

A Dynamic Variable Exchange Method for Data-Intensive Workflow

Minjae Park *, Jin Ma**, Hyunah Kim***, Hyun Ahn***, Kwanghoon Pio Kim***

*Engineering Innovation Center, BISTel, Inc., Seoul, South Korea

**National Institute of Supercomputing and Networking, KISTI, Daejeon, South Korea

***Dept. of Computer Science, Kyonggi University, Suwon, Kyonggido, South Korea

mjpark@bistel.com, majin@kisti.re.kr, {hyuna486, hahn, kwang}@kgu.ac.kr

Abstract— In order to create or modify workflow model which is validated, it is good to support real-time trace and debug for data-intensive workflow model design tool. And, if it is possible to change variables of workflow instance, when workflow model trace or debug, it is very useful. So, we propose dynamic variables exchange method, and attempt to exchange variables on a data-intensive workflow modelling tool with visual approach.

Keywords— data-intensive workflow, workflow trace or debug, workflow variables exchange

I. INTRODUCTION

Traditionally, workflow management concept was business process automation and control[1]. Nowadays, workflow concept and application are going to diffuse not only business process but also several area like data-intensive workflow[2, 3]. Data-intensive workflow execute workflow model with system and data resources, so it is more important make workflow model robust, because it is hard find incorrect working by human in running.

In this paper, we discuss how to create or modify data-intensive workflow model robust and validated. Particularly we focus on real-time workflow tracing/debugging of data-intensive workflow with variables exchange method.

II. WORKFLOW REAL-TIME TRACING

[4] described a real-time method about data-intensive workflow model with visual approach. Generally, data-intensive workflow model is defined without human resources, therefore, workflow model is consist of activities are defined each properties not use human resources, but system or data resources.

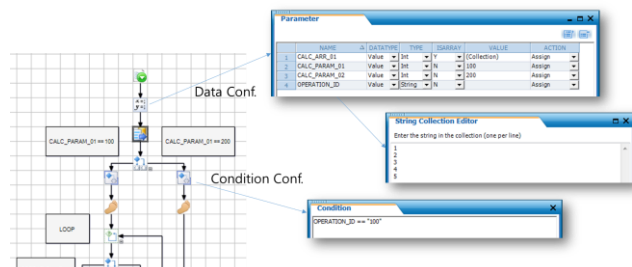


Figure 1. Part of Data-intensive Workflow Model and Activity Property

Figure 1 show a part of data-intensive workflow model and each activity's property.

Workflow real-time tracing method is similar to program debugging. Data-intensive workflow models executed by the start message that is triggering message of workflow application. The message is start sign of workflow model, which make workflow instance.

Functions workflow tracing/debugging that are consist start, stop, break, step-over and continue. Each function describes like below:

- Start: Starting real-time workflow tracing with a triggering message.
- Stop: Stopping real-time workflow tracing.
- Break: Stop at break point for check current state of the workflow instance.
- Step-over: Moving the next step from current step.
- Continue: Moving the next break point from current step.

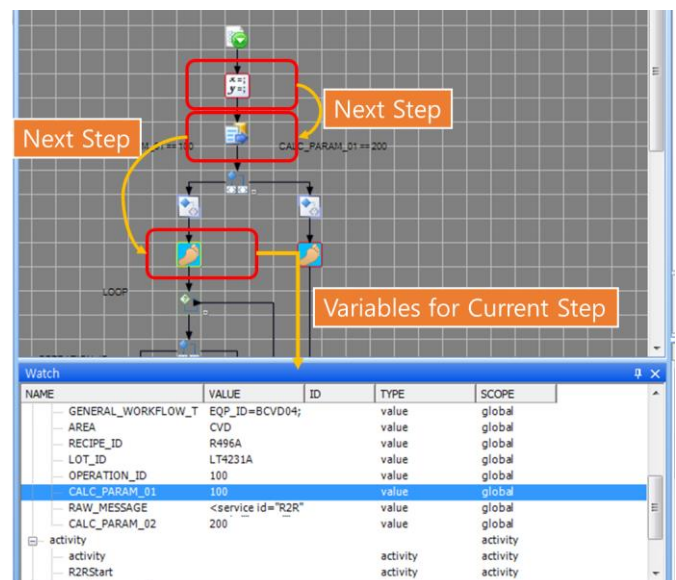


Figure 2. A Workflow Realtime Tracing Method

Workflow models are executed step by step (activity by activity), express each variables of workflow instance.

Figure 2 workflow execution step by step, workflow variables at current state.

III. A DYNAMIC EXCHANGE METHOD FOR DATA-INTENSIVE WORKFLOW

When workflow model executed, workflow instance is created, and has variables according to the workflow application triggering message. The message is start sign and could control workflow instance.

