A Study of IoT Node Discover and Registration Based on IETF CoAP Protocol

[1]Wen-Quan Jin, [2]Yong-Geun Hong, and [1]DoHyeun Kim

[1] Department of Computer Engineering,Jeju National University,
Jeju-Si, Ara 1 Dong, Republic of Korea
[2] ETRI, 218 Gajeong-ro Yuseung-Gu, Daejeon, Republic of Korea
pluskmk12@live.com, yghong@etri.re.kr, kimdh@jejunu.ac.kr

Abstract. Recently, IETF (Internet Engineering Task Force) CoRE(Constrained RESTful Environments) aims at realizing) group has studied CoAP(Constrained Application Protocol) protocol based on the REST architecture for the constrained nodes and networks. CoAP provides the special requirements of this constrained environment, especially considering energy, automation, and other IoT(Internet of Things) applications. In this paper, we present a IoT node registration and discover mechanism based on IETF CoAP protocol using RD (Resource Directory).

Keywords: CoAP, Node registration, Resource directory

1   Introduction

CoAP (Constrained Application Protocol) supports the devices constrained in terms of memory, processing and power i.e. small low power sensors, switches and valves etc. CoAP uses a request/response interaction model between application nodes, supports built-in discovery of services and resources, and includes key concepts of the Web such as URIs and Internet media types. CoAP is designed to easily interface with HTTP for integration with the Web while meeting specialized requirements such as multicast support, very low overhead, and simplicity for constrained environments. CoAP allows such devices to interactively communicate over the Internet. There are two entities required for CoAP communication i.e. CoAP client and CoAP server.   A CoAP server may also act as client and vice versa if both of these entities have resources to share and require certain resources from each other [1].

The CoAP server discovers a RD (Resource Directory). The discovery of RD means finding location of the register function set in the RD using which a CoAP server may register the resources which it wants to share. Once a complete path is obtained for a register function set in the RD, the CoAP server may then register (publish) resources to the RD. The CoAP clients then requests the RD to look up for registered resources. The RD then returns the access paths for the registered resources according to the request of the client. The returned resources may include simple or composite resources and the client can communicate with these resources [2]. Yet,

there is not design and implement the node registration based on RD using CoAP protocol in detail.

In this paper, we propose the node registration and discover mechanism based on IETF CoAP protocol using RD (Resource Directory) in IoT(Internet of Things) networks. This mechanism provides an implementation of a node registration on Internet. A node registration mechanism is important for the efficiency IoT systems

2   IoT node registration and discover mechanism

Figure 1 illustrates the conceptual RD architecture for registration and lookup of those resources. A RD has a repository of resources for nodes. A physical node associates with a IP address and a port. The CoAP node communicates with RD through CoAP. RD and client can communicate through CoAP or HTTP. If HTTP is selected in the communication, the RD have to implements CoAP and HTTP [2].
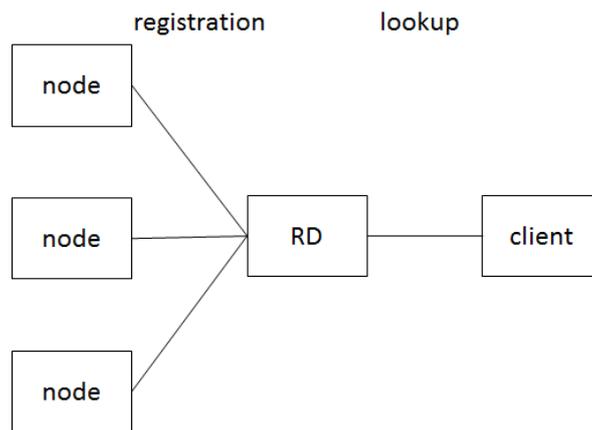

Fig. 1. The resource directory architecture.

We assume that a node know the RD's IP address, port and the path of its RD firstly. Then it can make use of an RD for discovering the RD. A node send either a multicast or unicast GET request message for discovery.

Next, a node perform to register its resources using the registration interface after discovering the location of an RD using POST request message. The RD accepts a POST request message from a node containing the list of resources to be added to the directory as the message payload. The list of resources of a node stores in the database of RD.

Figure 2 shows the sequence diagram for process of a node registration and discover. Firstly, a node sends a GET request with "ni" parameter to "conn" resource of a RD. The parameter is a node ID which is used for retrieving a node in the database of a RD. If there is confirmed through a node ID, then RD responds a node version. Otherwise, RD responds a string to notify the node for there isn't node

information. After the node receives the response, it sends POST request to the RD with "ni" and a payload which includes a node's information for register a new node.
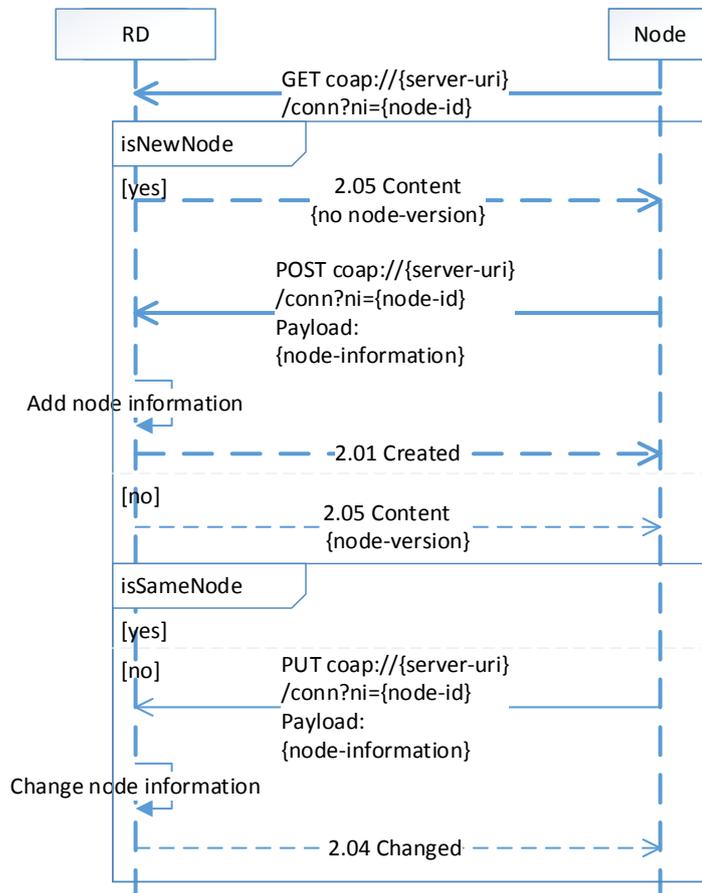

Fig. 2. Sequence diagram for discover and registration of a node.

References

1. Shelby, Z., Hartke, K., and C. Bormann, "The Constrained Application Protocol (CoAP)", RFC 7252, June 2014.
2. Shelby, Z., Bormann, C., and S. Krco, "CoRE Resource Directory", ID draft-ietf-core-resource-directory-05, October 2015.
3. Y. Hong, Y. Choi, D. Kim, M. Khan, W. Jin, "CoAP Endpoint Unit Identification for Multiple Sensor and Actuator in a Node", Internet-Draft, draft-hong-core-coap-endpoint-unit-id-00, July 2014.