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1. Authentication

OAuth 2.0 is used for authorizing the API calls. In order to access users data via the API, one needs to first receive an access token. Then this access token needs to be included either as a query parameter or in the headers.

1.1 Receiving an access_token

POST api/auth

```
JSON: {"username":"user@example.com","password":"secret"}
```

CURL example:

```
curl -H "Content-Type: application/json" -d '{"username":"user@example.com","password":"secret"}'  
http://localhost:3000/api/auth
```

Response:

```
{  
  "access_token": "1f964f74ea84e50663cde2f2d888d60f7878b6b089c1e7274c3d44270a69aa8d",  
  "refresh_token":  
  "a7c0f36d2d737b8adcb839aebbbbed03943dae6375edcf77de2146fc53db4369df5532a7a989dc35b168b0eaa67c  
  36db16cebe9ec72fe1dbd155b0280274b61f",  
  "token_type": "bearer",  
  "userID": "1"  
}
```

In case of a successful login, you get an access token back giving you authentication and authorization. Additionally, you get the userID which you can use in the URIs of the subsequent API calls to the platform. You need to include this token in each and every consecutive request APIs to confirm the authentication.

1.2. Singing API requests with an access token

As a query parameter:

GET /api/fhir/Patient/:userID?access_token=[access_token]

CURL example:

```
curl -H 'Content-Type: application/json'  
http://localhost:3000/api/fhir/Patient/:userID?access_token=1f964f74ea84e50663cde2f2d888d60f7878b6b08  
9c1e7274c3d44270a69aa8d
```

In the headers:

Set 'Authorization' header to 'bearer [access_token]'

CURL example:

```
curl -H 'Content-Type: application/json' -H 'Authorization: bearer  
1f964f74ea84e50663cde2f2d888d60f7878b6b089c1e7274c3d44270a69aa8d'  
http://localhost:3000/api/fhir/Patient/1
```

2. Observations API

2.1 Search for observations

GET /api/fhir/Observation?type=[type]&start=[start]&end=[end]

This is the endpoint where a series of a particular observation type (weight for example) can be retrieved given a range. One possible usage could be to plot entries on a UI chart. Observations API endpoint retrieves user data in the FHIR format (<https://www.hl7.org/fhir/>). Since observations API retrieves multiple observations for a period of time, these are returned as a part of FHIR 'bundle' (<https://www.hl7.org/fhir/bundle.html>). The array of entries of this bundle are the (aggregated) observations for the requested period with each one being a FHIR 'observation' resource (<https://www.hl7.org/fhir/observation.html>).

For some observation types such as 'feeding' and 'bloodpressure' observations are also organized in components.

2.1.1 Parameters

'Start' and 'end' (required)

- These are start and end dates of the period for which observations will be retrieved;
- The only accepted format is 'YYYY-MM-DDTHH:mm', for example, '2014-11-25T12:00'
- All times are in UTC

'Type' (required)

Supported types:

- 'weight' (retrieved with minute resolution)
- 'steps' (retrieved with minute resolution)
- 'calories' (retrieved with minute resolution)
- 'energyintake' (retrieved with minute resolution)
- 'heartrate' (retrieved with minute resolution)
- 'restingheartrate' (retrieved with minute resolution)
- 'bloodpressure' (retrieved with minute resolution)
- 'skintemperature' (retrieved with minute resolution)
- 'bloodglucose' (retrieved with minute resolution)

- 'fatpercentage' (retrieved with minute resolution)
- 'hba1c' (retrieved with minute resolution)
- 'feeding' (retrieved with minute resolution)
- 'sleepduration' (retrieves durations of sleep intervals ending inside the requested time period)

2.2 Retrieve a single observation by id:

GET /api/fhir/Observation/:id

response:

```

{
  "resourceType": "Observation",
  "status": "final",
  "reliability": "ok",
  "appliesPeriod": {
    "start": "2015-01-04T00:19:00+00:00",
    "end": "2015-01-04T06:53:00+00:00"
  },
  "name": {
    "coding": [
      {
        "system": "http://browser.ihtsdotools.org/",
        "code": "248263006",
        "display": "Duration of sleep"
      }
    ]
  },
  "valueQuantity": {
    "units": "s",
    "system": "http://unitsofmeasure.org",
    "value": 23640
  },
  "id": "1:sleepduration:86400:1420329600:1420416000"
}

