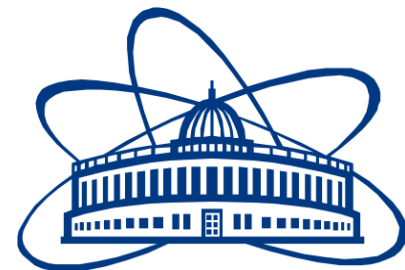


Geometry Database for the CBM Experiment



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Motivation

- Variety of detector modules
- Flexibility: combine the modules for different setups
- Each module can be located in different placement
- Evolution of geometries in accordance with the phases of experiments
- Administration of the geometries variety in a fail-safe, reproducible and transparent way

Tasks

- Store the modules of CBM
- Load the geometry modules for setup construction
- Construct setup from the stored modules
- Support different versions of setup

Basic terms

Geometry Module

File in ROOT format with content of detector geometry

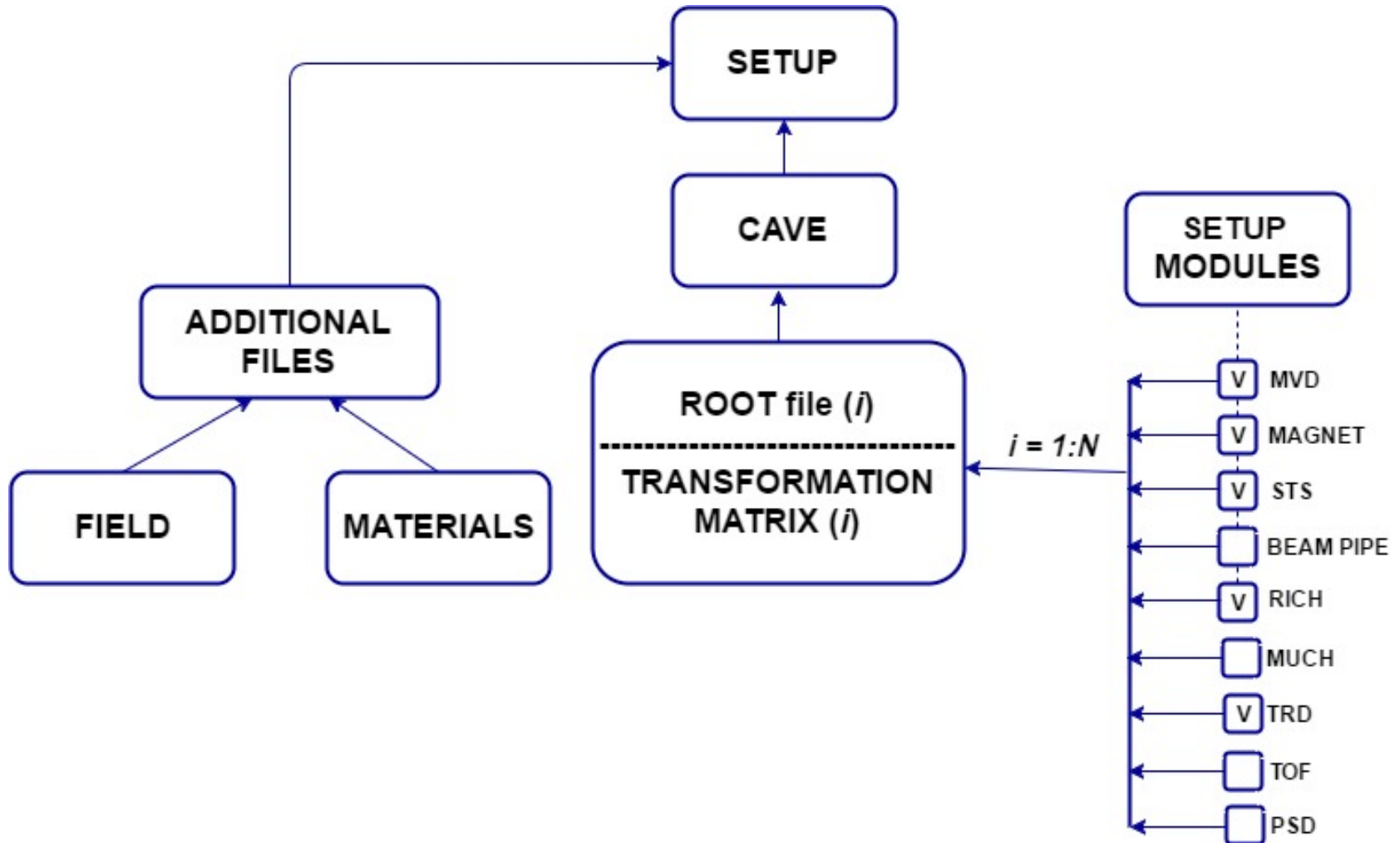
Setup Module

Geometry module, link to the mother geometry module, its placement in the mother module (transformation matrix or object of class TGeoMatrix)

