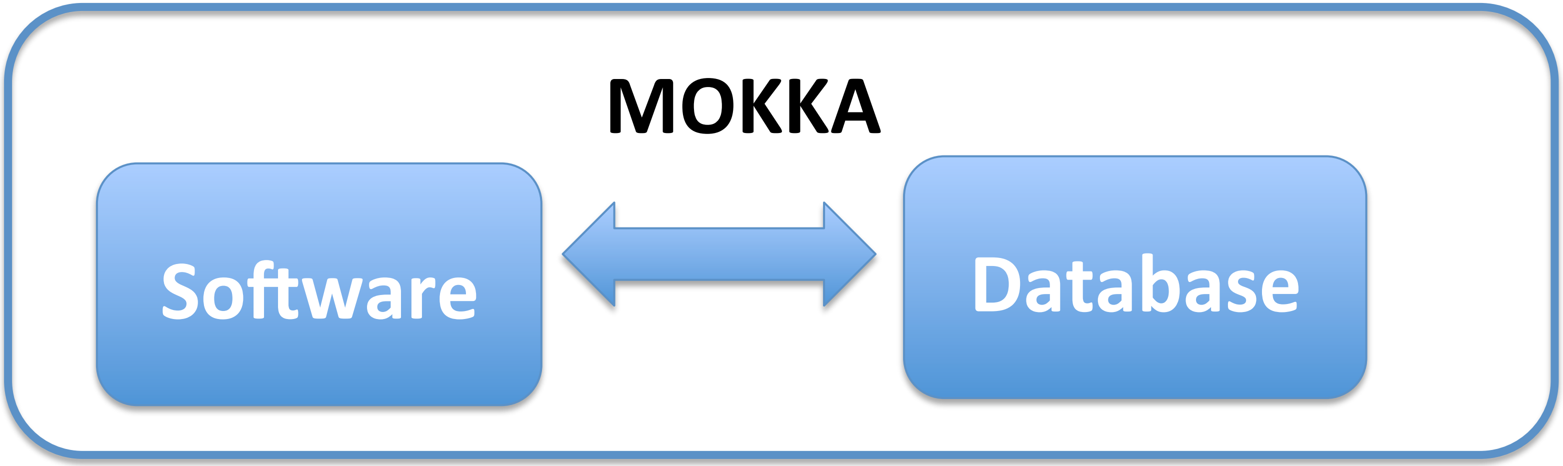

I. General presentation of Mokka software and database architecture, overview relationships between software and database

II. Modifying detector geometry using steering commands

III. Creating new geometry with new drivers

Get better understanding of internal structure of the code, learn how to create a driver template

IV. Creating new geometry model in the database

Mokka Databases Presentation

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Outline

- Global presentation of Mokka db
- Model concept
- Models03 database: general schema and relantionships
- Exploring mokka db using mysql commands
- User case => introduce new subdetector:

where in the db (which tables) and how (SQL queries for manipulating data)

Global Mokka databases Reminder

Mokka databses include several mysql databases

- mysql: administration database

- Databases for subdetectors: vxd, tpc, yoke, mask, coil, services.., materials, models03,.

- Databases for Calice prototype simulation

- Databases for tests beam

- Temporary databases
  TMP_..

……….

Exploring database

- Browsing database via web page:

