

Introduction

EHRServer is a generic, minimal, open source, openEHR clinical data storage with a REST interface for committing and querying data. It also has a web UI for management and visual query creation.

EHRServer on GitHub: <https://github.com/ppazos/cabolabs-ehrserver>

Using EHRServer

Before committing any data, you need an archetype that will specify the structure, meaning and constraints of your data (see sample archetype). Only flat COMPOSITION archetypes are allowed right now, but this constraint will be removed.

Put your ADL files in this path: “ehr\archetypes\composition”.

Commit

Also, before committing any data, you have to create a patient and his/her EHR. This can be done using the EHRServer UI.

To commit data to EHRServer, use the commit REST service:

`_base_/rest/commit(String ehrId, Collection versions)`

Where `_base_` is where EHRServer is running, e.g. <http://localhost:8090/ehr/rest/commit>

See “sample composition” as an example of what can be sent on versions parameter.

Querying

Using the Web UI, you can create a query. You can query for COMPOSITIONs using criteria over data (e.g. retrieve all the compositions with systolic BP > 100), or query for data (e.g. retrieve systolic BP, diastolic BP and body temperature).

Show Query

UID	1d00aef6-1609-4567-9ca9-1af457a910d0
Name	dsgs
Group	path
Format	xml
Type	datavalue
Select	
archetypeld	path
openEHR-EHR-COMPOSITION.signos.v1	/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0004]/value
openEHR-EHR-COMPOSITION.signos.v1	/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0005]/value
openEHR-EHR-COMPOSITION.signos.v1	/content[at0008]/data[at0009]/events[at0010]/data[at0011]/items[at0012]/value

Fig. 1: Query for data, grouped by path, format as XML by default.

The examples below are shown after committing two records to the EHRServer, for the same EHR. Each query is executed in the context of one EHR. In the future, we'll remove this constraint to run queries over different EHRs.

You can test your query using the EHRServer Web UI. If your query retrieves data and you selected JSON as an output format, the Web UI will show you a chart of your data.

[Ver datos](#)

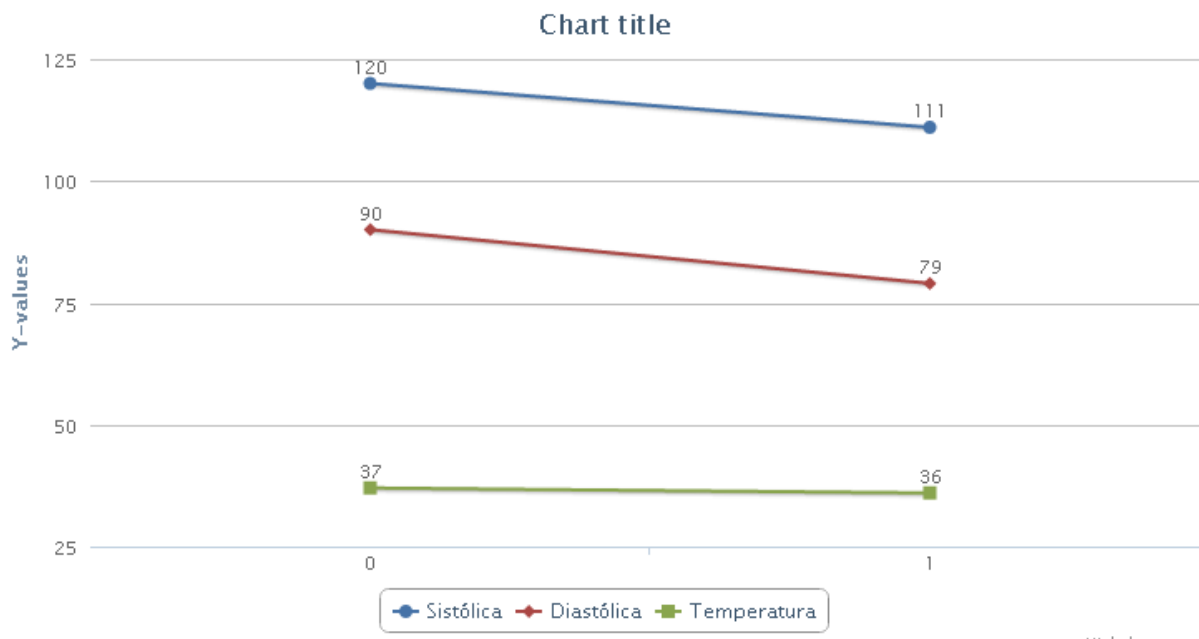


Fig. 2: Automatic data charting for JSON data results

And you can display the returned data:

