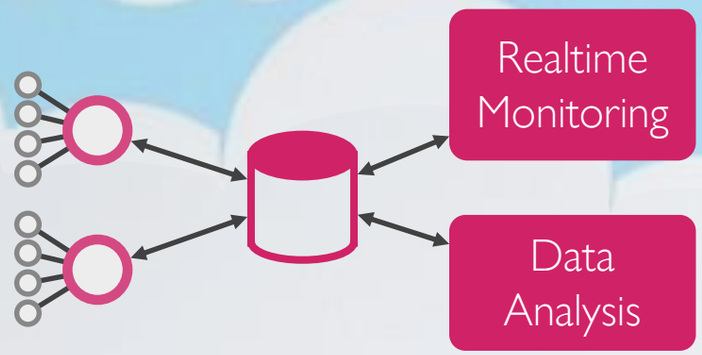
cloud.iO Presentation

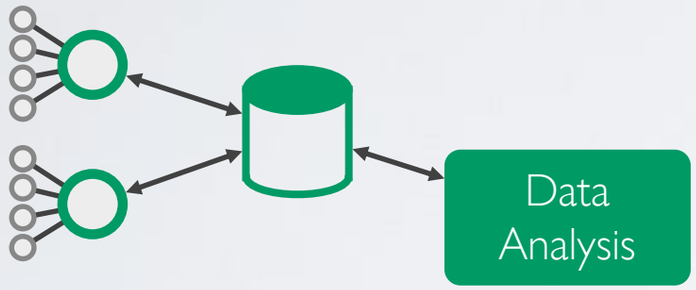
Lucas Bonvin

Why **cloud.iO**?

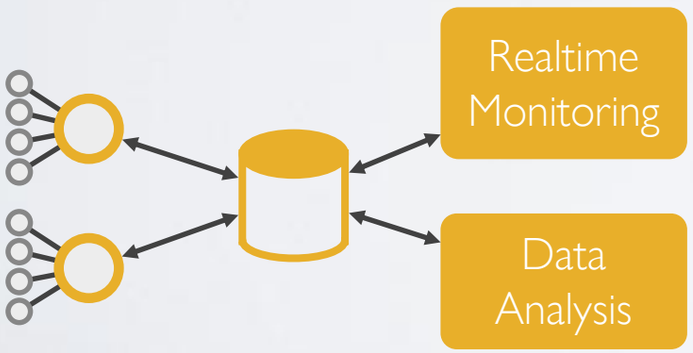
Motivation for cloud.iO



My Solution



Colleague A Solution



Colleague B Solution

- Our problems:
  - Each time a new solution for similar problems is developed.
  - There is not that much budget to create a stable/flexible solution. Data of different
  - projects are not simple to compare and may have to be converted first.
  - Monitoring is mostly very inefficient (Database Polling for example)


SCADA
Automation
Health Supervision
cloud.iO
Internet of Things
Social Data Exploration
Scientific Data Acquisition
Data Analysis
Building Control

