WHITE PAPER

Smart Commercial Buildings Work Group

OPEN CONNECTIVITY FOUNDATION®

BACnet Gateway & OCF

BACNET GATEWAY SOLUTION

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Introduction

Due to the EU energy savings directive, there will be a pull from the industry to have more sensors in the buildings. More sensors in buildings will give better data to optimize the energy consumption of the building. However, due to old building stock in the EU, this means partly retrofitting buildings and most buildings are using wires for connectivity. To have an option to reduce installation cost, wireless solutions can be used. To do this cheaply and for devices that are battery powered one can use the meshed IP technology of the Thread Group. The Thread technology is optimised for low power constrained devices, which does not perform well with HTTP, and so UDP is the preferred transport layer. To use the Thread protocol in the building automation domain devices running Thread need an application layer. The Open Connectivity Foundation (OCF) has an IP based, secure framework that is based on UDP. This framework is used in the smart home domain, but also can be used in the commercial domain. The advantage of OCF is that an open source implementation exists of their specifications. The open source project is called IoTivity and the IoTivity-Lite stack that can run on a Thread-based. Hence technology is already available to create IP based mesh devices with a secure stack.

BACnet Gateway with OCF device support

The OCF devices can be used as a subordinate to a BACnet gateway. The BACnet Gateway will implement an OCF Client. An OCF Client can interact with the OCF devices. The Gateway needs to translate the OCF Devices and Resources to the BACnet Devices and objects that will represent the modelled values in the BACnet network.

Existing BACnet gateways have been performing translations of non-BACnet devices to the BACnet network for many years. As an example: data coming from a MODBUS device can be represented by a BACnet gateway as BACnet Objects in the BACnet network. This approach might work well with existing BACnet gateways that already have internal features available to do translation to the BACnet network. The BACnet specification has defined in Annex H, which describes how such a Gateway should function. The implementer of a BACnet gateway can list the OCF devices as separated BACnet devices or aggregate them in a single BACnet device. The OCF devices can also implement a single sensor or have multiple (same) sensors implemented. This is a product choice as well. The deployment of a system will determine which products are the most suitable. For example, if the system requires that the same sensors are deployed in multiple spaces, the physical deployed device will have a single sensor.

The Gateway can represent these separate OCF devices as a single BACnet device representing all the OCF devices as BACnet objects .

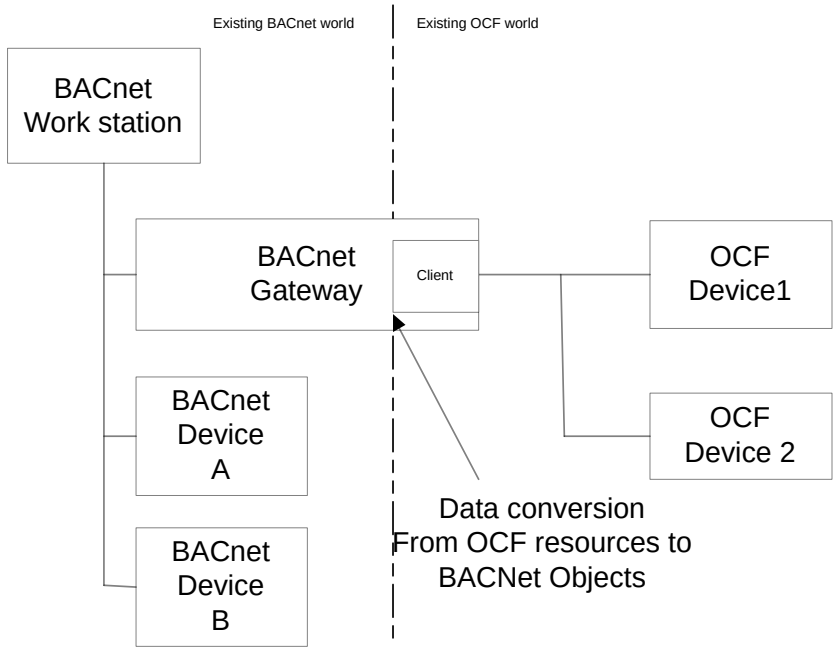

Figure 1 OCF as sub ecosystem of BACnet

The BACnet gateway is then an application level gateway and there is always a need to translate models at the application level. Typical OCF sensors and Actuators will be converted in a BACnet gateway. Typical OCF sensors are read-only, and OCF actuators have read and write access. OCF sensors are indicated with the interface value "oic.if.s". OCF actuators are indicated with the interface value "oic.if.a".

OCF interface	JSON type in the OCF resource	BACnet object type
oic.if.s	number	0-AnalogInput
oic.if.s	integer	0-AnalogInput
oic.if.s	boolean	0-BinaryInput
oic.if.a	number	0-AnalogValue
oic.if.a	integer	0-AnalogValue
oic.if.a	boolean	0-BinaryValue

Table 1 Simple translation rules from OCF resources to BACnet objects

The integration of OCF with an BACnet Gateway leaves both the OCF world and the BACnet world intact. Another approach can be to transport the BACnet models itself over the OCF framework, e.g. removing the need to application level translation in the gateway.

Future considerations

The OCF Core Framework has been designed to securely transport data between clients and servers. In this document a description is given of how to use the OCF Core Framework to transport BACnet object data.

The BACnet objects can be transferred by the OCF framework, The OCF Framework supports the methods RETRIEVE and UPDATE these methods are implemented with the CoAP verbs, hence the methods are available in confirmable and non-confirmable form. These methods can be mapped to the BACnet objects access mechanisms.

The BACnet models itself can be transported over the OCF framework as ASN-1 data or as CBOR encoded JSON.

References

BACnet	ISO 16484-5:2017
Concise Binary Object Representation (CBOR)	https://tools.ietf.org/html/rfc7049
Constrained Application Protocol (CoAP)	https://tools.ietf.org/html/rfc7252
Datagram Transport Layer Security	https://tools.ietf.org/html/rfc6347
IoTivity	https://iotivity.org/
Open Connectivity Foundation (OCF)	ISO/IEC 30118
Standardized rt values:	https://www.iana.org/assignments/core-parameters/core-parameters.xhtml#rt-link-target-att-value
Thread Group	https://www.threadgroup.org/