Figure 3 show an example of workflow application triggering message that has variables for workflow control. And figure 4 show variables of the started workflow instance by the message. We can see to check through the variable 'OPERATION_ID'.

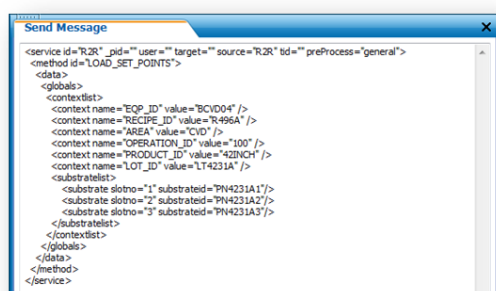


Figure 3. An example of workflow application triggering message

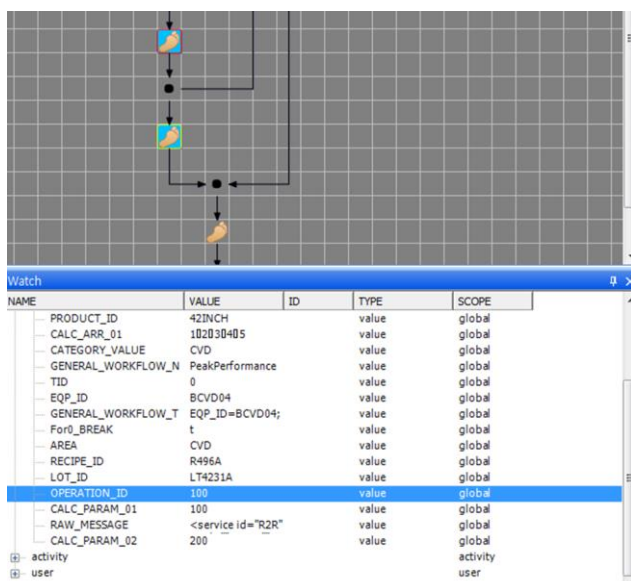


Figure 4. Variables of Data-intensive Workflow Instance

Our basic approach of workflow variable exchange is data sharing.

Workflow engine and workflow runtime tracing tool use file set that files like bellows:

- Model information: Workflow model that could be defined by modeling tools and executed by workflow engines.
- Application triggering message: Triggering message that could execute defined workflow model as workflow application.
- Workflow runtime control data: Control data has break point and current state information. If control data changed by workflow runtime tracing tool, workflow engine should be observed.
- Workflow instance variables: workflow instance variables are created and modified by workflow engine that workflow execute step by step. Therefore, workflow runtime tracing tool observe the file during workflow running time.

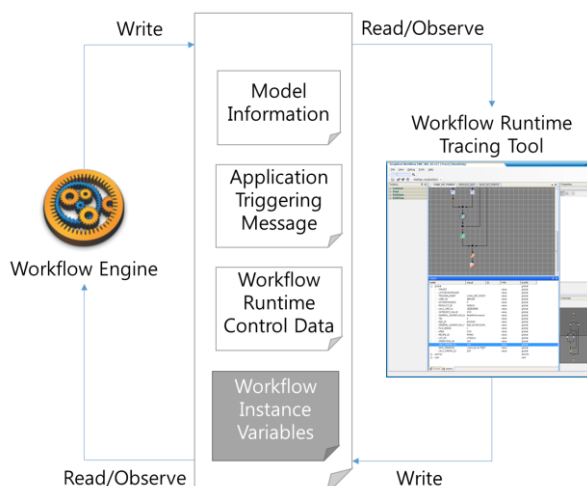


Figure 5. Files for Workflow Runtime Tracing

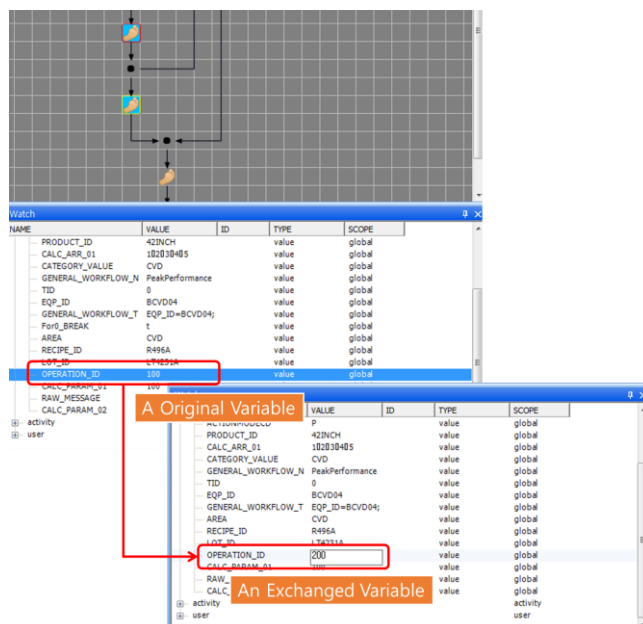


Figure 6. A Variables Exchange of Workflow Runtime

A workflow engine and a workflow runtime tracing tool communicate via shared workflow files. In particular, there are meaningful ‘workflow instance variables’ file is changed by the workflow engine step by step, the information always observed by the workflow runtime tracing tool.