cloud.iO environment

cloud.iO

Endpoint

Endpoint

Endpoint

cloud.iO features

Device Monitoring

MIT License Open Source

Endpoint Library

On-premise Deployment

cloud.iO

RESTful API

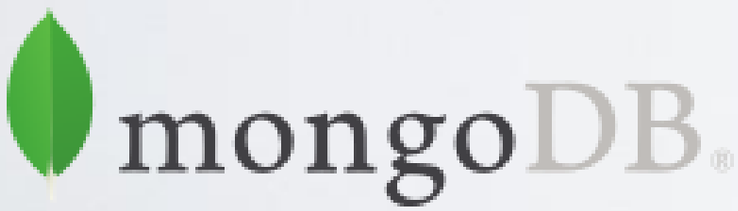
W3C Compatible

Remote jobs Execution

Logging

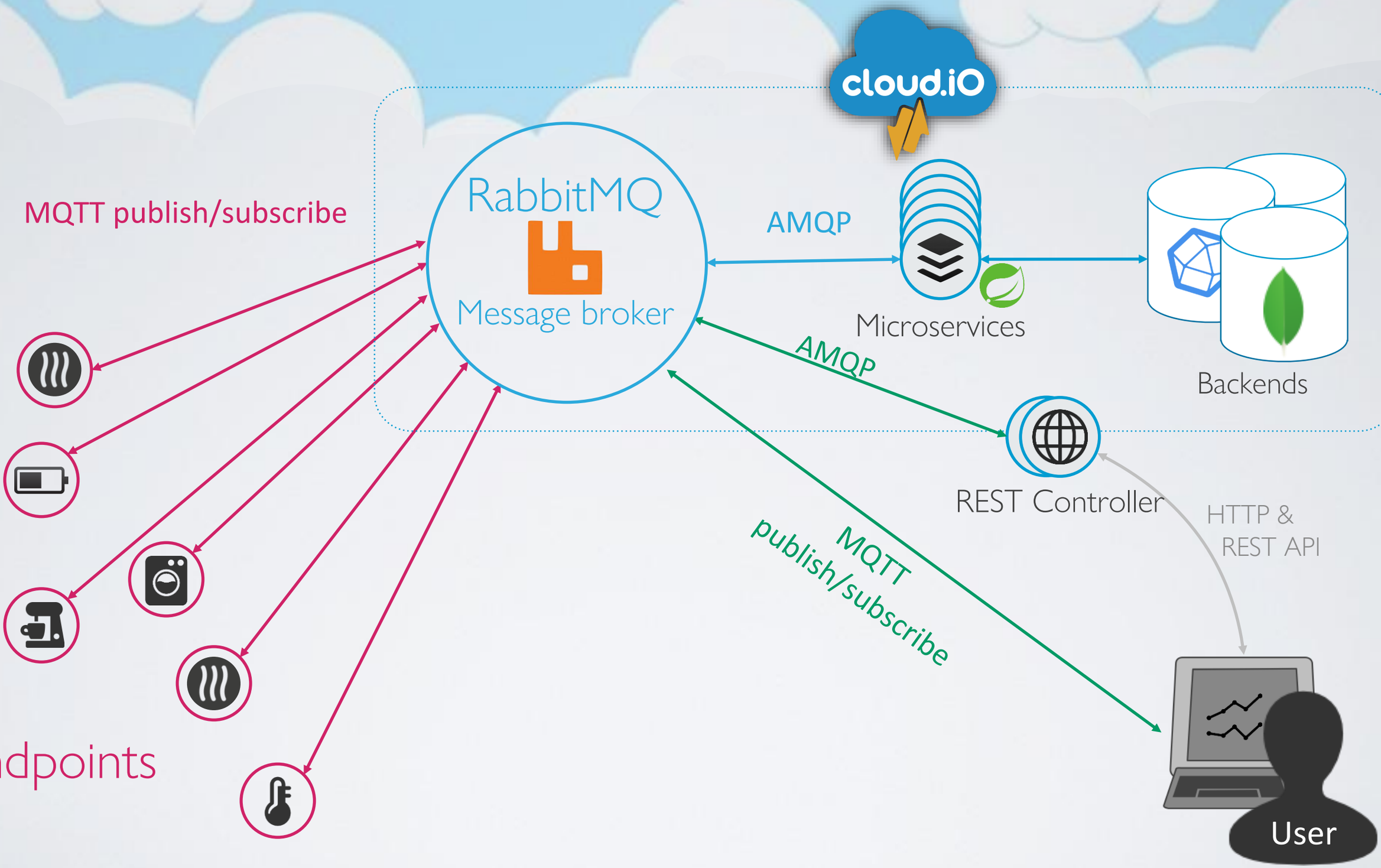
cloud.iO Architecture

cloud.iO components



- Spring.io
  - Micro-service Platform
  - Open source
- RabbitMQ
  - Message Broker
  - Support AMQP and MQTT
  - Open source
- MQTT
  - Messaging protocol
  - Support TLS/SSL
  - Authentication using x509 certificate
- MongoDB and InfluxDB
  - DataBase
  - Free Software

Overview


cloud.iO
RabbitMQ
Message broker
MQTT publish/subscribe
AMQP
Microservices
Backends
AMQP
REST Controller
HTTP &
REST API
MQTT
publish/subscribe
Endpoints
User

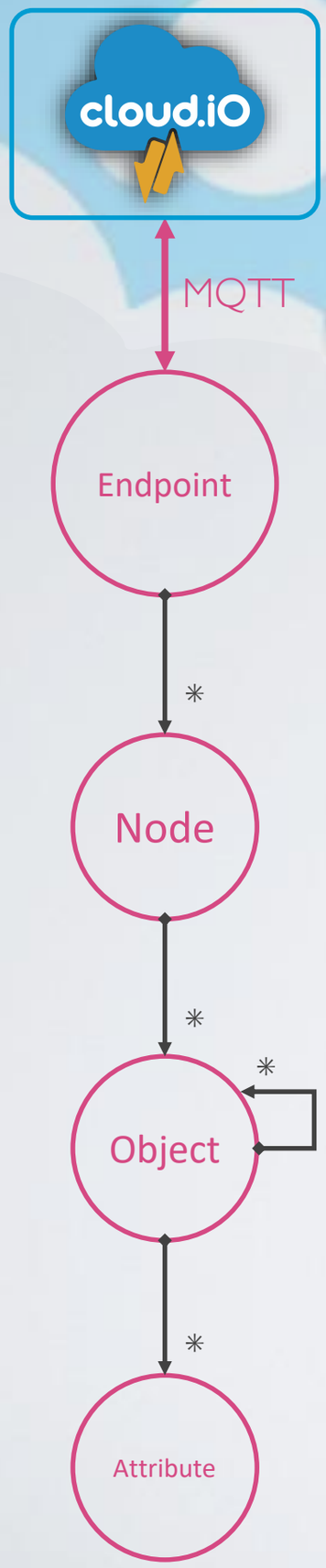
Backends

cloud.iO

Authentication / Permission	Endpoint Repository	History Repository	Logs Repository