Ver datos

```
{
  "/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0004]/value": {
    "type": "DvQuantity",
    "name": "Sistólica",
    "serie": [
      {
        "magnitude": 120,
        "units": "mm[Hg] ",
        "date": "2013-09-07T20:16:09Z"
      },
      {
        "magnitude": 111,
        "units": "mm[Hg] ",
        "date": "2013-09-07T20:29:31Z"
      }
    ]
  },
  "/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0005]/value": {
    "type": "DvQuantity",
    "name": "Diastólica",
    "serie": [
      {
        "magnitude": 90,
        "units": "mm[Hg] ",
        "date": "2013-09-07T20:16:09Z"
      },
      {
        "magnitude": 79,
        "units": "mm[Hg] ",
        "date": "2013-09-07T20:29:31Z"
      }
    ]
  },
  "/content[at0008]/data[at0009]/events[at0010]/data[at0011]/items[at0012]/value": {
    "type": "DvQuantity",
    "name": "Temperatura",
    "serie": [
      {
        "magnitude": 37,
        "units": "°C",
        "date": "2013-09-07T20:16:09Z"
      }
    ]
  },
}
```

Fig. 3: data retrieved for query

Of course, queries can be executed using a REST service:

`_base_/rest/query(String queryUid, String ehrId, String format)`

This is a real query execution for the previously defined query, with two COMPOSITIONS committed for the same EHR:

<http://localhost:8090/ehr/rest/query?queryUid=1d00aef6-1609-4567-9ca9-1af457a910d0&ehrId=0963c0bf-e8dd-43ee-80d5-57ecf8742413>

Result:

```
<map>
  <entry key="/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0004]/value">
    <entry key="type">DvQuantity</entry>
    <entry key="name">Sistólica</entry>
    <entry key="serie">
      <map>
        <entry key="magnitude">120.0</entry>
        <entry key="units">mm[Hg]</entry>
        <entry key="date">2013-09-07 17:16:09.843 UYT</entry>
      </map>
      <map>
        <entry key="magnitude">111.0</entry>
        <entry key="units">mm[Hg]</entry>
        <entry key="date">2013-09-07 17:29:31.984 UYT</entry>
      </map>
    </entry>
  </entry>
  <entry key="/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0005]/value">
    <entry key="type">DvQuantity</entry>
    <entry key="name">Diastólica</entry>
    <entry key="serie">
      <map>
        <entry key="magnitude">90.0</entry>
        <entry key="units">mm[Hg]</entry>
        <entry key="date">2013-09-07 17:16:09.843 UYT</entry>
      </map>
      <map>
        <entry key="magnitude">79.0</entry>
        <entry key="units">mm[Hg]</entry>
        <entry key="date">2013-09-07 17:29:31.984 UYT</entry>
      </map>
    </entry>
  </entry>
  <entry key="/content[at0008]/data[at0009]/events[at0010]/data[at0011]/items[at0012]/value">
    <entry key="type">DvQuantity</entry>
    <entry key="name">Temperatura</entry>
    <entry key="serie">
      <map>
        <entry key="magnitude">37.0</entry>
        <entry key="units">°C</entry>
        <entry key="date">2013-09-07 17:16:09.843 UYT</entry>
      </map>
      <map>
        <entry key="magnitude">36.0</entry>
        <entry key="units">°C</entry>
        <entry key="date">2013-09-07 17:29:31.984 UYT</entry>
      </map>
    </entry>
  </entry>
</map>
```

Now specifying format=json

<http://localhost:8090/ehr/rest/query?queryUid=1d00aef6-1609-4567-9ca9-1af457a910d0&ehrId=0963c0bf-e8dd-43ee-80d5-57ecf8742413&format=json>

