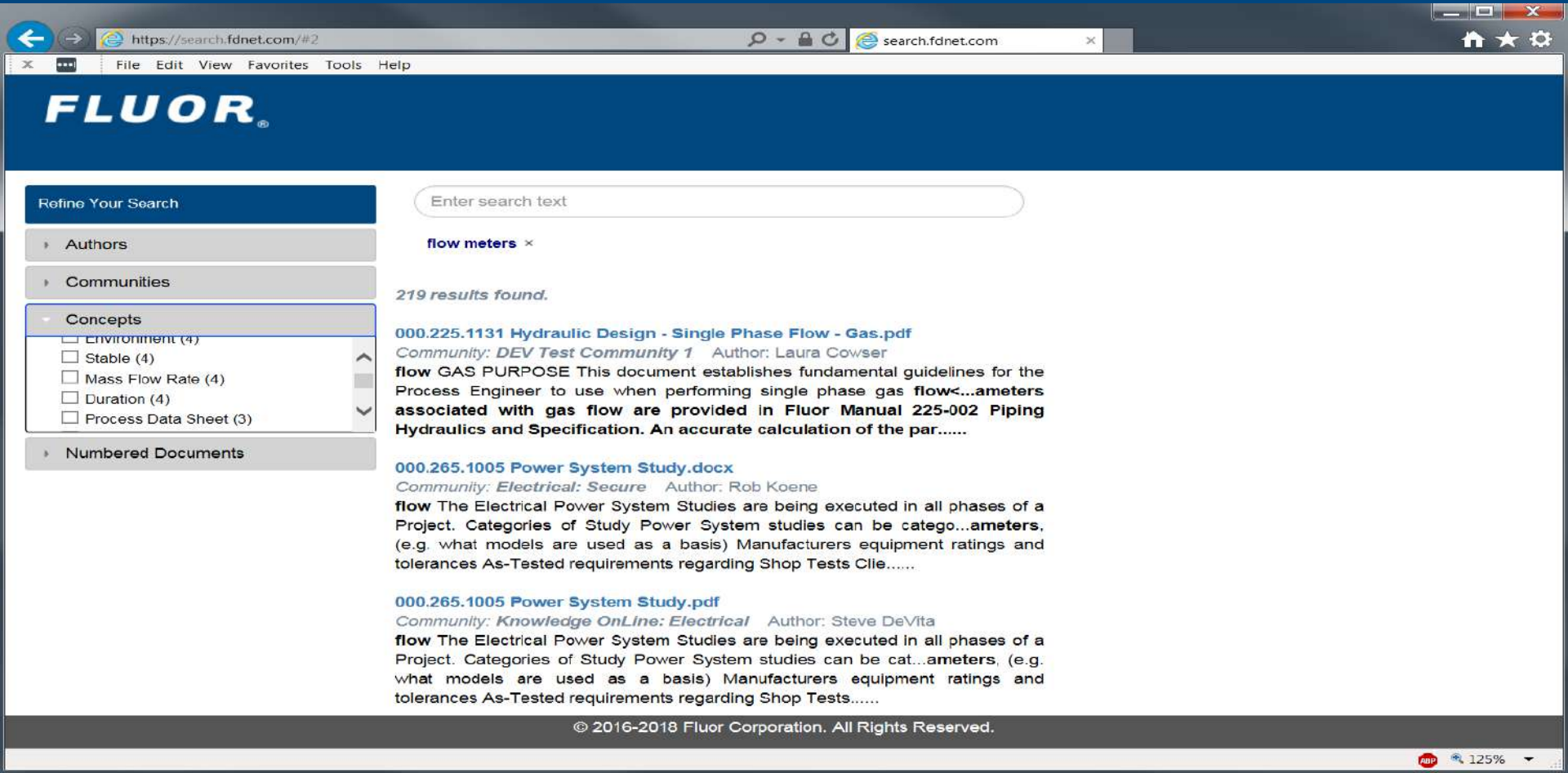
Semantic Search Architecture



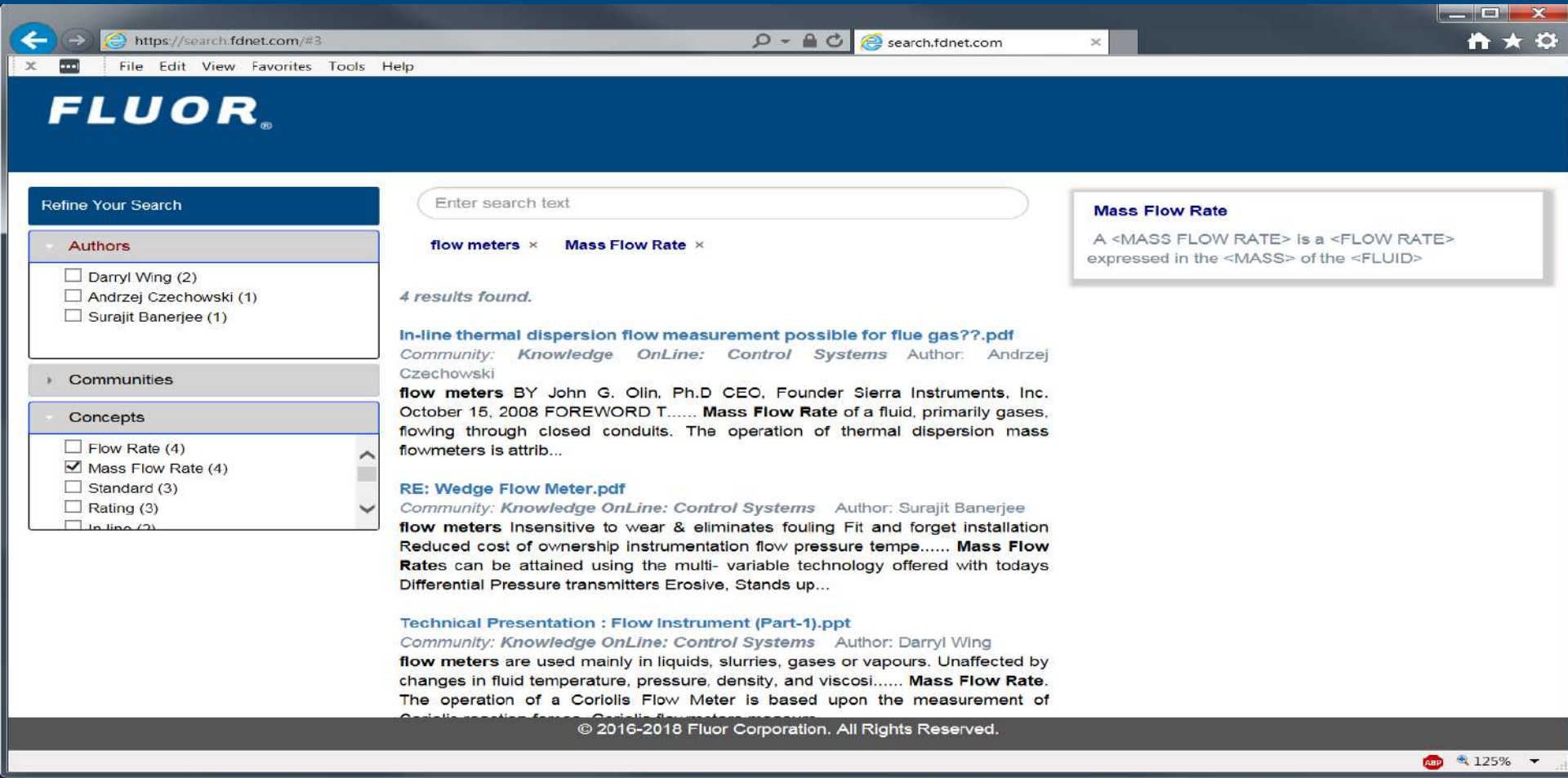
Semantic Search



Semantic Search



Semantic Search



Search Assist – Curated Answers

Challenges in Fluor Knowledge Base (KOL):

1) 99% of Q&A not recorded → can't be leveraged by others
2) Users complain about Search in KOL
3) Our systems perceived as 'not clever' compared with personal phone search capabilities, etc
4) 20K monthly searches are being conducted, on a limited domain
5) Data is stored in silos → users need to be 'location aware'

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Search Assist – Curated Answers

Potential **support** to make Search easier in Fluor Knowledge Base (KOL):

1) A single place to search for information → 'location agnostic'
2) Quality results that are highly relevant to role and activity
3) Quickly determine trust-worthiness of search results
4) Obtain the 'answer' instead of 'search results'
5) Confidence that if a question is asked, an answer will appear soon.