```

2.3 Examples

Example 1: retrieve weight observations for patient 1 from 2015-03-22T15:00 until 2015-03-25T15:00

```
GET /api/fhir/Observation?patient.id=1&type=weight&start=2015-03-22T15:00&end=2015-03-25T15:00
&access_token=[access_token]
```

Response:

```
{
  "resourceType": "Bundle",
  "title": "Multiple observations",
  "total": 3,
  "link": [
    {
      "rel": "self",
      "href": "http://localhost:3000/api/fhir/Observation?patient.id=1&type=weight&start=2015-03-22T15:00&end=2015-03-25T15:00"
    }
  ],
  "entry": [
    {
      "content": {
        "subject": {
          "reference": "Patient/1"
        },
        "resourceType": "Observation",
        "status": "final",
        "reliability": "ok",
        "appliesDateTime": "2015-03-23T06:39:00+00:00",
        "name": {
          "coding": [
            {
              "system": "http://loinc.org",
```

```
    "code": "3141-9",
    "display": "Weight measured"
  }
]
},
"valueQuantity": {
  "units": "kg",
  "system": "http://unitsofmeasure.org",
  "code": "kg",
  "value": 73.8323
},
"id": "1:weight:60:1427092740:1427092800"
}
},
{
  "content": {
    "subject": {
      "reference": "Patient/1"
    },
    "resourceType": "Observation",
    "status": "final",
    "reliability": "ok",
    "appliesDateTime": "2015-03-24T06:32:00+00:00",
    "name": {
      "coding": [
        {
          "system": "http://loinc.org",
          "code": "3141-9",
          "display": "Weight measured"
        }
      ]
    },
    "valueQuantity": {
      "units": "kg",
      "system": "http://unitsofmeasure.org",
```

```
"code": "kg",
"value": 74.5564
},
"id": "1:weight:60:1427178720:1427178780"
}
},
{
"content": {
"subject": {
"reference": "Patient/1"
},
"resourceType": "Observation",
"status": "final",
"reliability": "ok",
"appliesDateTime": "2015-03-25T06:32:00+00:00",
"name": {
"coding": [
{
"system": "http://loinc.org",
"code": "3141-9",
"display": "Weight measured"
}
]
},
"valueQuantity": {
"units": "kg",
"system": "http://unitsofmeasure.org",
"code": "kg",
"value": 76.3873
},
"id": "1:weight:60:1427265120:1427265180"
}
}
]
}
```

Example 2: retrieve sleep duration for patient 1 in (Amsterdam/Netherlands timezone) for 2015-03-23

* the API returns the sleep duration of the sleep intervals ending in the requested period of time

GET /api/fhir/Observation?patient.id=1&type=sleepduration&start=2015-03-22T22:00&end=2015-03-23T22:00

Response:

```
{
  "resourceType": "Bundle",
  "title": "Multiple observations",
  "total": 1,
  "link": [
    {
      "rel": "self",
      "href": "http://localhost:3000/api/fhir/Observation?patient.id=1&type=sleepduration&start=2015-03-22T22:00&end=2015-03-23T22:00"
    }
  ],
  "entry": [
    {
      "content": {
        "subject": {
          "reference": "Patient/1"
        },
        "resourceType": "Observation",
        "status": "final",
        "reliability": "ok",
        "appliesPeriod": {
          "start": "2015-03-22T21:19:00+00:00",
          "end": "2015-03-23T06:20:00+00:00"
        },
        "name": {
          "coding": [
            {
```



```

    "system": "http://browser.ihtsdotools.org/",
    "code": "248263006",
    "display": "Duration of sleep"
  }
]
},
"valueQuantity": {
  "units": "s",
  "system": "http://unitsofmeasure.org",
  "value": 32460
},
"id": "1:sleepduration:86400:1426982400:1427068800"
}
}
]
}

```

Example 3: retrieve feeding data for patient 3 from 2015-06-04T00:00 until 2015-06-04T14:00

