

An IoT-aware Workflow Model Designer for Smart Alarm Service about Companion Animal Health Check

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

*Department of Computer Software, Daelim University, South Korea

**Department of Computer Science, Kyonggi University, South Korea

mjpark@daelim.ac.kr, {hyuna486, hahn, kwang}@kgu.ac.kr

Abstract— Process-based application-driven environments are becoming very diverse. As IoT-based application implementations are widely used, an execution environment that can run IoT devices is needed. We want to use this IoT environment as a way to check the health of companion animals. We describe a workflow designer that supports an alarm service to provide an alarm service for health checks. This will provide access to one workflow designer to support the new service, and through these extensions, we will develop a workflow that supports a variety of IoT environments.

Keywords— IoT Workflow Designer, Workflow, BPM

I. INTRODUCTION

As the interest of companion animals grows, there are various approaches to managing companion animals. We want to design and implement smart toilets to check the health of companion animals. Therefore, we propose a workflow model designer based on IoT for companion animal health check by combining the technology of this IoT technology and the process.

II. A SMART COMPANION TOILET FOR COMPANION ANIMAL HEALTH CHECK

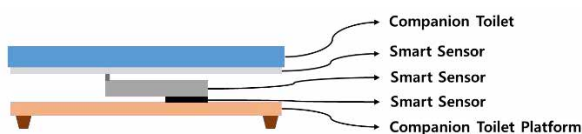


Figure 1. A Smart Companion Toilet Concept

The proposed smart toilet for companion animals is a sensor based companion toilet for companion animal check and activity check.

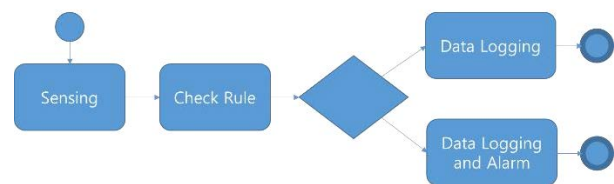


Figure 2. Process Definition of Smart Companion Toilet

The smart companion animal toilet can provide record of bowel activity and alarm service from the data of the companion animals during the bowel movement, the data sensing. We define the set of activities that will take place during this defecation as a process. Therefore, to define such a process, there must be a workflow designer in place, and the workflow designer must include a node corresponding to the service needed in the smart companion animal toilet.

III. AN IOT-AWARE WORKFLOW MODEL DESIGNER

We propose an IoT-aware workflow model designer to define services such as smart companion animal toilet. We describe this workflow modeling tool as an IOT workflow model designer. This modeling tool extends the nodes of the workflow to include various sensors and services to design various IoT-based workflows.

The base node of the workflow follows the BPMN 2.0 standard. Among these BPMN nodes, we use basic user tasks and service tasks. Then expand the node associated with IoT.

