Smart Object

CoAP Resources

Definition and Format

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1. Introduction

1.1 Purpose

The purpose of this document is to present the list of resources defined by the smart object as well as their attributes.

1.2 Definitions, Acronyms, and Abbreviations

AAA Authentication, Authorization and Accounting Protocol
DAG Directed Acyclic Graph
DODAG Destination Oriented Directed Acyclic Graph
DIO DODAG Information Object
DAO DODAG Advertisement Object
DIS DODAG Information Solicitation
LLN Low Power Lossy Network
MP2P Multipoint to Point
OF Objective Function
OCP Objective Code Point
P2MP Point to Multipoint
P2P Peer to Peer
ROLL Routing over Low Power and Lossy Links
RPL Routing Protocol for Low Power and Lossy Networks
FAR Field Access Router
RBR RPL Border Router
LBR LLN Border Router

2. Resources List

There are two flavors of smart objects firmware:

- VN400 firmware (VN400) – intended for radios installed in the customer product
- Development Kit firmware (DevKit) – intended for radios installed on the Nivis power pack or support boards

The resources supported differ between smart object flavors.

2.1 Smart Object defined resources

Resource	URI	Content Type	Interface	SO Flavor	Obs	Default Publish Period	MaxAge (s)	R/W
WellKnown	/.well-known/core	COAP_LINKFORMAT	Adm	VN400 DevKit	No	N/A	900	R
DevInfo	/dev/info	XML TEXTPLAIN	Ema	VN400 DevKit	No	N/A	10	R
DevStat	/dev/stat	XML TEXTPLAIN	Ema	VN400 DevKit	No	N/A	10	R
DevConfig	/dev/config	XML TEXTPLAIN	Adm	VN400 DevKit	No	N/A	10	R W
NetInfo	/net	XML TEXTPLAIN XML	Ema	VN400 DevKit	No	N/A	10	R
ToggleSW	/app/sw	XML TEXTPLAIN	App0	DevKit	Yes	1800	not observed: 2s observed: 300s + 2*pubPeriod	R
Potentiometer-%	/app/ptm	XML TEXTPLAIN	App0	DevKit	Yes	1800	not observed: 2s observed: 300s + 2*pubPeriod	R
Battery-%	/app/batt	XML TEXTPLAIN	App0	DevKit	Yes	1800	not observed: 2s observed: 300s + 2*pubPeriod	R

2.1.1 Well Known Resource

Well-Known resource is defined in CoAP standard and must have Linkformat content type. Information about this resource can be found in "draft-shelby-core-link-format": http://datatracker.ietf.org/doc/draft-ietf-core-link-format/

As a particular note, Nivis custom implementation for W-K resource, each resource that has the mark 'o=<publish-period>' is an observable resource. <publish-period> indicates the **default** publish period on the device in number of seconds. If no 'pb' query is included in a subscription request, device will start publishing with this default publication period. The presence of 'o=<publish-period>' is just an indication that the resource is observable not that the resource is observed.

Example:

```
</dev/info>;rt="DevInfo";if="Ema",
</dev/stat>;rt="DevStat";if="Ema",
</dev/config>;rt="DevConfig";if="Adm",
</net>;rt="NetInfo";if="Ema",
</app/sw>;rt="ToggleSW";if="App0";o=180,
</app/ptm>;rt="Potentiometer-%";if="App0";o=180,
</app/batt>;rt="Battery-%";if="App0";o=300
```

Where interfaces used by the radio modem are:
Ema = Exposed management attributes
Adm = Administration
App0 = Application resources on radio modem (toggle switch, potentiometer and battery).

If Content type is XML, device's unix timestamp is included in each element. **<e t="1348107092">.** This is also valid for application defined resources.

2.1.2 Device Information Resource

Example:

```
<?xml version="1.0"?>
<e t="1349671781">
<PlType v="GFSK-915-50/150/200kbps"/>
<MacType v="TSCH"/>
<EUI64 v="0022FF0100000017"/>
<Addr16 v="0010"/>
<IP v="20010470DB0C00020022FF0100000017"/>
<FwVer v="00.00.01"/>
<Uptime v="698"/>
</e>
```

2.1.3 Device Statistics Resource

Example:

```
<?xml version="1.0"?>
<e t="1349671679">
<LLRSSI v="67"/>
<FailTx v="0"/>
<SuccessTx v="535"/>
<FCSerr v="0"/>
<SuccessRx v="123"/>
<NACK v="1"/>
<PSR v="100,100,90,100,100,100,100,100"/>
</e>
```

Where:
PSR=pachet success rate in percent for all used channels, separated by comma

