

Linked Data for Parts Management

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GLOBAL PRODUCT DATA INTEROPERABILITY **S U M M I T** 2014



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Background

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- **A project sponsored by Department of Defense (DOD) to make its vast supply chain more efficient**
- **XSB has developed the PartLink platform**
 - Information about 40M component parts
 - Their manufacturers and suppliers
 - Materials, technical characteristics and more
- **Using Semantic Web Standards**
 - Provide a consistent format for data exchange
 - Model a large collection of engineering product information

About XSB

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- **Specializes in parts data management solutions**
 - Integrated system to acquire, categorize, and standardize product data
 - Large public procurement knowledge base; ~65M Items of Supply
 - Products, Sources, Prices, Technical Characteristics, etc.
- **Patented technologies and semantic web solutions**
- **Aerospace, Government and MRO concentration**

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XSB Partners

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Master Data File (MDF) Technology

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Parts Management - MDF



Web Service API

Web Crawlers

**In a recent study XSB identified \$5.5B in savings
from the elimination of duplicate parts across three Fortune 100 companies.**

The Situation

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- **EXTENSIVE, DISPARATE DATA**
 - The Government manages information on more than 40 million component parts purchased by the DOD
 - Multiple sources including manufacturers and distributors
 - Specification and standard documents, both public and private, are also part of this extensive data collection
 - Data is dispersed among a variety of databases and documents
 - The information is not standardized or linked together
 - No single source which contains all of the information needed to make effective parts management decisions
- **A VARIETY OF USER FUNCTIONS AND NEEDS**
 - Procurement officers are interested in part selection, sourcing, availability, price, obsolescence, and more.
 - Maintenance personnel require information on repair and replacement procedures, testing

Our Objective

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Make one of the largest parts databases in existence interoperable with data on the web, and provide a reliable means to exchange and use information across the DOD supply chain.