http://www-flc.desy.de/ldcoptimization/tools/mokkamodels.php

Very helpful for finding quickly a particular information

- Command line interface

Very useful when you need to understand the relashionship between data

A little bit history

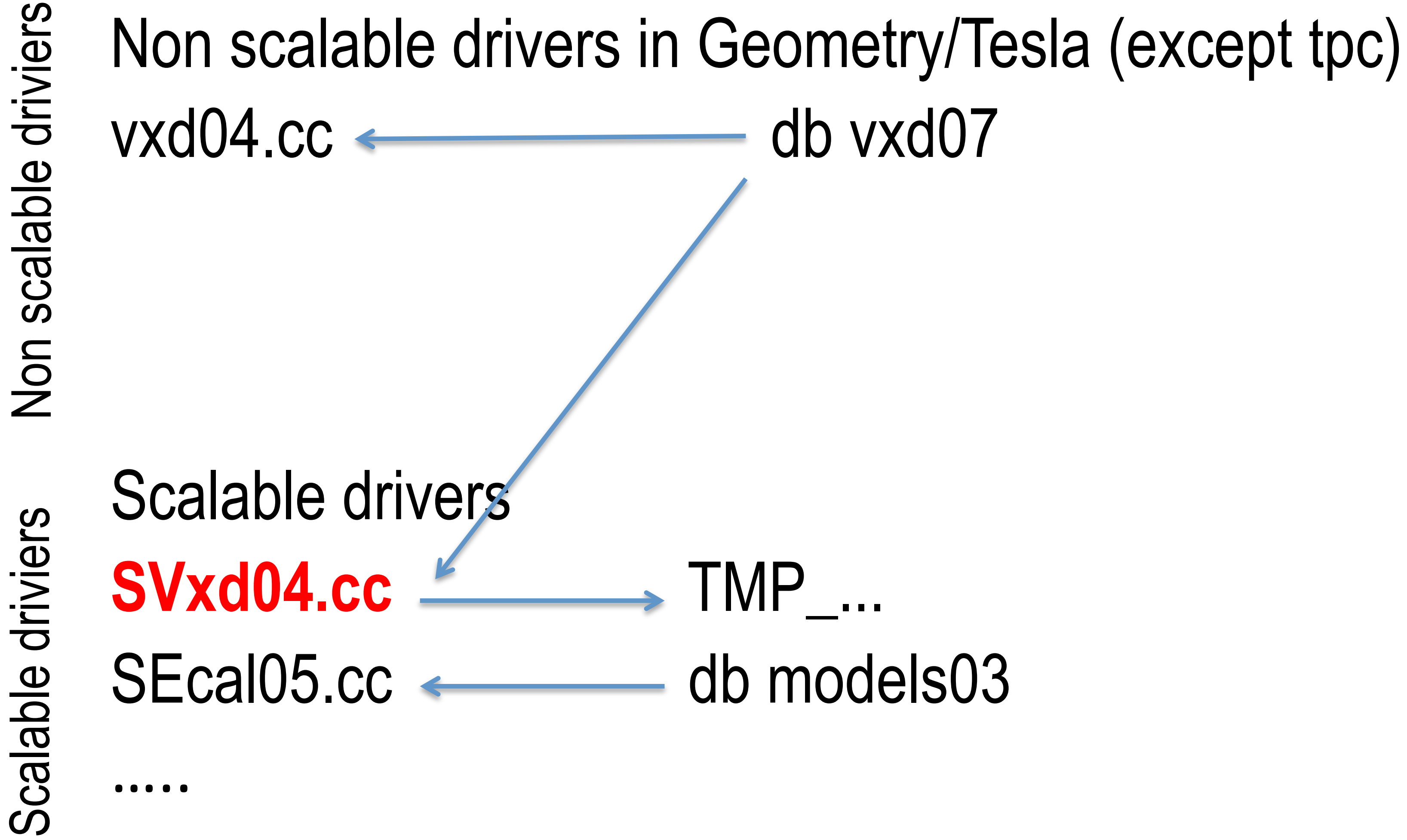
- First databases versions for subdetectors:

vxd, tpc, yoke, mask, coil, services.., => one database per subdetector

- Users need more functionalities, so need a db that take into account the relationship between the subdetectors

⇒ **Was created new database, models03, based on the « model » concept**

A little bit history



Non scalable driviers

Non scalable drivers in Geometry/Tesla (except tpc)

vxd04.cc ← db vxd07

Scalable driviers

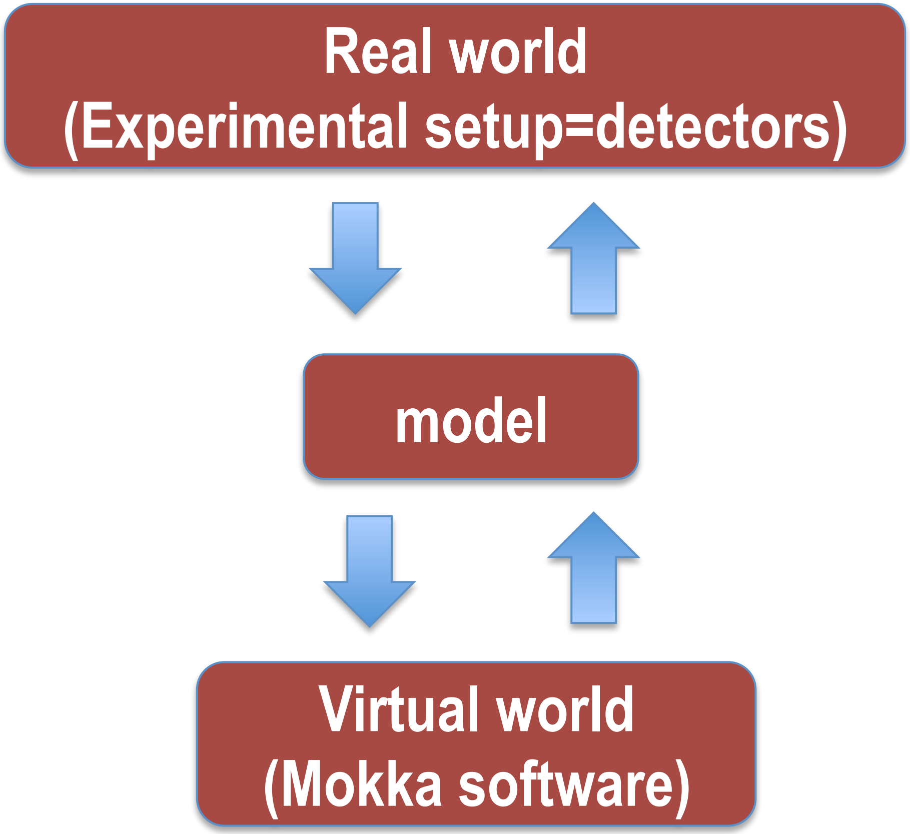
Scalable drivers

SVxd04.cc → TMP_...

