Experience of the Development of the Geometry Database for the CBM Experiment

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CBM

GSI

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Motivation

- Variety of detector modules;

- Flexibility: combine different modules for different setups (e.g., sis100_electron, sis100_muon);

- Evolution of geometries and variants in particular in the design and construction phase of the experiment;

- The same module can be used in different contexts / setups with different placements;

- Necessity to administer this variety and flexibility and the evolution of geometries 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;

- Show the CBM setup;

- Support different versions of setup.

Basic Definitions

Geometry Module
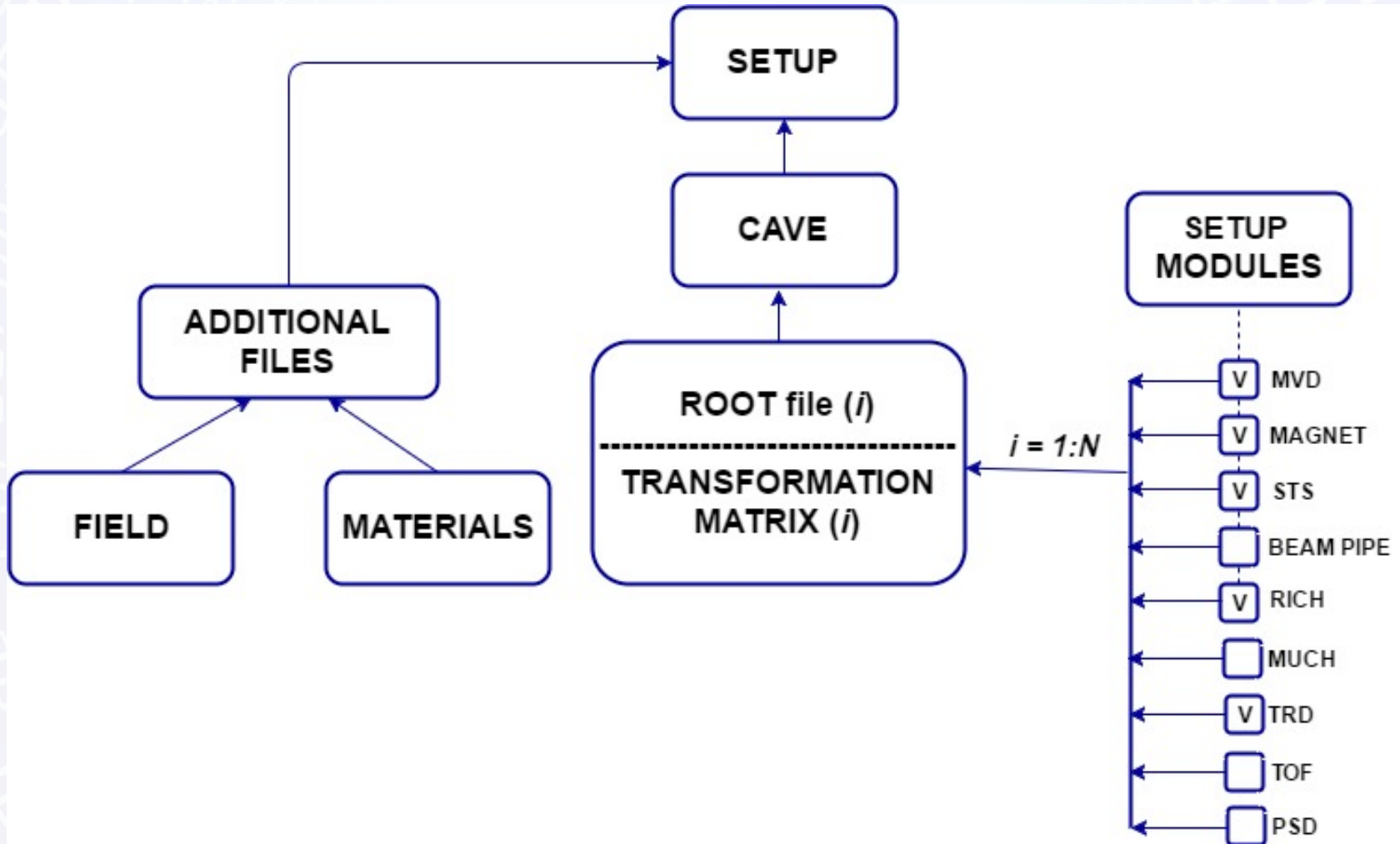
File in ROOT format with content of detector geometry