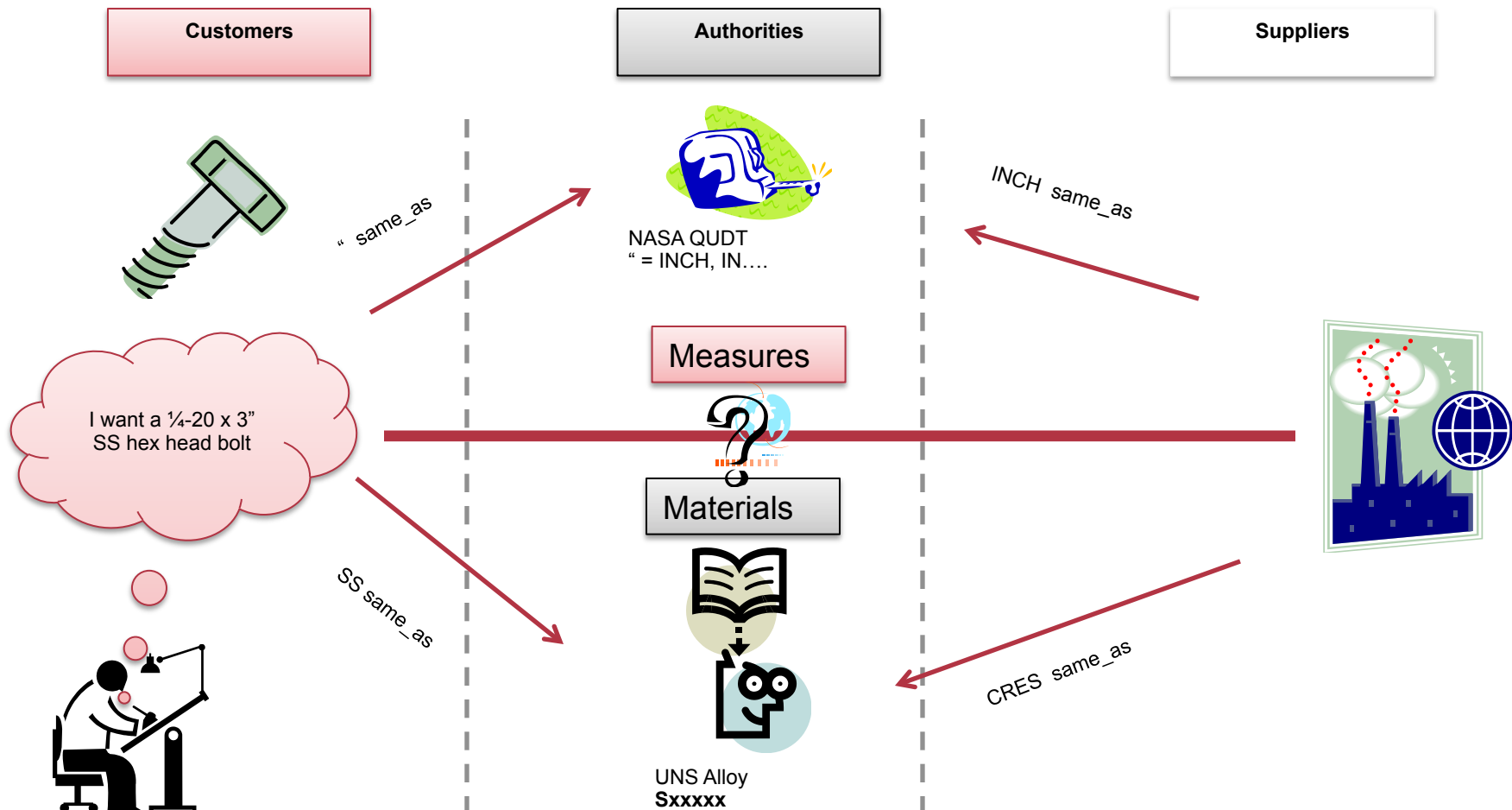
Technical Approach

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- **Use W3C Semantic Web Standards to build an interoperable digital model for the semantics of parts and the specifications that govern them**
- **Leverage the infrastructure of the internet to operate at Web scale**
- **Publish parts management data as a linked data model utilizing a set of Web Resources with Uniform Resource Identifiers (URI)**
- **Develop an Application Programming Interface (API)**
- **Engage industry, standards bodies and Government in the development and adoption of standards**