SEcal05.cc ← db models03

.....

Model concept



The model is the link between two worlds

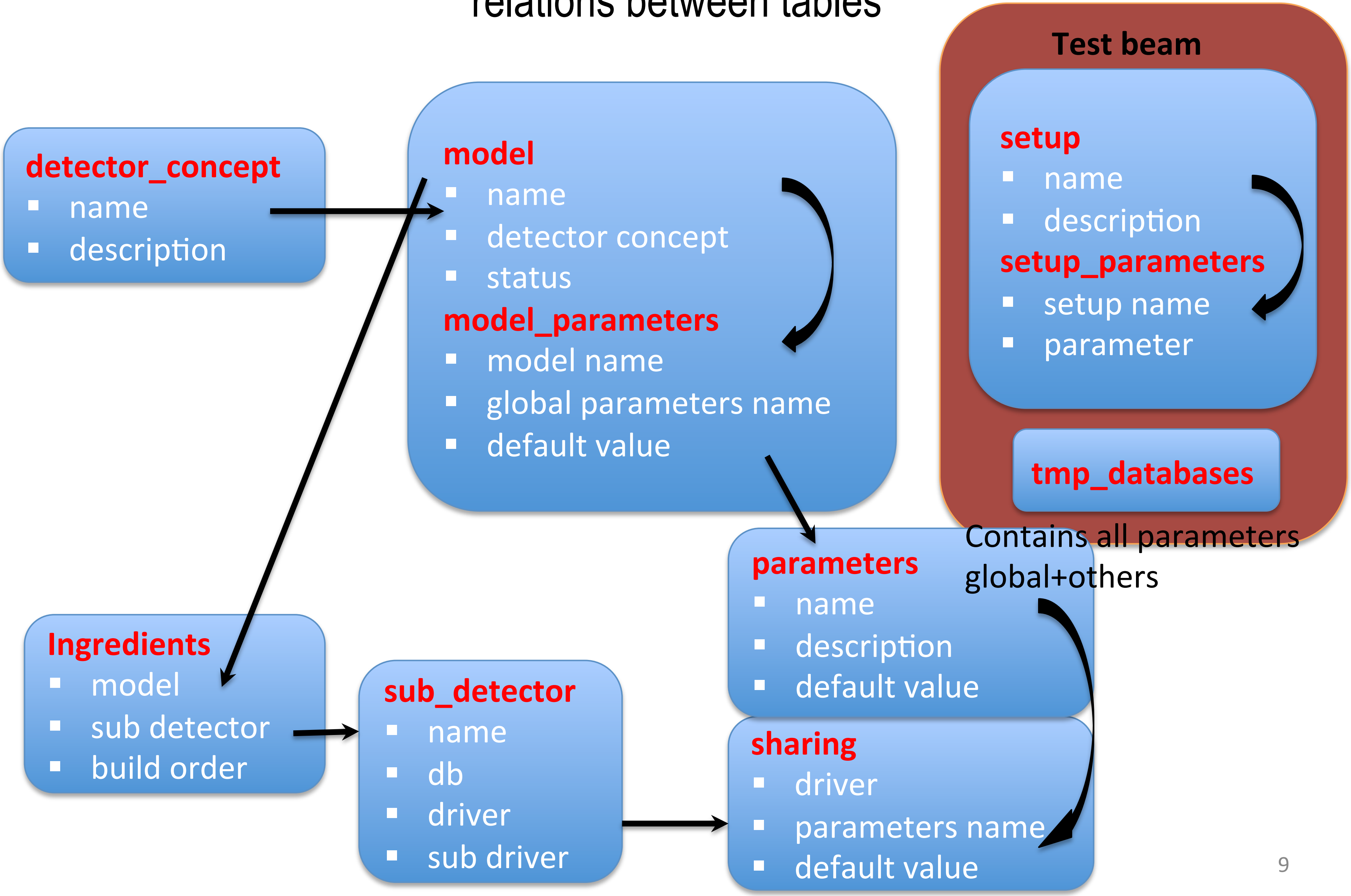
- It propagate the information from the experimental constraints to the simulation environment
- It keep structured information based on internal relationshipss
- Could be duplicated

⇒ Simulate new experimental setups

⇒ Allow to create specific identify for different geometry versions of the experimental setup (model1, model2, ..)

