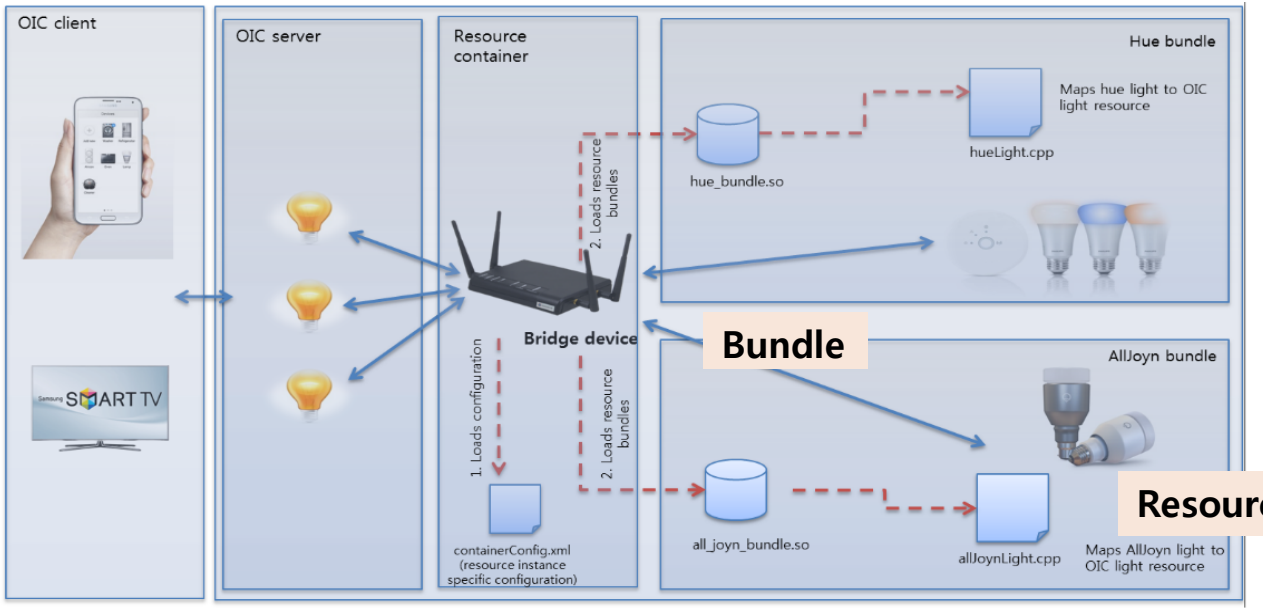
Tizen/Artik IoT Lecture Chapter 12. IoTivity Resource Container