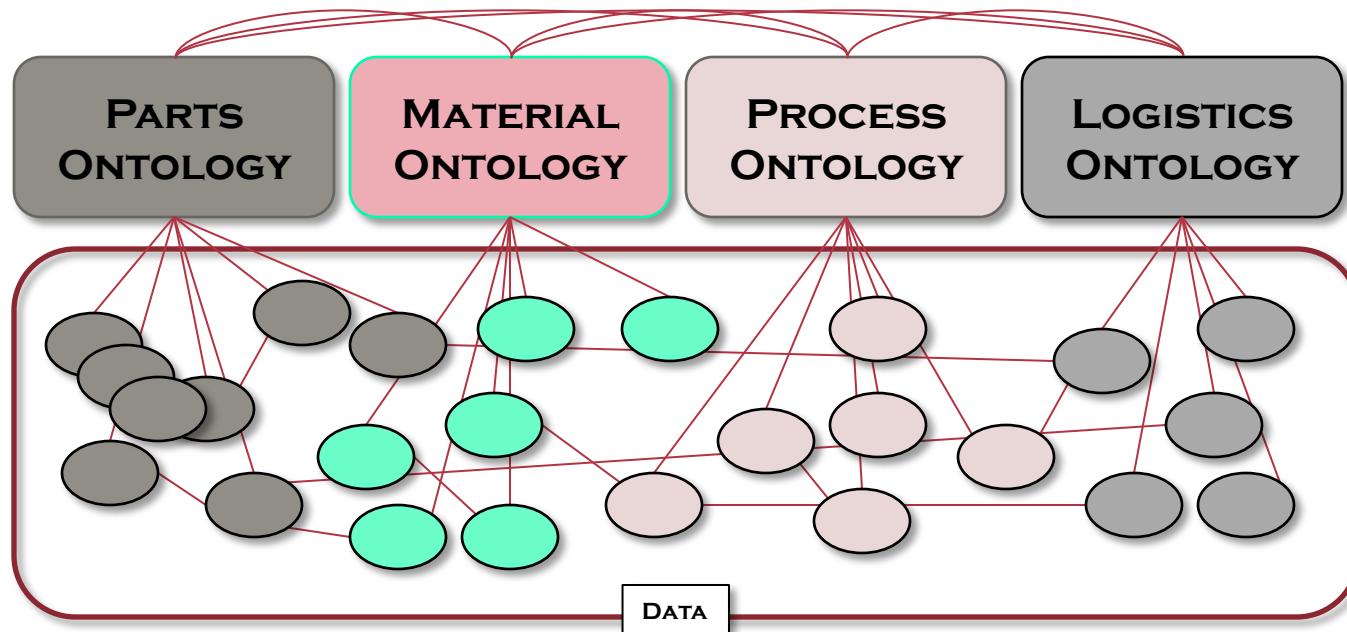
Linked Data Interoperability

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Ontology

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Part Classes:

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Bearing

PART (0)	Type	Relation Name
node00: UNCLASSIFIED INCS (0)	allrid	BEARING SEAL TYPE
node01: ELECTRICAL AND ELECTRONICS (0)	allrid	BORE DIAMETER
node02: MECHANICAL DEVICES, COMPONENTS AND HARDWARE (0)	allrid	HARDNESS RATING
node0201: MECHANICAL DEVICES (0)	allrid	HAS MANUFACTURING PROCESS
node0202: MECHANICAL COMPONENTS / HARDWARE (0)	allrid	HAS SPECIFICATION
node020201: RIVETS (0)	allrid	HAS UNSTANDARDIZED ATTRIBUTE
node020202: THREADED DEVICES (0)	allrid	HEAT TREATMENT
node020203: PROPELLER SHAFTS (0)	allrid	LOAD DIRECTION
node020204: WHEELS AND PULLEYS (0)	allrid	LUBRICATION MATERIAL
node020205: SHAFTS (0)	allrid	MATERIAL AND LOCATION
node020206: IMPELLERS AND PROPELLERS (0)	allrid	OVERALL DIMENSION
node020207: PLATES - RETAINING AND MOUNTING (0)	allrid	SEAL QUANTITY
node020208: RINGS (0)	allrid	SURFACE FINISH
node020209: PISTONS (0)	allrid	SURFACE TREATMENT
node020210: HINGES (0)	allrid	
node020211: BLOCK AND TACKLE (0)	allrid	
node020212: SPRINGS (0)	allrid	
node020213: BRACKETS (0)	allrid	
node020214: SHAFT COUPLINGS (0)	allrid	
node020215: PINS (0)	allrid	
node020216: BEARINGS (0)	allrid	
node02021601: PLAIN BEARINGS (0)	allrid	
node02021602: ROD END BEARINGS (0)	allrid	
node02021603: BALL BEARINGS (0)	allrid	
node0202160301: BEARING,BALL,ANNULAR (0)	allrid	
node0202160302: BEARING,BALL,AIRFRAME (0)	allrid	
node0202160303: BEARING,BALL,DUPLICATE (0)	allrid	
node02021604: ROLLER BEARINGS (0)	allrid	
node02021605: LINEAR BEARINGS (0)	allrid	
node02021606: SLEEVE BEARINGS (0)	allrid	
node020217: WASHERS (0)	allrid	
node020218: SPROCKETS, GEARS AND GEAR (0)	allrid	
node020219: HANDWHEELS (0)	allrid	
node020220: COLLARS, SLEEVES, BUSHINGS (0)	allrid	
node020221: HANDLES AND KNOBS (0)	allrid	
node020222: EYE BRACKETS (0)	allrid	
node020223: BEARING COMPONENTS (0)	allrid	
node03: PUMPS AND COMPRESSORS (0)	allrid	
node04: VEHICULAR COMPONENTS (0)	allrid	
node05: ENCLOSURES, CONTAINERS AND ACCESSORIES (0)	allrid	
node06: RAW MATERIALS (0)	allrid	
node07: MEASUREMENT, CONTROL DEVICES AND INDICATORS (0)	allrid	
node08: FLUID COMPONENTS (0)	allrid	
node09: MACHINERY AND POWER TOOLS (0)	allrid	
node10: PROTECTION AND SAFETY EQUIPMENT / DEVICES (0)	allrid	