Modesl03

relations between tables



detector_concept
- name
- description

model
- name
- detector concept
- status

model_parameters
- model name
- global parameters name
- default value

Test beam

setup
- name
- description

setup_parameters
- setup name
- parameter

tmp_databases

Contains all parameters global+others

parameters
- name
- description
- default value

Ingredients
- model
- sub detector
- build order

sub_detector
- name
- db
- driver
- sub driver

sharing
- driver
- parameters name
- default value

Explore db using command line interface

- Connect to the db

//official mokka db

```
mysql –h pollin1.in2p3.fr -uconsult –pconsult
```

//local mokka db installed in your server

```
mysql –h your_mysql_server -uconsult –p
mysql>
```

- See all databases names

```
mysql> show databases;
```

- See databases containing models

// Select particular database

```
mysql> use models03;
mysql> show tables;
```

```
mysql> show tables;
+--------------------+
| Tables_in_models03 |
+--------------------+
| detector_concept   |
| ingredients        |
| model              |
| model_parameters   |
| parameters         |
| scripts            |
| setup              |
| setup_parameters   |
| sharing            |
| sub_detector       |
| tmp_databases      |
+--------------------+
```

Explore db using command line interface

- Explore particular table in the db **models03**

```
mysql> describe model;

| Field             | Type                     |
+-------------------+--------------------------+
| name              | varchar(80)              |
| description       | varchar(255)             |
| detector_concept  | varchar(100)             |
| model_status      | enum('unstable','frozen') |
```

```
mysql> select * from model;
mysql> select * from model where name="ILD_o2_v06";
| name       | description                    | detector_concept | model_status |
+------------+--------------------------------+------------------+---------------
| ILD_o2_v06 | ILD simulation reference …… |       ILD        | unstable     |
+------------+------------------------------------------+--------+---------------
mysql> select * from model where detector_concept="ILD" AND model_status="frozen”;
```

Explore db using command line interface

- Display only two columnes

```
mysql> SELECT name, model_status FROM model WHERE detector_concept="ILD";
```

- Search by specific name (example: starting with ILD).

```
mysql> SELECT * FROM model WHERE name LIKE "ILD%";
```

Other possibilities: "%tpc%", "%tpc »

- Select data from two tables (example: tables « sharing » and « parameters »)

```
mysql> SELECT parameter, driver_default_value, default_value FROM sharing,
parameters WHERE parameter = name and driver='SEcal05';
```

```
Table "sharing"               Table "parameters"
+--------------------------+  +-----------------+
| Field                    |  | Field           |
+--------------------------+  +-----------------+
| driver                   |  | name            |
| parameter                |  | description     |
| driver_default_value     |  | default_value   |
+--------------------------+  +-----------------+
```

Explore db using command line interface

- Print in a log file the result of request

- Useful if the user does not have rights to connect to the server where is installed the db (for exemple llrmokka.in2p3.fr):

```
shell> mysql -h server_host -uconsult -p –e
                    ’use models03; select * from model where
name="ILD_o2_v06";' > out
shell> mysql db_name < script.sql > output.tab
```

If you have writing rights on your mysql server:

```
mysql> use models03;
mysql> select * from model where name="ILD_o2_v06’ INTO OUTFILE
'out';
```

Explore db using command line interface

- Dump database

```
mysqldump –ulogin -p --all-databases > dump_allDatabases.sql
```

Inside the dump file you can find all the sql commands used for creating tables and filling them with the data. You can use this commands also on line. For example type on line:

```
mysql>use models03
mysql> LOCK TABLES `model` WRITE;
mysql> INSERT INTO `model` VALUES ('ILD_o2_v06','ILD simulation reference Model using SD HCal','ILD','unstable');
mysql> UNLOCK TABLES;
```