Setup Module

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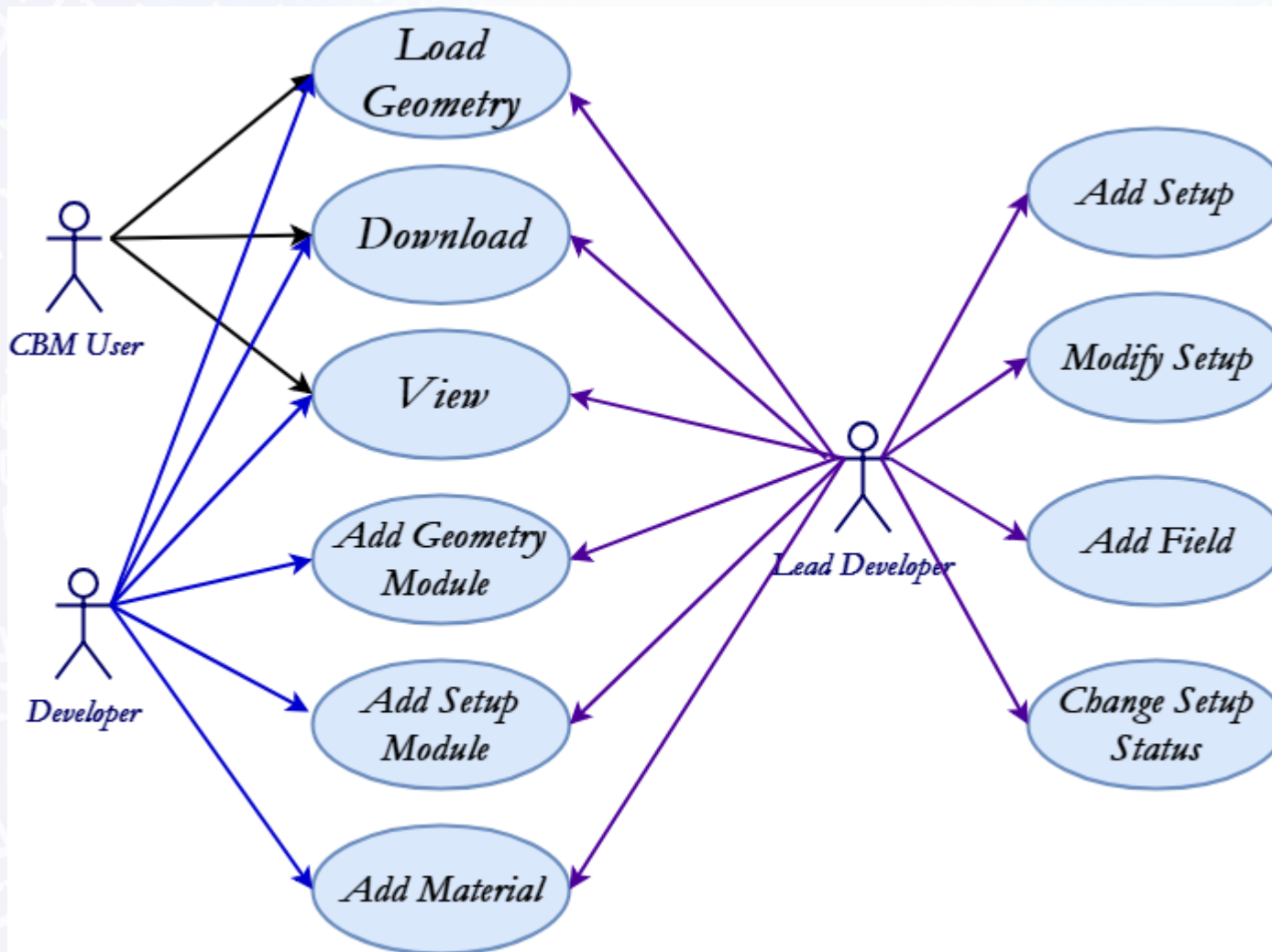
Setup