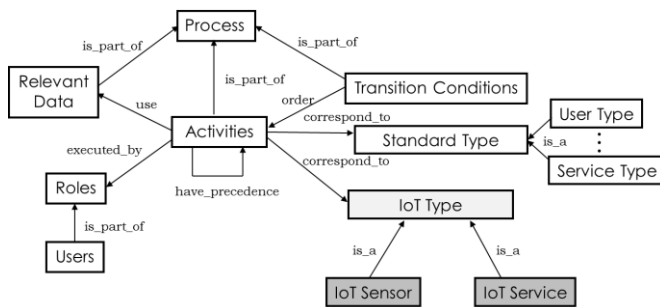


Figure 3. Workflow Model Elements

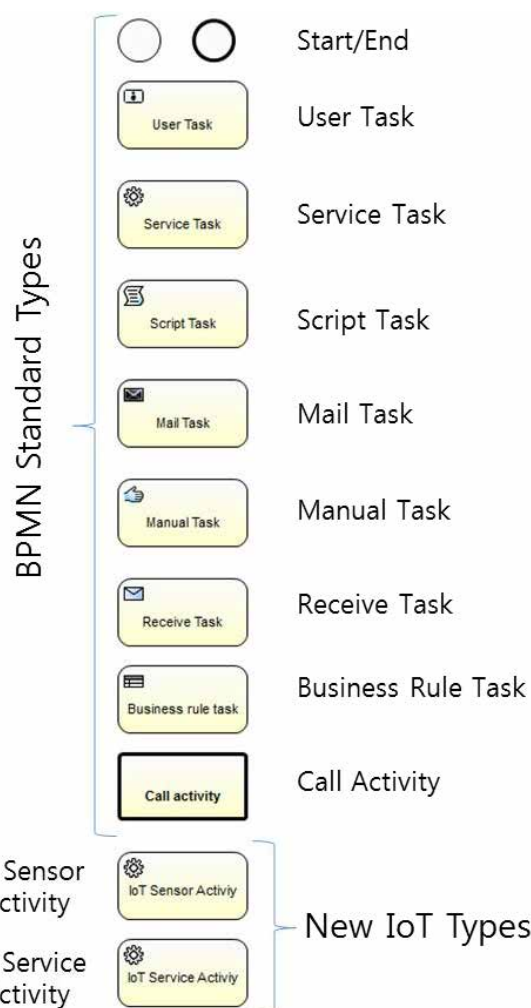


Figure 4. BPMN 2.0 Nodes Extension for IoT Nodes

We extend the elements of the model by adding IoT types to elements of an existing workflow model consisting of processes, activities, roles, actors, and standard activity types.

We also add this extended workflow model element to the BPMN 2.0 node type to reflect it in the standards-based workflow modeling tool.

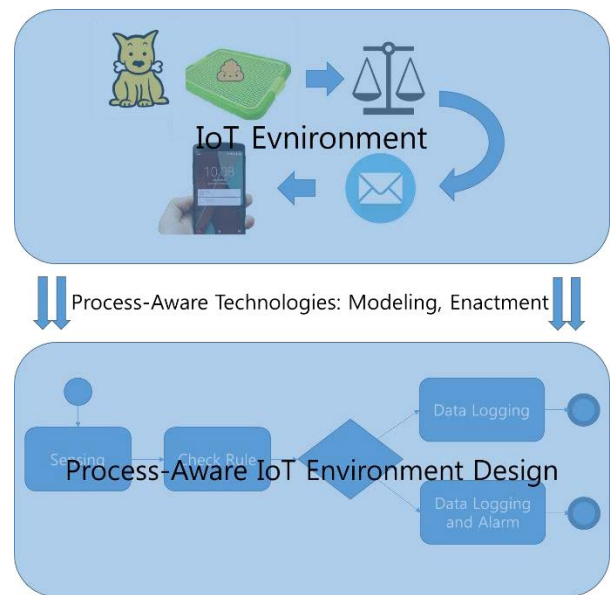


Figure 5. Process-Aware IoT Enactment Service

Using these tools, IoT workflow models can be designed, and the designed workflow models can be executed through the workflow engine according to defined rules.

The alarm service, which is mainly dealt with in this paper, can be described as a type of IoT service activity that receives IoT sensor data and expands it to send alarms as specified by e-mail or SNS.