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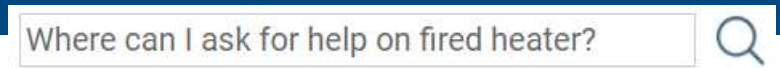
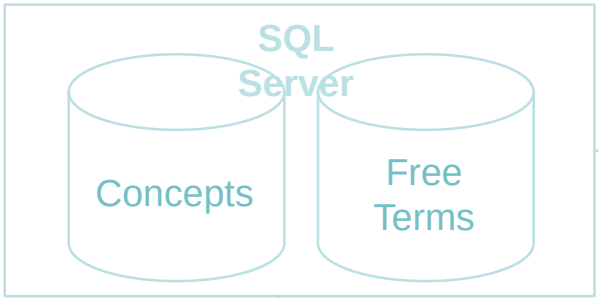
Search Assist – Curated Answers

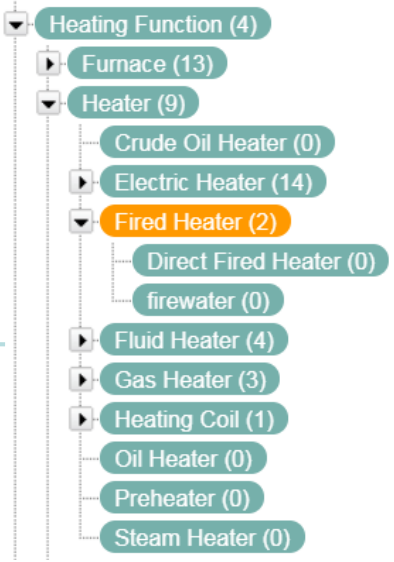


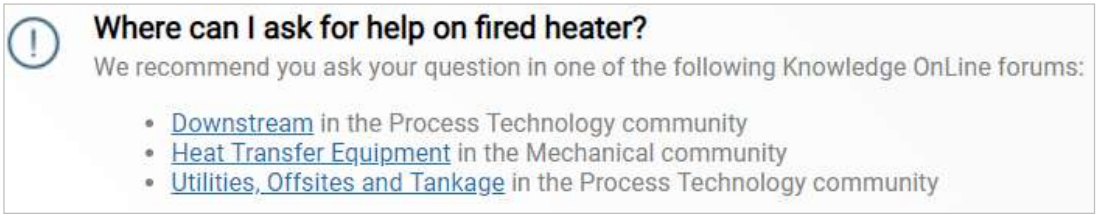
KNOWLEDGE ONLINE

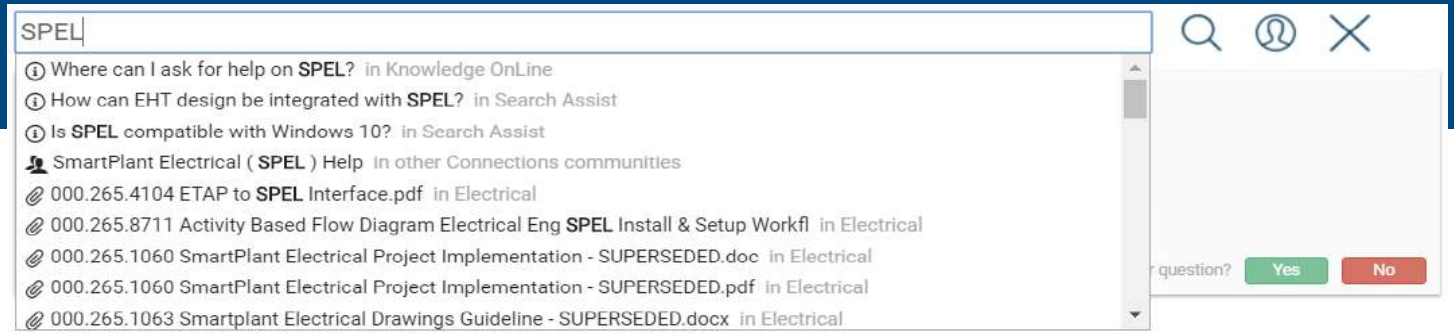
Extract Concepts and Free Terms from 17 years worth (20k) of questions and answers