- Recreate database or insert new data in the database

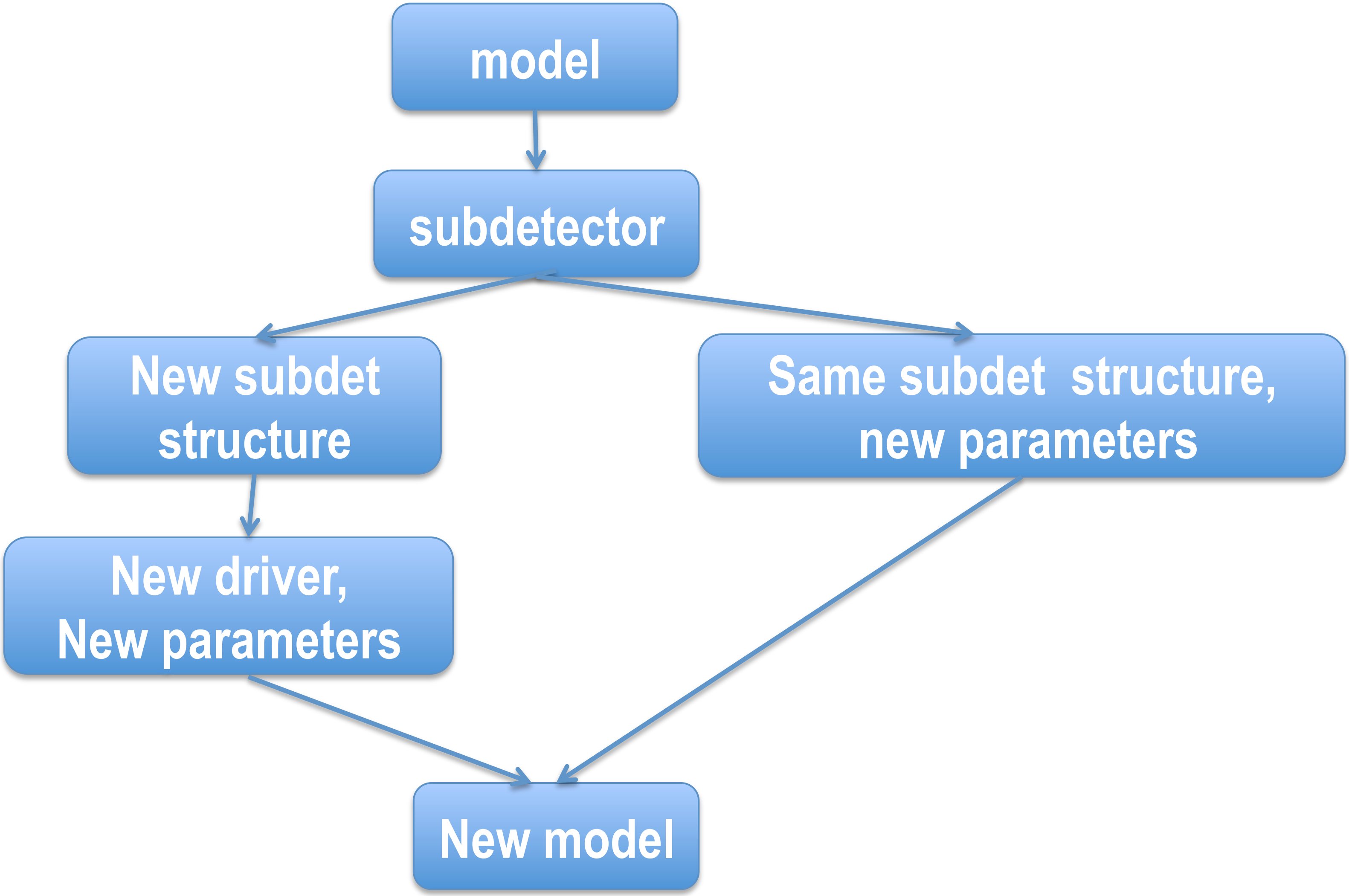
```
mysql < dump_allDatabases.sql
```

User cases

- Create new subdetector or modify subdetector structure
- Give new set of parameters for existing subdetector

How to manage the database in these cases?

Create new subdetector = new model



model

subdetector

New subdet structure

Same subdet structure, new parameters

New driver, New parameters

New model

Example of new subdetector=> new version of existing model

Table ingredients

id	model	sub_detector	build_order
1601	ILD_o1_v06	LHcal01	120
1602	ILD_o1_v06	tpc10_01	200
1603	ILD_o1_v06	ftd_simple_staggered_02	220
1604	ILD_o1_v06	SEcal05	90
1605	ILD_o1_v06	**SHcalSc04**	110
1606	ILD_o1_v06	SCoil03	400
1607	ILD_o1_v06	yoke05	500
1608	ILD_o1_v06	LumiCalV	100
1609	ILD_o1_v06	tubeX06	150
1610	ILD_o1_v06	sit_simple_planar_sensors_03	210
1611	ILD_o1_v06	SField01	1000
1612	ILD_o1_v06	vxd07	20
1613	ILD_o1_v06	set_simple_planar_sensors_01	230
1614	ILD_o1_v06	maskX03	160
1615	ILD_o1_v06	BeamCal08	650
1616	ILD_o1_v06	**SServices00**	1200

Example of new subdetector=> new version of existing model

Table ingredients

id	model	sub_detector	build_order
1633	ILD_o2_v06	LHcal01	120
1634	ILD_o2_v06	tpc10_01	200
1635	ILD_o2_v06	ftd_simple_staggered_02	220
1636	ILD_o2_v06	SEcal05	90
1637	ILD_o2_v06	**SHcalRpc01**	110
1638	ILD_o2_v06	SCoil03	400
1639	ILD_o2_v06	yoke05	500
1640	ILD_o2_v06	LumiCalV	100
1641	ILD_o2_v06	tubeX06	150
1642	ILD_o2_v06	sit_simple_planar_sensors_03	210
1643	ILD_o2_v06	SField01	1000
1644	ILD_o2_v06	vxd07	20
1645	ILD_o2_v06	set_simple_planar_sensors_01	230
1646	ILD_o2_v06	maskX03	160
1647	ILD_o2_v06	BeamCal08	650
1648	ILD_o2_v06	**SServices_O2_v00**	1200