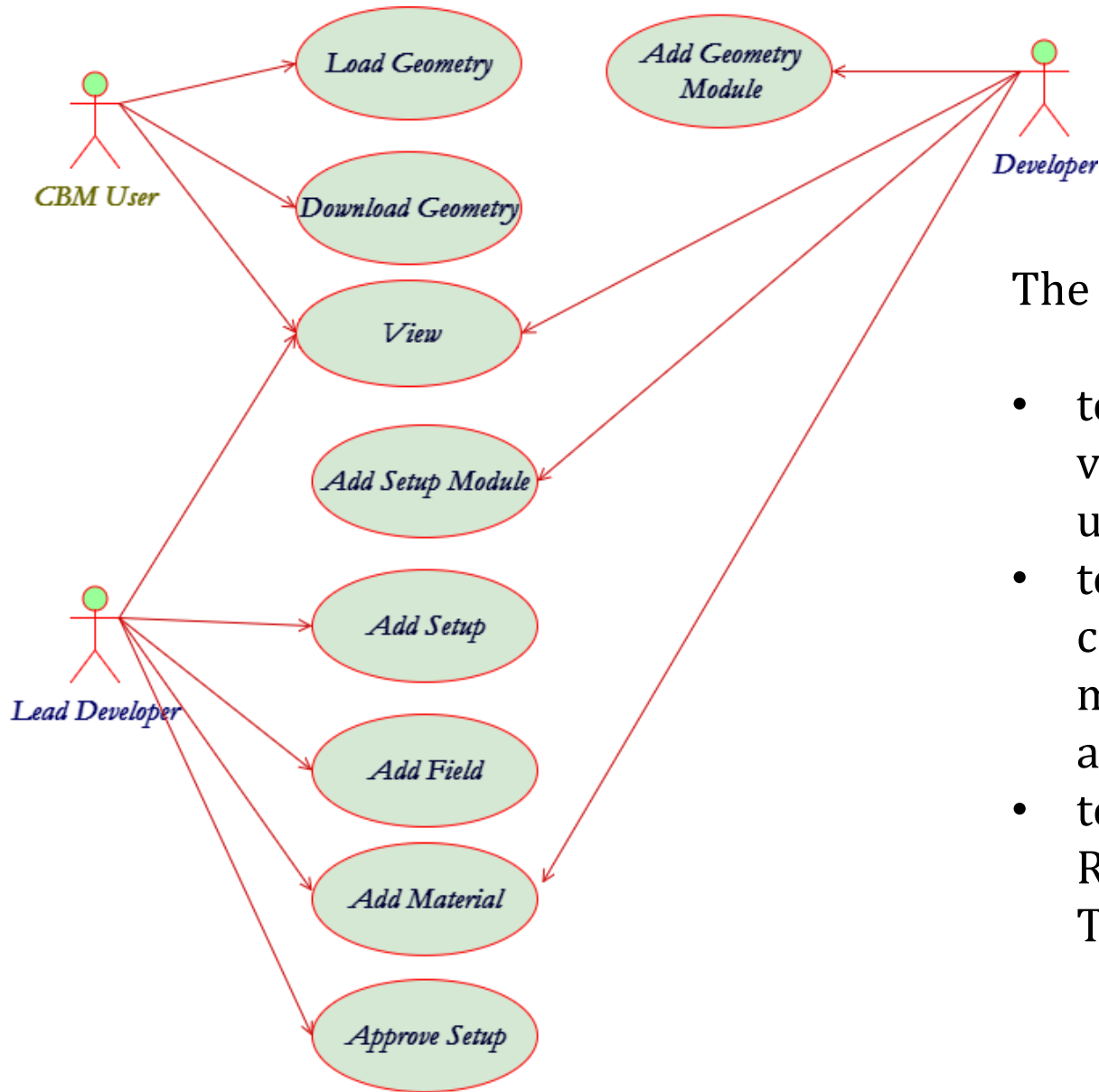
Setup

Combination of setup modules which represents the full geometry