MongoDB Backend	InfluxDB Backend

Endpoint structure



bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4

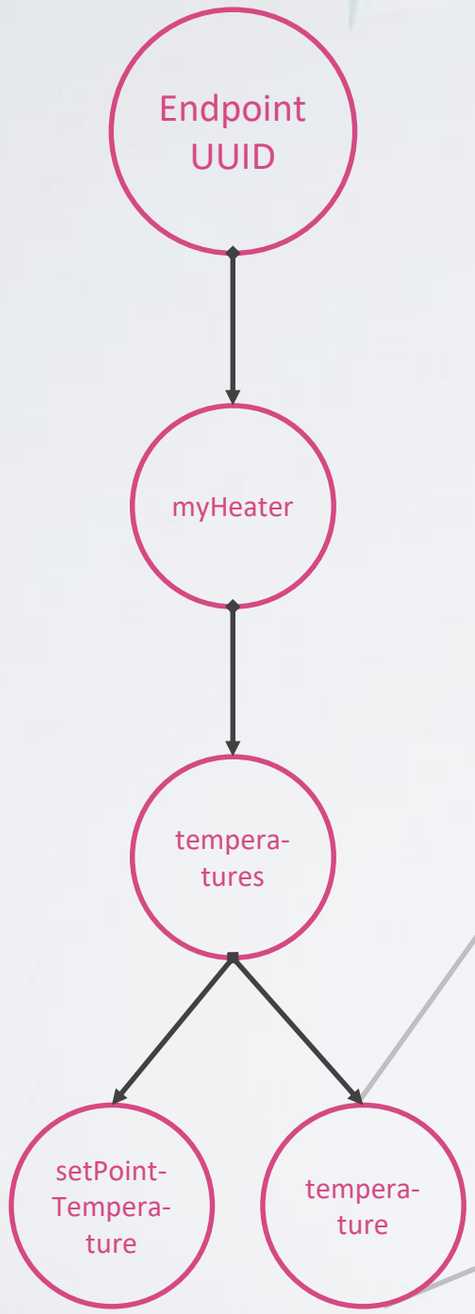
bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4/**myHeater**

bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4/myHeater/**temperatures**

bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4/myHeater/temperatures/**temperature**

Topic / json Object model

EndpointUUID: bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4



Topic:
@update/ bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4
/myHeater/temperatures/temperature

```
{
  „type“: „Number“,
  „constraint“: „Measure“,
  „timestamp“:1575547591859.0,
  „value“: 25
}
```

Topic / json Object model

EndpointUUID: bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4


```
{
  "endpointUuid": "bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4",
  "friendlyName": "test",
  "logLevel": "ERROR",
  "online": false
  "blocked": false,
  "endpoint": {
    "nodes": {
      "myHeater": {
        "implements": [],
        "objects": {
          "temperatures": {
            "attributes": {
              "setPointTemperature": {
                "constraint": "SetPoint",
                "timestamp": -1.0,
                "type": "Number",
                "value": 21.0
              },
              "temperature": {
                "constraint": "Measure",
                "timestamp": 1575547591858.0,
                "type": "Number",
                "value": 25.000000762939507
              }
            },
            "conforms": null,
            "objects": {}
          }
        }
      }
    }
  }
}
```


