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Распределенные системы и сети

Урок 4. Распределённые системы

Домашнее задание

1. Прислать результаты выполненных запросов через Swagger UI
2. Postman
3. Прислать скрипт на любом удобном языке программирования, где через API будут созданы 10 устройств (все переменные должны задаваться в коде, списком или массивом, но одной строкой), будет запрошена информация о 10 устройствах, будут обновлены имена 10 устройств, будут удалены 10 устройств.

Желательно использовать Python через Google Collab. Для сдачи ДЗ студент должен предоставить преподавателю ссылку с доступом к блокноту с кодом (перед отправкой ДЗ проверьте, что ссылка открывается в приватном режиме браузера).

Решение

1. Swagger UI

Создание API-token

ChirpStack

Search...

gb@iot.ru

GB_IoT_Tenant

Tenants / GB_IoT_Tenant / API Keys

Network Server

Regions

Tenant

Dashboard

Users

API Keys

Device Profiles

Gateways

Applications

Add API key

ID	Name	Action
c6c8ccd4-1caa-469a-a3c2-390f2527abf9	abcser	
862a33b6-becd-4b52-9a65-6d3e9f786ae3	ega-5471	
49644b19-91a7-43d3-9fe2-93662486ef6d	GVI	
251bd910-2143-408b-92ba-eb912685ac0a	GVI-1234	
00a3c805-74a6-4132-9b5d-60233b15f29a	GVI-5471	
c13990dd-327b-4fcc-be57-d35efe653251	RRG-5471	

Applications

Tenants / GB_IoT_Tenant / Applications / GB_IoT_Application

GB_IoT_Application

application id: 6bb2cce7-abe9-4e98-980e-f5ada088d177

Delete application

Devices

Multicast groups

Relays

Application configuration

Integrations

Add device

Selected devices

Last seen	DevEUI	Name	Device profile	Battery
<div><input type="checkbox"/></div> 2024-02-14 08:57:34	3441a8ffe00086d	DevKit	OTAA_LoRaWAN-1.0.4_Class-C_RU864	


<

1

>

10 / page

Swagger API

 **Swagger**
Supported by SMARTBEAR


api.json

Explore

ChirpStack REST API v4.6.0

api.json

For documentation, please refer to www.chirpstack.io.

Authorize 

ApplicationService

GET /api/applications Get the list of applications.

POST /api/applications Create creates the given application.

PUT /api/applications/{application.id} Update updates the given application.

Bearer token

Available authorizations

X

api_key (apiKey)

Authorized

Name: Grpc-Metadata-Authorization

In: header

Value: *****

Logout

Close

GET

DeviceService

GET

/api/devices Get the list of devices.

Parameters

Name	Description
limit integer(\$int64) <i>(query)</i>	Max number of devices to return in the result-set. <div>5</div>
offset integer(\$int64) <i>(query)</i>	Offset in the result-set (for pagination). <div>offset</div>
search string <i>(query)</i>	If set, the given string will be used to search on name (optional). <div>search</div>
applicationId string <i>(query)</i>	Application ID (UUID) to filter devices on. <div>6bb2cce7-abe9-4e98-980e-f5ada088d177</div>

Responses

Responses

Curl

```
curl -X 'GET' \
  'https://chirpstack-api.iotserv.ru/api/devices?limit=5&applicationId=6bb2cce7-abe9-4e98-980e-f5ada088d177' \
  -H 'accept: application/json' \
  -H 'Grpc-Metadata-Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJhdWQiOiJjaGlycHN0YWNRiwiiaXNzIj
```

Request URL

```
https://chirpstack-api.iotserv.ru/api/devices?limit=5&applicationId=6bb2cce7-abe9-4e98-980e-f5ada088d177
```

Server response

Code

Details

200

Response body

```
{
  "totalCount": 1,
  "result": [
    {
      "devEui": "3441a8fffe00086d",
      "createdAt": "2024-01-17T10:50:58.793954Z",
      "updatedAt": "2024-01-17T10:50:58.793954Z",
      "lastSeenAt": "2024-02-14T08:57:34.178648Z",
      "name": "DevKit",
      "description": "LoRaWAN DevKit",
      "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",
      "deviceProfileName": "OTAA_LoRaWAN-1.0.4_Class-C_RU864",
      "deviceStatus": {
        "margin": 6,
        "externalPowerSource": false,
        "batteryLevel": 100
      }
    }
  ]
}
```

POST

POST

/api/devices

Create the given device.