CBM Setup Structure



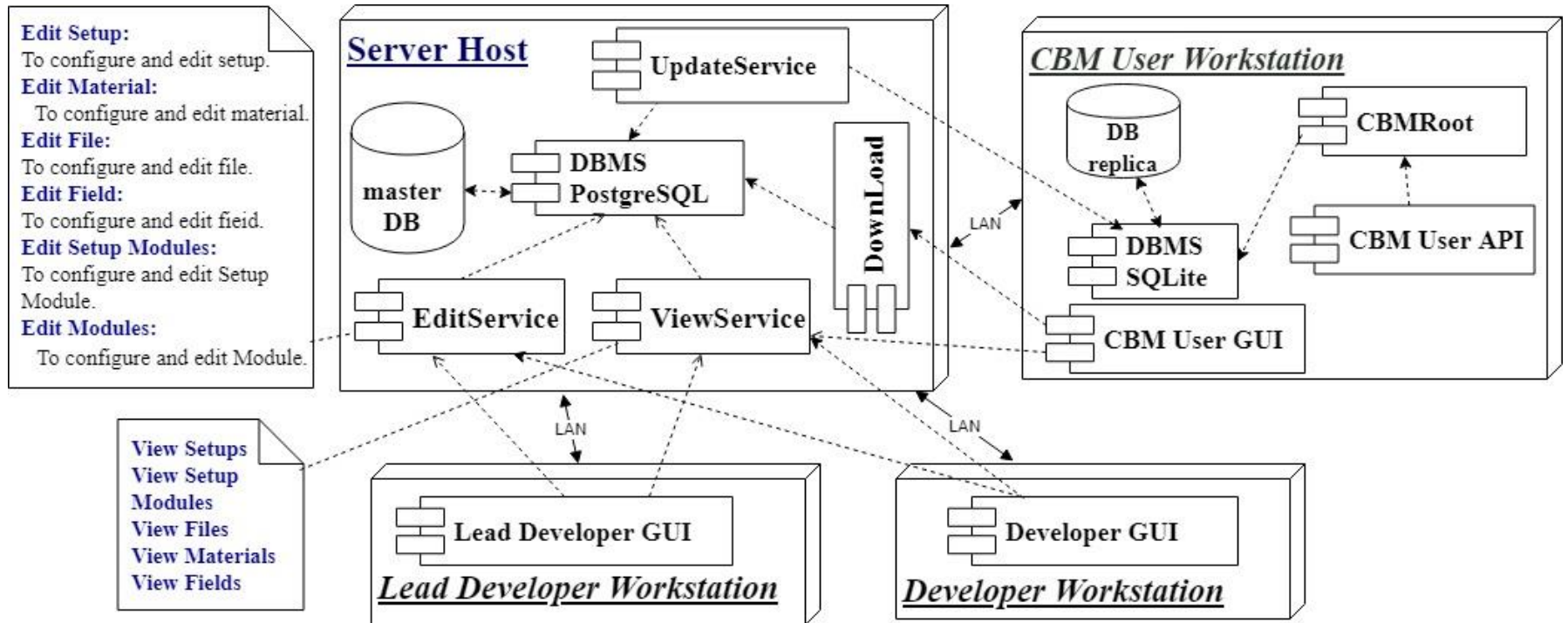
Geometry Database. Use Cases



The Geometry DB is used:

