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IEEE Standard for Ubiquitous Green Community Control Network Protocol

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Abstract: The standard identifies gateways for field-bus networks, data storage for archiving and developing data sharing platforms, and application units as important system components for developing digital communities, i.e., building-scale and city-wide ubiquitous facility networking infrastructure. The standard defines a data exchange protocol that generalizes and interconnects these components (gateways, storage, application units) over the IPv4/v6-based networks. This enables integration of multiple facilities, data storage, application services such as central management, energy saving, environmental monitoring, and alarm notification systems.

Keywords: access interface, actuator, APP, application, communication protocol, component, data structure, energy management, energy saving, facility networking, gateway, GW, IEEE 1888™, point, registry, sensor, SOAP, storage

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Introduction

This introduction is not part of IEEE Std 1888-2014, IEEE Standard for Ubiquitous Green Community Control Network Protocol.

The standard identifies gateways for field-bus networks, data storage for archiving and developing data sharing platforms, and application units to be important system components for developing digital communities, i.e., building-scale and city-wide ubiquitous facility networking infrastructure. The standard defines a data exchange protocol that generalizes and interconnects these components (gateways, storage, application units) over the IPv4/v6-based networks. This enables integration of multiple facilities, data storage, application services such as central management, energy saving, environmental monitoring, and alarm notification systems.

Facility networking in buildings, houses, and factories is now considered to be a promising tool for energy management or energy saving, and networking of facilities with TCP/IP protocols has certainly enabled building-scale or city-wide energy management. However, most of the systems are proprietarily and independently developed, deployed, and operated, which makes the installation and running costs quite high.

Traditionally, in order to extend access reachability to sensors and actuators at the field-bus level via the Internet, gateway design has been introduced. However, recent applications of facility networking for such scales are required beyond just a simple access to devices. In most of the practical implementations, they have (1) large storage to archive the history of sensor readings, (2) user interface for interactive operation, (3) reporting systems, and (4) a data analyzer.

Collaboration of these system components is mandatory, especially in energy-aware facility networking. However, they cannot simply collaborate or interoperate with each other without understanding the intended analysis, integration, and operation of systems, because these system components have been independently developed and proprietarily integrated.

Interoperability of these system components by a common communication protocol certainly increases the efficiency of facility networking deployment. It reduces the cost of system integration and interoperability management, allowing installation of them in small and medium-sized buildings and even houses. For vendors, their developed components can be sold worldwide without any customized implementation, sometimes resulting in mass production with reasonable cost.

Targeting building-scale and city-wide energy management, the IEEE P1888 Working Group initiated the project named Ubiquitous Green Community Control Network (UGCCNet), which specifies integration architecture of remote facilities. The scope and purpose of this project is to establish facility networking infrastructure over the Internet by specifying an interoperable communication protocol among the common (building-scale) facility networking components (i.e., device access gateways, data storage, and application units). This standard specifies UGCCNet in order to allow interoperability and open development of those facility networking components. First, the standard generalizes all the facility networking components by a simple component model. Then, the standard defines communication protocol among them. The standard also introduces a registry mechanism to support autonomous collaboration of these components.

It is a communication infrastructure that aims to construct a new network for the renewal of the facilities, next generation's facility management, and the energy conservation including small and medium-sized facilities. The aspect is expanded from a past facility management to the operation management that targets energy conservation and the integration of the management platform. This infrastructure will be used for some system-level collaborations in addition to the energy conservation.

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1. Overview

1.1 Scope

The standard identifies gateways for field-bus networks, data storage for archiving and developing data sharing platforms, and application units such as those providing user interfaces of analysis and for knowing that environmental information is an important system component for developing digital communities, i.e., building-scale and city-wide ubiquitous facility networking infrastructure. The standard defines a data exchange protocol that generalizes and interconnects these components (gateways, storage, application units) over the IPv4/v6-based networks. This opens the application interface to handle the statuses of multi-vendor facilities on a generalized digital infrastructure. The standard assumes distributed operation of the infrastructure by multiple service providers and integrators, and defines a component management protocol that autonomously interoperates such distributed infrastructure. Security requirements are taken into consideration in this standard to ensure the integrity and confidentiality of data.

1.2 Purpose

The standard aims to develop green communities whose energy usage is well managed and highly efficient, by allowing the interconnection of facilities of multiple buildings including small and medium-sized on different converged networks, data sharing platforms, and application units. The products based on the standard implement the functions of sensing, archiving, sharing and presenting of ubiquitous information such as power usage and generation, environmental status and signals, human behavior, heating, ventilation, and air conditioning (HVAC) working status, lighting systems, weather, warnings, analyzed data, forecasted data, and so on. With the capability of interoperable integration of these system

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