

Support for Collaboration between Large and Small & Medium Enterprises

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ABSTRACT

Collaboration between large and small & medium enterprises is still not adequately supported by current groupware solutions. In this paper, we present the VENIS approach for lightweight collaboration that addresses the challenges of inter-enterprise collaboration. Key elements of our approach are interoperability to legacy applications, basic services for sharing and management of shared collaboration spaces, use of email for collaboration on the SME's side and the application of lightweight semantic technologies to enable semantic search in inter-enterprise collaborations. We tested the approach on a use case from software development and describe the results.

Categories and Subject Descriptors

H.5.3 [Group and Organization Interfaces]: Collaborative computing, computer-supported cooperative work.

General Terms

Design, Human Factors.

Keywords

Groupware, interoperability, lightweight semantics.

1. INTRODUCTION

Collaboration between large enterprises (LE) and small and medium enterprises (SME) is often solely based on the exchange of documents via email, which, for example, leads to high barriers for newcomers in collaboration processes or to divergent document versions. This situation is attributable to some reasons:

- large enterprises do not allow use of and access to their collaboration solution in the enterprise, especially for temporary partnerships;

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GROUP '14, November 09 - 12 2014, Sanibel Island, FL, USA
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ACM 978-1-4503-3043-5/14/11...\$15.00
<http://dx.doi.org/10.1145/2660398.2663773>

- SMEs do not have the resources, either financially or with respect to personnel, to install and use all the different collaboration systems of their LE partners;
- the cooperating enterprises compliance rules do not allow to use services in the cloud such as Doodle for scheduling or Dropbox for sharing;
- the cooperating enterprises are using different collaboration systems that are not interoperable.

There are in principle two basic models to achieve interoperability of collaboration systems. The first model connects the enterprises collaboration systems to each other, i.e. each collaboration system provides the selected features. For shared workspaces, for example, the features could be create and delete shared workspaces, invite or un-invite members, assign roles to members, add, remove, lock, version and revise documents, notify members about activities, etc. This model has the advantage that no coordination instance is necessary. On the other side, the enterprise collaboration system has to be adapted and the number of different collaboration systems in the involved enterprises determines the necessary effort for this approach.

The second model connects the enterprises collaboration systems via a common collaboration system that is selected by the involved enterprises, i.e. the common collaboration system implements and provides the selected collaboration features that ensure the collaboration between the enterprises. The common collaboration system does not necessarily have to be a single system, but could also be a mash-up of different interconnected modules or services. This model has the advantage that the enterprise collaboration system has to be adapted only once to the set of collaboration features provided by the common collaboration system. Yet the common collaboration system has to be bought or leased, hosted and managed, and could be a bottleneck with regard to overall performance.

A reference architecture that supports collaborative work environment interoperability based on the first model as well as experiences with concrete implementations can be found in [7] and in [6]. An interesting approach that suggests collaborative sharing with email is described in [5].

2. THE VENIS APPROACH

The VENIS approach to interoperable collaboration is based on the second model and the VENIS services for enterprise interoperability (VSI) serve as common collaboration system that integrates also usage of email. Adapters connect to the legacy

systems of the collaborating enterprise, i.e. the legacy systems have not to be changed and the way of working remains almost unmodified, see Figure 1.

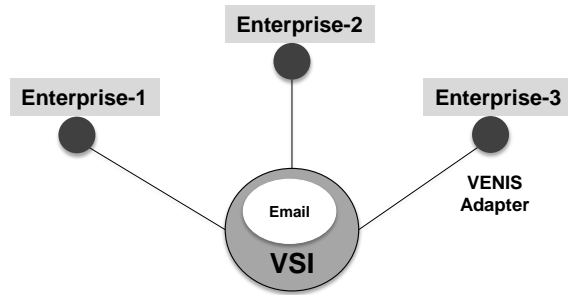


Figure 1: VENIS approach to interoperable collaboration.

