PhD Thesis Description

Name : Xavier Pucel
Director : Louise Travé-Massuyès

Problematic : Web Services Diagnosability Analysis

1 Goals of the work

The purpose of the phD consists in developping theory and tools for assistance of the design of self healable web services. The goals are to desing and implement a diagnosability analysis algorithm for a distributed system with private local models, and a test selection algorithm for such a system. These algorithms are to be applied to web services and more generally to Service Oriented Architectures, in the frame of the European project WS-DIAMOND [10].

2 Context and positionning

The considered systems are structured according to the Service Oriented Architecture : a system is a set of components communicating between one another; components may belong to different business partners; communication between components allows to execute a business process; only the component interface is published between business partners, implementation details are private. These systems offer a great modularity, a component may easily be replaced by another component delivering the same service. Standard protocol description languages (SOAP, WSDL) are designed in this purpose.

The rise of Service Oriented Architectures allow the apparition of businness process with complex conversations between partners. The complete automation and the great number of simultaneous transactions create the need for specific tools for diagnosis and repair, i.e. self-healing. The need also exists at design stage for diagnosability and repairability analysis tools, and for definition of self-healability.

In the current phase of the work, focus in put on internal processes, i.e. processes involving a unique partner, but respecting the contraint of modularity in order to facilitate the generalization to extenal business processes (involving several business partners). The diagnosis and diagnosability analysis approach uses state-based models, however an event-based approach is developped in parallel in the project. Comparison and integration of the two approaches are in close perspective.

3 State of the work

A comparative study of diagnosability definitions for continuous systems and discrete event systems was done and published in [9, 1]. This work allows a closer collaboration between people working on state based models and event based models, in the research group as well as in the project.

A diagnosability analysis for business processes was designed and implemented. This algorithm uses a state-based model, and reuses the diagnosis algorithm developped in the project and described in [3]. The diagnosability analysis algorithm is described in [8, 6]. It has several interesting aspects:

- Respect of component model privacy.
- Ability to analyze discriminability of many fault pairs in little operations.
- Short, user friendly result presentation.

This work opens perspectives for the design of a distributed test selection algorithm for diagnosability based on the same model as the one used for diagnosability analysis. Test selection with a state based model, in a distributed modular system has no equivalent at our knowledge, and make this perspective original.

Other perspectives concern the relationship between diagnosability and repair plan preconditions. This will allow to bridge theories of diagnosis and repair.

4 Publications

Papers [9, 1] describe the comparison between continuous and discrete event systems diagnosability approaches. This comparison applies easily to all state-based and event-based systems. This work gives a basis for hybrid system diagnosability analysis, and allow a better communication between the communities.

Papers [8, 7] describe a diagnosability analysis algorithm for a service oriented system. The theroetical approach is original, and offers the posibility to optimize the research space as well as presenting results in a concise way.

Project deliverables [2, 3, 4, 5, 6] contain the participation to the project, and references the articles above.

References

[1] M.-O. Cordier, L. Travé-Massuyès, and X. Pucel. Comparing diagnosability in continous and discrete-event systems. In C.A. González, T. Escobet, and B. Pulido, editors, *Proceedings of the 17th International Workshop on Principles of Diagnosis DX'06*, pages 55–60, June 2006.

[2] Deliverable 1.1. Requirements, application scenarios, overall architecture, and test/validation specification, common working environment and standards at Milestone M1 (R1.1). Technical report, WS-DIAMOND European project, March 2006.

[3] Deliverable 4.1. Characterization of Diagnosis and Repair for Web Services. Technical report, WS-DIAMOND European project, June 2006.

[4] Deliverable 4.2. Specification of diagnosis algorithms for Web-Services. Technical report, WS-DIAMOND European project, September 2006.

[5] Deliverable 5.1. Characterization of design for diagnosability and repairability. Technical report, WS-DIAMOND European project, March 2007.

[6] Deliverable 5.2. A new design methodology. Technical report, WS-DIAMOND European project, January 2008.

[7] X. Pucel, S. Bocconi, C. Picardi, D. Theseider Dupré, and L. Travé-Massuyès. Analyse de la diagnosticabilité des services web. Plateforme AFIA (Association Française pour l'Intelligence Artificielle). Atelier IAWI (Intelligence Artificielle et Web Intelligence), 2007.

[8] X. Pucel, S. Bocconi, C. Picardi, D. Theseider Dupré, and L. Travé-Massuyès. Diagnosability analysis for web services with constraint-based models. In *Proceedings of the 18th International Workshop on Principles of Diagnosis DX'07*, 2007.

[9] L. Travé-Massuyès, M.-O. Cordier, and X. Pucel. Comparing diagnosability in cs and des. In *Proceedings of the 6th IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes SAFEPROCESS'06*, 2006.

[10] WS-Diamond. Web-service diagnosability, monitoring and diagnosis. http://wsdiamond.di.unito.it, 2005.