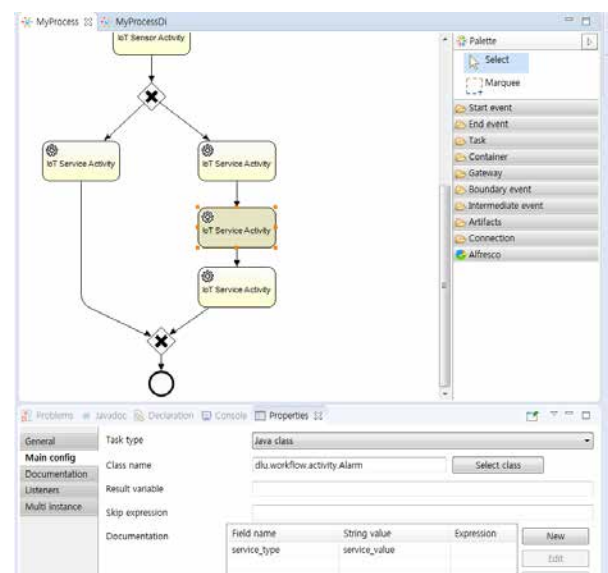


Figure 6. An IoT-Aware Workflow Model Designer

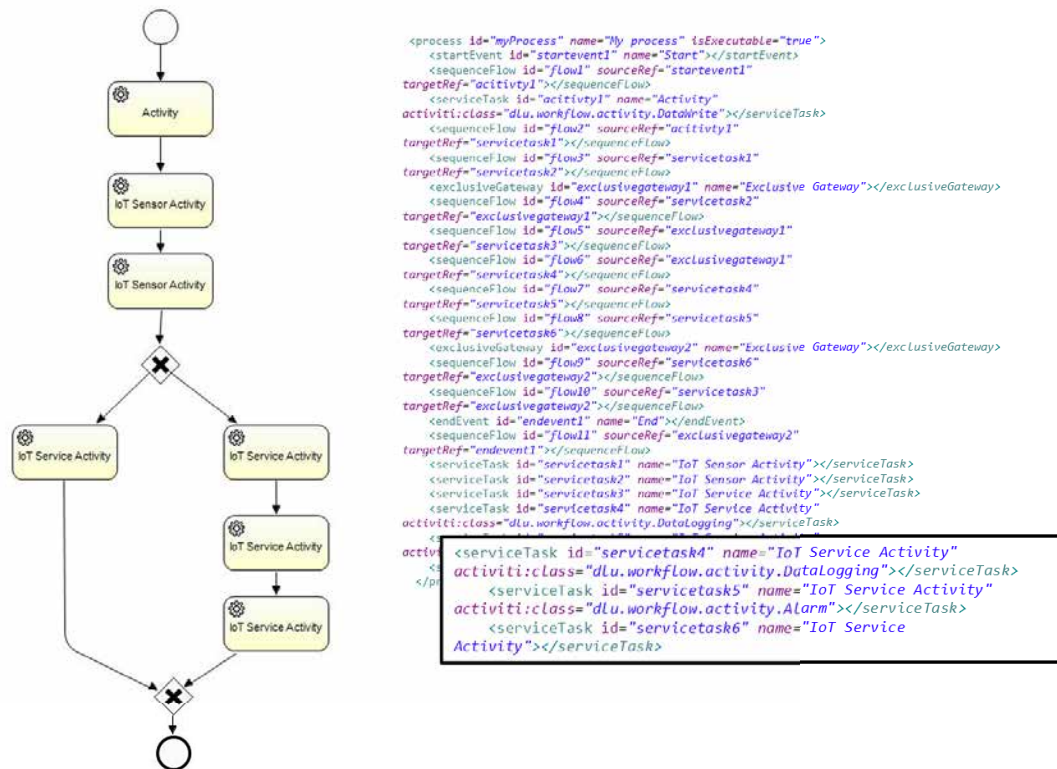


Figure 7. An IoT-Aware Workflow Model and Executable Language

IV. CONCLUSIONS

In this paper, we propose an IoT-aware workflow model designer that specified smart alarm service about companion animal health check. To describe it, we introduced the concept of smart companion toilets, and described the procedures that take place in the companion toilets. In order to provide automated services to the procedures that take place in the companion toilet, it is represented as a workflow and an IoT-aware workflow designer, a tool for defining it, is implemented.

We have used this designer for smart alarm service for companion health care, but since it is implemented to define IoT sensor related information and IoT service related information, it can be applied to more various IoT services.

Through this research, we expect that the workflow technology will be fused and used efficiently in various IoT environments.

ACKNOWLEDGMENT

This research was supported by the contents convergence software research center at Kyonggi University funded by the GRR program (Grant No. 2017-0194) of Gyeonggi Province, South Korea.

REFERENCES

- [1] Park, Minjae, et al. "A scientific workflow model designer based on scientific information control nets." Advanced Communication Technology (ICACT), 2015 17th International Conference on. IEEE, 2015.
- [2] Kim, Meesun, et al. "Modeling process-aware Internet of Things services over an ARDUINO community computing environment." Advanced Communication Technology (ICACT), 2017 19th International Conference on. IEEE, 2017.
- [3] Rademakers, Tijds. Activiti in Action: Executable business processes in BPMN 2.0. Manning Publications Co., 2012.



Minjae Park is an assistant professor of computer software at Daelim University, 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, process-aware information systems, data intensive workflows, and

process-driven Internet of Things and process-aware factory automation systems.



Hyunah Kim is an adjunctive professor and a faculty member of the collaboration technology research laboratory in the department of computer science at Kyonggi University, South Korea. She received her B.S. degree in computer science from Korea Nazarene University in 2001. Also, she received her M.S. and Ph.D. degrees in computer science from Kyonggi University in 2003 and 2009, respectively. Her research interests include workflow systems, SCORM-based e-Learning

process models, BPM, BPI, ACM, workflow-supported social networks discovery and analysis, and process-aware Internet of Things.



Hyun Ahn is a research professor of computer science department at Kyonggi University, South Korea. He received B.S., M.S., and Ph.D. degrees in computer science from Kyonggi University in 2011, 2013, and 2017, respectively. His research interests include workflow systems, BPM, business process intelligence, process mining.



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.