Figure 2 presents a schematic overview of inter-enterprise collaboration and shows in the left-hand part the usual situation when a large enterprise collaborates with a small enterprise. That is a member of the large enterprise prepares data and documents, required by the small enterprise to fulfill the contract, using legacy applications such as groupware, systems for enterprise resource planning, customer relationship management, content management or databases etc. Then this compiled information is put into an email, the documents are attached and the email is sent to the corresponding member of the small enterprise. The small enterprise does the required work and sends back information and documents using email. Then in the large enterprise the information and documents are extracted from the received email and used to update the corresponding information and documents in the legacy application.

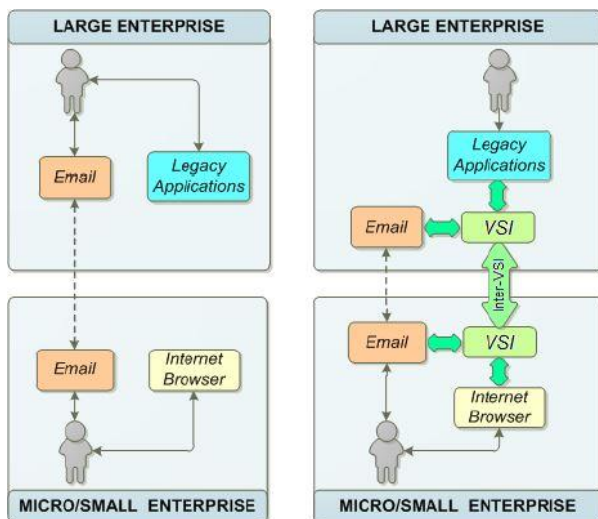


Figure 2. Collaboration of LE and SME. Left: today's practice, right: using VSI.

The right-hand part of Figure 2 shows the improved situation where both enterprises are using the VSI infrastructure that adapts to legacy applications, supports sharing and versioning of documents and notifies about activities of the co-workers. That is, for the simple process described above, the member of the large enterprise gives access to the information in the legacy application and the member of the small enterprise can directly update the corresponding business documents, for example a confirmation of order or a process sheet, and has basic groupware features available.

2.1 The VENIS Platform

The VENIS approach is based on REST/SOAP Web services that allow easy integration with legacy systems as well as user interfaces. Figure 3 shows the various modules of the VSI.

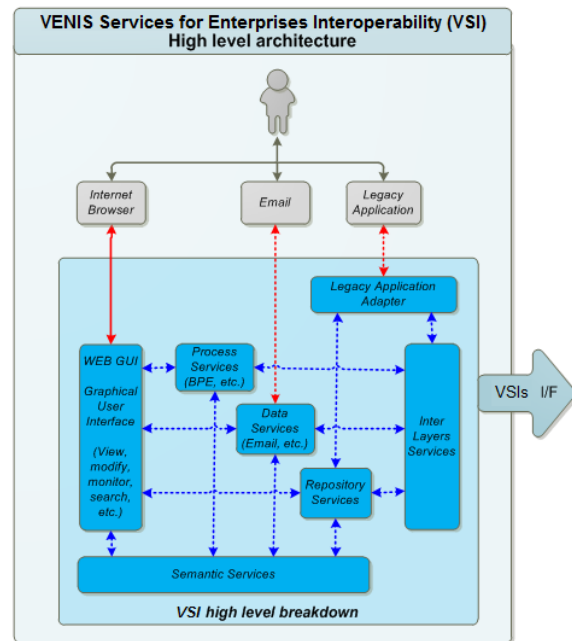


Figure 3. VSI architecture and interfaces with enterprise applications.

The basic modules of VSI are the repository services and the data services. Both services benefit from the semantic services and are connected to the inter-layer services which support distribution of events to notify users, for example. The basic services and the semantic services provide the necessary user-related features as services for the Web browser GUI and the integration into email client interface. The process services are currently under development and not further presented in this paper.

The repository services support upload, download and versioning of documents. In addition, the repository services provide a token-based access to shared artifacts. Legacy application adapters connect the repository services to legacy applications and enable either retrieval of documents in groupware or document management systems or create human readable documents from information stored in legacy systems such as ERP, CRM or database systems. Update of documents is also supported.

The data services support the creation and management of collaboration spaces, i.e. containers for a set of documents accessible by a group of users. Email attachment stripping is a service designed especially for the interaction with SMEs. This service strips attachments from emails, create a collaboration space if necessary, upload the attachments into the repository and replaces the attachments in the email by the corresponding links that allow token-based access. The data services comprise an indexing service to support full-text search in the documents and emails of the collaborations.

