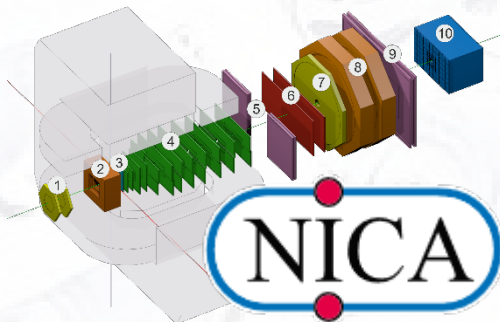


Development of the Geometry Database and related services for the NICA experiments

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¹JINR, Dubna



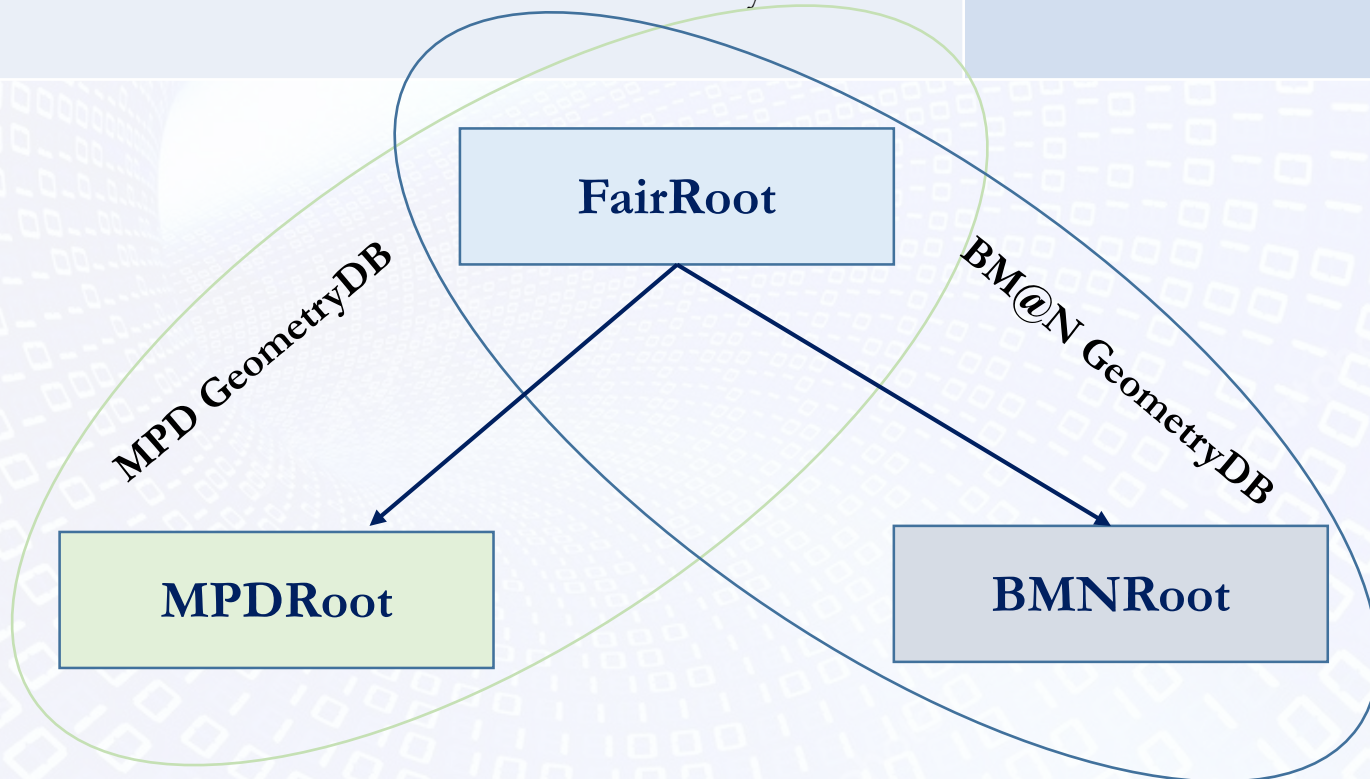
6th Collaboration Meeting of the BM@N,
26-27 October