Topic:
@update/ bc0f1bf8-bdae-11e9-9cb5-2a2ae2dbcce4
/myHeater/temperatures/temperature


```
{
  „type“: „Number“,
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}
```
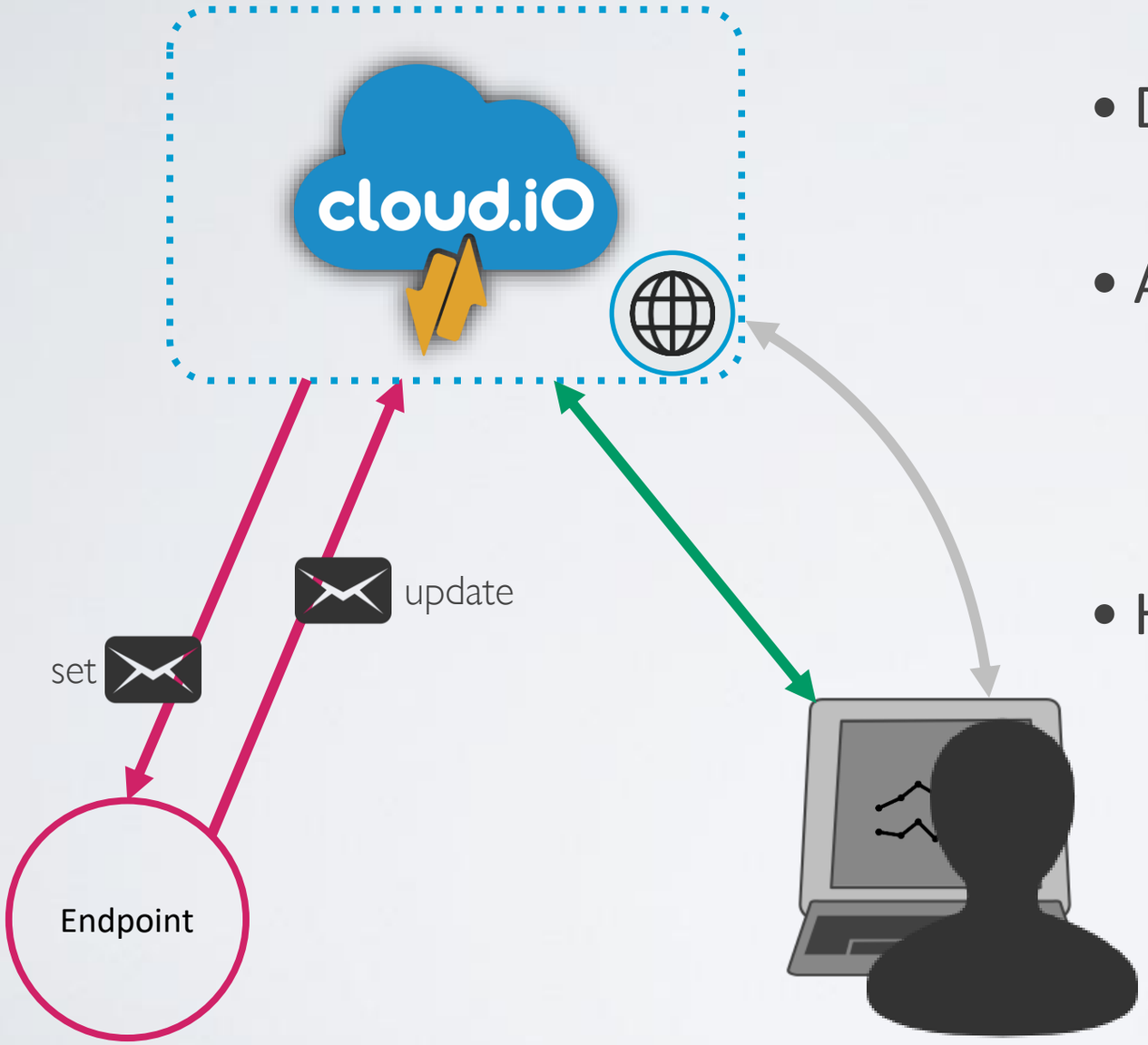
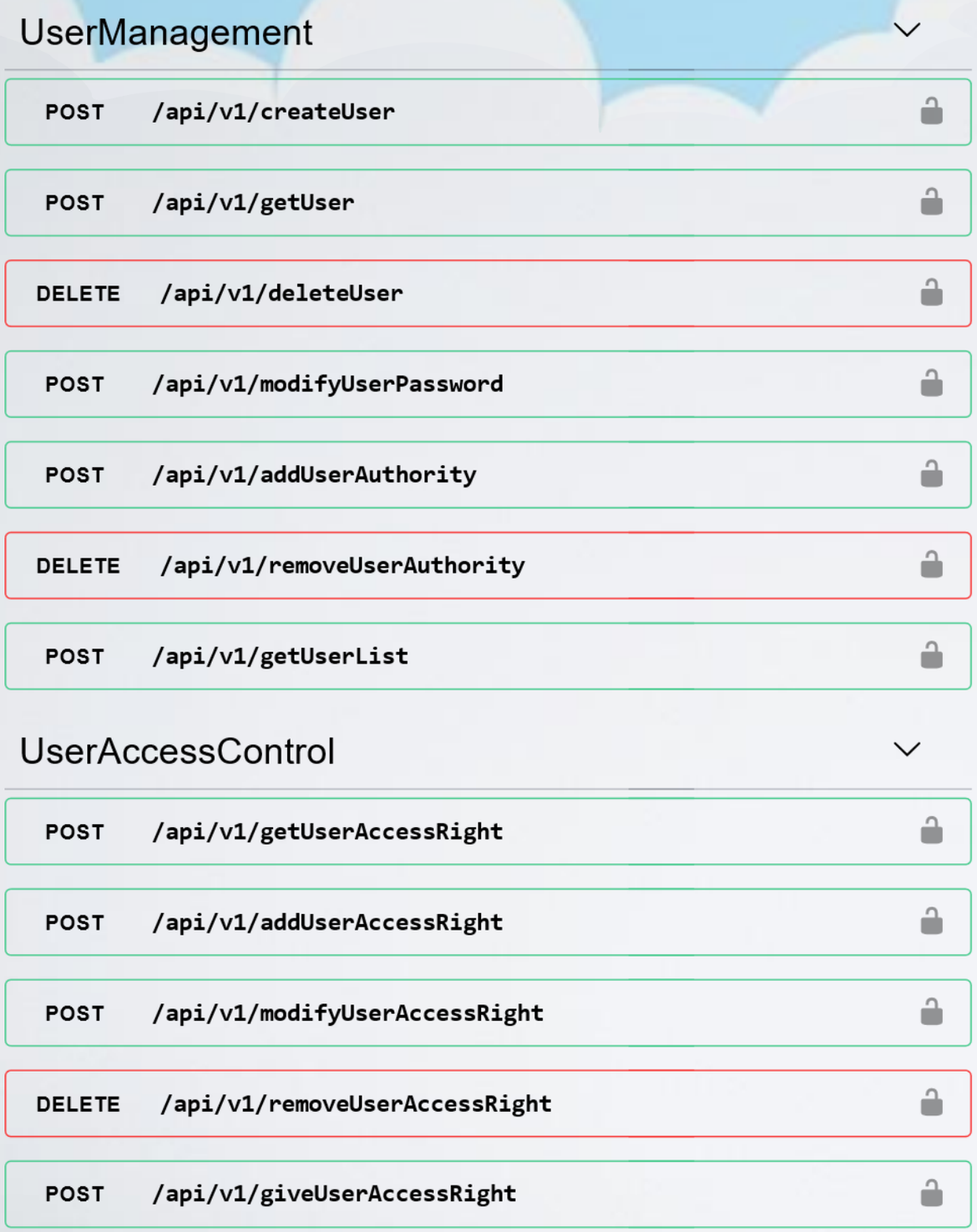