ILD_o1_v06 and ILD_o2_v06 differ by two sub_detectors **SHcal** and **Services**

Example of new subdetector=> new model

Table ingredients

id	model	sub_detector	build_order
1015	CILD_00	BeamCal01	650
1014	CILD_00	maskX03	160
1013	CILD_00	SSet02	230
1012	CILD_00	vxd05	20
1011	CILD_00	SField01	1000
1010	CILD_00	SSit03	210
1009	CILD_00	tubeX04	150
1008	CILD_00	SLcal02	100
1007	CILD_00	yoke04	500
1006	CILD_00	SCoil02	400
1005	CILD_00	SHcalSc02	110
1004	CILD_00	SEcal03	90
1003	CILD_00	SFtd07	220
1002	CILD_00	tpc08	200
1001	CILD_00	LHcal01	120
1000	CILD_00	SEtd02	250

CILD_00 model includes subdetectors used for ILD models.

Example of new subdetector => new model

Table ingredients

id	model	sub_detector	build_order
1116	CLIC01_ILD	SEtd02	250
1117	CLIC01_ILD	LHcal01	120
1118	CLIC01_ILD	tpc08	200
1119	CLIC01_ILD	SFtd07	220
1120	CLIC01_ILD	SEcal03	90
1121	CLIC01_ILD	SHcalSc02	110
1122	CLIC01_ILD	SCoil02	400
1123	CLIC01_ILD	yoke04	500
1124	CLIC01_ILD	SLcal02	100
1125	CLIC01_ILD	clic_tubeX05	150
1126	CLIC01_ILD	SSit03	210
1127	CLIC01_ILD	SField01	1000
1128	CLIC01_ILD	clic_vxd06	20
1129	CLIC01_ILD	SSet02	230
1130	CLIC01_ILD	clic_maskX04	160
1131	CLIC01_ILD	BeamCal01	650

CLIC01_ILD
model includes subdetectors used for ILD models + some modifyed subdetectors.

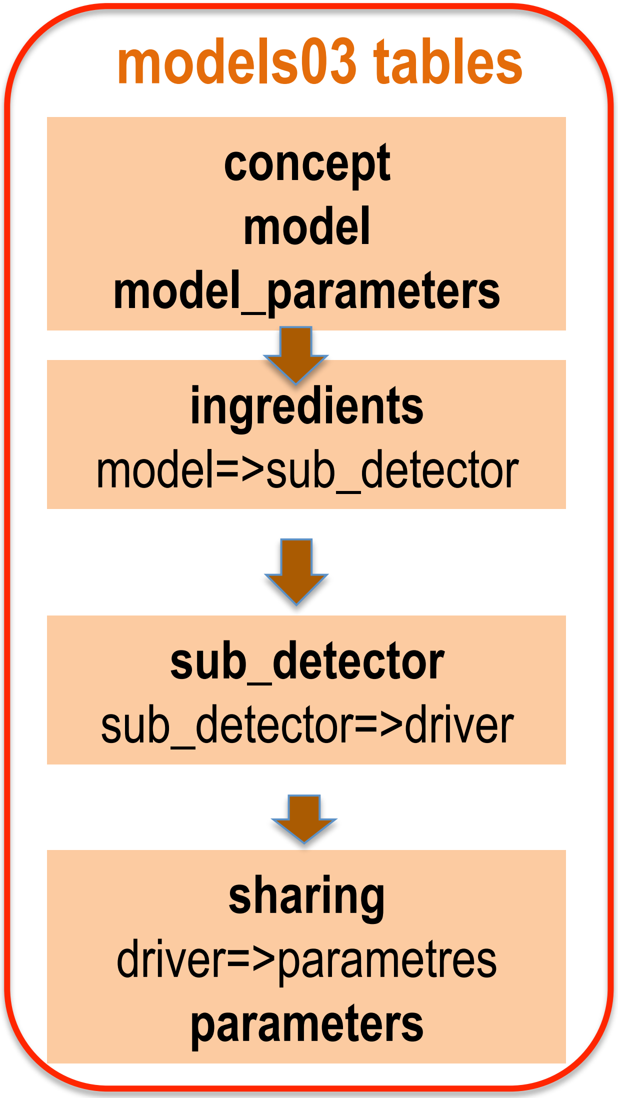
Create new subdetector

User case 1

- If modify the structure of existing subdetector => clone the related model, adapt the information for the modifyed driver: modify the driver name, change the parameters values, introduce new parameters...