Joint Institute for Nuclear Research

BM@N & MPD

Common features	Differences
Approaches to the methods of simulations and reconstructions	The sets of Detectors
Software: FAIRSOFT, FAIRROOT RunManager: <ul style="list-style-type: none">➤ FairRunSim for the simulation runs➤ FairRunAna for the reconstruction or analysis runs	



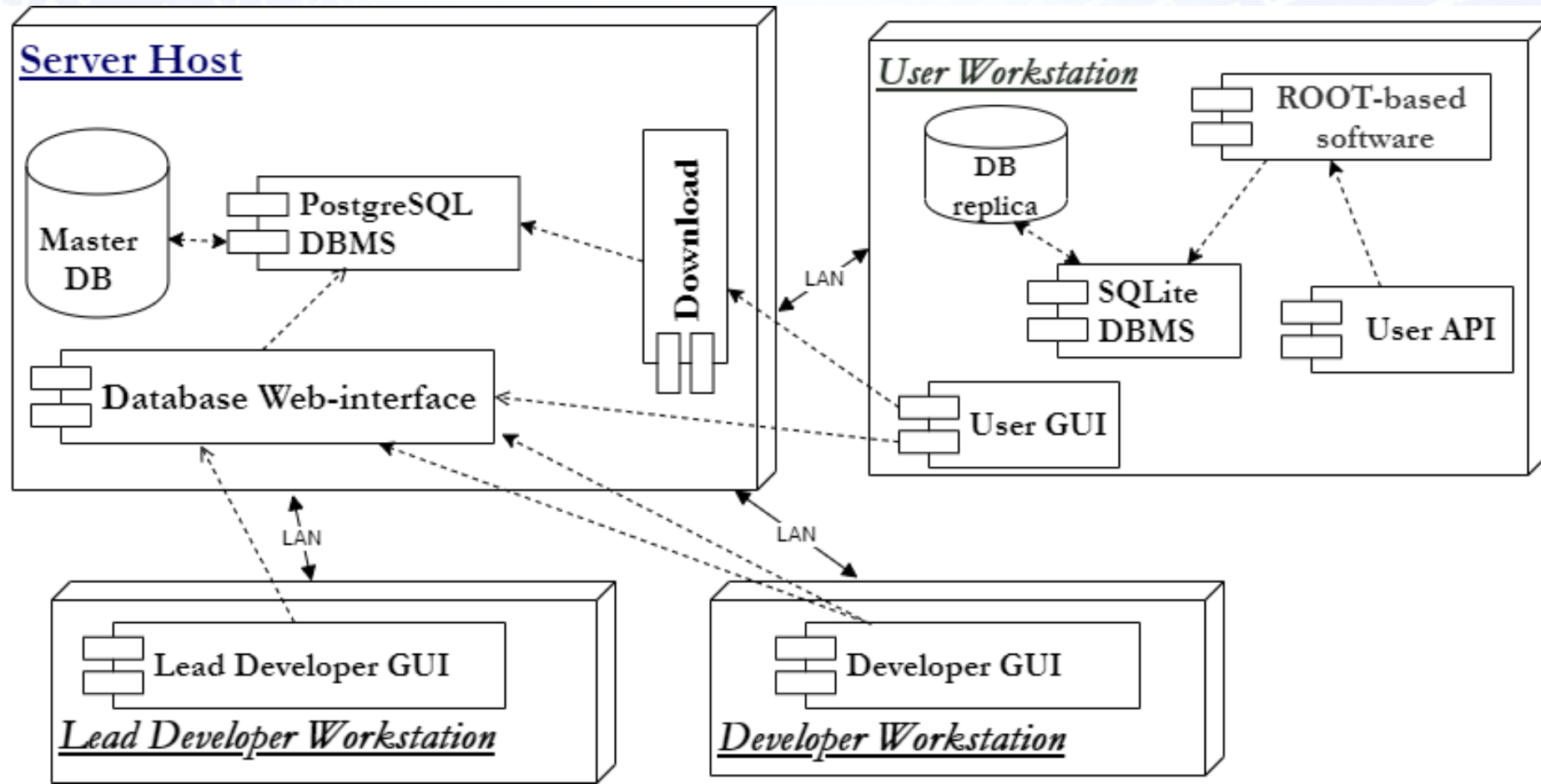
Guidelines

- **manage module geometries as ROOT binary objects**
- **for each module keep: tag, version, transformation matrix, mother module**
- **manage the pre-defined setups as combinations of module geometries**
- **manage module version**