Combination of setup modules which represents the full CBM geometry
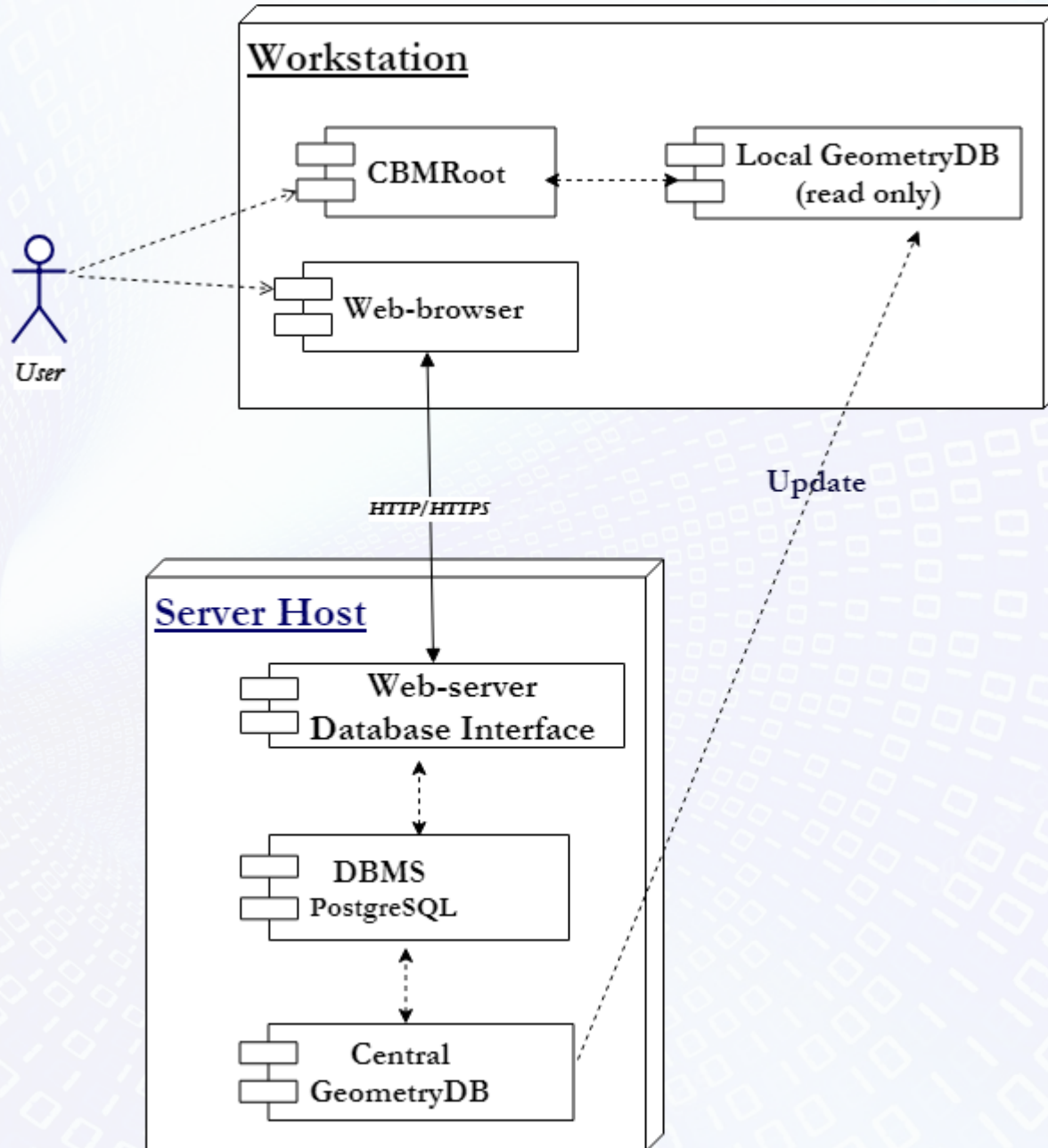
Setup Structure