Sungkyunkwan University

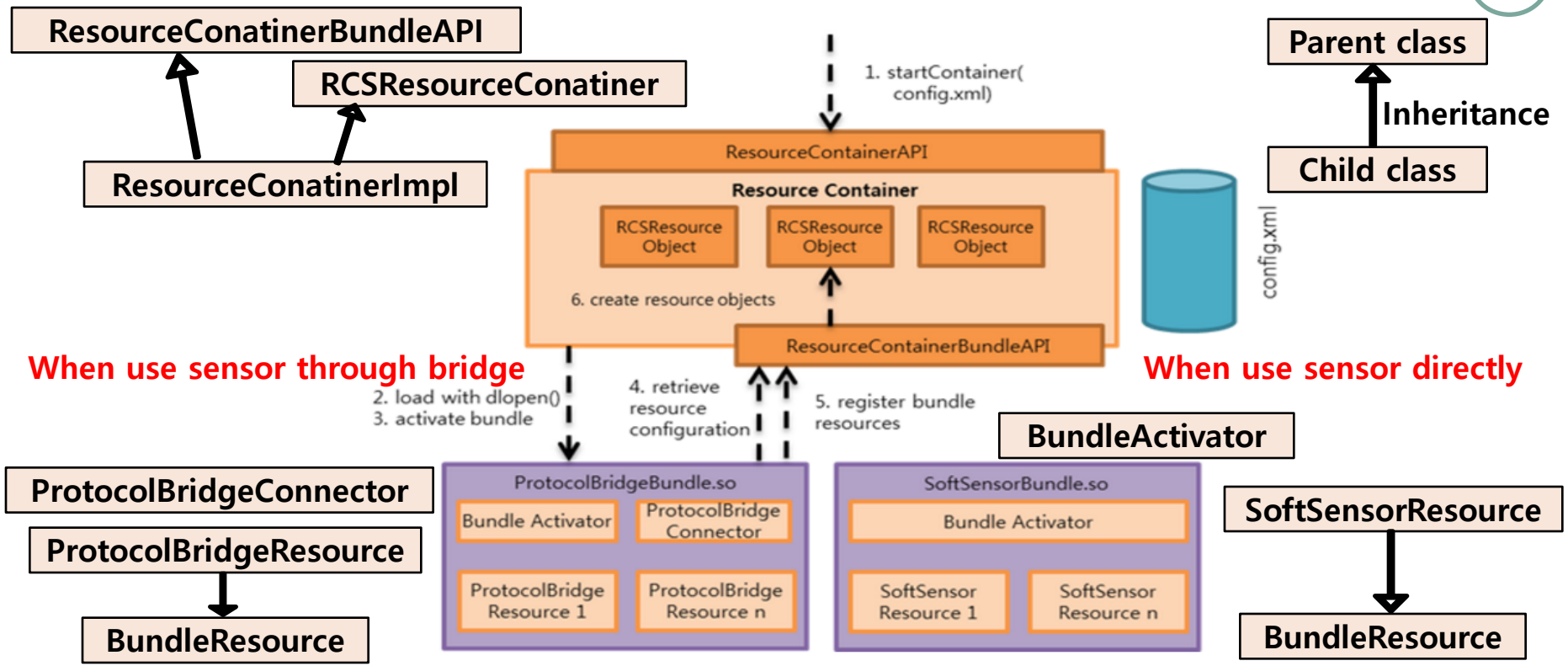
Use Case

- **Acts as a bridge between OIC & non-OIC ecosystems**
- **Enables Iotivity system to see non-OIC servers**