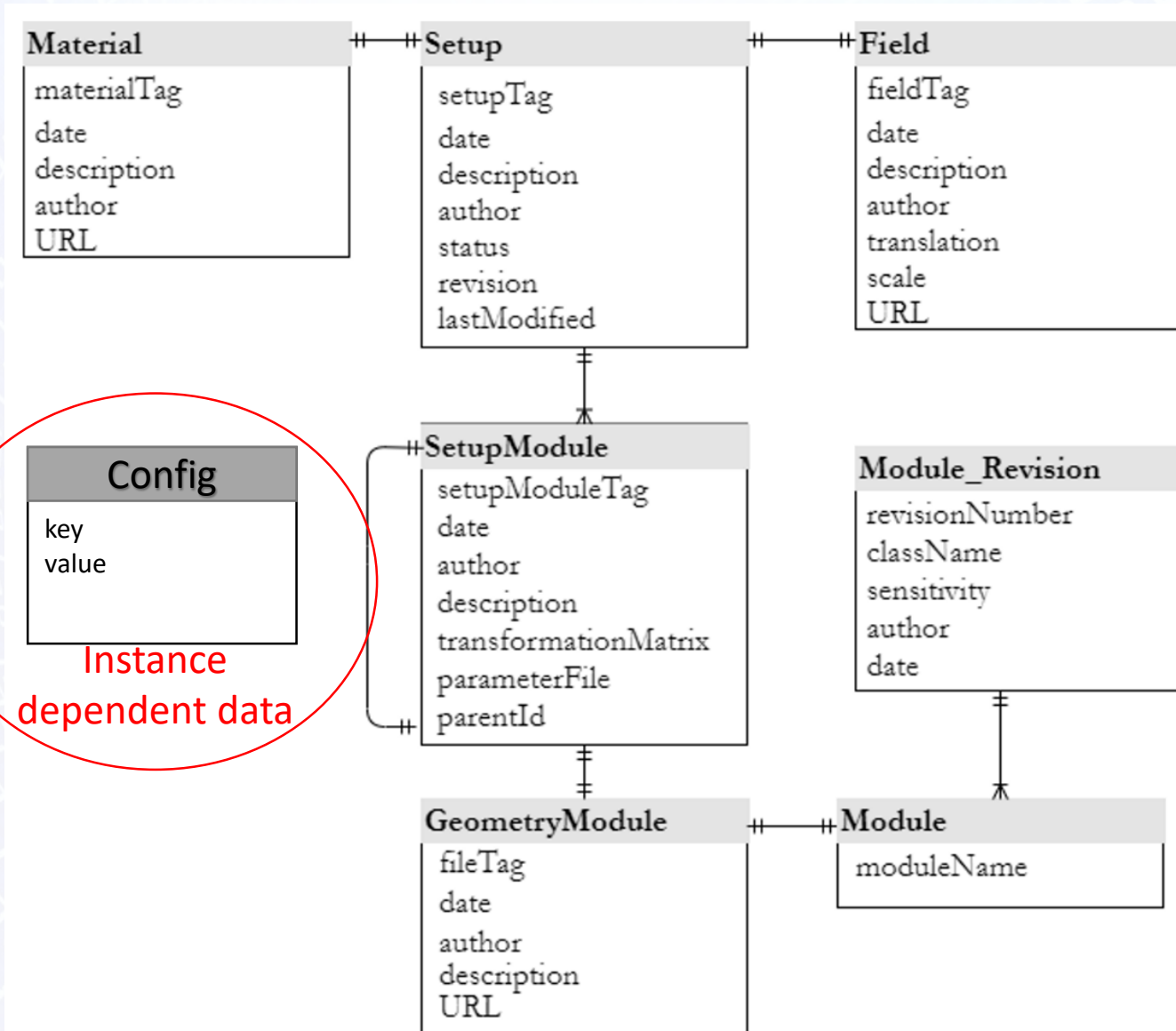
Tasks

- **Store the modules of experiment**
- **Construct setup from the stored modules**
- **Present the setup via WEB**
- **Support different versions of module**
- **Unified approach to Geometry DB**

General architecture of the Geometry Information System



Object model of the Geometry DB



Web-interface. View Mode

The screenshot shows a web browser window displaying the BM@N Geometry DataBase interface. The browser's address bar shows the URL `cbmdb.jinr.ru/geometry_bmn_test/vs.shtml`. The page header includes the BM@N logo and the text "Baryonic Matter at Nuclotron". The main content area is titled "Geometry Setups" and contains a table with the following data:

Tag	Revision	Date	Description	Author	Status	Download
run7	20.02.0	2020-04-19	run7 uploaded 19.04.2020	aleksand	Approved	Download
run6	19.04.0	2019-12-25	version 19.04.0 with error description	aleksand	Approved	Download
run6	17.04.0	2018-07-26	version 17.04.0	aleksand	Approved	Download

The sidebar on the left contains a "Menu" section with links for HOME, VIEW GEOMETRY, and EDIT GEOMETRY. Below the menu is a "Get in touch" section with an email icon and the name "Konstantin Gertsenberger", with a "Mail" link below it.

Git repositories: https://git.jinr.ru/nica_db/geodb_web.git

Web-interface. Add Setup Module

Menu

HOME

VIEW GEOMETRY

EDIT GEOMETRY

Get in touch

 [Konstantin Gertsenberger](mailto:Konstantin.Gertsenberger@nuclotron.ac.ru)