Parameters

Name	Description
<div>body ★ required</div> <div>object</div> <div>(body)</div>	<div>Edit Value Model</div> <div><pre>{ "device": { "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177", "description": "Device from RRG", "devEui": "0123456789ABCDEF", "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da", "isDisabled": false, "joinEui": "0000000000000000", "name": "Device from RRG", "skipFcmtCheck": false }}</pre></div> <div>Cancel</div> <div>Parameter content type</div> <div>application/json</div>

Execute

Application id

Tenants / GB_IoT_Tenant / Applications / GB_IoT_Application

GB_IoT_Application

application id: 6bb2cce7-abe9-4e98-980e-f5ada088d177

Device profile id

Tenants / GB_IoT_Tenant / Device profiles / OTAA_LoRaWAN-1.0.4_Class-C_RU864

OTAA_LoRaWAN-1.0.4_Class-C_RU864

device profile id: 29d26ba4-2bf0-452e-9341-2671f442c7da

DevEUI

Любое 64-битное значение в HEX: 0123456789abcdef

Responses

Curl

```
curl -X 'POST' \
'https://chirpstack-api.iotserver.ru/api/devices' \
-H 'accept: application/json' \
-H 'Grpc-Metadata-Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b2lnbm90dXRuaS50eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b2lnbm90dXRuaS50eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9' \
-H 'Content-Type: application/json' \
-d '{
  "device": {
    "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177",
    "description": "Device from RRG",
    "devEui": "0123456789ABCDEF",
    "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",
    "isDisabled": false,
    "joinEui": "0000000000000000",
    "name": "Device from RRG",
    "skipFcmtCheck": false
  }
}
```

Request URL

`https://chirpstack-api.iotserv.ru/api/devices`

Server response

Code	Details
200	<div><p>Response body</p><pre>{}</pre><p>Response headers</p><pre>content-length: 2 content-type: application/json date: Sat, 17 Feb 2024 10:48:29 GMT grpc-metadata-content-type: application/grpc grpc-metadata-date: Sat, 17 Feb 2024 10:48:29 GMT grpc-metadata-x-log-dev_eui: 0123456789ABCDEF grpc-metadata-x-log-is_disabled: false server: nginx x-http-version: HTTP/2.0</pre></div>

Result

Tenants / GB IoT Tenant / Applications / GB IoT Application

GB_IoT_Application application id: 6bb2cce7-abe9-4e98-980e-f5ada088d177

[Devices](#)
[Multicast groups](#)
[Relays](#)
[Application configuration](#)
[Integrations](#)

<input type="checkbox"/>	Last seen	DevEUI	Name	Device profile
<input type="checkbox"/>	Never	0123456789abcdef	Device from RRG	OTAA_LoRaWAN

PUT

Responses

Curl

```
curl -X 'PUT' \
'https://chirpstack-api.iotserver.ru/api/devices/0123456789abcdef' \
-H 'accept: application/json' \
-H 'Grpc-Metadata-Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b29udGVudCI6IiJ9.eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b29udGVudCI6IiJ9.' \
-H 'Content-Type: application/json' \
-d '{
  "device": {
    "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177",
    "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",
    "name": "Device from RRG UPDATED"
  }
}
```