Connector

PART (0)	Type	Relation Name
node00: UNCLASSIFIED INCS (0)	allrid	BODY STYLE
node01: ELECTRICAL AND ELECTRONICS (0)	allrid	CONNECTOR LOCKING METHOD
node0100: MISC ELECTRICAL COMPONENTS (0)	allrid	CONTACT POSITION ARRANGEMENT
node0101: ELECTRICAL SYSTEMS AND DEVICES (0)	allrid	CONTACT REMOVABILITY
node0102: ELECTRONIC COMPONENTS (0)	allrid	HAS MANUFACTURING PROCESS
node0103: ELECTRO-MECHANICAL HARDWARE (0)	allrid	HAS SPECIFICATION
node0104: ELECTRICAL CONNECTORS AND CONNECTIONS (0)	allrid	HAS UNSTANDARDIZED ATTRIBUTE
node010401: ELECTRICAL CONNECTOR BODIES (0)	allrid	INCLUDED CONTACT QUANTITY
node010402: ELECTRICAL CONNECTORS (0)	allrid	INCLUDED CONTACT TYPE
node01040201: CONNECTOR,PLUG,ELECTRICAL (0)	allrid	MATERIAL AND LOCATION
node0104020101: ADAPTER,CONNECTOR (0)	allrid	MATING END QUANTITY
node0104020102: CONNECTOR,RECEPTACLE,ELECTRICAL (0)	allrid	OVERALL DIMENSION
node0104020103: DUMMY CONNECTOR,PLUG (0)	allrid	SHELL TYPE
node010403: COMPONENT CONNECTION SOCKETS (0)	allrid	SURFACE TREATMENT
node0105: HEADSETS AND HANDSETS (0)	allrid	TERMINAL LOCATION
node0106: WELDING RODS AND ELECTRODES (0)	allrid	TERMINAL TYPE
node0107: GAGE RODS (0)	allrid	
node0108: HEATING DEVICES (0)	allrid	
node0109: FILTERS, ELECTRONIC (0)	allrid	
node0110: LENSES, FILTERS AND DISPLAY WINDOWS (0)	allrid	
node0111: ANTENNAS (0)	allrid	
node02: MECHANICAL DEVICES, COMPONENTS AND HARDWARE (0)	allrid	
node03: PUMPS AND COMPRESSORS (0)	allrid	
node04: VEHICULAR COMPONENTS (0)	allrid	
node05: ENCLOSURES, CONTAINERS AND ACCESSORIES (0)	allrid	
node06: RAW MATERIALS (0)	allrid	
node07: MEASUREMENT, CONTROL DEVICES AND INDICATORS (0)	allrid	
node08: FLUID COMPONENTS (0)	allrid	
node09: MACHINERY AND POWER TOOLS (0)	allrid	
node10: PROTECTION AND SAFETY EQUIPMENT / DEVICES (0)	allrid	
componentClasses (0)	allrid	
CDF Higher-Order (Class-Object)-Object Relations (0)	allrid	
CDF Class-Object Relations (0)	allrid	
CDF Higher-Order (Object-Object)-Object Relations (0)	allrid	
CDF Higher-Order ((Object-Object)-(Object-Object)) Relations (0)	allrid	

