

# Design Implementation of I-SOAS IPM for Advanced Product Data Management

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**Abstract**— Designing an intelligent application capable of reading and analyzing user’s structured and unstructured text based requests and then extracting desired concrete and optimized results from knowledge base is still a challenging task for the designers because still it is very difficult to completely extract Meta data out of data. This research paper is mainly about to briefly discussing PDM Systems, PDM community’s current unresolved issues and targeting those unresolved issues a semantic based solution. Moreover by keeping some already proposed approaches in mind, this research paper is also about to propose a new intelligent semantic based information processor and discuss its design in detail including the information about the theme, design requirements, designed designs and technologies involved in the development.

**Index Terms**— Analysis, Design, Meta Data, PDM

## I. INTRODUCTION

PRODUCT DATA MANAGEMENT (PDM) SYSTEMS are heavily contributing in industries by electronically maintaining organizational data, improving data repository system and providing information management module controls to access, store, integrate, secure, recover and manage information. Moreover PDM Systems are also capable of establishing basic networked computer environment, implementing interface module to support user queries, providing information structure management to produce exact structured information and system administration to set up administration and configuration of the system [1]. Where PDM Systems are heavily benefiting the industries there PDM community is also facing some serious unresolved issues .i.e., Successful Platform Independent System Implementation, Easy and friendly PDM System deployment and Reinstallation mechanism, Static and Unfriendly Human Machine Interface (HMI), Static and Unintelligent Search, Insecurity and non standardized Framework.

Targeting these above mentioned problems many approaches and solution based systems including Metaphase (SDRC), SherpaWorks (Inso), Enovia (IBM), CMS (WTC),

Windchill (PTC), and Smarteam (Smart Solutions) [2] etc are proposed, but these issues are still unresolved. Targeting these alive unresolved issues we have also proposed a semantic oriented information engineering and knowledge based solution .i.e., *Intelligent Semantic Oriented Agent based Search (I-SOAS)* towards PDM community. (See Fig 1)

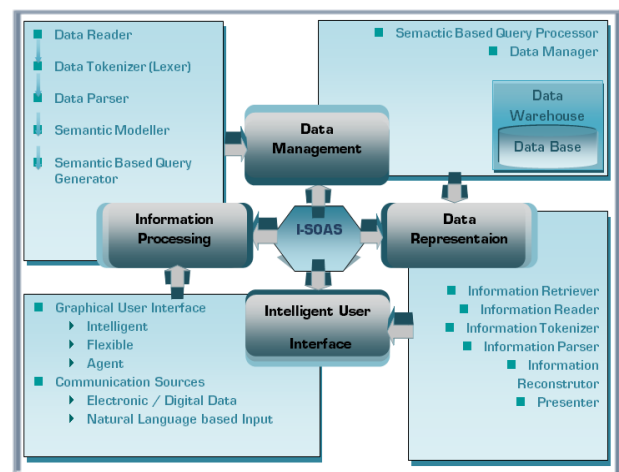


Fig.1. I-SOAS Concept [3]

As shown in Fig. 1, the main concept of I-SOAS is divided into four sequential iterative components .i.e., *Intelligent User Interface (IUI)*, *Information Processing (IP)*, *Data Management (DM)* and *Data Representation (DR)*. IUI is proposed to design intelligent human machine interface for efficient system user communication, IP is proposed to process and model user’s unstructured and structured inputted request by reading, lexing, parsing, and semantic modeling, DM is proposed to manage user requests and system performance based information and DR is proposed to represent system’s output in user’s understandable format [4].

To implement I-SOAS Concept in a software application, we have designed an implementation architecture of I-SOAS consisting of four main modules i.e., *Graphical Interface*, *Processing and Modelling*, *Repository and Knowledge base* and three communication layers i.e., *Process Presentation Layer (PPL)*, *Process Database Layer (PDL)*, and *Process Knowledge Layer (PKL)* [5] (See Fig 2).