User case 2 **Follow the schema** ⇒

- If completelly new subdetector (driver development from scratch), before creating the model think about the different parameters and the default values.



models03 tables

concept
model
model_parameters

ingredients
model=>sub_detector

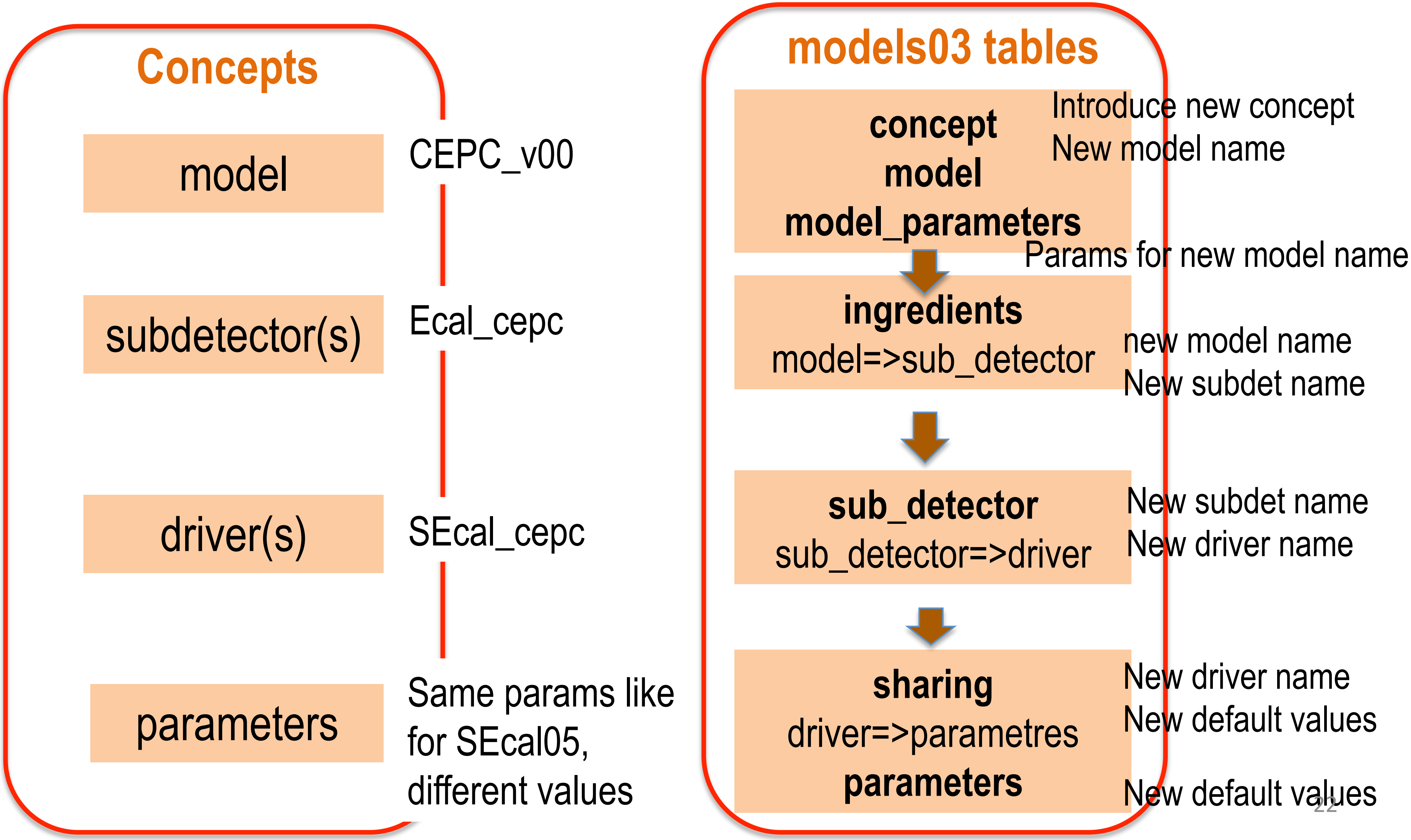
sub_detector
sub_detector=>driver

sharing
driver=>parametres
parameters

User case 1

Modify existing subdetector

new Ecal det in ILD like model



Concepts

model — CEPC_v00

subdetector(s) — Ecal_cepc

driver(s) — SEcal_cepc

parameters — Same params like for SEcal05, different values

models03 tables

concept **model** **model_parameters**

Introduce new concept
New model name

Params for new model name

ingredients
model=>sub_detector

new model name
New subdet name

sub_detector
sub_detector=>driver

New subdet name
New driver name

sharing
driver=>parametres
parameters

New driver name
New default values

New default values

User case 1

Table « model »

Table: model

```
+------------------+--------------------------+------+-----+----------+-------+
| Field            | Type                     | Null | Key | Default  | Extra |
+------------------+--------------------------+------+-----+----------+-------+
| name             | varchar(80)              | NO   | PRI |          |       |
| description      | varchar(255)             | NO   |     |          |       |
| detector_concept | varchar(100)             | NO   |     |          |       |
| model_status     | enum('unstable','frozen') | NO   |     | unstable |
```

