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Preferential Subject N° - PS1. Software platforms for control of distributed energy resources (DER)

Implementation of Interoperability Adaptor for Interface with External Systems in Campus Microgrid

H.-Y. Kang, I.-H. Lim, M.-H. Lee, S.-C. Lee, and Y.-H. Shin*
LSIS*
South Korea
hykang@lsis.com

Microgrids are electricity distribution systems containing loads and distributed energy resources, (such as distributed generators, storage devices, or controllable loads) that can be operated in a controlled, coordinated way either while connected to the main power network or while is landed. Microgrid has off-grid type and connected type. Off-grid type microgrid is applied to various islanded areas which conventional power utility company supplies power hardly by natural environment issues such as too far distance, blackout by hurricane and storm. Connected microgrid is applied to areas such as university campus, military, factory, and hospital with special configuration as island in order to emergency islanding operation in blackout and to reduce electric energy cost by scheduled islanding operation.

The campus microgrid is a connected type system with goals to reduce electric charges and to increase power supply reliability at blackout from scheduled/non-scheduled islanding operation. The campus microgrid was configured by whole campus microgrid operation but a new type of campus microgrid consists of small group-based microgrid of a single building or a couple of buildings depending on effectiveness and DERs at the buildings. Thus, the campus microgrid should interface with external systems such as distribution management system (DMS), power exchange system, and the others; and with internal systems such as building management system (BEMS), electric vehicle management system (EVMS), and demand response automation server (DRAS) comfortably.

In these interface requirements for campus microgrid, the existing works for the interface were very hard and complex because of technical security issues of each vendor and an inquest into interface failure whether communication network or protocol or request/response side problem. Its implementation of the interface is hard; and detection of the problems also needs efforts, time, and expenses.

Therefore, this paper presents an implementation of interoperability adaptor for external interface with the other systems for campus microgrid of Seoul National University in South Korea. The presented interoperability adaptor has been designed and implemented by considering comfortable interface with external systems such as distribution operation systems; and with internal systems like BEMS and the other MG-EMS in the campus microgrid.



The presented interoperability adaptor has these specifications as below:

- ◆ To employ IEC 62541 OPC UA technology for IEC 61970/61968-published CIM implementation and interface infrastructure
- ◆ Automatic conversion of CIM and OPC UA data model depending on meta model conversion rule by an engineering tool
- ◆ To reduce development cost by modular design and implementation regardless of communication-based operating systems and development languages.
- ◆ Improvement of maintenance due to easy change and expansion of communication functions between TCP, FTP, and HTTP
- ◆ Development productivity improvement of interface with the other systems
- ◆ To increase work efficiency for application developers of the other systems
- ◆ To check causes of data communication errors easier than the existing work in order to interface with other systems
- ◆ Validation check of data in order to prevent unexpected events by data communication error.

The presented interoperability adaptor has been implemented and applied to the campus microgrid of Seoul National University in South Korea which has various systems, operating systems, and development languages; and it has contributed to increase work efficiency due to resolve work conflict between system vendors with dispatch.

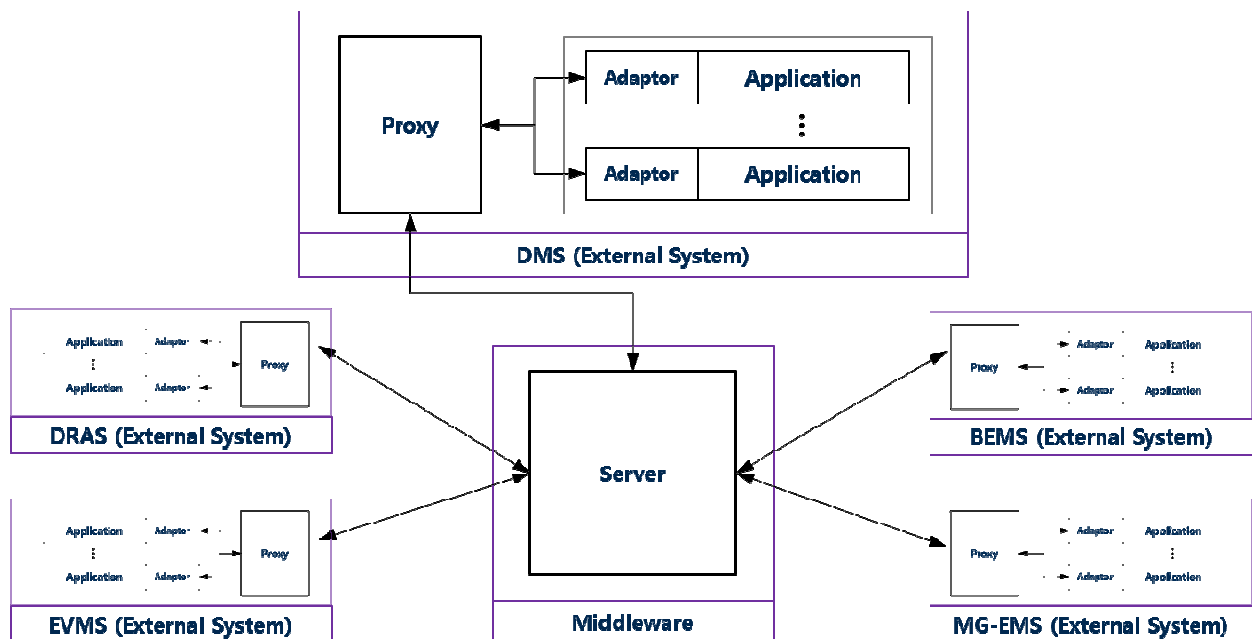


Fig. 1. Deployment architecture