

Cassia Hub SDK Technical Whitepaper.

Version 1.0

Overview:

Cassia Hub is a protocol gateway for Bluetooth LE devices. It enables remote access to your Bluetooth LE devices and the ability to sync your sensor data to the cloud.

In this document, we will cover the architecture and software interfaces of the Cassia Hub SDK. We will provide detailed information on the functionalities of the SDK as well as the signatures of each API.

System Architecture:

Cassia Hub has a build-in smart antenna array and industrial strength Bluetooth ICs. It also has a built-in Ethernet port and supports Wi-Fi. One Cassia Hub can connect to up to 22 Bluetooth LE devices at the same time. In relay mode, a Cassia Hub can also be used to extend the range of Bluetooth signals. With the embedded SDK, the Cassia Hub can be used as a protocol gateway, which will translate between Bluetooth LE protocol and IP protocol. This can enable internet access to your Bluetooth LE devices from a remote location.

In the Cassia Hub SDK, most of the Bluetooth GAP/GATT operations are exposed in Restful APIs/Endpoints. An http server on the Hub will respond to all http requests to the endpoints. The signatures of those APIs are fully compliant with Bluetooth SIG's internet work group Restful API spec. For a complete list of those APIs, please refer to the Restful API section of this document.

Prerequisites:

Once you have Cassia Hub (enterprise version) and SDK, you will also need a developer account for authorization of the APIs on the hub and on the cloud server. You can go to this page (<http://en.cassianetworks.com/pages/partners>) or contact our Business Development team (david@cassianetworks.com) to get your developer account.

Here's what a sample account looks like:

```
client_id:us-office, secret:198c776539c41234
```

Below are the sample scripts to verify your account and basic operation:

```
var credentials = {
  id: 'tester',
  secret: '816213f8b5c2877d'
};

var access_token = "";

var request = require('request');
var options = {
  url : 'http://localhost:3000/oauth2/token',
  method : 'POST',
  form : {'grant_type' : 'client_credentials'},
  headers : {
    Authorization : 'Basic ' + new Buffer(credentials.id + ':' +
      credentials.secret, 'ascii').toString('base64'),
  }
};

// options.url = ;
// options.method = 'POST';
// options.form = {'grant_type' : 'client_credentials'};
```

```
        Authorization : 'Bearer ' + access_token,
    }
};
});
});

request(options, function(error, request, body) {
    console.log(body);
});
```

Restful APIs:

A complete list of the APIs are documented here: <http://docs.cassiasdk.apiary.io/#>

Cloud-based access point.

Each Cassia Hub has a mirror site on the cloud. You can access your Hub's APIs from <http://api.cassianetworks.com/cassia/hubs/{hub'smacaddress}>

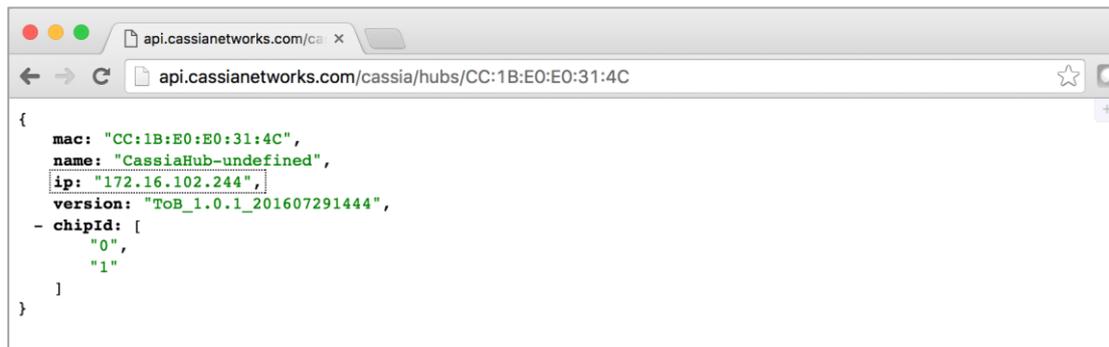
The signature of all the APIs on the cloud is the same as that from the local hub.

Best Practices:

1. How to find out the IP address of your hub?

Once the hub is powered on and connected to the network via either Ethernet or WiFi, it will get an IP address from the DHCP server on the subnet. To get the configuration information of your hub, you can visit this page: <http://api.cassianetworks.com/cassia/hubs/{your hub's bluetooth address}>. (Note: you can find the Bluetooth Address from the bottom of the hub.)

Here's a sample of the hub configuration page.



```
{
  mac: "CC:1B:E0:E0:31:4C",
  name: "CassiaHub-undefined",
  ip: "172.16.102.244",
  version: "ToB_1.0.1_201607291444",
  - chipId: [
    "0",
    "1"
  ]
}
```

2. How to use Cassia hub to scan for Bluetooth devices in its range?

There are 2 sets of APIs/Endpoints that you can use to interact with the hub: the APIs on the local hub and the APIs on our cloud server (<http://api.cassianetworks.com>). The two different endpoints will have the same set of APIs and give you the same result for any specific operations.

To use the hub to scan for Bluetooth LE devices using hub's endpoints:

```
GET http://{your hub's ip address}/gap/nodes/?event=1&mac=mac&chip=1
```

To use the hub to scan for Bluetooth LE devices using Cassia cloud server's endpoints:

```
GET http://api.cassianetworks.com/gap/nodes/?event=1&mac=mac&chip=chip
```

3. How to connect/disconnect to a target device?

To use the hub to connect to a specific Bluetooth LE device using hub's endpoints:

```
POST http://{your hub's IP address}/gap/nodes/<node>/connection?mac=mac&chip=chip
```

To use the hub to connect to a specific Bluetooth LE devices using Cassia cloud server's endpoints:

```
POST http://api.cassianetworks.com/gap/nodes/<node>/connection?mac=mac  
&chin=chin
```

To disconnect:

```
DELETE http://api.cassianetworks.com/gap/nodes/<node>/connection?mac=mac
```

4. How to discover GATT services and characteristics?

Services:

Discover all services:

```
GET http://api.cassianetworks.com/gatt/nodes/<node>/services/<servi  
ce>/characteristics?mac=mac&all=1
```

Discover a specific service by service UUID:

```
GET http://api.cassianetworks.com/gatt/nodes/<node>/services/?mac  
=mac&all=1&uuid=uuid
```

Characteristics:

```
GET http://api.cassianetworks.com/gatt/nodes/<node>/characteristics?  
mac=mac&uuid=uuid
```

5. How to read/write the value of a specific characteristic?

The read/write operations is based on the handle of a specific characteristic.

The handle of a specific characteristic can be found in the discovery result.

To read by handle:

```
GET http://api.cassianetworks.com/gatt/nodes/<node>/handle/<handle>/  
value/?mac=mac
```

To write by handle:

```
GET http://api.cassianetworks.com/gatt/nodes/<node>/handle/<handle>/value/<value>/?mac=mac
```

6. How to subscribe to a notification/indication to a specific characteristic?

```
GET http://api.cassianetworks.com/gatt/nodes/?event=1&mac=mac
```

Known Issues:

1. Pairing and bonding.

Cassia Hub SDK does not support Bluetooth pairing and bonding as of now.