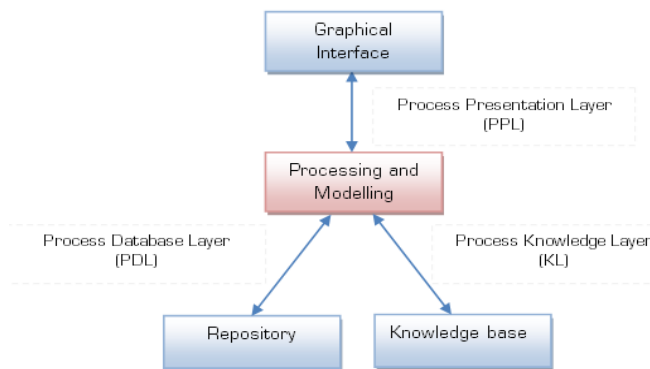


Fig.2. I-SOAS Implementation Architecture

Graphical Interface is the intelligent human machine interface, Repository is to store and manage data, Knowledge base is to capture, manage, improve and deliver knowledge and Processing and Modelling is to read, organized, tokenize, parse, semantically evaluate and generate a semantic based queries to extract desired results from Repository and Knowledge base. Moreover three communication layers are to transfer data between above mentioned four major modules of I-SOAS Implementation Architecture. PPL is responsible for data transfer between Graphical Interface and Processing and Modeling, PDL is responsible for data transfer between Repository and Processing and Modeling, whereas PKL is responsible for data transfer between Knowledge base and Processing and Modeling.

In this research paper we are not going in details of any module or layer of I-SOAS implementation architecture except Processing & Modelling module. Next, initially, we briefly discuss most relevant research and development based literature to our research work in section II of this research paper. Then, we present Processing & Modelling in detail in section III of this research paper, including the information about PM design requirements then in section III-A, PM internal work flow in section III-B, PM system sequence design in section III-C and information about involved tools and technologies in the development of PM in section III-D. In the end we conclude the discussion in section IV and present future recommendations in section V of this research paper.

## II. RELATED RESEARCH & DEVELOPMENT WORK

Relevant literature as the part of related research work is collected from several sources like proceedings of conferences,

and journals. We used web based search engines Google [10] and Wikipedia [11] for querying to extract and review the relevant information. In the domain of information engineering and semantic modeling many methodologies, propositions and approaches have been introduced by many researchers but we are only considering the Language Technology [13] based work as the most relevant literature to our research work in this research paper.

### A. Language Technology

Language Technology is a linguistic based field of computer science, also called as Human Language Technology or Natural Language Processing [12], about to make machine capable of read, listen, understand and analyze human (natural) language. The main objective of Languages Technology is to teach machines, how to communicate and help humans by communicating (listening and speaking) with them [13].

Although existing Language Technology based desktop, web and semantic web applications are not able to completely listen, understand and analyze human (natural) language based instructions. But still the community of Language Technology is struggling in producing such intelligent systems which will be based on natural language interfaces capable of communicating with human in natural language by listening, understanding and analyzing the context and semantic.

There are many ongoing language technology based research projects contributing in cross lingual Information, knowledge management, multilingual document production and multilingual natural communication like TWENTYONE [14], MULINEX [15], MIETTA [16], OLIVE [17], PARADIME [18], Whiteboard [19], GETESS [20], TG/2 [21] and TEMSIS [22] etc.

#### 1) TWENTYONE

A European Commission sponsored project for disclosure and dissemination of documents on sustainable development for environmental organizations by locating and automatic translation of information [14].

#### 2) MULINEX

A European Commission sponsored project for multilingual indexing, navigation and editing extensions for efficient use of multilingual online information by providing the combinations of the newest Information Retrieval Technology with advanced Language Technology to improve search and navigation in the WWW [15].

#### 3) MIETTA

Multilingual Tourist Information on the World Wide Web is a European Commission sponsored project for providing flexible cross-lingual access to tourist information in the web, combination of class-based and free text search, Simultaneous access to heterogeneous data sources, presentation of information in different languages through machine translation and multilingual generation and Advanced localization and web-technology for simplified maintenance [16].

#### 4) *OLIVE*

Retrieval of video material based on speech-recognition is a European Commission sponsored project for providing Video-retrieval on the basis of indices constructed from transcribed speech, three step retrieval process from textual index terms, cross-lingual retrieval on the basis of document translation and query translation, additional background material integrated for improved speech recognition and for further disclosure of video contents [17].

#### 5) *PARADIME*

Intelligent Extraction of Information from On-line Documents is a European Commission sponsored project for providing intelligent retrieval of information from German documents, management of vast sources of linguistic knowledge, new functions with machine learning processes and integration of graphic visualization techniques, server architecture and access to the Internet [18].

#### 6) *Whiteboard*

Multilevel Annotation for Dynamic Free Text Processing is BMB+F sponsored project for designing, implementing, investigating and evaluating a new system architecture that facilitates the combination of different language technologies for a range of practical applications [19].