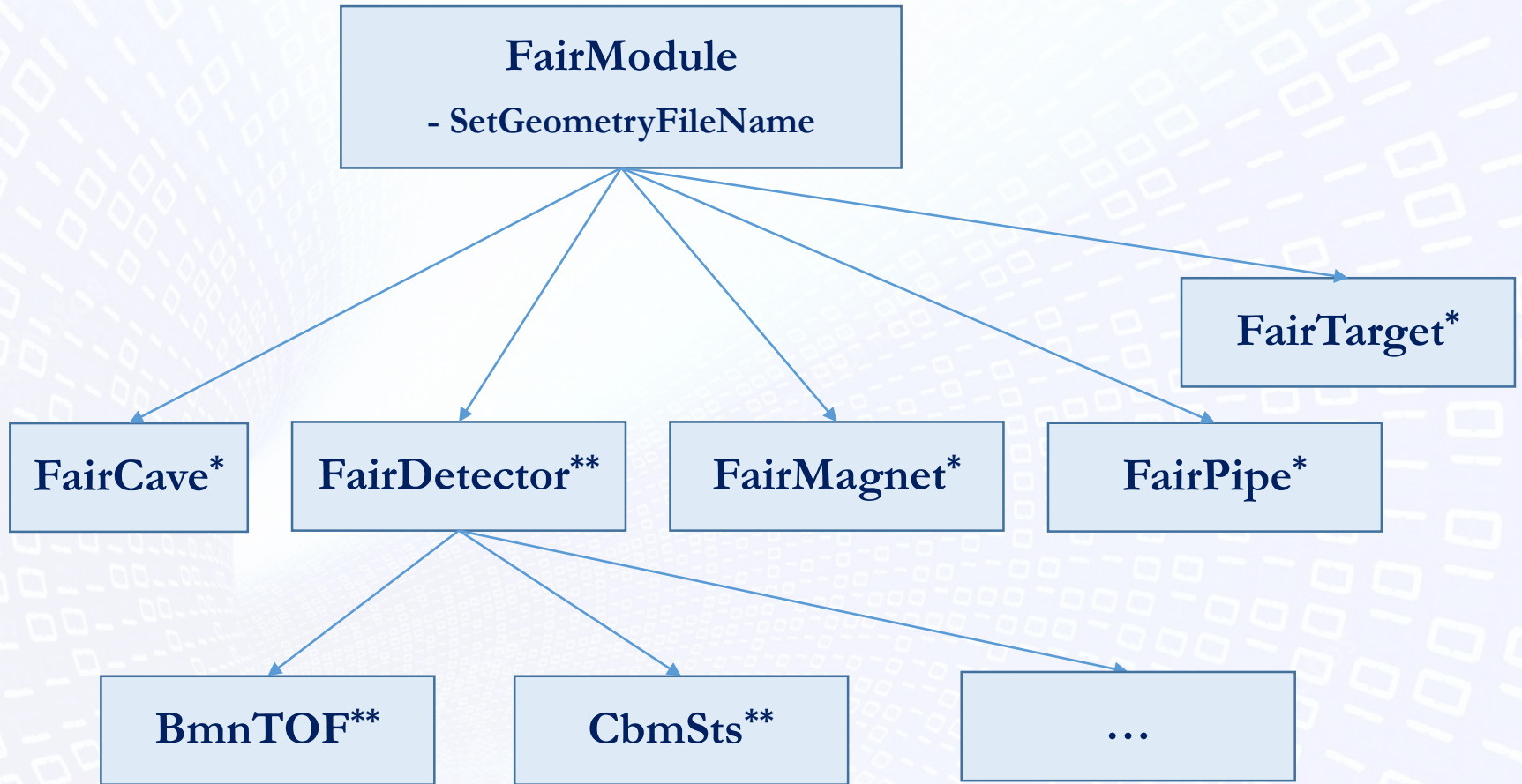
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Supported by RFBR grant №18-02-40125



Setup Module Tag: trew	Description: [*]	
Module: [*] STS	Parent Module: CAVE	
File: [*] STS		
<input checked="" type="radio"/> GEMS_RunSpring201 7		
<input type="radio"/> GEMS_RunSpring201 7		
<input type="radio"/> GEMS_RunSpring201 8		
Transformation:		
r11: 1	r12: 0	r13: 0
r21: 0	r22: 1	r23: 0
r31: 0	r32: 0	r33: 1
Translation:		
X: 0	Y: 0	Z: 0
Parameter File: <input type="button" value="Выберите файл"/> Файл не выбран		

Inheritance diagram of FairModule



* It has constructor with 1 String parameter (name)

** It has constructor with 1 String parameter (name) and 1 Boolean parameter (active)

Load FairModule

1. Create FairModule use name and parameter active
`FairModule *obj=(FairModule*)gInterpreter->Calc(command);`

2. Set path to geometry file
`obj->SetGeometryFileName(path);`

3. Add to **FairRunSim** this module
`fRun->AddModule(obj);`

Macros

<i>Signature</i>	<i>Description</i>	<i>Call Example</i>	<i>Comment</i>
<code>void getSetupList();</code>	Get the list of available setups. Print the list of available setups including tag, date of creation, author and description parameters for each approved setup.	<code>getSetupList.c();</code>	Require set variable DBL_FILE_PATH before use.
<code>bool loadSetup(const char* setupTag, const char* revision);</code>	Load setup into the Fair framework. The Geometry can be used in ROOT framework afterwards. Return FALSE if setup is not loaded, and TRUE if the loading is successful.	<code>bool res = loadSetup("run6", "19.04.0");</code>	Require set variable DBL_FILE_PATH before use.
<code>void installLocalDB.C(const char* urlServer);</code>	Install local database from server to client. Download replica of central database to client computer.	<code>installLocalDB("http://cbmdb.jinr.ru/geometry_bmn");</code>	Require set variable DBL_FILE_PATH before use.
<code>void installServerDB.C();</code>	Install new server instance. Install and init PostgreSQL database server, install and init WEB part of Geometry DB to Apache server.	<code>installServerDB();</code>	Required config file with name geodb.config.xml