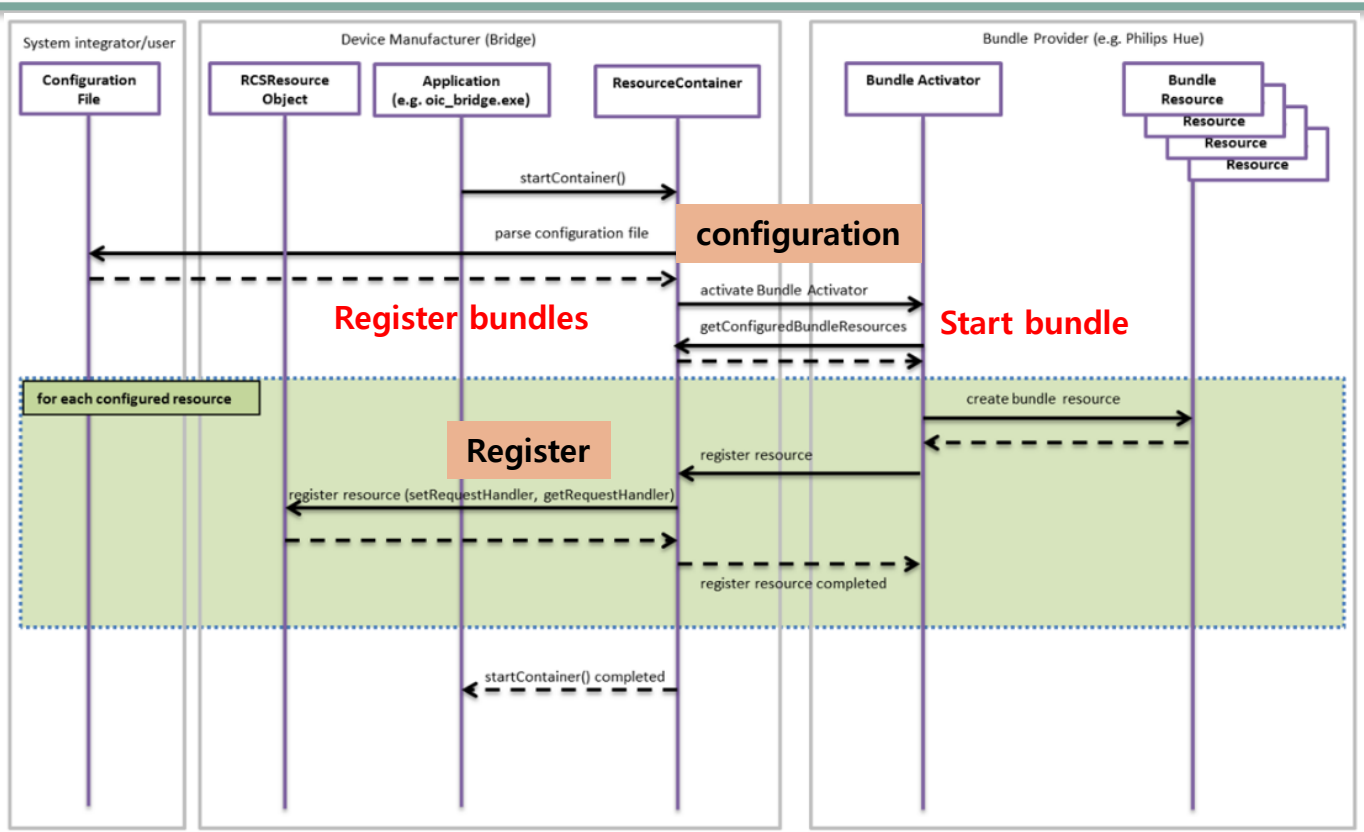
https://wiki.iotivity.org/resource_container_-_programming_guide

Architecture



https://wiki.iotivity.org/resource_container_-_programming_guide

Control Flow of startContainer()



https://wiki.iotivity.org/resource_container_-_programming_guide

XML Configuration File

- **XML file defines the interface and configuration of resource with resource container**
  - Id, path, activator, resource info …
- **When adding bundles, Resource Container parses configuration file and create object (RCSResourceObject) and resource**

