A Framework for Building a Collaborative Environment in an Open IoT Platform

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Abstract. Today, a 'co-creation' culture that creates shared values through the collaboration is emerging. When developing IoT Objects, collaboration is increasingly important. However, existing IoT platforms do not support a collaborative environment between users. Thus, the objective of this study is to propose a collaborative environment that can enable users to co-work by sharing diverse ideas and data. For this, we built the framework for a collaborative environment that enables people to collaboratively develop IoT-based objects based on an open IoT platform. This framework for collaborative environments provides new ways of working.

Keywords: Open IoT Platform, Collaborative Environment, Internet of Things

1 Introduction

Today, with the advance of ICT (Information and Communication Technology), it is possible for people to quickly and easily prototype their ideas with open-sources development kits such as Arduino, Edison, and RasberryPi. The embedded objects that surround us begin with Internet networks for diverse opportunities [1]. The "Internet of Things" (IoT) transforms everyday physical objects into smart physical Objects through a network for exchanging data between each other via network infrastructure [2][3]. In order to effectively provide IoT-based intelligent services, the platforms that can manage and control networked objects are being developed.

According to a recent digital paradigm, a 'co-creation' culture is emerging, one that creates shared values through human collaboration. Also, in developing IoT Objects, the ability to collaborate with different people is important. However, existing IoT platforms do not support a collaborative environment between users. Thus, this re-

search aims to propose an environment that will enable users to co-work through sharing diverse ideas and data. In this paper, we establish the framework for a collaborative environment that helps people effectively co-create IoT-based objects. This framework is based on an open IoT platform conceived through in-depth case studies.

2   Analysis of Open IoT Platforms

Open IoT Platforms generally consist of web services for the IoT that allows users to connect their objects and open source APIs that allow users to build applications within the IoT environments. These provide 'real-time data collection,' 'data processing,' and 'data visualizations' to their users. *Thingspeak* and *Open.sen.se* are considered as representative open IoT platforms where people can use any device for free. Thus, we extracted some issues for collaborative environments in an open IoT platform through in-depth analysis of *Thingspeak* and *Open.sen.se*. *Thingspeak* and *Open.sen.se* provide a few possibilities for collaborative environments through open dashboards by which other people can check on diverse IoT data. Also, *Open.sen.se* allows other people to share IoT data through its dashboards called *sense board* [4]. *Thingspeak* enables people to make comments and questions in open dashboards [5].

Both platforms have some problems for collaborative environments, since you cannot share diverse information concerning hardware and software. Because of these problems, it is difficult to share detailed ideas and collaborate with IoT-based projects. Thus, a new collaborative environment that helps people collaborate in the development of IoT objects is needed.

3   Elements for Collaborative Environments

The elements for collaborative environments in an IoT platform were extracted by in-depth case studies of representative collaborative platforms: *Github, Cage,* and *Mural.ly*. The basic structure and functions of these collaborative platforms were first investigated and their communication functions between users were analyzed. These collaborative platforms basically provide functions that can manage the overall process of development or design. These processes can broadly be divided into three steps: (1) registration, (2) modification, and (3) renewal. Users can record all issues that happen in the process in detail. Based on these basic steps, the collaborative platforms have functions for the effective collaboration that is required in each step. The detail functions for collaboration differ according to each platform. However, the elements for collaboration are classified through the process of idea-sharing, discussion, and decision. Figure 1 shows the elements for collaborative environments in each step.
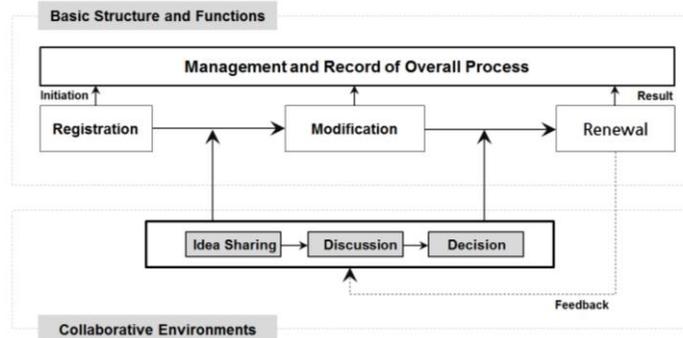
Fig. 1. Elements for Collaborative Environments

4   Framework for Collaborative Environments in an Open IoT Platform

Smart objects are created as the combination of hardware and software, and the smart objects work by being connected to the IoT platform [6]. The development of IoT objects requires iterative processes: developing hardware, developing software, and configuring an IoT platform from the initial developmental stage to the final developmental stage. Thus, the IoT platform with collaborative environments needs to have a structure that can systematically record, manage, and match the iterative processes of each development. Thus, this structure in Figure 2 takes advantage of being able to quickly and effectively apply modifications from diverse discussions and decisions.
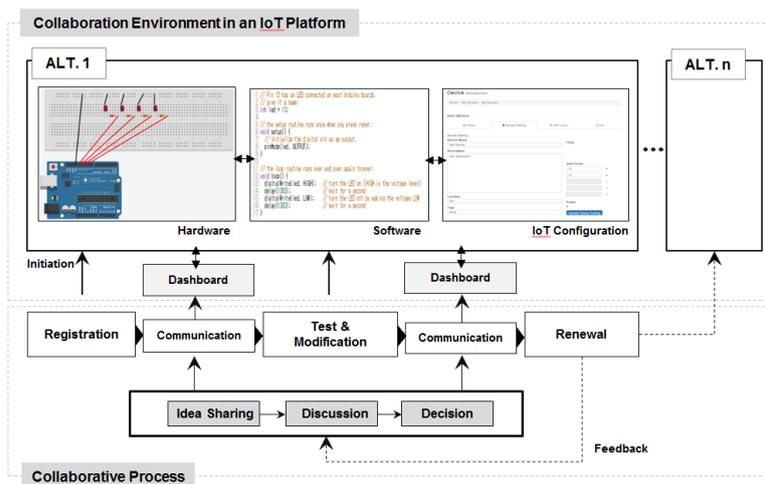

Fig. 2. Structure of an IoT Platform with Collaborative Environments

5   Conclusions

In this paper, we have presented a framework for collaboration environments based on an open IoT platform. For effective collaboration in developing IoT objects, the open IoT platform needs to have a structure that can systematically record, manage, and match the processes of each development. At present, we are developing a collaboration environment for an open IoT platform based on the built framework. We believe that this framework for collaborative environments will play an important role in providing new ways of working and new ways of service.

References

1. Gubbi, J., Buyya, R., Marusic, S., Palaniswami, M.: "Internet of Things (IOT): A Vision, Architectural Elements, and Future Directions,", Future Generation Computer Systems, Vol.29, NO.7, pp.1645-1660 (2013)
2. Kortuem, G.,Kawsar, F., Fitton D., Sundramoorthy, V.: "Smart Objects as Building Blocks for the Internet," Internet Computing, Vol.14, NO.1, pp.44-51(2010)
3. Open.sen.se.,http://open.sen.se
4. Hodges, S., Taylor, S., Villar, N., Scott, J., Bial, D., Fischer, P. T.: "Prototyping connected devices for the internet of things. Computer," Vol.46, No.2, pp.26-34(2013)
5. Mural.ly, http://mural.ly
6. Miorandi, D., Sicari, S., De Pellegrini, F., Chlamtac, I.: "Internet of things: Vision, applications and research challenges." Ad Hoc Networks, Vol.10, No.7, pp.1497-1516(2012)