2.1.4 Device Configuration Resource

Example:

```
<?xml version="1.0"?>
<e t="1360793987">
<Sec v="00"/>
<Obs v="5=180,6=180,7=300"/>
</e>
```

Where Security value:
0 – none
1 – auth 32
2 – auth 64
3 – auth 128
4 – reserved
5 – sec + auth 32
6 – sec + auth 64
7 – sec + auth 128

2.1.5 Network Information Resource

Example:

```
<?xml version="1.0"?>
<e t="1348106887">
<DODAGID v="20010470DB0C00020000000001200001"/>
<RPLInstanceId v="0"/>
<Ver v="244"/>
<OCP v="0"/>
<Rank v="256"/>
<JoinStat v="2"/>
<PreferredParent v="0022FF0100000009,256,0"/>
<BackupParent v="0000000000000000,0,0"/>
</e>
```

Where:
Preferred parent=EUI64, rank, PER
Backup parent=EUI64, rank, PER

2.1.6 ON/OFF Switch Resource

Publish: Publish at interval and on change
Example:

```
<?xml version="1.0"?>
<e t="1348107026">
<Sw v="0"/>
</e>
```

Where:
Sw values: 0 or 1

2.1.7 Potentionmeter Resource

Publish: Publish at interval and on 5% change
Example:

```
<?xml version="1.0"?>
<e t="1348107061">
<Ptm v="34"/>
</e>
```

Where:
Ptm values: 0 … 100

2.1.8 Battery Resource

Publish: Publish at interval and on 5% change
Example:

```
<?xml version="1.0"?>
<e t="1348107092">
<Batt v="100"/>
</e>
```

Where:
Batt values 0 … 101 (101 means line powered)

2.2 Application processor defined resources

Application processor can define maximum 4/8 (DevKit/VN400) resources each ***with its self-defined*** URI, resource type, interface and content type.

Content type for application processor defined resources can be ***one*** of the following:

-text plain
-XML
-octet stream

All application defined resources are observable and default publish period is 300s.

All application defined resources are by default writable via API commands (*Nivis Smart Object API Integration Manual.docx*).

Multiple tags with the same name can exist inside a resource payload.

Example of resources defined by the application processor:

Title	URI	Resource Type	Interface	Observable	Publish Period	Max Age (s)	Read only	Examples and comments
Power	**/power**	**ipso.pwr**	**App1**	**Yes**	**10**	**20**	**No**	**Content Type =** EXI <?xml version="1.0"?> <e t="**1349794383**"> <Timestamp v="**1349790000**"/> <InstPower v="**123456790528.0000000**"/> <CumulativePower v="**45454545131667460.0000000**"/> </e>
Light Control	**/lgtcontrol**	**ipso.lt**	**App1**	**Yes**	**10**	**20**	**No**	**Content Type =** EXI <?xml version="1.0"?> <e t="**1349804649**"> <LightStatus v="**1**"/> <LightDimmer v="**50**"/> </e>**>**

2.3 Changing publish period

Publication period can be changed for each observable resource by including a "pb=<NewPublishPeriod >" query option together with the observe option within a GET request. Example of sending GET request with observe option and query option "pb=10" from browser (through proxy):

http://observe-resources-set/?enable=1&device=2001::1:4&path=/app/sw&pb=10

to set publish rate = 10 seconds.

When updating publish period on the device, max-age automatically changes to:

NewMaxAge = 2*NewPublishPeriod +300; //2*NewPublishPeriod + 5 minutes

2.4 List of observed resources

The list of observed resources and the associated publish period can be retrieved by executing a GET-request on the '/dev/config' resource.

Section Obs is an array of ResourceID=<publicationPeriodInNumberOfSeconds>. The resolution from resourceID to resource URI can be performed based on the resource directory (Well-Known resource).

Note that the publication period specified in the resource directory (Well-Known resource) is the default publication period for that resource; any update on the publication period for a particular observe tuple will not be seen in the Well-Known resource. If device receives a subscription for a resource without the publication period included, default publication period is assumed. In this case, ',ResourceIDOfNewObservedResource=<publicationPeriodInSeconds>' is appended to /dev/config, Obs resource.

An example of the payload for this resource is provided below:

```
<?xml version="1.0"?>
<e t="1360793987">
<Sec v="00"/>
<Obs v="5=180,6=180,7=300"/>
</e>
```

Resource with ID 5 (/app/sw) is observed with publication period 180s.

Resource with ID 6 (/app/ptm) is observed with publication period 180s.

Resource with ID 7 (/app/batt) is observed with publication period 300s.