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<container>
    <bundle>
        <id>oic.bundle.discomfortIndexSensor</id>
        <path>libDISensorBundle.so</path>
        <activator>disensor</activator>
        <version>1.0.0</version>
        <resources>
            <resourceInfo>
                <name>DiscomfortIndexSensor1</name>
                <resourceType>oic.r.sensor</resourceType>
                <outputs>
                    <output>
                        <name>discomfortIndex</name>
                        <type>int</type>
                    </output>
                    <output>
                        <name>humidity</name>
                        <type>double</type>
                    </output>
                    <output>
                        <name>temperature</name>
                        <type>double</type>
                    </output>
                </outputs>
                <inputs>
                    <input>
                        <name>humidity</name>
                        <type>double</type>
                        <resourceType>oic.r.humidity</resourceType>
                    </input>
                    <input>
                        <name>temperature</name>
                        <type>double</type>
                        <resourceType>oic.r.temperature</resourceType>
                    </input>
                </inputs>
            </resourceInfo>
        </resources>
    </bundle>
```

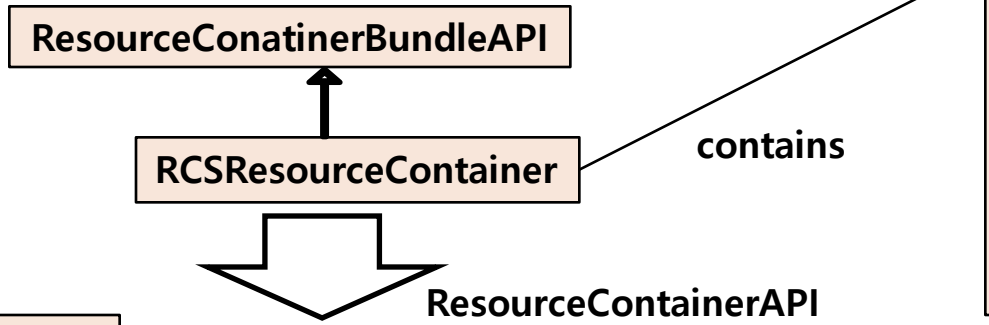
bundle

output

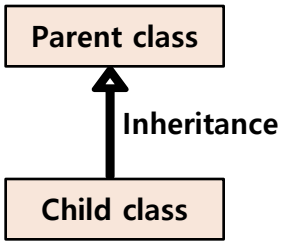
input

APIs

Bundle API accessing resource container



ResourceContainerAPI



Return	Interface	Parameter
void	startContainer	string configFile
void	stopContainer	void
list<BundleInfo*>	listBundles	void
void	startBundle	BundleInfo *bInfo
void	stopBundle	BundleInfo *bInfo
void	addBundle	string bundleId, string bundleUri, string bundlePath, map<string,string> params
void	removeBundle	string bundleId
void	addResourceConfig	string bundleId, string resourceUri, map<string,string> params
void	removeResourceConfig	string bundleId, string resourceUri
list<BundleResource*>	listBundleResources	string bundleId

Dynamic configuration

Test Program: ContainerSample (1/2)


```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 1
Type Configuration File Path (Press '0' to start with example): 0
48:47.117 INFO: RESOURCE_CONTAINER: Starting resource container.
48:47.117 INFO: RESOURCE_CONTAINER: Resource container without Java support.
48:47.117 INFO: RESOURCE_CONTAINER: Init Bundle:(oic.bundle.discomfortIndexSensor;libDISensorBundle.
48:47.117 INFO: RESOURCE_CONTAINER: Registering bundle: (libDISensorBundle.so)
48:47.117 DEBUG: RESOURCE_CONTAINER: Register SO bundle
48:47.117 DEBUG: RESOURCE_CONTAINER: Activator name disensor
48:47.117 DEBUG: RESOURCE_CONTAINER: Looked up disensor_externalActivateBundle
48:47.117 DEBUG: RESOURCE_CONTAINER: Looked up disensor_externalDeactivateBundle
48:47.117 DEBUG: RESOURCE_CONTAINER: Looked up disensor_externalCreateResource
48:47.117 DEBUG: RESOURCE_CONTAINER: Looked up disensor_externalDestroyResource
48:47.117 DEBUG: RESOURCE_CONTAINER: Register SO bundle finished
48:47.117 INFO: RESOURCE_CONTAINER: Activating bundle: (oic.bundle.discomfortIndexSensor)
48:47.117 INFO: RESOURCE_CONTAINER: Activating bundle: (oic.bundle.discomfortIndexSensor)
48:47.117 INFO: RESOURCE_CONTAINER: Loading resource configuration!
48:47.117 INFO: RESOURCE_CONTAINER: Comparing bundle ids oic.bundle.discomfortIndexSensor - oic.bundle.discomfortIndexSensor
48:47.117 INFO: RESOURCE_CONTAINER: Inspecting
48:47.117 INFO: RESOURCE_CONTAINER: Bundle has input (oic.bundle.discomfortIndexSensor)
48:47.117 INFO: RESOURCE_CONTAINER: key: name, value discomfortIndex
48:47.117 INFO: RESOURCE_CONTAINER: key: type, value int
48:47.117 INFO: RESOURCE_CONTAINER: Bundle has input (oic.bundle.discomfortIndexSensor)
48:47.117 INFO: RESOURCE_CONTAINER: key: name, value humidity
48:47.117 INFO: RESOURCE_CONTAINER: key: type, value double
48:47.117 INFO: RESOURCE_CONTAINER: Bundle has input (oic.bundle.discomfortIndexSensor)
48:47.117 INFO: RESOURCE_CONTAINER: key: name, value temperature
48:47.117 INFO: RESOURCE_CONTAINER: key: type, value double
48:47.117 INFO: RESOURCE_CONTAINER: key: name, value humidity
48:47.117 INFO: RESOURCE_CONTAINER: key: type, value double
48:47.117 INFO: RESOURCE_CONTAINER: key: resourceType, value oic.r.humidity
48:47.117 INFO: RESOURCE_CONTAINER: key: name, value temperature
48:47.117 INFO: RESOURCE_CONTAINER: key: type, value double
48:47.117 INFO: RESOURCE_CONTAINER: key: resourceType, value oic.r.temperature
48:47.117 INFO: RESOURCE_CONTAINER: set attribute (discomfortIndex', with )'
48:47.117 INFO: RESOURCE_CONTAINER: set attribute (humidity', with )'
48:47.117 INFO: RESOURCE_CONTAINER: set attribute (temperature', with )'
```

1 – start resource container
Read config and .so files

