EDI support with LOD

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Abstract A wide variety of mechanical parts circulate in the field of manufacturing. It is often the case that a set of codes for products is necessary for EDI (Electronic Data Interchange) that supports distributions of them. Generally such product codes are maintained by a certain organization consists of related companies, business communities, so forth. While *Linked Open Data* is getting popularity it is quite meaningful to add semantically rich information to such data resources in order to enhance business transaction usability. As a case study, this paper explains LOD of so called "N-ken Code". This set of numerical data is based on a well-specified product identification code that has been utilized over 10 years in a certain business community in Osaka, Japan. We have produced LOD from them as well as implemented a mashup application based on the data set. The application is for a new CAD service in the field of mechanical engineering. We discuss perspective in utilizing LOD for variety of EDI requirements.

Keywords: LOD EDI CAD SVG mashup Screw

1 Introduction

LOD (Linked Open Data) has a potential in supporting existing EDI (Electronic Data Interchange) procedures of business transactions in various aspects. EDI is an acronym for Electronic Data Interchange,[1] and is defined as the "means to represent a variety of documents—management, commercial, and transfer—using a set of structured alpha-numeric linguistic strings based on standardized rules.[2] The use of EDI enables enterprises to exchange transaction information with other companies in a more effective way. Introducing LOD to EDI functions, we can expect enhancement of the scheme.

In this paper our interest is focused on the distribution of mechanical parts and related industry sector. A wide variety of mechanical parts circulate in the field of manufacturing. A set of codes for identifying products is necessary for EDI that supports distributions of these products. Commonly such product codes are maintained by a certain organization of business community. EDI has been considered an indispensable element of business-to-business transactions in the field.

There is so called “N-ken Code” of *screw* identification code that is EDI supporting numerals of a business community for in Osaka, Japan[6]. We have produced LOD from them. A mashup application based on the LOD is provided for a new CAD service in the field of mechanical engineering. In this paper we discuss perspective in utilizing LOD for variety of EDI requirements with this example.

This paper is organized in the followings. In the next section, overview of research activities in terms of business data linkage is introduced. In section 3, typical problem occurred in applying EDI is explained. In 4, the configuration of a LOD and related application software is explained. The system’s architecture style is based on so-called ROA(Resource Oriented Architecture) and RESTful Web API. We will see the detail of the structure of the application. Section 5 is the concluding remarks.

2 Related Research

There have been not many LOD activities applying to EDI so far, for the best of our knowledge. The following is rather general perspective about high-level data linkage in business transactions. Combining input and output from a Web API, it is necessary to describe the API and input and output as a series flow in order such as EDI. One of the research example is the European FAST Project, which has been funded from the ICT Policy of the European Commission to research enterprise information system methodologies. This project is the successor to the “SecSE (Service Centric Software Engineering) Research Project. The goal of the projects was to construct a platform that would allow multiple enterprises to coordinate their services aiming to develop service-centered applications and also effective methods and tools for use. In [3], it analyzed of a number of data-link patterns between enterprises using Web APIs, and used the results of this analysis to create models.

3 Problem to Solve

3.1 Perspective over EDI in Manufacturing related industry in Japan

Generally among the enterprises in Japan that are affiliated with supply chains of large distributors and large manufactures, 80 to 90 percent of them have already introduced EDI. However among small- and medium-sized companies (SMC), EDI usage in transactions is much smaller, and the introduction ratio is estimated to be 10 percent or less. So that the introduction of LOD for EDI associated features has high potential to improve business transactions in the area of manufacturing and products circulations.

3.2 Multiple Screen Phenomenon

What should we cope with in terms of EDI, when we are able to introduce LOD related technology for solving such issue? A typical problem that should be solved is

that the occurrence of the multi-terminal phenomenon has been one of the impediments, which causes problems including the following:

1. Because of multiple independent EDIs for contacting each business customer, the EDI operator has to switch from screen to screen (many Web browser windows).
2. Data is not always compatible with that of the existing in-house information system. The operator may have to re-enter the data manually.
3. The user is billed for each EDI and for each user ID.

In this paper, a pilot implementation to cope with above issue by introducing LOD features based on the database.

4 Mashup Application

The most important and labor-intensive process in EDI-system construction is to put a common standard in place, and to resolve the associated management problems in line with it. To the former aspect of the challenge, LOD is highly promising. Even so, we have to cope with the later problem and put efforts on it. In the following use case scenario, we would like to describe an example usage of LOD in EDI.

4.1 N-ken Code

N-ken is a business community of screw dealers. They have been collaborating about EDI introduction and knowledge sharing among member companies. It consists of many SMCs which deal with screws in Osaka, and their code is defined for the group's business activities and has been used over 10 years. This code covers 250 thousand items in 3400 categories.

While Linked Open Data is getting popularity it is quite meaningful to construct semantically rich information over such data resources in order to enhance business transaction usability. As a case study, we will explains so called "N-ken Code" of screw identification code that is EDI supporting numerals of a business community for in Osaka, Japan. We have produced LOD from them. Once LOD is created, at lease for transactions among companies which use same N-ken Code, EDI function becomes more flexible and possesses potentials for new feature in business transactions. We are going to show a pilot implementation in the followings.