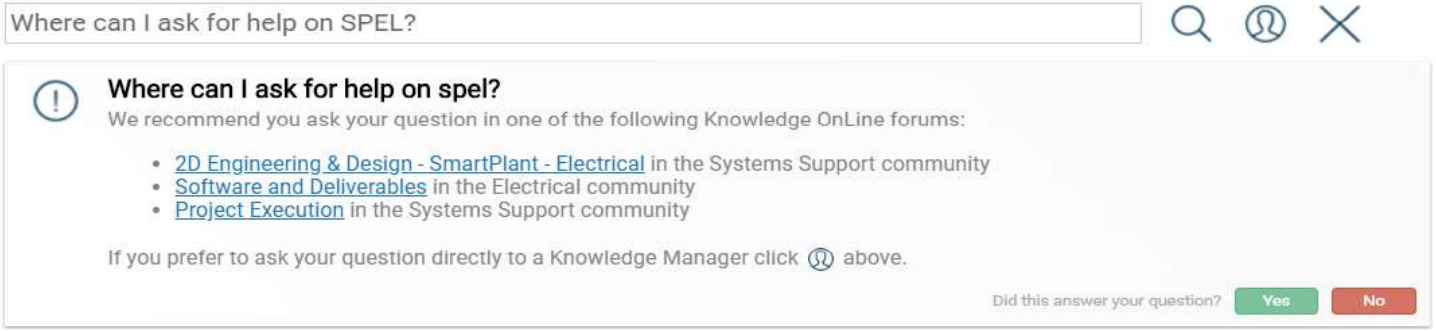


poolparty






SPEL
Where can I ask for help on SPEL? in Knowledge OnLine
How can EHT design be integrated with SPEL? in Search Assist
Is SPEL compatible with Windows 10? in Search Assist
SmartPlant Electrical (SPEL) Help in other Connections communities
000.265.4104 ETAP to SPEL Interface.pdf in Electrical
000.265.8711 Activity Based Flow Diagram Electrical Eng SPEL Install & Setup Workfl in Electrical
000.265.1060 SmartPlant Electrical Project Implementation - SUPERSEDED.doc in Electrical
000.265.1060 SmartPlant Electrical Project Implementation - SUPERSEDED.pdf in Electrical
000.265.1063 Smartplant Electrical Drawings Guideline - SUPERSEDED.docx in Electrical
question?
Yes
No


Where can I ask for help on SPEL?
Where can I ask for help on spel?
We recommend you ask your question in one of the following Knowledge OnLine forums:
2D Engineering & Design - SmartPlant - Electrical in the Systems Support community
Software and Deliverables in the Electrical community
Project Execution in the Systems Support community
If you prefer to ask your question directly to a Knowledge Manager click above.
Did this answer your question?
Yes
No


How can EHT design be integrated with SPEL?
How can EHT design be integrated with SPEL?
Submitted on 21 Jun 2018 by Susan Skinner (Inactive)
Click on the link above to access a presentation that compares a conventional EHT design work process against a more data-centric EHT workflow. It also contains a demonstration of this new work process highlighting SPEL's functionality within this data-centric concept.
Did this answer your question?
Yes
No

Requisition Packages – Current State

What's in a Requisition Package?

1,354
DOCUMENTS

825
VALVES

59
VENDOR
DOCUMENTS

Requisition Package Traits:

- Numerous File Types and Access Protocols
- Hundreds or thousands of revisions
- Bundled in a ZIP file for delivery
- Minimal content re-use, if any at all.

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Requisition Packages – Future State

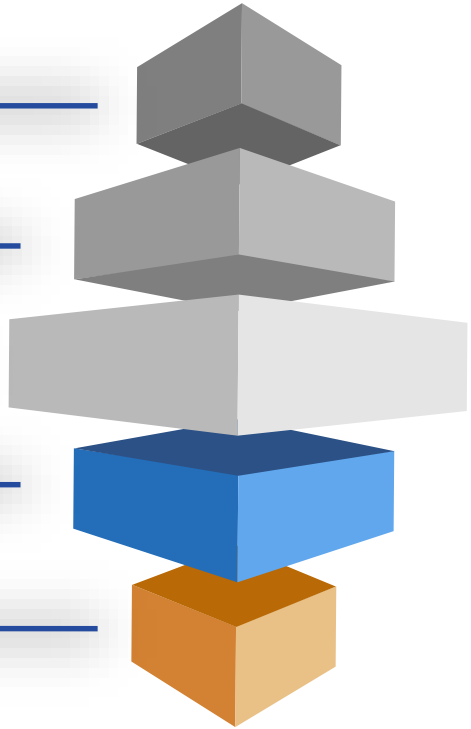
Engineering Knowledge Graph

Intelligent data structures

Rule Driven Modeling

Seamless Collaboration

Re-use; Not re-invent



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Where we want to go

- **Utilize semantics to**
  - Provide the right information to the right role at the right time
  - Establish (flexible) integration between dispersed systems
  - Combine structured and unstructured data in intelligent class objects
  - Create bots → rules-based engineering
  - ‘Reversed Push/Pull’ → cognitive behavior
  - Utilize better query mechanisms for information gathering (‘KM on steroids’)

Where we want to go

- **End of presentation**

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