Result:

```
{
  "/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0004]/value": {
    "type": "DvQuantity",
```

```

    "name": "Sistólica",
    "serie": [
      {
        "magnitude": 120,
        "units": "mm[Hg]",
        "date": "2013-09-07T20:16:09Z"
      },
      {
        "magnitude": 111,
        "units": "mm[Hg]",
        "date": "2013-09-07T20:29:31Z"
      }
    ]
  },
  "/content[at0006]/data[at0007]/events[at0002]/data[at0003]/items[at0005]/value": {
    "type": "DvQuantity",
    "name": "Diastólica",
    "serie": [
      {
        "magnitude": 90,
        "units": "mm[Hg]",
        "date": "2013-09-07T20:16:09Z"
      },
      {
        "magnitude": 79,
        "units": "mm[Hg]",
        "date": "2013-09-07T20:29:31Z"
      }
    ]
  },
  "/content[at0008]/data[at0009]/events[at0010]/data[at0011]/items[at0012]/value": {
    "type": "DvQuantity",
    "name": "Temperatura",
    "serie": [
      {
        "magnitude": 37,
        "units": "°C",
        "date": "2013-09-07T20:16:09Z"
      },
      {
        "magnitude": 36,
        "units": "°C",
        "date": "2013-09-07T20:29:31Z"
      }
    ]
  }
}

```

Query types and grouping

There are two kinds of queries: composition and datavalue.

- **Composition:** the result of the query will be a set of compositions, and the criteria of the query is defined over datavalues and date range.
- **Datavalue:** the result of the query will be a set of datavalues that can be grouped in different ways. The criteria is defined only by date range.

There are 3 ways of grouping datavalues:

- **Ungrouped:** just a set of datavalues without any grouping.

- **Composition:** group datavalues that belongs to the same composition. This is also called “row grouper”.
- **Path:** group datavalues with the same path. This is also called “column grouped”.

Grouping by composition simplifies displaying data as tables, and path grouper simplifies charting. The mix of REST querying services and grouping, make the creation of clinical dashboards a trivial task.

Sample archetype

```
archetype (adl_version=1.4)
  openEHR-EHR-COMPOSITION.signos.v1

concept
  [at0000] -- Signos
language
  original_language = <[ISO_639-1::es]>
description
  original_author = <
    ["name"] = <" ">
  >
  details = <
    ["es"] = <
      language = <[ISO_639-1::es]>
      purpose = <"Signos">
      use = <" ">
      misuse = <" ">
      copyright = <" ">
    >
  >
  lifecycle_state = <"0">
  other_contributors = <>
  other_details = <
    ["MD5-CAM-1.0.1"] = <"CA0D9C5FC48EAAEBF0DDCCC29CE382D6">
  >

definition
  COMPOSITION[at0000] matches { -- Signos
    category matches {
      DV_CODED_TEXT matches {
        defining_code matches {[openehr::433]}
      }
    }
    context matches {
      EVENT_CONTEXT matches {
        other_context matches {
          ITEM_TREE[at0001] matches {*}
        }
      }
    }
  }
  content cardinality matches {0..*; unordered} matches {
    OBSERVATION[at0006] matches { -- Presión Arterial
      data matches {
        HISTORY[at0007] matches { -- Event Series
          events cardinality matches {1..*; unordered} matches {
            EVENT[at0002] occurrences matches {0..1} matches { -- Cualquier evento
              data matches {
                ITEM_TREE[at0003] matches { -- Arbol
                  items cardinality matches {0..*; unordered} matches {
```

```

ELEMENT[at0004] occurrences matches {0..1} matches { -- Sistólica
    value matches {
        C_DV_QUANTITY <
            property = <[openehr::125]>
            list = <
                ["1"] = <
                    units = <"mm[Hg]">
                    magnitude = <|0.0..400.0|>
                >
            >
        >
    }
}
ELEMENT[at0005] occurrences matches {0..1} matches { -- Diastólica
    value matches {
        C_DV_QUANTITY <
            property = <[openehr::125]>
            list = <
                ["1"] = <
                    units = <"mm[Hg]">
                    magnitude = <|0.0..400.0|>
                >
            >
        >
    }
}
OBSERVATION[at0008] matches { -- Temperatura corporal
    data matches {
        HISTORY[at0009] matches { -- Event Series
            events cardinality matches {1..*; unordered} matches {
                EVENT[at0010] occurrences matches {0..1} matches { -- Cualquier evento
                    data matches {
                        ITEM_TREE[at0011] matches { -- Arbol
                            items cardinality matches {0..*; unordered} matches {
                                ELEMENT[at0012] occurrences matches {0..1} matches { -- Temperatura
                                    value matches {
                                        C_DV_QUANTITY <
                                            property = <[openehr::127]>
                                            list = <
                                                ["1"] = <
                                                    units = <"°C">
                                                    magnitude = <|0.0..50.0|>
                                                >
                                                ["2"] = <
                                                    units = <"°F">
                                                    magnitude = <|32.0..122.0|>
                                                >
                                            >
                                        >
                                    >
                                }
                            }
                        }
                    }
                }
            }
        }
    }
}
OBSERVATION[at0013] matches { -- Frecuencia cardiaca
    data matches {