4.2 System Configuration

N-ken Code LOD is provided as RESTful Web API based on ROA design paradigm [4]. The resource oriented architecture of the design can provide a suitable interface between the client and the server in this representation. In the architecture, the resource is divided into each URI and names are given to them. These specified resources are accessed through Web service schema. The data is managed by a general Java framework.

4.3 Mashup Application

Here CAD data associated EDI transaction is introduced. In the application, we focused on SVG (Scalable Vector Format) uses XML (Extensible Markup Language). SVG is a file extension for a vector graphics image file format created by the W3C to describe such images by mathematical equations. With the addition of technologies like the canvas element, CAD data processing is possible over normal Web browser.
For our mashup service, we have utilized Japanese DBpedia. It is a crowd-sourced community effort to extract structured information from Wikipedia and make this information available on the Web. There is Japanese sub-version of DBpedia that we used for our mashup application. N-ken LOD may linkage with other LOD by referring key words related manufacturing such as “neji(screw)”. The LOD allows you to ask sophisticated queries against Wikipedia, and to link the different data sets on the Web to Wikipedia data (Fig.1). Suppose you have your CAD design sheet of planed product. For the estimation of cost of assembling parts, it is quite useful if you’ll be able to refer inventory database of screw which may be provided by several companies. We take mashup example for our N-ken LOD with SVG data produced common CAD application (Fig.2).

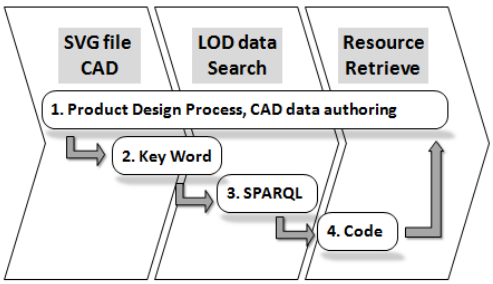

Fig. 1. Process of Mashup

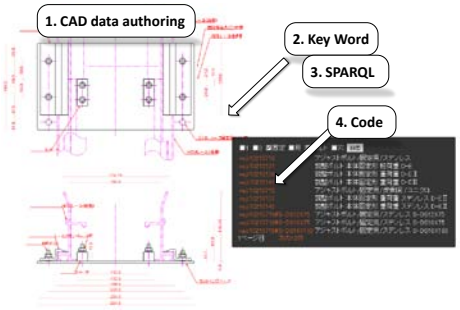

Fig. 2. CAD-Code Mashup linkage Application

SVG over LOD.

Although SVG (Scalable Vector Graphics) is not yet fully matured technology, there is an important aspect in this example application. SVG format has high potential to produce new services especially CAD data related business practices in the context of LOD applications. When we design LOD platform, RESTful Web API is standard architectural style. When we provide a CAD data, URI can be uniquely associated with some DOM (document object modeling) representation. Ongoing pilot project touches upon mashup editor for DOM managements based on the concept that chunk of data could be provided through Web API from LOD database.

HR/MR.

The above mentioned scenario may help the designer to choose most favorable item for the design. And such function could be provided either HR(human readable) inter-face or MR(machine readable) one. The mashup process can be realized in both format and even those interface schema could be provided from different source through Web API . We prepare parsers for both HR and MR interface for the LOD.

Web Site

We have opened a web site for this LOD (http://monodzukurilod.org/), named after "monodukuri" which is the Japanese word for manufacturing. It is officially authorized LOD practice in Japan. Not only for just publishing N-ken code LOD, the site is also aiming to be a center of information of utilization of this type of LOD in manufacturing industry sector. We are planning to enhance the collections of service applications starting with above explained CAD applications with having help through industry-academy collaborations. (Fig. 3)

Fig. 3. http://monodzukurilod.org/

5 Conclusion

As the cloud computing becoming more and more popular in enterprise IT-system, the cost of implementation of EDI may become lower. For the direction, a large amount of standardization effort is currently being taken on the premise of wide-spread use of the cloud, for example in [8]. In the mean time the standardization of EDI in utilizing LOD over cloud environment is one of the key objectives in this trend[5][7][9].

Author of this article consider that introduction of LOD has several positive effects over EDI practices in general.

A) Lowering of (initial) cost for EDI introduction

B) Flexibility of EDI and the software running on it, capable of agile response to changes in the business environment of the enterprise

C) Ease of participation in the EDI promoted by an industry group

Introduced Mashup application in this paper is one of academic-industrial collaboration example. Between a university and an individual industry group, could prove productive, whereby the university could provide a platform for experiments. It may be difficult to reach agreements for standardization effort when it comes to break down to realistic business practice. However, enterprise IT system over the cloud environment, especially in utilizing semantic feature, is an ongoing effort of many companies and business communities. We hope that the lesson learned in our approach should be reviewed and modified for other trials.

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