Request URL

<https://chirpstack-api.iotserv.ru/api/devices/0123456789abcdef>

Server response

Code	Details
200	<div><p>Response body</p><pre>{}</pre><p>Response headers</p><pre>content-length: 2 content-type: application/json date: Sat, 17 Feb 2024 11:07:14 GMT grpc-metadata-content-type: application/grpc grpc-metadata-date: Sat, 17 Feb 2024 11:07:14 GMT grpc-metadata-x-log-dev_eui: 0123456789abcdef grpc-metadata-x-log-is_disabled: false server: nginx x-http-version: HTTP/2.0</pre></div>

Responses

Responses

Curl

```
curl -X 'PUT' \
'https://chirpstack-api.iotserver.ru/api/devices/0123456789abcdef' \
-H 'accept: application/json' \
-H 'Grpc-Metadata-Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b290eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1b290eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.' \
-H 'Content-Type: application/json' \
-d '{
  "device": {
    "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177",
    "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",
    "name": "Device from RRG UPDATED"
  }
}
```

Request URL

`https://chirpstack-api.iotserv.ru/api/devices/0123456789abcdef`

Server response

Code	Details
200	<div><p>Response body</p><pre>{}</pre><p>Response headers</p><pre>content-length: 2 content-type: application/json date: Sat, 17 Feb 2024 11:07:14 GMT grpc-metadata-content-type: application/grpc grpc-metadata-date: Sat, 17 Feb 2024 11:07:14 GMT grpc-metadata-x-log-dev_eui: 0123456789abcdef grpc-metadata-x-log-is_disabled: false server: nginx x-http-version: HTTP/2.0</pre></div>

Result

Tenants / GB IoT Tenant / Applications / GB IoT Application

GB_IoT_Application application id: 6bb2cce7-abe9-4e98-980e-f5ada088d177

[Devices](#)
[Multicast groups](#)
[Relays](#)
[Application configuration](#)
[Integrations](#)

<input type="checkbox"/>	Last seen	DevEUI	Name	Device profile
<input type="checkbox"/>	Never	0123456789abcdef	Device from RRG UPDATED	OTAA_LoRaWAN C_RU864

DELETE

DELETE

/api/devices/{devEui}

Delete the device with the given DevEUI.

Parameters

Name	Description
<div>devEui ★ required</div> <div>string</div> <div>(path)</div>	DevEUI (EUI64).

0123456789ABCDEF

Execute

Responses

Responses

Curl

```
curl -X 'DELETE' \
'https://chirpstack-api.iotserv.ru/api/devices/0123456789ABCDEF' \
-H 'accept: application/json' \
-H 'Grpc-Metadata-Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiIsInR5cCI6IkpzZW50L3N1bWU6IjE2MzQ1NjY4OTABCDEF'
```

Request URL

```
https://chirpstack-api.iotserv.ru/api/devices/0123456789ABCDEF
```

Server response

Code	Details
200	<div><div>Response body</div><div><pre>{}</pre></div><div><div>Response headers</div><div><pre>content-length: 2 content-type: application/json date: Sat,17 Feb 2024 11:15:32 GMT grpc-metadata-content-type: application/grpc grpc-metadata-date: Sat,17 Feb 2024 11:15:32 GMT grpc-metadata-x-log-dev_eui: 0123456789ABCDEF server: nginx x-http-version: HTTP/2.0</pre></div></div></div>

Result

Devices

Multicast groups

Relays

Application configuration

Integrations

Add device

<input type="checkbox"/>	Last seen	DevEUI	Name	Device profile
<input type="checkbox"/>	2024-02-14 08:57:34	3441a8fffe00086d	DevKit	OTAA_LoRaWAN-1.0.4_Class-C_RU864

<

1

POST Queue to real device

POST

/api/devices/{queueItem.devEui}/queue

Enqueue adds the given item to the downlink queue.

