

MABT - a multiagent-based toolkit for transforming existing systems into self-adaptive systems

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Abstract—Some methods and auxiliary platforms/tools have been proposed to design and develop Self-Adaptive Systems (SASs). However, these methods and tools ignore how to turn existing systems to SASs. Therefore, the paper proposes a multiagent-based toolkit for adding self-adaptive abilities to the existing systems. With the Agent Packager and Rule Designer in it, existing systems are transformed into Multi-Agent Systems (MAS), without modifying codes. Based on the Supporting Platform in MABT, MAS run normally and achieves self-adaption with both Global and Local approach.

Keywords—self-adaptive system; software transformation; multi-agent system; software reuse; software development kit

Since the cost of developing new software systems is prohibitive, there are many researches on the existing software systems. The complexity of adapting the existing softwares to software changes (such as the abnormal software units, the changes of requirements, and the modifications of software architecture) is beyond the capabilities of manual control, so it is badly needed to make the existing software become the SASs which are able to measure and spontaneously adjust the behaviors based on the analysis of software changes.

Therefore, this paper proposes a MultiAgent-Based Toolkit, called MABT, for transforming existing software into SASs. In this toolkit, the agent technology (i.e. the agent based framework, the design patterns of SASs based on agents, agents' role modeling of SASs, etc.) is used to establish the SASs. The proposed MABT is divided into three phases, as shown in figure 1. The Toolkit offers Agent Packager and Rule Designer for software developers in the design phase. The original software units are packaged as agents by Agent Packager with the Agent Model and the Structure of Packaging. And the organizations of and collaborations among units are transferred into collaborations among agents and defined by Rule Designer with the Agent-based Logic Description Language [2] and the Comprehensive Checking Mechanism. With these tools, developers can quickly transform the existing software into MAS. And, new software units which can enhance the adaptive ability of the software can be added to MAS by these toolkit in the design phase. In the operational phase, toolkit can support the normal running and self-adaption of MAS by Supporting Platform. Basic Services supports the normal running of MAS mainly by providing the services of communications and managements. Self-adaptive Services are responsible for

providing the supports for self-adaptation in both Global and Local self-adaptive approaches. For Global Events which influence many agents (such as the changes of the context or requirements), the Global approach can adjust the collaborations among agents to form a new behavior of software. For Local Events which influence only an agent, Local approach adjusts the external services provided by an agent to the adjustment of the Business Logics.

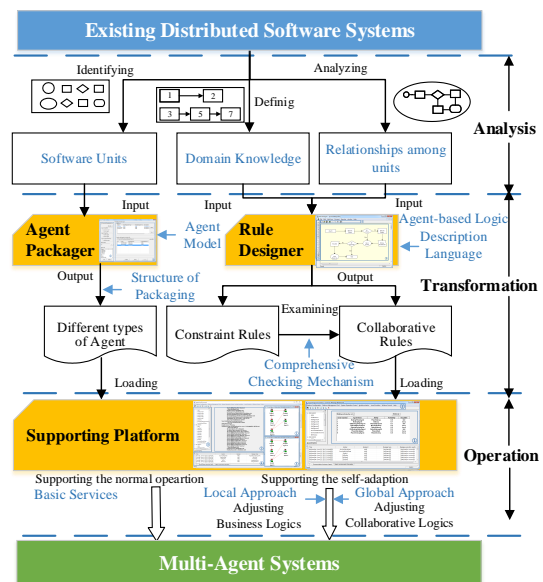


Figure 1. The structure of the MABT

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REFERENCES

- [1] L. Qingshan, C. Hua, and L. Cong, "An Agent-based Logic Description Language for Dynamic Evolution," Third World Congress on Software Engineering, Xinhua Huang, Li Da Xu, Eds. IEEE, 2012, pp. 15-18, November 2012.