```

```

HISTORY[at0014] matches { -- Event Series
  events cardinality matches {1..*; unordered} matches {
    EVENT[at0015] occurrences matches {0..1} matches { -- Cualquier evento
      data matches {
        ITEM_TREE[at0016] matches { -- Arbol
          items cardinality matches {0..*; unordered} matches {
            ELEMENT[at0017] occurrences matches {0..1} matches { -- Frecuencia
Cardiaca
              value matches {
                C_DV_QUANTITY <
                  property = <[openehr::382]>
                  list = <
                    ["1"] = <
                      units = <"/min">
                    >
                  >
                >
              }
            }
          }
        }
      }
    }
  }
}

OBSERVATION[at0018] matches { -- Frecuencia respiratoria
  data matches {
    HISTORY[at0019] matches { -- Event Series
      events cardinality matches {1..*; unordered} matches {
        EVENT[at0020] occurrences matches {0..1} matches { -- Cualquier evento
          data matches {
            ITEM_TREE[at0021] matches { -- Arbol
              items cardinality matches {0..*; unordered} matches {
                ELEMENT[at0022] occurrences matches {0..1} matches { -- Frecuencia
Respiratoria
                  value matches {
                    C_DV_QUANTITY <
                      property = <[openehr::382]>
                      list = <
                        ["1"] = <
                          units = <"/min">
                        >
                      >
                    >
                  }
                }
              }
            }
          }
        }
      }
    }
  }
}

} -- frec resp
OBSERVATION[at0023] matches { -- Peso corporal
  data matches {
    HISTORY[at0024] matches { -- Event Series
      events cardinality matches {1..*; unordered} matches {
        EVENT[at0025] occurrences matches {0..1} matches { -- Cualquier evento
          data matches {
            ITEM_TREE[at0026] matches { -- Arbol
              items cardinality matches {0..*; unordered} matches {
                ELEMENT[at0027] occurrences matches {0..1} matches { -- Peso
                  value matches {
                    C_DV_QUANTITY <
                      property = <[openehr::124]>
                      list = <
                        ["1"] = <
                          units = <"kg">
                        >
                      >
                    >
                  }
                }
              }
            }
          }
        }
      }
    }
  }
}

```



```

                                magnitude = <|0.0..400.0|>
                                >
                                >
                                }
                                }
                                }
                                }
                                }
                                }
                                }
                                }
                                }
                                } -- peso

OBSERVATION[at0028] matches {   -- Estatura
    data matches {
        HISTORY[at0029] matches {   -- Event Series
            events cardinality matches {1..*; unordered} matches {
                EVENT[at0030] occurrences matches {0..1} matches { -- Cualquier evento
                    data matches {
                        ITEM_TREE[at0031] matches {   -- Arbol
                            items cardinality matches {0..*; unordered} matches {
                                ELEMENT[at0032] occurrences matches {0..1} matches { -- Estatura
                                    value matches {
                                        C_DV_QUANTITY <
                                            property = <[openehr::122]>
                                            list = <
                                                ["1"] = <
                                                    units = <"cm">
                                                    magnitude = <|0.0..250.0|>
                                                >
                                            >
                                        >
                                    }
                                }
                            }
                        }
                    }
                }
            }
        }
    } -- estatura / talla
}

ontology
term_definitions = <
["es"] = <
    items = <
        ["at0000"] = <
            text = <"Signos">
            description = <"Registro de signos">
        >
        ["at0001"] = <
            text = <"Arbol">
            description = <"@ internal @">
        >
        -- presion arterial
        ["at0006"] = <
            text = <"Presión Arterial">
            description = <"unknown">
        >
        ["at0007"] = <
            text = <"Event Series">
            description = <"@ internal @">
        >
        ["at0002"] = <
            text = <"Cualquier evento">