* observations are grouped inside of a component, because they all belong to the same feeding

GET /api/fhir/Observation?patient.id=3&type=sleepduration&start=2015-03-22T22:00&end=2015-03-23T22:00

response:

```

{
  "resourceType": "Bundle",
  "title": "Multiple observations",
  "total": 1,
  "link": [
    {
      "rel": "self",
      "href": "http://localhost:3000/api/fhir/Observation?patient.id=3&type=feeding&start=2015-06-04T00:00&end=2015-06-04T14:00"
    }
  ],
  "entry": [
    {

```

```
"content": {
  "subject": {
    "reference": "Patient/3"
  },
  "resourceType": "Observation",
  "status": "final",
  "reliability": "ok",
  "appliesDateTime": "2015-06-04T13:14:10+00:00",
  "code": {
    "coding": [
      {
        "system": "http://browser.ihtsdotools.org/",
        "code": "129007004",
        "display": "Baby feeding from a bottle"
      }
    ]
  },
  "component": [
    {
      "name": {
        "coding": [
          {
            "display": "Bottle content"
          }
        ]
      },
      "valueQuantity": {
        "value": "Formula milk"
      }
    },
    {
      "name": {
        "coding": [
          {
            "display": "Feeding performer"
          }
        ]
      }
    }
  ]
}
```

```
    }
  ]
},
"valueQuantity": {
  "value": "Mother"
}
},
{
  "name": {
    "coding": [
      {
        "display": "Overall score"
      }
    ]
  },
  "valueQuantity": {
    "value": 5
  }
},
{
  "name": {
    "coding": [
      {
        "display": "Happiness score"
      }
    ]
  },
  "valueQuantity": {
    "value": 5
  }
},
{
  "name": {
    "coding": [
      {
```

```
    "display": "Feeding duration"
  }
]
},
"valueQuantity": {
  "units": "s",
  "system": "http://unitsofmeasure.org",
  "value": 469.66
}
},
{
  "name": {
    "coding": [
      {
        "display": "Average temperature of bottle contents"
      }
    ]
  },
  "valueQuantity": {
    "units": "deg C",
    "system": "http://unitsofmeasure.org",
    "value": 36.8198
  }
},
{
  "name": {
    "coding": [
      {
        "display": "Average environmental light"
      }
    ]
  },
  "valueQuantity": {
    "units": "lx",
    "system": "http://unitsofmeasure.org",
```

```
"value": 111.505
}
},
{
  "name": {
    "coding": [
      {
        "display": "Average noise level"
      }
    ]
  },
  "valueQuantity": {
    "units": "dB",
    "system": "http://unitsofmeasure.org",
    "value": 50.3617
  }
},
{
  "name": {
    "coding": [
      {
        "display": "Number of brakes"
      }
    ]
  },
  "valueQuantity": {
    "value": 2
  }
},
{
  "name": {
    "coding": [
      {
        "display": "Duration of brakes"
      }
    ]
  }
}
```

```
]
},
"valueQuantity": {
  "units": "s",
  "system": "http://unitsofmeasure.org",
  "value": 169.924
}
}
],
"id": "3:feeding:60:1433423640:1433423700"
}
}
]
}
```

... more examples to come

3. Data

Here is the list of data per persona currently available:

3.1. Diabetes Patient, for 1 year: 2014-09-22 - 2015-09-22

- blood glucose,
- blood pressure,
- burned calories,
- energy intake ,
- fat percentage ,
- hba1c (glycohemoglobin),
- heart rate,
- resting heart rate,
- skintemperature ,
- sleep duration ,
- steps,
- weight

3.2. Healthy person, for 1 year: 2014-09-22 - 2015-09-22

- blood pressure,
- burned calories,
- energy intake ,
- fat percentage ,
- heart rate,
- resting heart rate,
- skintemperature ,
- sleep duration ,
- steps,
- weight

3.3. Baby, for 1 month: 2015-05-19 - 2015-06-08

- Feeding performer
- Bottle content
- Overall score
- Happiness score
- Bottle initial weight
- Bottle end weight
- Feeding duration
- Bottle contents avg temperature
- Average environmental light
- Average noise level
- Number of brakes
- Duration of brakes