#### 7) *GETESS*

German Text Exploitation and Search System is BMB+F sponsored project for the development of an intelligent work tool for researching information [20].

#### 8) *TG/2*

Practical generation of natural language text, TG/2 stands for a new generation of template based generators and designed to organize a classical production system, separating the generation rules from their interpreter. TG/2 can provide solutions for limited sublanguages that are tuned towards the domain, can quickly be accommodated to new tasks, can be integrated smoothly with 'deep' generation processes, can reuse generated substrings for alternative formulations and can be parameterized to produce the preferred formulations[21].

#### 9) *TEMSIS*

Transnational Environmental Management Support & Information System is a European Commission sponsored project for increasing availability of up-to-date data in the information age is of limited use without adequate presentation. TEMSIS can provide On-line access to current measurements, can select Information according to the user's requirements, can generate environmental reports in the user's language (German, French), can Build data and parameter dependent structure, can combine extemporaneous and fixed text components and can represent, comprise and summaries collected data [22].

#### 10) *COSMA*

Automated Appointment Scheduling by E-Mail provides concepts of automatic planned and manage Appointments using software agents to save Time and money savings during the

arrangement of business appointments by communicating with a number of partners via e-mail, distributing client/server solution in the Internet, robusting dialogue control with intelligent failure handling and Shallow-Parsing techniques for the analysis of the German language [23].

Language Technology is a very important field with respect to our research goals and has much relevancy to our research and development work. Language Technology aims to teach machines, how to communicate and help humans by communicating (listening and speaking) with them which is one of the key interests and very important goal of my research and development work. Moreover the followed or proposed mythologies by the Language Technology community in fulfilling their goals of research can also be very helpful in our research and development work.

### III. PROCESSING AND MODELING (PM)

Processing and Modeling (PM) module is information engineering and semantic based system proposed and designed to read, organized, tokenize, parse, semantically evaluate, model and process information to extract desired results from Repository and Knowledge base.

#### A. *I-SOAS Processing and Modeling Design Requirement*

Processing and Modelling is designed keeping five major requirements in mind .i.e., the designed PM module must be capable of

1. Handling user inputted request by analyzing the inputted instructions
2. Understanding the context and semantic of user's requested input by lexing, parsing, processing and modeling instructions
3. Storing and managing the user's requested input and final output in database
4. Extracting user's requested knowledge and Producing system output in user understandable format

#### B. *I-SOAS Processing and Modeling Work Flow*

To take advantage and organize the implement process of proposed and designed PM in a software application, we have designed of internal work flow model of PM (see Fig. 3).

PM internal work flow model starts with the input text, which then moves to I-SOAS Lexer after storing into the I-SOAS Database. I-SOAS Lexer first tokenizes the input text into possible number of token, evaluates the context with respect to the used grammar of the input language and then forward to I-SOAS Parser.

I-SOAS Parser considers all the statements or instructions as the combination of all tokens produced by I-SOAS Lexer for semantic evaluation and forward resultant semantically evaluated information to I-SOAS Modeler.

I-SOAS Modeler produces semantic based models using syntactically and semantically evaluated information and forward resultant modeled information to I-SOAS Resolver after storing into database.

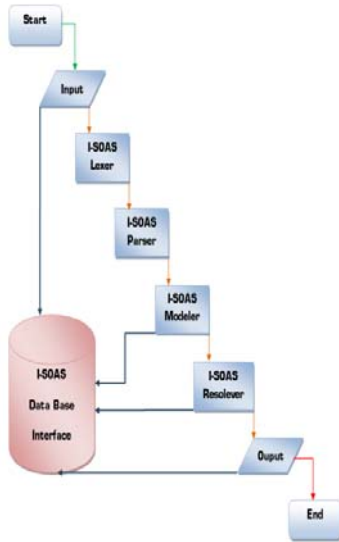


Fig 3. I-SOAS: Processing and Modelling Internal Work Flow

I-SOAS Resolver takes semantic models as input and then resolves these models by producing relationships between modeled statements. Then finally resolved relation based information is stored in to database and can be treated as the final output of I-SOAS Information Processing.