cloud.iO Features

Device Monitoring



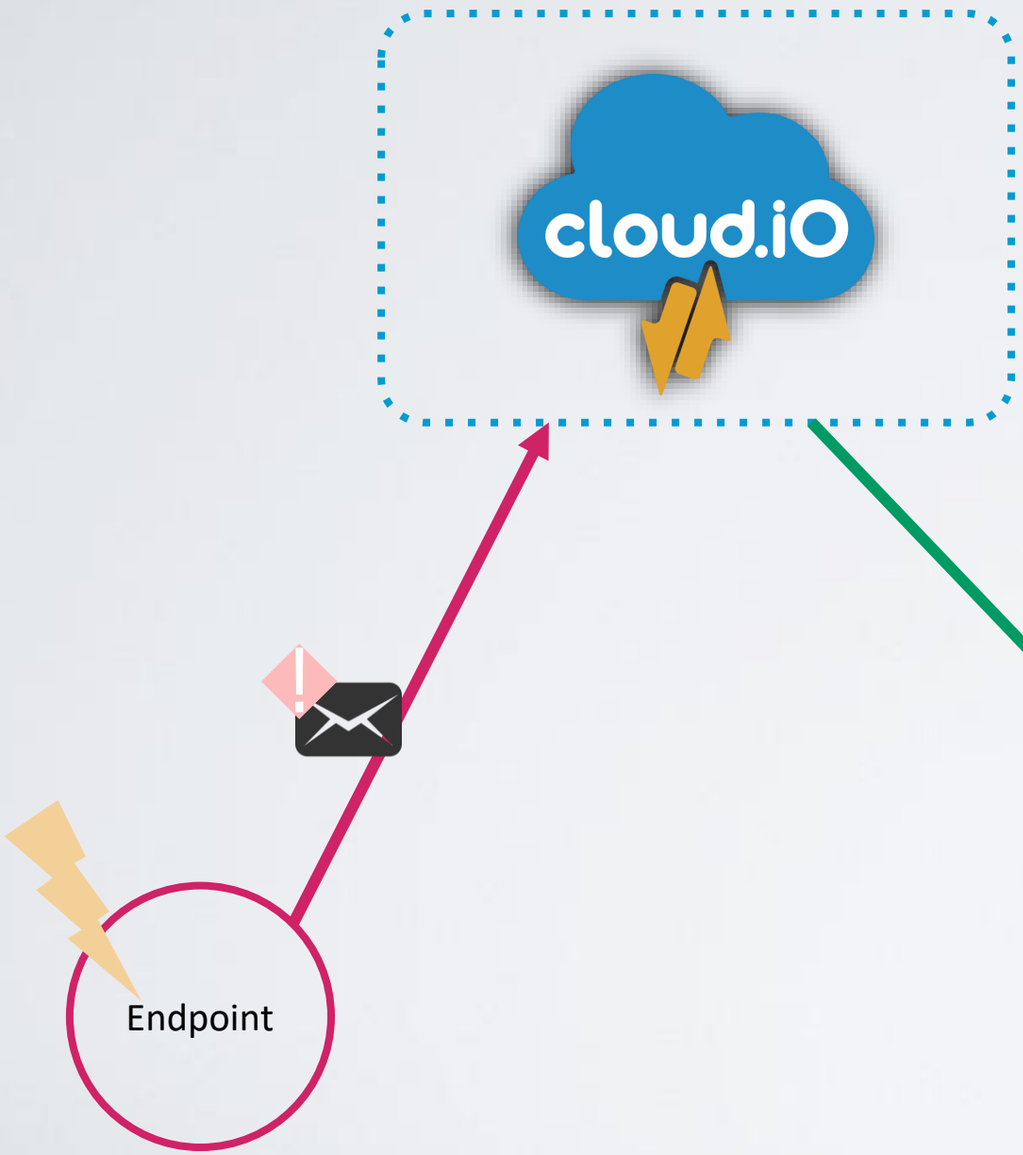
- **Device Twin**
  - Available through RESTful API
- **Access Control**
  - Manage through RESTful API
  - Control who can access cloud.iO resources (From Endpoint to Attribute)
- **History**
  - Available through RESTful API
  - Grafana plugin using RESTful API in early development at the HEVs