- to provide interfaces to view, retrieve, load and update modules and setups;
- to store setups as combination of setup modules, magnetic fields and materials;
- to store setup modules as ROOT files and Transformation matrix.

Architecture of the Geometry DB



The implementation

- **GUI (Graphical User Interface)** implemented as Web-interface.
 - View;
 - Edit;
 - Download.
- **API (Application Programming Interface)** implemented as macros of the ROOT environment. Any macro can be used as executable file or can be called from other ROOT macros.

Web-interface. Configure Access

Role Administration

Configure WebAccess

Code	Name	Actions	Users
LDV	Lead Developer	Full Set	Grant / Revoke
CBM	CBM User	Read Only	Grant / Revoke
DVP	Developer	MVD	Grant / Revoke
DVP	Developer	PIPE	Grant / Revoke
DVP	Developer	STS	Grant / Revoke
DVP	Developer	RICH	Grant / Revoke
DVP	Developer	MAGNET	Grant / Revoke
DVP	Developer	TRD	Grant / Revoke
DVP	Developer	TOF	Grant / Revoke
DVP	Developer	PSD	Grant / Revoke
DVP	Developer	PLATFORM	Grant / Revoke

Connect user to role Developer

Select user: [Connect](#)

Connected users to role Developer MVD:

are absent!

Found 2 matching users:

ID	email	Developer/PIPE/
3	axion2rv@gmail.com	Revoke
15	wwq21@yyyyyy.com	Revoke

WebAccess Admin

Selection for WebAccess Admin

Role Area

To configure administration rights and authorization rules.

User Area

To configure administration rights for the users.

Manage Accounts

To manage user accounts

Accounts Overview

Create New Account

Edit Account

User Administration

Enter part of the user Nickname or Email:

[Search](#)

Found 5 matching users:




ID	email	Nickname	Role
1	fia@jinr.ru	adms	show details
4	aleksand@jinr.ru	susu	show details
10	axion2rv@gmail.com		show details
12	fira@cv.jinr.ru		show details
14	ivanov@jinr.ru	Ivanov	show details

Roles connected to user *aleksand@jinr.ru*:

Code	Name	Actions	Role
LDV	Lead Developer	Full Set	Revoke
CBM	CBM User	Read Only	Revoke
			Grant

Web-interface. View Mode

Available Setups

Tag	Revision	Date	Description	Status	Author	Download
sis100_electron	14985	2019-09-19	version 18.09.2019	Approved	aleksand@jinr.ru	
sis100_electron	2	2019-02-26	version 25.02.2019	Approved	aleksand@jinr.ru	
sis100_electron	1	2018-03-07	test! abc	Approved	aleksand@jinr.ru	

magnet	v18a	2019-09-19	aleksand@jinr.ru	unknown
pipe	v16b_1e	2017-12-21	aleksand@jinr.ru	Exists only old version description
mvd	v17a_tr	2019-02-26	aleksand@jinr.ru	v17a_tr_file
sts	v19a	2019-09-19	aleksand@jinr.ru	unknown
rich	v17a_1e	2019-02-26	aleksand@jinr.ru	v17a_1e
trd	v17n_1e	2019-02-26	aleksand@jinr.ru	v17n_1e
tof	v16c_1e	2019-02-26	aleksand@jinr.ru	v16c_1e
psd	v18e	2019-02-26	aleksand@jinr.ru	v18e
platform	v13a	2017-12-21	aleksand@jinr.ru	2016-05-19 - VF - Add platform module
Field	v18a	2019-09-19	aleksand@jinr.ru	sis100_electron 19.09.2019
Material	1.10	2017-11-30	aleksand@jinr.ru	

tof / v16c_1e

Transformation	Scale	Translation	File Tag
1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	1.000; 1.000; 1.000	0.000; 0.000; 0.000	v16c_1e_file