The semantic services are a further key feature of the VENIS approach. They support automatic extraction of tags and annotations in the artifacts of collaborations and offer semantic search, see next section on lightweight semantics and search.

2.2 Lightweight Semantics and Search

Lightweight semantics based on tags and annotations are used in many social media systems such as Wikipedia, Twitter or Facebook and seem adequate for LE-SME collaborations because no complex ontology has to be set up and no inference techniques with exponential complexity have to be used.

The semantic information is extracted from human-readable documents and communications (email) that are used in collaborations. The semantic information is stored in a semantic network as a free collection of types. In earlier research work [4] default annotation types for business documents have been identified: organization, person, address, product, document, inventory, etc. The type organization, for example, is substructured into attributes such as name, registration and tax registration number. The type of a document could be invoice, order, contract, or change request. For example, a set of annotations for an invoice document could be {[org.name: abc], [doc.type: invoice], [id: 4711], [date: 2014-08-01]}.

The extracted semantic information enable rich semantic search over communication (emails) and collaboration artifacts [1] [2] and can trigger business processes. The semantic search is envisioned to substitute to certain extend the missing CRM or ERP system in small and medium enterprises.

2.3 Proof of Concept

The ongoing VENIS developments, especially the semantic search, have been tested with the use case and data from the project partner InterSoft [3]. In this use case a customer asks a large provider of software solutions to fulfill a complex project. The provider does not have all the required resources available and therefore searches for suitable subcontractors. The management of such collaborations is usually achieved by email communication including exchange of documents.

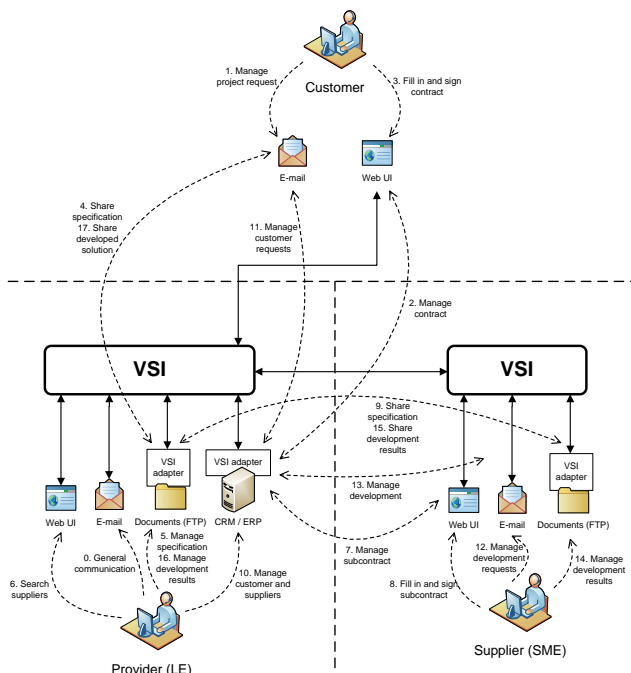


Figure 4. Data flow, actors and services. Use case: software development supply chain.

The VENIS platform supports this use case with various features. For example, the email conversation between customer and provider is automatically stored in a collaboration space and information extraction methods create semantic information of the content of the emails. An adapter for the provider's CRM/ERP system allows the customer to fill in and sign the contract via a Web form. On the provider's side the search for adequate subcontractors is supported by semantic search in earlier collaborations. Sharing of specifications, development results and other documents between the provider and supplier is supported by the corresponding adapters of the respective FTP servers. The cooperating partners are notified by email about changes in shared documents.

3. FUTURE WORK

Currently the process services that support modeling, configuration and execution of business procedures are further developed. When all VSI modules are available, tested and integrated, then a broader use of the VENIS platform will take place and an evaluation and feedback cycle will follow.

4. ACKNOWLEDGMENTS

Our thanks are due to all partners of the VENIS (Virtual Enterprises by Networked Interoperability Services) project that is partially funded by the EU under grant number 284984. Special thanks go to Bruno Casali who created Figure 2 and Figure 3.

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