IV. CONCLUSIONS

So far, this paper has variables exchange method and its implementation on workflow real-time tracing for data-intensive workflow with visual approach.

Based upon this proposed method, we are create or modify data-intensive workflow more robust and verified. We so believe that this work might be one of contributions for advancing the data-intensive workflow technology.

In future work, we will have attempt more advancing and improving functions of data-intensive workflow.

ACKNOWLEDGMENT

This research was supported by the contents convergence software research center at Kyonggi University funded by the GRRC program of Gyeonggi Province, South Korea.

REFERENCES

- [1] Hollingsworth, David, and U. K. Hampshire. "Workflow management coalition the workflow reference model." Workflow Management Coalition 68 (1993): 26.
- [2] Barker, Adam, and Jano Van Hemert. "Scientific workflow: a survey and research directions." Parallel Processing and Applied Mathematics. Springer Berlin Heidelberg, 2008. 746-753.
- [3] Yildiz, Ustun, Adnene Guabtni, and Anne HH Ngu. "Business versus scientific workflows: A comparative study." Services-I, 2009 World Conference on. IEEE, 2009.
- [4] Minjae Park, Hyun Ahn, Kwanghoon Pio Kim, "A Real-Time Tracing Method for Data-Intensive Workflow", Proceedings of 28th Annual Conference of Biomedical Fuzzy System Association (BMFSA2015), pp.63-65, Nov. 2015.



Minjae Park is a senior member of research staff at the solution R&D research center of BISTel, Inc., South Korea. He received B.S., M.S., and Ph.D. degrees in computer science from Kyonggi University in 2004, 2006, and 2009, respectively. His research interests include groupware, workflow systems, BPM, CSCW, collaboration theory, process warehousing and mining, workflow-supported social networks discovery and analysis, and process-aware factory automation systems.



Jin Ma is a Researcher at the Supercomputing R&D Center of KISTI (Korea Institute of Science and Technology Information), South Korea. He received B.S., M.S. degrees in computer software and computer science from Kwangwoon University in 2010, 2012, respectively. He had worked as member of research staff at the solution R&D research center of BISTel, Inc., South Korea. His research interests Big Data, Analysis System and Visualization, distributed system, BPM.



Hyunah Kim is a senior member of research staff at BIEE, Inc., and she is an adjunctive professor of the computer science department at Kyonggi University, South Korea. She received B.S. degree in computer science and engineering from Korea Nazarene University, and M.S. and Ph.D. degrees in computer science from Kyonggi University in 2005, and 2009, respectively. Her research interests include groupware, workflow systems, SCORM based e-Learning process modeling and management systems, e-Learning process mining techniques, and workflow-supported social networking knowledge discovery and analysis.



Hyun Ahn is a full-time Ph.D. student of computer science department and a graduate member of the collaboration technology research laboratory at Kyonggi University, South Korea. He received B.S. and M.S. degrees in computer science from Kyonggi University in 2011 and 2013, respectively. His research interests include workflow systems, BPM, scientific workflow systems, workflow-supported social and affiliation networks discovery, analysis, and visualization.



Kwanghoon Pio Kim is a full professor of computer science department and the founder and supervisor of the collaboration technology research laboratory at Kyonggi University, South Korea. He received B.S. degree in computer science from Kyonggi University in 1984. And he received M.S. degree in computer science from Chungang University in 1986. He also received his M.S. and Ph.D. degrees from the computer science department at University of Colorado Boulder, in 1994 and 1998, respectively. He had worked as researcher and developer at Aztek Engineering, American Educational Products Inc., and IBM in USA, as well as at Electronics and Telecommunications Research Institute (ETRI) in South Korea. In present, he is a vice-chair of the BPM Korea Forum. He has been in charge of a country-chair (Korea) and ERC vice-chair of the Workflow Management Coalition. He has also been on the editorial board of the journal of KSII, and the committee member of the several conferences and workshops. His research interests include groupware, workflow systems, BPM, CSCW, collaboration theory, Grid/P2P distributed systems, process warehousing and mining, workflow-supported social networks discovery and analysis, process-aware information systems, data intensive workflows, and process-driven Internet of Things.