Geometry Database. Use Cases

The Geometry DB is used:

- to provide interfaces to view, retrieve 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

Component Diagram

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

Web-interface. View Mode

Web-interface. Edit Mode

Available Setups

Tag	Date	Description	Author	Status	Last Modified	Admin Tools
mytest	2018-03-14	test! abc [OK!]	fia@jinr.ru	Approved		✗
sis100_electron	2018-03-07	test! abc [OK!]	aleksand@jinr.ru	Approved		✗
test_002	2018-06-06	Test setup again [OK!]	fia@jinr.ru	Created		✔ ✎ ✗
test_001	2018-03-15	test! [OK!]	fia@jinr.ru	Created	2018-06-06	✔ ✎ ✗

Cancel | Create New Setup

Please, enter new value for tag:
test_003
OK

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

✔ Approve this setup: *change the status to Approved*

✎ Modify 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 →

Setup Tag:
test_003

Description:*
description for test_003

Author:
fia@jinr.ru

Available Setup Modules

magnet	⊕
pipe	⊕
mvd	⊕
sts	⊖

	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
⦿	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	STS_fake_test1	2018-01-30	alexand@jinr.ru	root_fake_file_sts_t	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	Fake STS module for test

rich	⊕
trd	⊕
tof	⊕
psd	⊕
platform	⊕

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
○	TESTER	2018-04-02	fia@jinr.ru	1.000	1.000	1.000	2.000	terter description
○	v13b	2018-04-02	fia@jinr.ru	2.000	2.000	2.000	3.000	new field
○	TESTER2	2018-04-02	fia@jinr.ru	2.000	2.000	3.000	5.000	dfsdfsfds
○	34534534535	2018-04-09	fia@jinr.ru	1.000	1.000	1.000	1.000	trytrytrytrytryrty
○	34534534535	2018-04-09	fia@jinr.ru	1.000	1.000	1.000	1.000	test

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
○	MATERIALTEST	2018-04-02	fia@jinr.ru	MATERIALTEST_EDIT
○	MATERIAL_test1	2018-01-30	alexand@jinr.ru	Test material, can not be used for real setup.EDIT

Cancel · Add Setup

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Web-interface. Setup Modifying (Change the Selected Setup)

Setup Tag: test_001   **Description:** test!   **Author:** fia@jinr.ru

List of Setup Modules

magnet	⊕
pipe	⊕
mvd	⊕
sts	⊖

	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
○	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	STS_fake_test1	2018-01-30	alexand@jinr.ru	root_fake_file_sts_t	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	Fake STS module for test

rich	⊕
trd	⊕
tof	⊖

	Type	Tag	Date	Author	File Tag	Transformation	Translation	Parent	Description
◉	tof	v16a_1e_tof	2017-12-21	aleksand@jinr.ru	v16a_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	cave	No any comments

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
○	TESTER	2018-04-02	fia@jinr.ru	1.000	1.000	1.000	2.000	terter description
○	v13b	2018-04-02	fia@jinr.ru	2.000	2.000	2.000	3.000	new field
◉	TESTER2	2018-04-02	fia@jinr.ru	2.000	2.000	3.000	5.000	dfsdfsfds
○	34534534535	2018-04-09	fia@jinr.ru	1.000	1.000	1.000	1.000	trytrytrytrytryrty
○	34534534535	2018-04-09	fia@jinr.ru	1.000	1.000	1.000	1.000	test

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
○	MATERIALTEST	2018-04-02	fia@jinr.ru	MATERIALTEST_EDIT
◉	MATERIAL_test1	2018-01-30	alexand@jinr.ru	Test material, can not be used for real setup.EDIT

Cancel   Save Setup

Macros

Signature	Description	Call Example	Comment
`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);	***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", "*");	"*" – all setup modules to be loaded
bool loadSetup(const char* setupTag, int moduleId);	***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);	
bool loadSetup(const char* setupTag, const char* moduleName, 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", "*", "local.xml")	xml file contains information on the setup modules and their shifts.

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;
- Beta Testing.

> Continue filling DB
> Preparing to include into CBMRoot release

Thanks for your attention!