PINCET - Process Integration of Collaborative Enterprises

Rik Eshuis  
Eindhoven University of Technology  
PO Box 513  
5600 MB Eindhoven, The Netherlands  
h.eshuis@tm.tue.nl

Heiko Ludwig  
IBM T.J. Watson Research Center  
PO Box 704  
Yorktown, NY 10598, USA  
hludwig@us.ibm.com

Abstract

Enterprises more and more collaborate with other enterprises in networked organizations. Such collaborations require the business processes of the partner companies to be aligned and integrated with each other, both on a process and data level in a dynamic, ad-hoc fashion. At the first International Workshop on Process Integration of Collaborative Enterprises (PINCET) at WETICE 2006 several approaches for achieving such flexible integration were presented and discussed. This paper gives a summary of the presented papers at the workshop and the final discussion.

1 Introduction

Enterprises collaborate with other enterprises in networked organizations to deliver a joint service or product. Such collaborations require the business processes of the partner companies to be aligned and integrated with each other, both on a process and data level in a dynamic, ad-hoc fashion.

Traditional business process integration approaches succeeded integrating standardized processes by defining interaction protocols, e.g., using BizTalk, and specifying how messages of the external protocol map to internal processes. However, this way of integrating processes requires either a high degree of standardization of interaction between organizations or a significant lead time.

Business trends such as increasing product and service variability, fast time-to-market, and increasing division of labor along a global supply chain of goods and services make that networked collaborations become ad hoc, dynamic, flexible and adaptive. Furthermore, collaboration moves to high-value functions in corporations. For example, biotech companies collaborate on drug discovery and development with their equipment makers. Automotive companies outsource design and development of car parts like interiors to ad-hoc networks of small automotive suppliers that coordinate themselves. Semiconductor manufacturers jointly work with their customers on application-specific circuitry design. To support process integration for dynamic, flexible, adaptive and ad-hoc collaborations of this kind, an advanced collaboration infrastructure is needed that goes beyond current state-of-the-art process integration approaches.

The aim of the PINCET workshop was to bring together researchers and practitioners to discuss key problems and solutions in this research area.

2 Overview

The first paper Flexible Behaviours for Emergent Process Interoperability outlines an agent-based approach for the bottom-up formation of virtual organisations. The main argument put forward is that existing formation approaches, which are top down, impose certain process steps on partners, which limits the possibility of finding innovative formations and does not address the fact that companies have already pre-existing processes or might not join a virtual organisation for political reasons. The paper proposes a bottom-up approach based on peer-to-peer agents that can propose and extend partial solutions for formations by posting them on notice boards. Partner agents can contact each other through the notice board and negotiate the final formation, allowing partners to customise their processes.

The second paper Peer-to-Peer-based Model-Management for Cross-organizational Business Processes proposes a peer-to-peer infrastructure for business processes that span multiple independent enterprises. Such a cross-organizational business process consists of process modules, one for each peer, that are linked through interfaces. Each peer can compose its own cross-organizational business process by buying process modules from other peers. The paper explains how process modules can be efficiently distributed in a peer-to-peer network using module metadata. Next, it addresses aspects as versioning (to allow migration of process modules) and security,
and outlines the composition approach and its technical implementation. Finally, the technical architecture of the complete system is presented.

The third paper *Adaptive Business Protocol Support in Service Oriented B2B Collaborations* explains several aspects of adaptivity in business protocols in the context of service-oriented architectures. An application-level gateway is proposed to dynamically map a cross-organizational business process choreography to the internal process of an organization and vice versa.

The fourth paper *Process Modelling Framework for Collaboration Networks* proposes a framework for integrative process modelling of collaboration networks. For the global level (the collaboration network) process module chains (PMCs) are used, while for the local level (single enterprise) event-driven process chains (EPCs) are used. A PMC is derived from an EPC by hiding and aggregating private details.

The fifth paper *Modelling of Complex Supply Networks* identifies requirements for modeling complex supply chains. A supply chain is seen as a network of independent agents from which certain behavior emerges. A modeling language should support distributed modeling, integrating context-dependent information and allowing local coordination. Most important, however, is that the end users understand the language easily.

### 3 Discussion

**Context and Requirements.** Summarizing, all papers addressed the context of dynamic supply chains (dSCs), which are ad-hoc, decentralized, short-living, and highly agile. Several requirements were identified:

1. Supplier partners in a dSC usually have already pre-existing business processes and infrastructure in place. To allow smooth collaboration with other partners, customization of the local business processes and infrastructure is inevitable.

2. Collaboration between partners in a dSC can change, due to changes in the environment of the dSC. Support for adaptivity is therefore important.

3. Decision making in dSCs is decentralized: there is no central leader that can force other suppliers to behave in a certain way.

4. Integration has to be done fast. The time-to-market for many products is shrinking. Fast integration is therefore needed, since there is not much time for integrating supplier partners.

5. Quality of service is becoming more and more important. Suppliers are obliged to meet certain quality requirements. Therefore, it is important that these requirements are expressed in a way understandable for business people.

6. If companies are to collaborate in a smooth way, semantic alignment is required. Such an alignment ensures that companies agree upon their vocabulary so they can do business with each other in a coherent way.

**Technologies.** Several partial technological solutions were identified, such as peer-to-peer technology, service-oriented architectures & service composition, agents with behaviours, workflows, ontologies, modelling languages. However, the key problem is how to make these partial solutions work together to achieve tight process integration.

**Research Challenges.** Based on the papers, the presentations, and the resulting discussions, several research challenges have been identified, which have not yet been completely solved by the approaches discussed in the papers.

First, most papers outlined approaches that were in the prototyping stage. A proper validation remains to be done. In particular, it is still unclear how well the proposals scale up to realistic scenarios.

Next, all papers dealt with complex process-based interactions: companies do not act as black boxes but export a public view on their private business process to their business partners. To support this, mapping a private from/to public views was identified as important. To support monitoring of business processes, gateways need to be developed. An important aspect of monitoring is performance monitoring.

Furthermore, self-organizing/emerging behaviors were recognized as important structuring mechanisms. Problems that appear here are social intransigencies (if agents cannot agree that they disagree) and lack of support for holonic modelling.

Finally, frequently heterogeneous partners need to be integrated. This raises several problems, such as how to manage trust, how to support electronic contracting, and finally how to improve end user understanding.

### 4 Acknowledgments

The workshop organizers would like to thank all authors and participants of this workshop for their valuable contributions. Furthermore, we are grateful to the members of the programme committee who helped us in evaluating the papers for this workshop. Finally, we would like to thank the WETICE general chair and his co-organizers for arranging all practical matters.