```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 3
48:59.404 INFO: RESOURCE_CONTAINER: Add Bundle: (oic.bundle.hueSample; libHueBundle.so)
48:59.404 INFO: RESOURCE_CONTAINER: Registering bundle: (libHueBundle.so)
48:59.404 DEBUG: RESOURCE_CONTAINER: Register SO bundle
48:59.404 DEBUG: RESOURCE_CONTAINER: Activator name huesample
48:59.404 DEBUG: RESOURCE_CONTAINER: Looked up huesample_externalActivateBundle
48:59.404 DEBUG: RESOURCE_CONTAINER: Looked up huesample_externalDeactivateBundle
48:59.404 DEBUG: RE
48:59.404 DEBUG: RE
48:59.404 DEBUG: RE
```

3 - Add bundles

```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 4
53:05.204 INFO: RESOURCE_CONTAINER: list bundles (3)
53:05.204 INFO: RESOURCE_CONTAINER: startBundle oic.bundle.hueSample
53:05.204 INFO: RESOURCE_CONTAINER: Activating bundle: (oic.bundle.hueSample)
53:05.204 INFO: RESOURCE_CONTAINER: Activating bundle: (oic.bundle.hueSample)
53:05.204 INFO: RESOURCE_CONTAINER: Loading resource configuration!
53:05.204 INFO: RESOURCE_CONTAINER: Comparing bundle ids oic.bundle.discomfortIndexSensor - oic.bundle.hueSample !
53:05.204 INFO: RESOURCE_CONTAINER: Comparing bundle ids oic.bundle.BMISensor - oic.bundle.hueSample !
53:05.204 INFO: RESOURCE_CONTAINER: Bundle activated: (oic.bundle.hueSample)
53:05.204 INFO: RESOURCE_CONTAINER: Bundle activated: (oic.bundle.hueSample)
```

4 – start bundles (activate)

Test Program: ContainerSample (2/2)


```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 7
53:56.407 INFO: RESOURCE_CONTAINER: list bundles (3)
53:56.407 INFO: RESOURCE_CONTAINER: set attribute (on-off', with false)'
53:56.407 INFO: RESOURCE_CONTAINER: set attribute (dim', with 0)'
53:56.407 INFO: RESOURCE_CONTAINER: set attribute (color', with 0)'
53:56.407 INFO: RESOURCE_CONTAINER: Registration of resource (/hue/light/sample, oic.r.light,oic.bundle.hueSample)
53:56.407 INFO: RESOURCE_CONTAINER: Registration finished (/hue/light/sample, oic.r.light)
53:56.407 INFO: RESOURCE_CONTAINER: isHasInput out of range oic.bundle.hueSample.
53:56.407 INFO: RESOURCE_CONTAINER: Resource has no input (/hue/light/sample, oic.r.light)
53:56.407 INFO: RESOURCE_CONTAINER: Registration finished (/hue/light/sample, oic.r.light)
```

7 – add resources