RESTful API



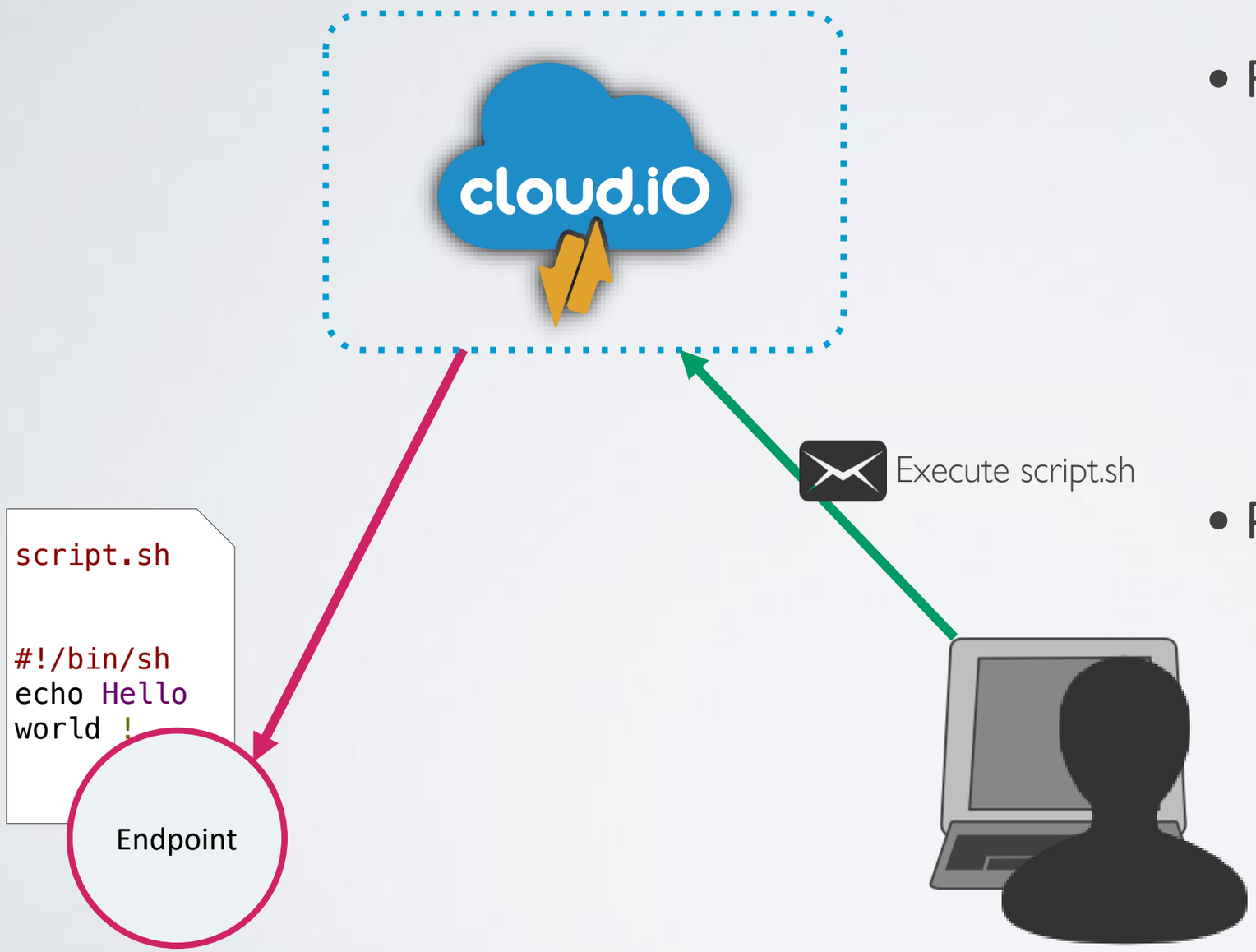
- Http tools
  - User authentication
  - Support Https
- Tools for User and Administrator
  - User & User Group Management
  - Endpoint Management
  - Certificate
  - History
  - Logging
  - Remote Jobs Execution