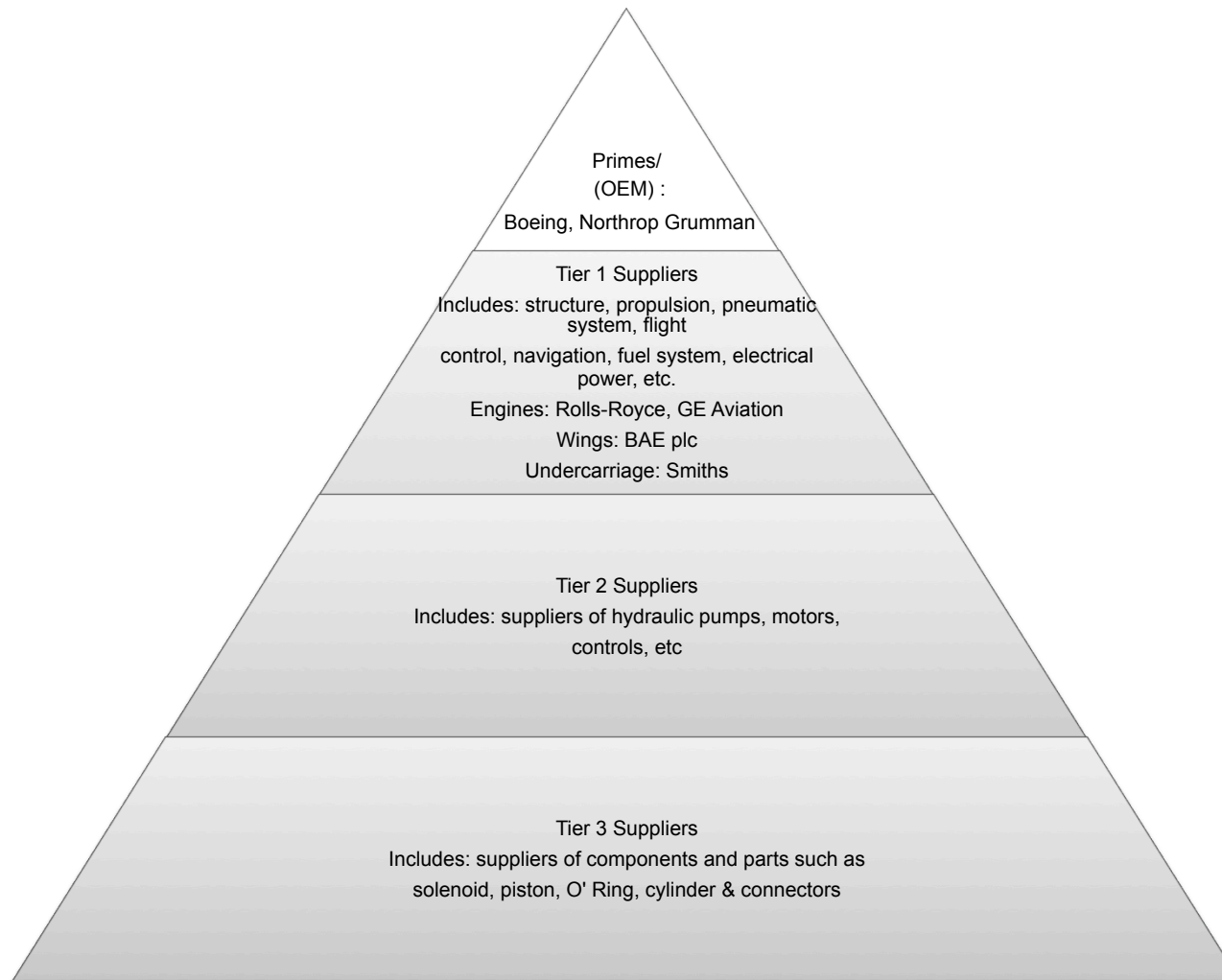
Impact

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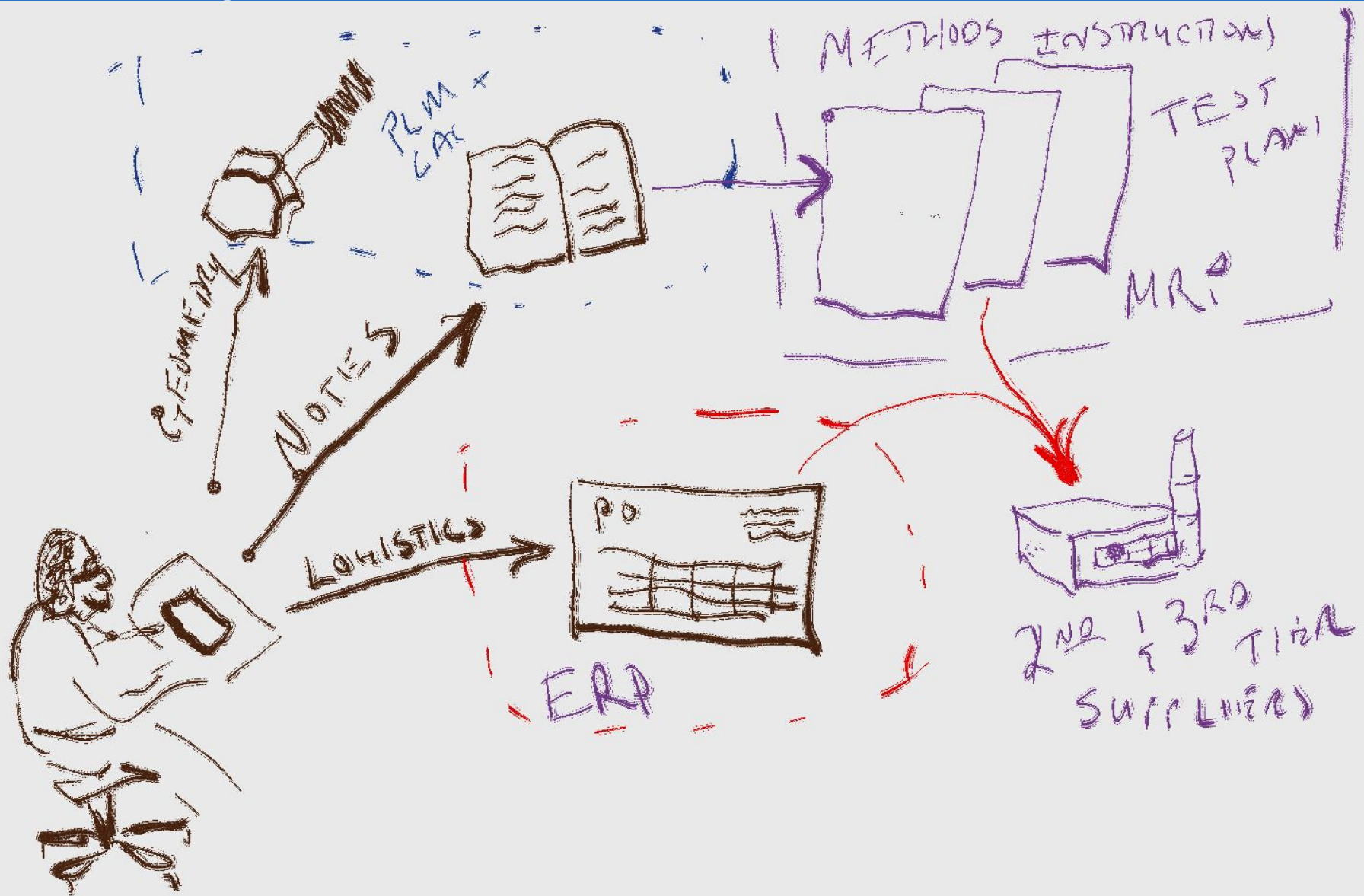
- **PartLink represents a big convergence in parts management**
 - **Database enhancements**
 - Linking more related and highly useful information
 - **Semantic technology**
 - Increasing processing capability for creating better knowledge
- **Potential gains for DOD**
 - **Greater parts information – means better buying efficiency**
 - **Smaller logistics footprint and greater effectiveness**

Aerospace Supply Chain

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The Reality



Future Direction

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- **Leverage PartLink to provide data standardization as-a-service**
- **Support public/private supply chain partnerships**
- **Develop new applications for industry**
- **Allow developers to build their own applications**
 - Shared, searchable data marts
 - Agile access to data analytics

Questions?

email: a.cassola@xsb.com

Contributions Welcome

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App Developer Challenge

Develop Applications using the PartLink data model

Cash prizes – best App earns \$5,000

Join us in building the Industrial Semantic Web

<https://partlink.xsb.com>

Example Apps

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- **NSN Information Search**
- **Weapon System Information**
- **3D Model Research**