Field Tag: v18a

X	Y	Z	Scale
0.000	0.000	40.000	1.000

 View Setups

View Setup Modules

View Files

View Materials

View Fields

Download GeometryDB

User Guide

Web-interface. Edit Mode

Available Setups

Tag	Revision	Date	Description	Author	Status	Last Modified	Admin Tools
sis100_electron	14985	2019-09-19	version 18.09.2019 OK!	aleksand@jinr.ru	Approved		✗ +
sis100_electron	2	2019-02-26	version 25.02.2019 OK!	aleksand@jinr.ru	Approved		✗ +
sis100_electron	1	2018-03-07	test! abc OK!	aleksand@jinr.ru	Approved		✗ +
sis200_electron_test	1	2019-04-17	test setup OK!	fia@jinr.ru	Created		✓ ✎ ✗ +

Please, enter new value for tag:

Please, enter value for setup revision:



Delete this setup: *make this setup unavailable for usage*



Approve this setup: *change the status to Approved*



Modify this setup: *go to modification form*



Make a copy of this setup: *go to modification form*

Edit Admin Interface

Selection for Edit Admin

✓ Edit Setup

To configure and edit setup.

Edit Material

To configure and edit material.

Edit File

To configure and edit file.

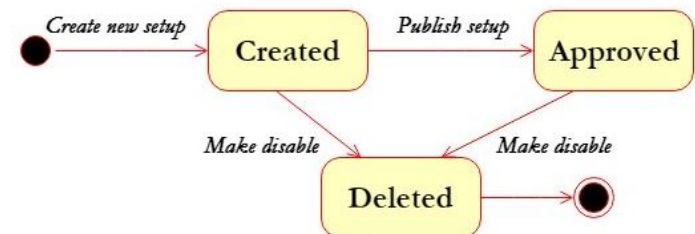
Edit Field

To configure and edit field.

Edit Setup Modules

To configure and edit Setup Module.

Go to the Form for Setup
Compiling →



Web-interface. Setup Compiling Form

(Add New Setup)

Setup Tag:
sis500_test

Revision:
1

Description:*

test

Author:
fia@jinr.ru

Available Setup Modules

magnet

+

pipe

+

mvd

+

sts

-

	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
○	sts	v16g	2019-02-26	aleksand@jinr.ru	v16g_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 65.000	cave	v16g
○	sts	v16x	2017-12-21	aleksand@jinr.ru	v16x_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 65.000	cave	use STS v16x as new default, see issue #647
○	sts	v19a	2019-09-19	aleksand@jinr.ru	v19a_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 65.000	pipe	Unknown

rich

+

trd

+

tof

+

psd

+

platform

+

much

+

Available Fields

Tag	Date	Author	X	Y	Z	Scale	Description
v12b	2017-11-30	aleksand@jinr.ru	0.000	0.000	40.000	1.000	Field for sis100_electron
v18a	2019-09-19	aleksand@jinr.ru	0.000	0.000	40.000	1.000	sis100_electron 19.09.2019

Available Materials

Tag	Date	Author	Description
1.10	2017-11-30	aleksand@jinr.ru	// Revision 1.10 2006/09/12 07:27:58 kresan // media file for new TOF geometry