Logging



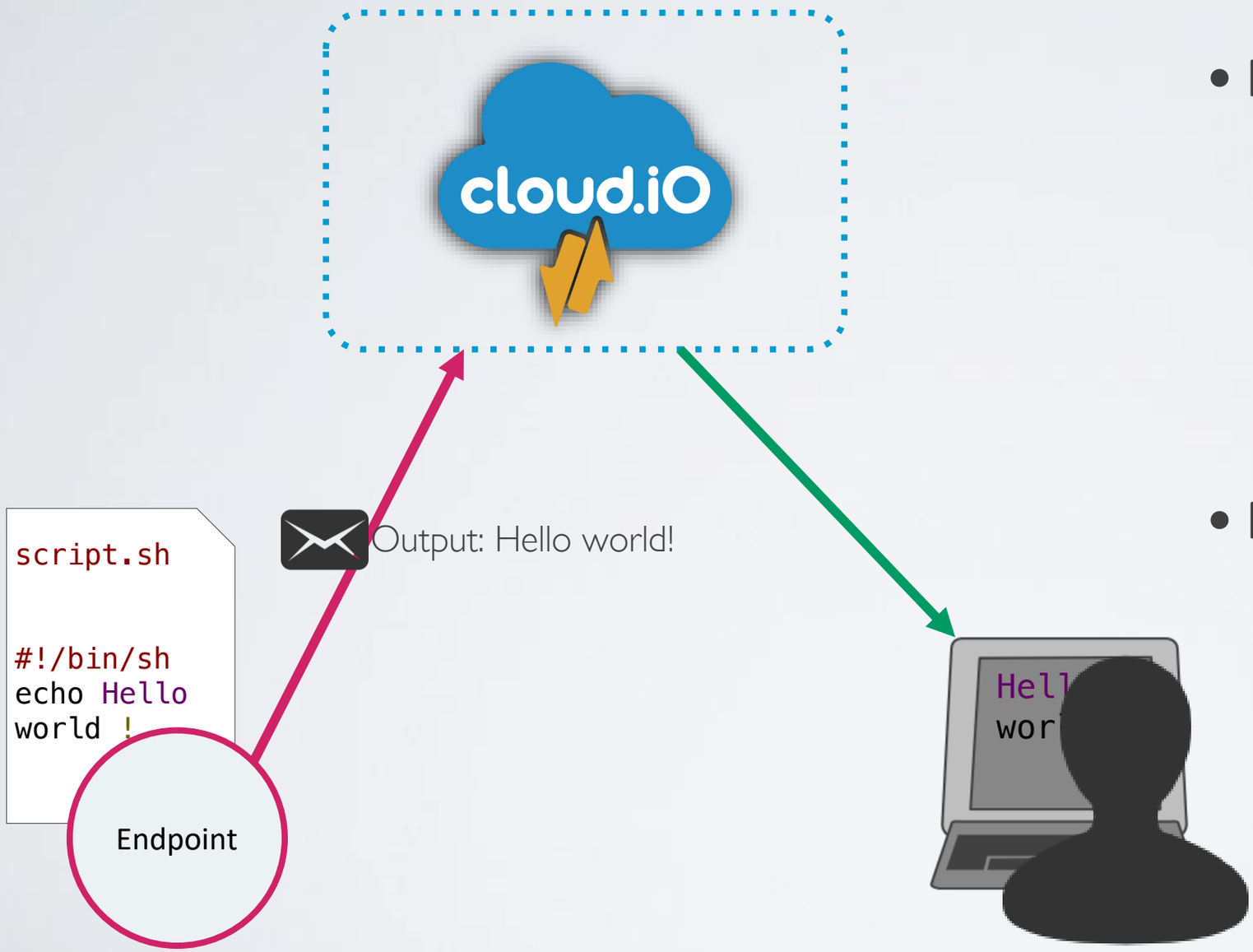
- Logging
  - Saved as time-series
  - Possibility to filter by log level
  - Retrieve through RESTful API
- Different log level
  - OFF
  - FATAL
  - ERROR
  - WARN
  - INFO
  - DEBUG
  - TRACE
  - ALL

Remote jobs Execution



- **Remote Jobs Execution**
  - Execute Shell script remotely
  - Execution launched with MQTT or RESTful API
  - Possibility to retrieve output of script
- **Pre-implemented command**
  - Listing all available commands/scripts
  - Update Scripts from an URL