```

```

        description = <"*">
    >
    ["at0003"] = <
        text = <"Arbol">
        description = <"@ internal @">
    >
    ["at0004"] = <
        text = <"Sistólica">
        description = <"*">
    >
    ["at0005"] = <
        text = <"Diastólica">
        description = <"*">
    >
    -- presion arterial

    -- temperatura
    ["at0008"] = <
        text = <"Temperatura corporal">
        description = <"unknown">
    >
    ["at0009"] = <
        text = <"Event Series">
        description = <"@ internal @">
    >
    ["at0010"] = <
        text = <"Cualquier evento">
        description = <"*">
    >
    ["at0011"] = <
        text = <"Arbol">
        description = <"@ internal @">
    >
    ["at0012"] = <
        text = <"Temperatura">
        description = <"*">
    >
    -- temperatura

    -- frec cardiaca
    ["at0013"] = <
        text = <"Frecuencia cardiaca">
        description = <"unknown">
    >
    ["at0014"] = <
        text = <"Event Series">
        description = <"@ internal @">
    >
    ["at0015"] = <
        text = <"Cualquier evento">
        description = <"*">
    >
    ["at0016"] = <
        text = <"Arbol">
        description = <"@ internal @">
    >
    ["at0017"] = <
        text = <"Frecuencia Cardiaca">
        description = <"*">
    >
    -- frec cardiaca

    -- frec resp
    ["at0018"] = <
        text = <"Frecuencia respiratoria">
        description = <"unknown">
    >
    ["at0019"] = <
        text = <"Event Series">
        description = <"@ internal @">
    >

```

```

["at0020"] = <
  text = <"Cualquier evento">
  description = <"*">
>
["at0021"] = <
  text = <"Arbol">
  description = <"@ internal @">
>
["at0022"] = <
  text = <"Frecuencia Respiratoria">
  description = <"*">
>
-- frec resp

-- peso
["at0023"] = <
  text = <"Peso corporal">
  description = <"unknown">
>
["at0024"] = <
  text = <"Event Series">
  description = <"@ internal @">
>
["at0025"] = <
  text = <"Cualquier evento">
  description = <"*">
>
["at0026"] = <
  text = <"Arbol">
  description = <"@ internal @">
>
["at0027"] = <
  text = <"Peso">
  description = <"*">
>
-- peso

-- estatura / talla
["at0028"] = <
  text = <"Estatura">
  description = <"unknown">
>
["at0029"] = <
  text = <"Event Series">
  description = <"@ internal @">
>
["at0030"] = <
  text = <"Cualquier evento">
  description = <"*">
>
["at0031"] = <
  text = <"Arbol">
  description = <"@ internal @">
>
["at0032"] = <
  text = <"Estatura">
  description = <"*">
>
-- estatura / talla
>
>
>