Cancel

Add Setup

Web-interface. Creation of a new setup from existing

!Mode: Create a new setup from existing

Setup Tag:
sis100_electron

Revision:
14987

Description:*

version 18.09.2019

Author:
aleksand@jinr.ru

List of Setup Modules

magnet									
	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
<input type="radio"/>	magnet	v15a	2017-12-19	aleksand@jinr.ru	v15a_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 40.000	cave	magnet v15a is v12b with correct keeping volume hbvnb material
<input checked="" type="radio"/>	magnet	v18a	2019-09-19	aleksand@jinr.ru	v18a_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 0.000	cave	Magnet Unknown

pipe									
	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
<input checked="" type="radio"/>	pipe	v16b_1e	2017-12-21	aleksand@jinr.ru	v16b_1e_file	1.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 1.000	0.000 0.000 0.000	magnet	Exists only old version description

Available Fields

	Tag	Date	Author	X	Y	Z	Scale	Description
<input type="radio"/>	v12b	2017-11-30	aleksand@jinr.ru	0.000	0.000	40.000	1.000	Field for sis100_electron
<input checked="" type="radio"/>	v18a	2019-09-19	aleksand@jinr.ru	0.000	0.000	40.000	1.000	sis100_electron 19.09.2019

Available Materials

	Tag	Date	Author	Description
<input checked="" type="radio"/>	1.10	2017-11-30	aleksand@jinr.ru	// Revision 1.10 2006/09/12 07:27:58 kresan // media file for new TOF geometry

Cancel Save Setup

Web-interface. Add/Edit Setup Module

Setup Module Tag:

test_2a

Author:

fia@jinr.ru

Description:*

test

Module&File

Module:*

sts ▼

Files:*

sts



v16g_file



v16x_file

Parent

Select Parent Module:

cave ▼

Available Setup Modules:

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
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Cancel

Add a New Setup Module

Macros (1)

<i>Signature</i>	<i>Description</i>	<i>Call Example</i>	<i>Comment</i>
void getSetupList() ;	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.	getSetupList.c() ;	Return the available setups' list
bool loadSetup (const char* setupTag, const char* moduleName, long revision);	Load setup into the CBM ROOT framework. The Geometry can be used in ROOT framework afterwards. Return FALSE if setup is not loaded, and TRUE if the loading is successful.	bool res = loadSetup ("sis100_electron", "*", 14985);	"*" – all setup modules to be loaded
bool loadSetup (const char* setupTag, int moduleId, long revision);	Load setup into CBM ROOT environment by module Id to load setup into the CBM ROOT framework. The Geometry can be used in ROOT framework afterwards. Return FALSE if setup is not loaded, and TRUE if loading is successful.	bool res = loadSetup ("sis100_electron",-1,-1);	Revision '-1' – get number of revision from local svn or last (if svn not exists).
bool loadSetup (const char* setupTag, const char* moduleName, long revision, const char* xml);	Load setup into the ROOT environment. Geometry can be used in the ROOT environment after this operation. User can use xml file in order to move any setup module during loading. Return false if setup was not loaded because of errors and true if load is successful.	loadSetup ("sis100_electron", "*", -1,"local.xml")	xml file contains information on the setup modules and their shifts.

Macros (2)

<i>Signature</i>	<i>Description</i>	<i>Call Example</i>	<i>Comment</i>
bool loadSetupByUrl (const char* setupTag, const char* moduleName, long revision, const char* url);	<i>Load setup into the CBM ROOT framework.</i> The Geometry can be used in ROOT framework afterwards. Return FALSE if setup is not loaded, and TRUE if the loading is successful.	bool res = loadSetupByUrl ("s is100_electron", "*", 14985, "http://cbmdb.jinr.ru/ geometry/");	Can load not improved setup

Conclusion and Next Steps

Geometry DB prototype for storing and retrieving the geometry of CBM modules has been developed:

- DB (DBMS PostgreSQL, SQLite);
- GUI (Graphical User Interface) tools;
- API (Application Programming Interface) tools as a set of ROOT macros;
- Preparing to include into CBMRoot release;
- Beta Testing of CBM database.

- Continue filling the DB,
- Macros for installing DB.

Thanks for your attention!