Remote jobs Execution



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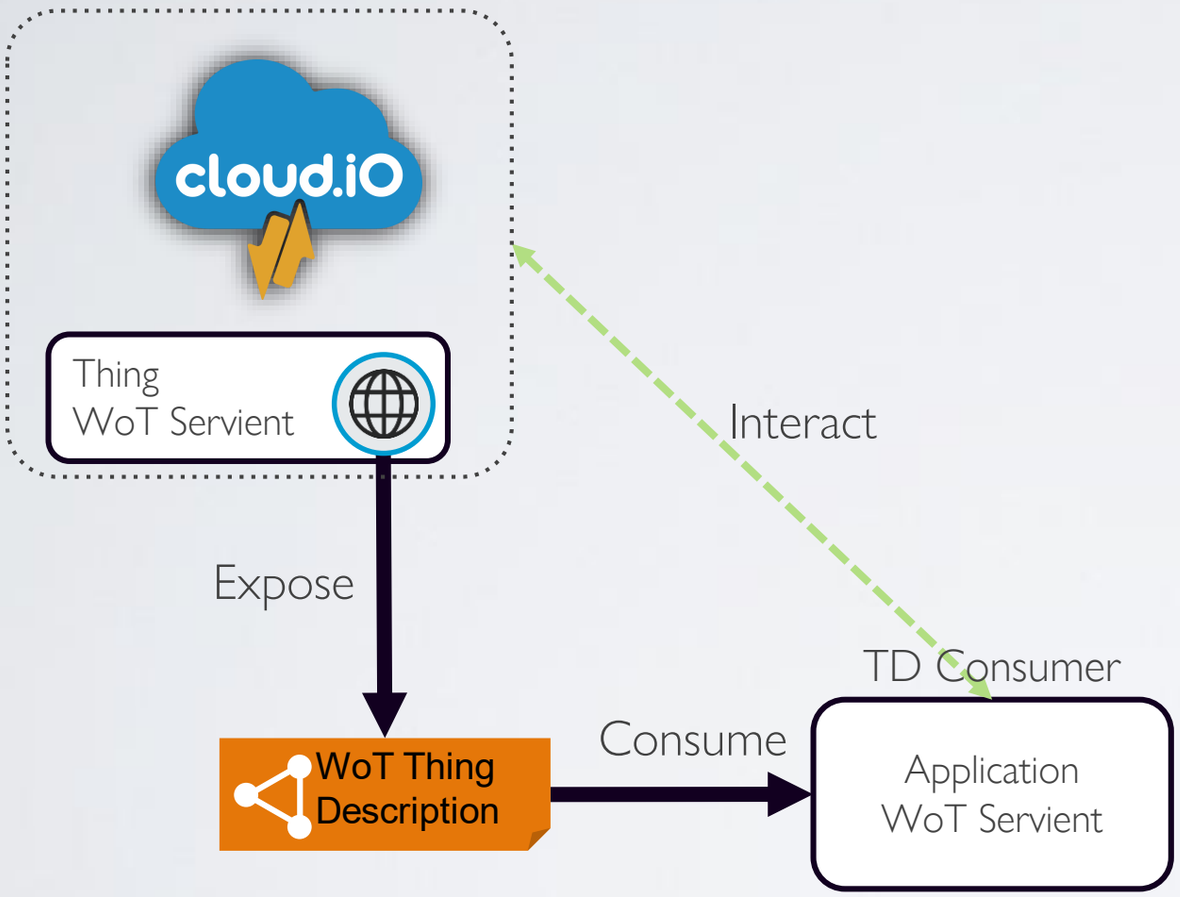
W3C compatibility



- World Wide Web Consortium (W3C)
  - Standardization organism
  - Behind HTLM, RDF, CSS, PNG, SVG….
  - Standardization of the IoT
- Web Of Thing (WoT)
  - Candidate Recommendation
  - Enhance IoT Interoperability
  - Define a data model for the *Things* :TD
  - TD contain a self-describing API

Endpoint Library

Java Example of simple Heater System

```
public class Application {
    CloudioEndpoint myEndpoint;
    DemoHeater demoHeater;

    static Logger logger = LogManager.getLogger(Application.class);

    public static void main(String[] args) {

        try {
            myEndpoint = new CloudioEndpoint("EndpointUUID");

            myEndpoint.addNode("myHeater", DemoHeater.class);

            demoHeater = myEndpoint.getNode("myHeater");

            demoHeater.temperatures.setPointTemperature.addListener(
            new CloudioAttributeListener() {
                @Override public void attributeHasChanged
                                    ↳ (CloudioAttribute attribute) {
                    logger.trace("New Temperature set");
                    setSetPointTemperature((double)attribute.getValue());
                }
            });

            while(true){
                demoHeater.temperatures.temperature.setValue
                                    ↳ (retreiveAmbientTemperature());
                Thread.sleep(1000);
            }
        } catch (Exception e) {
             logger.error("Error In Application");
        }
    }
}
```

- Java
  - Device Monitoring
  - Logging
  - Remote Job Execution
- Python (early development)
  - Device Monitoring
- More language to come

Who is using cloud.iO?

- SEMIAH
  - European FP7 research project
- Goflex
  - Horizon 2020 research project
  - Installed in more than 200 houses in Valais

- You in your future projects!

Open source

http://cloudio.hevs.ch

https://github.com/cloudio-project

cloudio-rabbitmq-docker

cloudio-services

cloudio-documents

cloudio-documentation

cloudio-endpoint-java

cloudio-endpoint-python

cloudio-grafana-plugin

cloudio-project.github.io

Questions?