### C. I-SOAS Processing and Modeling System Sequence Design

To implement proposed and designed PM in way that not only it will perform its individual jobs but can also work in an integrated form by sending and receiving information to the other connected modules of the I-SOAS implementation architecture via layers. (See Fig. 4)

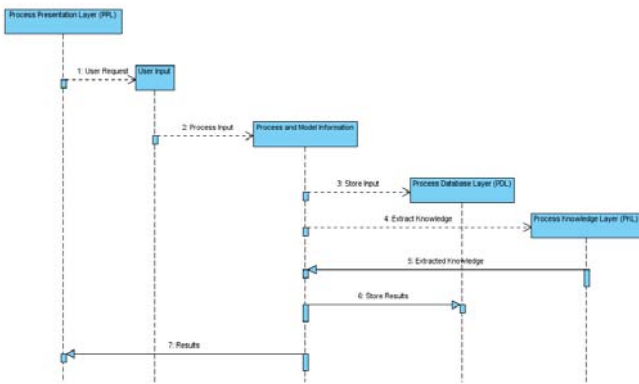


Fig 4. I-SOAS: Processing and Modelling System Sequence Design

PM system sequence diagram consists of five main stepped activities .i.e., *Process Presentation Layer (PPL)*, *User Input, Process and Model Information, Process Database Layer (PDL) and Process Knowledge Layer (PKL)* (see Fig. 4). These five stepped activities are designed to perform certain jobs. The job of Process Presentation Layer (PPL) is to bring user requested input from Graphical Interface to the User Input component of PM. Then User Input component will forward the user requested inputted instructions to Process and Model Information. Process and Model Information component will first store the information in to Repository via Process Database Layer (PDL), then will process the information by lexing, parsing and semantically modeling, and then extract needed knowledge from Knowledge Base via Process Knowledge Layer (PKL). In the end Process and Model Information will first save the information in I-SOAS Database via Process Database Layer (PDL), and then return the final system output to I-SOAS Graphical Interface via Process Presentation Layer (PPL).

### D. I-SOAS Processing and Modeling Implementation

To implement the PM in a software application we are considering Java [6] by Sun Microsystems as the main programming language and Ontology based technologies XML [7], RDF [8] and OWL [9] for semantic based modeling and structuring of information. (See Fig. 5)

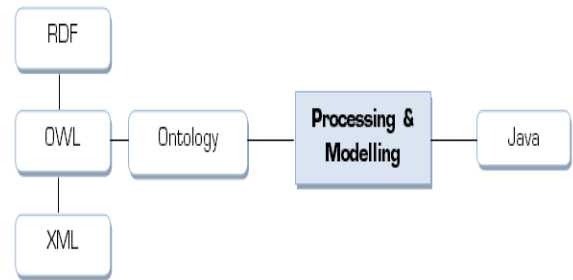


Fig 5. I-SOAS: Processing and Modelling Technologies Involved

## IV. CONCLUSION

In this research paper we have briefly described Product Data Management and its some major existing challenges, then continuing the presentation of research briefly described the conceptual and implementation architecture of our own proposed solution towards PDM challenges .i.e., I-SOAS.

In this research paper we mainly focused on the design implementation of an important module of I-SOAS implementation architecture .i.e., Processing and Modelling (PM).

Going into the details of PM we have presented the information about the theme, design requirements, designed designs and technologies involved in the development of PM.

## V. FUTURE RECOMMENDATIONS

As this research paper is about an ongoing in process research work, right now we are developing I-SOAS Processing and Modelling as a real time software application by implementing above discussed proposed and designed designs. A prototype version of I-SOAS is available at the moment (See Fig. 6).

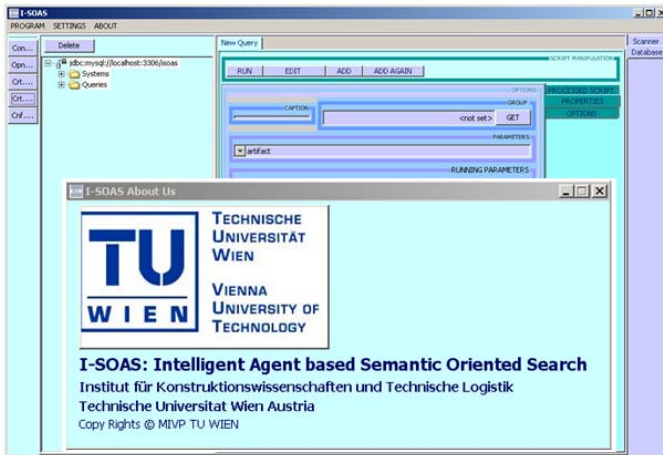


Fig.6. I-SOAS

In future we will not only present the implemented version of I-SOAS Processing and Modelling but also will present obtained and observed experimental results from implemented version of I-SOAS Processing and Modelling.

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