```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 9
55:05.276 INFO: RESOURCE_CONTAINER: list bundles (3)

-- oic.bundle.BMISensor
-- oic.bundle.discomfortIndexSensor
-- oic.bundle.hueSample
```

9 – list bundles

```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 10
Type Bundle Id to get Resource List (Press '0' to get example resource list): 0
56:02.599 INFO: RESOURCE_CONTAINER: list bundles (3)
56:02.599 INFO: RESOURCE_CONTAINER: listBundleResources oic.bundle.hueSample

-- /hue/light/sample
```

10 – list resources

Oic.bundle.hueSample

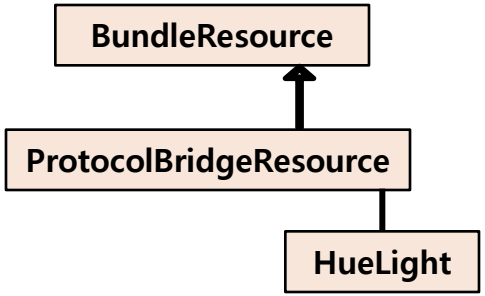
```
============================================================
        IoTivity Resource Container Test Application
============================================================
   1.  Start Resource Container
   2.  Stop Resource Container
   3.  Add Sample Bundle
   4.  Start Sample Bundle
   5.  Stop Sample Bundle
   6.  Remove Sample Bundle
   7.  Add Sample Resource
   8.  Remove Sample Resource
   9.  List Bundles
   10. List Resources
   11. Exit
============================================================
   Please Enter the NO: 10
Type Bundle Id to get Resource List (Press '0' to get example resource list): oic.bundle.discomfortIndexSensor
56:15.394 INFO: RESOURCE_CONTAINER: list bundles (3)
56:15.394 INFO: RESOURCE_CONTAINER: listBundleResources oic.bundle.discomfortIndexSensor