geodb.config.xml

```
<geodb>
  <!-- PostgreSQL server -->
  <server host="127.0.0.1" port="5432" login="postgres" pwd="****" />
  <!-- Apache server -->
  <web_server html_root_path="/var/www/html/" folder_name="bmn_test22" set_up_script="/home/aleksand/bmn/geodb/setup.sh"/>
  <!-- Database init data-->
  <db name="bmn_test22">
    <config_parameter name="storage_path" value="/tmp/local/cbmdb/bmn_test22/storage/" />
    <config_parameter name="field_dir" value="/opt/bmn" />
    <geo_user login="test_user" pwd="sss333" mail="aleksand@jinr.ru"/>
    <cave size="20000"/>
  </db>
  <!-- Experiment specification -->
  <experiment name="BMAN_TEST" logotip_path="logo.png" responsible_person_name="test mail" responsible_person_mail="test_jinr@m.ru"/>
</geodb>
```

Install new server

```
[aleksand@cbmdb geodb]$ root -b -q installServerDB.C
```

```
-----  
| Welcome to ROOT 6.16/00                                     https://root.cern |  
|                                                           (c) 1995-2018, The ROOT Team |  
| Built for linuxx8664gcc on Mar 02 2020, 16:09:00         |  
| From tag v6-16-00, 23 January 2019                       |  
| Try '.help', '.demo', '.license', '.credits', '.quit'/'.'q' |  
-----
```

```
Processing installServerDB.C...
```

```
Parse config file... Ok
```

```
Connecting to PostgreSQL... Ok
```

```
Database with name bmn_test22 already exists.
```

```
Do you want drop it[y/n]?
```

```
y
```

```
Create database... Ok
```

```
Install Web... Ok
```

```
(int) 1
```

```
[aleksand@cbmdb geodb]$ █
```

Web-interface. New Server



Menu

HOME

VIEW GEOMETRY

EDIT GEOMETRY

Get in touch



test mail



BMAN_TEST Geometry DataBase



User::test_user

CONFIGURE WEBACCESS

LOGOUT

Geometry DataBase

GENERAL INFORMATION

The Geometry Database is a part of the Geometry Information System, which provides a central storage of the detector geometries and a set of convenient tools to manage the geometry modules and software assemblies of various versions of the setup as a combination of these modules and additional files containing a description of the magnetic field, detector materials and media. Two user interfaces are available to work with the Geometry Database of the experiment: the specialized Web interface and an application programming interface (API) providing a set of ROOT macros for selecting and loading the setup geometry and its components into the experiment software for simulation, reconstruction and physics data analysis of the particle collision events. The Geometry Database is intended for storing, processing and managing information on detector geometries. The Web interface of the database provides the following functionality:

- viewing, adding and deleting files with geometry materials and magnetic fields;
- viewing and managing files with detector geometries of the setup, CERN ROOT, ASCII and GDML files are supported;
- viewing and managing geometry modules as these geometry files with corresponding transformation matrices which allow to set a displacement and rotation of the detectors in the setup without changing an original geometry in the files;
- constructing and approving various versions of the setup geometries as a combination of the stored modules, magnetic field and geometry materials; viewing, loading, updating and deleting existing setup geometries;
- search and download of detector geometries from the Web service;
- download a full local version of the Geometry Database based on the SQLite DBMS, which is a local replica of the central PostgreSQL geometry database.

Conclusion

Geometry DB for storing and retrieving the geometry has been developed:

- **DB (DBMS PostgreSQL, SQLite) in use**
- **GUI (Graphical User Interface) tools implemented**
- **API (Application Programming Interface) tools as a set of ROOT macros done**
- **Unified approach is implemented**

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