Parameters

Name	Description
<div><div>queueItem.devEui</div><div>string</div><div>(path)</div></div> <div>★ required</div>	<div>Device EUI (EUI64).</div> <div>3441a8fffe00086d</div>
<div><div>body</div><div>object</div><div>(body)</div></div> <div>★ required</div>	<div>Edit Value Model</div> <div><pre>{ "queueItem": { "data": "VGVzdCBmcm9tIFJSRw==", "fPort": 123 }}</pre></div>

Data to Base64

Save & Send

GP ChirpStack API / Get Devices

Save

GET

https://chirpstack-api.iotserv.ru/api/devices?limit=10&applicationId=6bb2cce7-abe9-4e98-980e-f5ada088d177

Send

Params

Authorization

Headers (7)

Body

Pre-request Script

Tests

Settings

Cookies

Query Params

<input checked="" type="checkbox"/> Key	Value	Description	...	Bulk Edit
<input checked="" type="checkbox"/> limit	10			
<input checked="" type="checkbox"/> applicationId	6bb2cce7-abe9-4e98-980e-f5ada088d177			

Body

Cookies

Headers (9)

Test Results

Status: 200 OK

Time: 111 ms

Size: 763 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

```
4      {
5        "devEui": "3441a8fffe00086d",
6        "createdAt": "2024-01-17T10:50:58.793954Z",
7        "updatedAt": "2024-01-17T10:50:58.793954Z",
8        "lastSeenAt": "2024-02-14T08:57:34.178648Z",
9        "name": "DevKit",
10       "description": "LoRaWAN DevKit",
11       "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",
12       "deviceProfileName": "OTAA_LoRaWAN-1.0.4_Class-C_RU864",
13       "deviceStatus": {
14         "margin": 6,
15         "externalPowerSource": false,
16         "batteryLevel": 100
17       }
18     },
```

POST

Body

RAW -> JSON

Save & Send

HTTP

GP ChirpStack API / POST Device

Save

POST

https://chirpstack-api.iotserve.ru/api/devices

Send

Params

Authorization

Headers (9)

Body

Pre-request Script

Tests

Settings

Cookies

none

form-data

x-www-form-urlencoded

raw

binary

GraphQL

JSON

Beautify

1 {

2 "device": {

3 "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177",

4 "description": "Device from RRG",

5 "devEui": "0123456789ABCDEF",

6 "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",

7 "isDisabled": false,

8 "joinEui": "0000000000000000",

9 "name": "Device from RRG",

10 "skipFcmtCheck": false

11 }

12 }

Body

Cookies

Headers (10)

Test Results

200 OK

188 ms

358 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

1 {}

PUT

Body

RAW -> JSON

Save & Send

HTTP

GP ChirpStack API / PUT Devices

Save

PUT

https://chirpstack-api.iotserve.ru/api/devices/0123456789ABCDEF

Send

Params

Authorization

Headers (9)

Body

Pre-request Script

Tests

Settings

Cookies

none

form-data

x-www-form-urlencoded

raw

binary

GraphQL

JSON

Beautify

1 {

2 "device": {

3 "applicationId": "6bb2cce7-abe9-4e98-980e-f5ada088d177",

4 "deviceProfileId": "29d26ba4-2bf0-452e-9341-2671f442c7da",

5 "name": "Device from RRG UPDATED"

6 }

7 }

Body

Cookies

Headers (10)

Test Results

200 OK

69 ms

358 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

1 {}

DELETE

Save & Send

GP ChirpStack API / DELETE Device

Save

Send

DELETE

https://chirpstack-api.iotserv.ru/api/devices/0123456789ABCDEF

Send

Params

Authorization

Headers (7)

Body

Pre-request Script

Tests

Settings

Cookies

Type

Bearer ...

Heads up! These parameters hold sensitive data. To keep this data secure while working in a collaborative environment,we recommend using variables. Learn more about [variables](#).

The authorization header will be automatically generated when you send the request. Learn more about [Bearer Token](#) authorization.

Token

eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ...