-- /softsensor/discomfortIndex/1
```

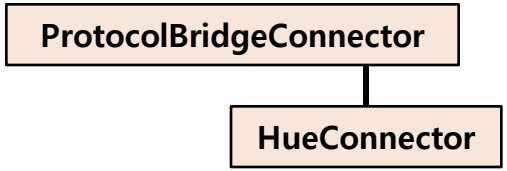
Oic.bundle.discomfortIndexSensor

Resource Example

With Bridge – Hue Sample

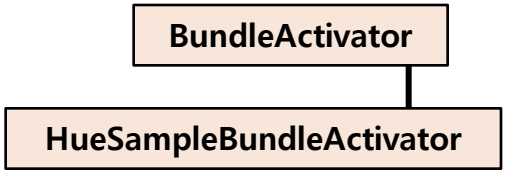


Resource within bridge

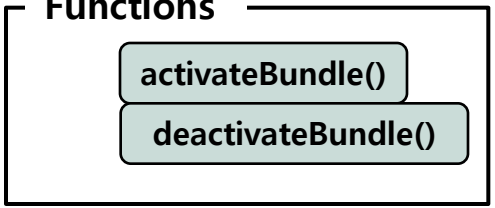


Role of connecting and data transfer

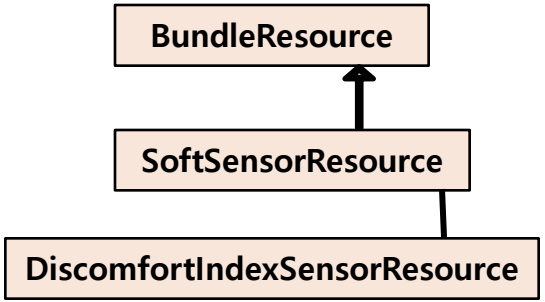
Common Part

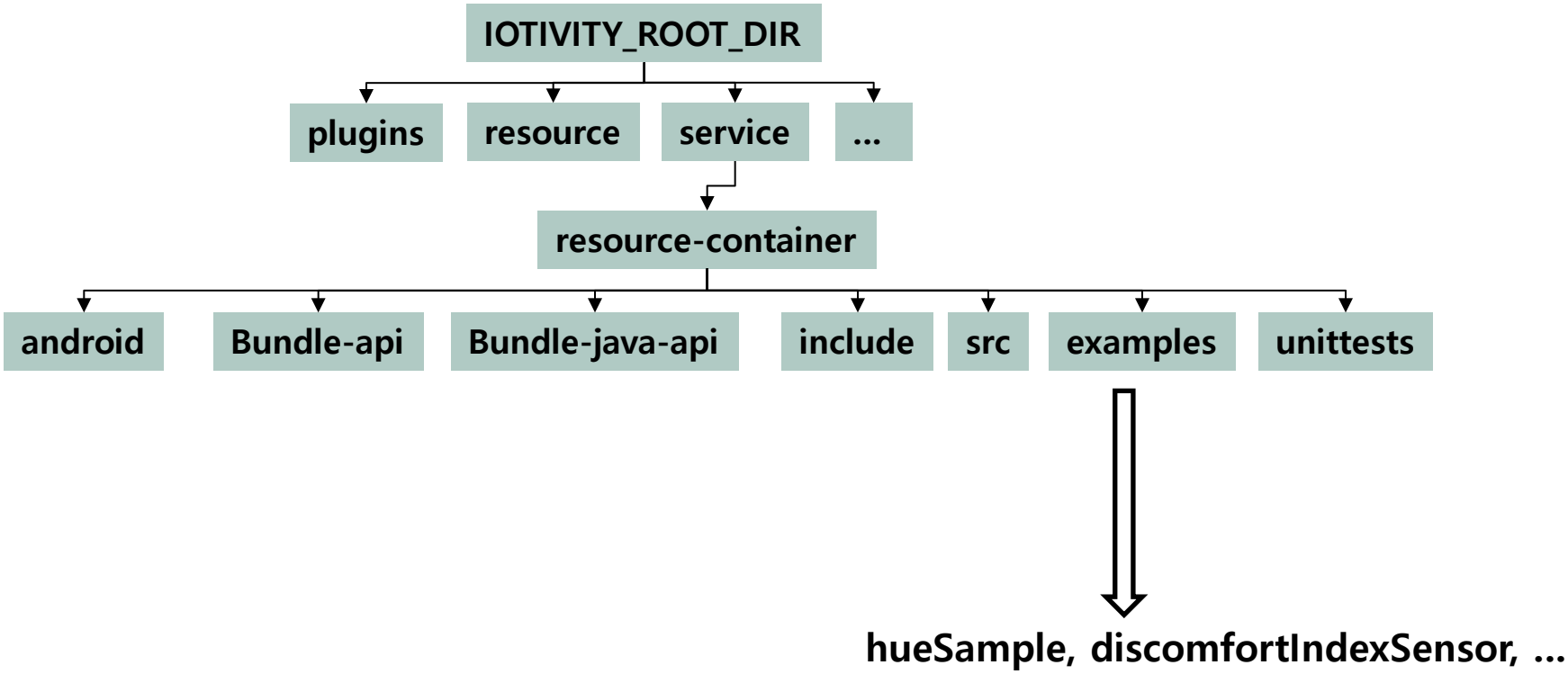


Role of activating and creating resources



Without Bridge – Discomfort Index Sensor



Resource representing sensor

Source Directory