```

Sample composition

```
<version xmlns='http://schemas.openehr.org/v1' xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'>
  <commit_audit>
    <change_type>
      <value>creation</value>
      <defining_code>
        <terminology_id>
          <value>openehr</value>
        </terminology_id>
        <code_string>249</code_string>
      </defining_code>
    </change_type>
    <committer>
      <name>Dr. Pablo Pazos</name>
    </committer>
  </commit_audit>
  <data xsi:type='COMPOSITION' archetype_node_id='openEHR-EHR-COMPOSITION.signos.v1'>
    <name>
      <value>Signos</value>
    </name>
    <language>
      <terminology_id>
        <value>ISO_639-1</value>
      </terminology_id>
      <code_string>es</code_string>
    </language>
    <territory>
      <terminology_id>
        <value>ISO_3166-1</value>
      </terminology_id>
      <code_string>UY</code_string>
    </territory>
    <category>
      <value>event</value>
      <defining_code>
        <terminology_id>
          <value>openehr</value>
        </terminology_id>
        <code_string>443</code_string>
      </defining_code>
    </category>
    <composer xsi:type='PARTY_IDENTIFIED'>
      <name>Dr. Pablo Pazos</name>
    </composer>
    <context>
      <start_time>
        <value>20130907T172931,0984-0300</value>
      </start_time>
      <setting>
        <value>Hospital Montevideo</value>
        <defining_code>
          <terminology_id>
            <value>openehr</value>
          </terminology_id>
          <code_string>229</code_string>
        </defining_code>
      </setting>
    </context>
    <content xsi:type='OBSERVATION' archetype_node_id='at0006'>
      <name>
        <value>Presión Arterial</value>
      </name>
      <data xsi:type='HISTORY' archetype_node_id='at0007'>
        <name>
          <value>Event Series</value>
        </name>
        <events xsi:type='EVENT' archetype_node_id='at0002'>
          <name>
```

```

        <value>Cualquier evento</value>
    </name>
    <data xsi:type='ITEM_TREE' archetype_node_id='at0003'>
        <name>
            <value>Arbol</value>
        </name>
        <items xsi:type='ELEMENT' archetype_node_id='at0005'>
            <name>
                <value>Diastólica</value>
            </name>
            <value xsi:type='DV_QUANTITY'>
                <magnitude>79.0</magnitude>
                <units>mm[Hg]</units>
            </value>
        </items>
        <items xsi:type='ELEMENT' archetype_node_id='at0004'>
            <name>
                <value>Sistólica</value>
            </name>
            <value xsi:type='DV_QUANTITY'>
                <magnitude>111.0</magnitude>
                <units>mm[Hg]</units>
            </value>
        </items>
    </data>
</events>
</data>
</content>
<content xsi:type='OBSERVATION' archetype_node_id='at0008'>
    <name>
        <value>Temperatura corporal</value>
    </name>
    <data xsi:type='HISTORY' archetype_node_id='at0009'>
        <name>
            <value>Event Series</value>
        </name>
        <events xsi:type='EVENT' archetype_node_id='at0010'>
            <name>
                <value>Cualquier evento</value>
            </name>
            <data xsi:type='ITEM_TREE' archetype_node_id='at0011'>
                <name>
                    <value>Arbol</value>
                </name>
                <items xsi:type='ELEMENT' archetype_node_id='at0012'>
                    <name>
                        <value>Temperatura</value>
                    </name>
                    <value xsi:type='DV_QUANTITY'>
                        <magnitude>36.0</magnitude>
                        <units>°C</units>
                    </value>
                </items>
            </data>
        </events>
    </data>
</content>
<content xsi:type='OBSERVATION' archetype_node_id='at0013'>
    <name>
        <value>Frecuencia cardiaca</value>
    </name>
    <data xsi:type='HISTORY' archetype_node_id='at0014'>
        <name>
            <value>Event Series</value>
        </name>
        <events xsi:type='EVENT' archetype_node_id='at0015'>
            <name>
                <value>Cualquier evento</value>
            </name>
            <data xsi:type='ITEM_TREE' archetype_node_id='at0016'>
                <name>

```

```

        <value>Arbol</value>
      </name>
    <items xsi:type='ELEMENT' archetype_node_id='at0017'>
      <name>
        <value>Frecuencia Cardiaca</value>
      </name>
      <value xsi:type='DV_QUANTITY'>
        <magnitude>78.0</magnitude>
        <units>/min</units>
      </value>
    </items>
  </data>
</events>
</data>
</content>
<content xsi:type='OBSERVATION' archetype_node_id='at0018'>
  <name>
    <value>Frecuencia respiratoria</value>
  </name>
  <data xsi:type='HISTORY' archetype_node_id='at0019'>
    <name>
      <value>Event Series</value>
    </name>
    <events xsi:type='EVENT' archetype_node_id='at0020'>
      <name>
        <value>Cualquier evento</value>
      </name>
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