Body

Cookies

Headers (9)

Test Results

200 OK 64 ms 318 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

1

{}

POST Downlink

Save & Send

GP ChirpStack API / POST Downlink

Save

Send

POST

https://chirpstack-api.iotserv.ru/api/devices/3441a8ffe00086d/queue

Send

Params

Authorization

Headers (9)

Body

Pre-request Script

Tests

Settings

Cookies

none

form-data

x-www-form-urlencoded

raw

binary

GraphQL

JSON

Beautify

2

3

4

5

6

{

"queueItem": {

"data": "VGZzdCBmcm9tIFJSRw==",

"fPort": 132

}

}

Body

Cookies

Headers (9)

Test Results

200 OK 86 ms 362 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

1

{

2

"id": "7890394a-da2e-4941-8784-0d9e20e28caf"

3

}

Result in Grafana

Time	RSSI	SNR	COUNTER	PORT	Payload	Decode
2024-02-17 19:02:05	-45	6	19	132	546573742066726F6D20525247	Test from RRG

3. Python

Создание 10 устройств

```
import requests
import json

token="eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJhdWQiOiJjaGlycHN0YWNRiIiwiaXNzIjoiy2hpcnBzdGFjayIsInN1YiI6ImMxMzk5MGRkLTMyN2ItNGZjYy1iZTU3LWQzNWVmZTY1MzI1MSIsInR5cCI6ImtleSJ9.irLcZ138B8-UTrYhWZG-gFXwvsDMheqz8uiozaOyGzs"
url = 'https://chirpstack-api.iotserv.ru/api/devices'
applicationId = "6bb2cce7-abe9-4e98-980e-f5ada088d177"
deviceProfileId = "29d26ba4-2bf0-452e-9341-2671f442c7da"
devQuantity = 10
devicesList = [{"i:02d}23456789ABCDEF" for i in range(devQuantity)]
```

```
def create(url, token, applicationId, deviceProfileId, name, devEui):
    headers = {
        'accept': 'application/json',
        'Grpc-Metadata-Authorization': f'Bearer {token}',
        'Content-Type': 'application/json',
    }
    data = {
        "device": {
            "applicationId": applicationId,
            "description": name,
            "devEui": devEui,
            "deviceProfileId": deviceProfileId,
            "isDisabled": False,
            "joinEui": "0000000000000000",
            "name": name,
            "skipFcmtCheck": False
        }
    }
    return requests.post(url, json=data, headers=headers)

for i in range(len(devicesList)):
    print(create(url, token, applicationId, deviceProfileId, f"RRG Device {i:02d}", devicesList[i]))
```

Запрос информации о 10 устройствах

```
def info(url, token, applicationId, limits):
    headers = {
        'accept': 'application/json',
        'Grpc-Metadata-Authorization': f'Bearer {token}',
    }
    params = {
        'limit': limits,
        'applicationId': applicationId
    }
    response = requests.get(url, headers=headers, params=params)
    return response.json()

print(json.dumps(info(url, token, applicationId, devQuantity+1), indent=4))
```

Обновить имена 10 устройств

```
def update(url, token, applicationId, deviceProfileId, newName, devEui):
    headers = {
        'accept': 'application/json',
        'Grpc-Metadata-Authorization': f'Bearer {token}',
        'Content-Type': 'application/json',
    }
    data = {
        "device": {
            "applicationId": applicationId,
            "deviceProfileId": deviceProfileId,
            "name": newName,
            "description": newName
        }
    }
    put_url = f"{url}/{devEui}"
    return requests.put(put_url, json=data, headers=headers)

for i in range(len(devicesList)):
    print(update(url, token, applicationId, deviceProfileId, f"RRG Device {i:02d} UPDATED", devicesList[i]))

print(json.dumps(info(url, token, applicationId, devQuantity+1), indent=4))
```

Удаление 10 устройств

```
def delete(url, token, devEui):
    headers = {
        'accept': 'application/json',
        'Grpc-Metadata-Authorization': f'Bearer {token}',
    }
    return requests.delete(f"{url}/{devEui}", headers=headers)

for i in range(len(devicesList)):
    print(delete(url, token, devicesList[i]))
```