Modify:
Name
Description
detector_concept
model_status

- Example: Existing information for **ILD_o2_v06 model**

INSERT INTO `model` VALUES
('**ILD_o2_v06**','ILD simulation reference Model using SD HCal','**ILD**','unstable’)

- Add new informations for new model

INSERT INTO `model` VALUES
('**CEPC_v00**',’CEPC simulation reference Model using adapted ecal detector',’**ILD**','unstable’)

keep ‘ILD’ or give a new name for for detector_concept

User case 1

Table « detector concept »

If give new name for detector_concept in the table « model » one should introduce a new concept in the table: **detector_concept** of models03 database.

```
| Field                  | Type         | Null | Key | Default | Extra |
------------------------------------------------------------------------
| name                   | varchar(100) | NO   | PRI |         |       |
| description            | varchar(100) | NO   |     |         |       |
| world_box_hx           | double       | NO   |     | 0       |       |
| world_box_hy           | double       | NO   |     | 0       |       |
| world_box_hz           | double       | NO   |     | 0       |       |
| tracker_region_rmax    | double       | NO   |     | 0       |       |
| tracker_region_zmax    | double       | NO   |     | 0       |       |
| calorimeter_region_rmax | double      | NO   |     | 0       |       |
| calorimeter_region_zmax | double      | NO   |     | 0       |
+------------------------+--------------+------+-----+---------+------
```

Modify:
Name
Description
…
Other fields if needed

CLIC
Detector concept: 'CILD'
Models: 'CILD_00', 'CILD_00fw', etc

Existing entry

```
INSERT INTO `detector_concept` VALUES
('ILD','The ILD detector concept',9000,9000,14000,1842,2500,3490,4044),
```

- Add new detector_concept name

```
INSERT INTO `detector_concept` VALUES
('CEPC','The ILDish CEPC detector concept',9000,9000,14000,1842,2500,3490,4044)
```

User case 1

Table model_parameters

Table: model_parameters

```
+----------------+---------------+-------+-------+----------+--------+
| Field          |     Type      | Null  |  Key | Default | Extra |
+-----------------+---------------+-------+-------+----------+-------+
| model          | varchar(80) | NO   |  PRI | 0        |        |
| parameter      | varchar(80) | NO   |  PRI | 0        |        |
| default_value | varchar(80) | NO   |        | 0        |        |
+--------------+-------------+------+-----+-------+---------+--------+
```

- Existing information for ILD_o2_v06 model

```
INSERT INTO `model_parameters` VALUES
('ILD_o2_v06','Coil_extra_size','1522'),
(`ILD_o2_v06','Coil_Yoke_radial_clearance','250'),
('ILD_o2_v06','Ecal_Barrel_halfZ','2350'),
('ILD_o2_v06','Ecal_endcap_extra_size','60.8’)…..
```

User case 1

Table model_parameters

Table: model_parameters

```
INSERT INTO `model_parameters` VALUES
('CEPC_v00','Coil_extra_size','1522'),
(`CEPC_v00','Coil_Yoke_radial_clearance','250'),
('CEPC_v00','Ecal_Barrel_halfZ','2350'),
('CEPC_v00','Ecal_endcap_extra_size','60.8'),
('CEPC_v00','Ecal_support_thickness','9.3'),
('CEPC_v00','Ecal_Tpc_gap','35’),
……………………………………
```

Modify:
Model
parameter
Default_value

User case 1

Table « ingredients »
What should be changed

CEPC_v00

Ecal_cepc

Table: ingredients

```
+------+------------+----------------------------+------------+
| id   | model      | sub_detector               | build_order |
+------+------------+----------------------------+------------+
| 1633 | ILD_o2_v06 | LHcal01                    |        120 |
| 1634 | ILD_o2_v06 | tpc10_01                   |        200 |
| 1635 | ILD_o2_v06 | ftd_simple_staggered_02    |        220 |
| 1636 | ILD_o2_v06 | SEcal05                    |         90 |
| 1637 | ILD_o2_v06 | SHcalRpc01                 |        110 |
| 1638 | ILD_o2_v06 | SCoil03                    |        400 |
...........................................................
```

mysql>select * from ingredients and order by id;

To see the last id

User case 1

How to do it

In dump_models03.sql we have

```
INSERT INTO `ingredients` VALUES
.....
(1633,'ILD_o2_v06','LHcal01',120),
(1634,'ILD_o2_v06','tpc10_01',200),
(1635,'ILD_o2_v06','ftd_simple_staggered_02',220),
(1636,'ILD_o2_v06','SEcal05',90),
(1637,'ILD_o2_v06','SHcalRpc01',110),
(1638,'ILD_o2_v06','SCoil03',400),
(1639,'ILD_o2_v06','yoke05',500),
(1640,'ILD_o2_v06','LumiCalV',100),
(1641,'ILD_o2_v06','tubeX06',150),
(1642,'ILD_o2_v06','sit_simple_planar_sensors_03',210),
(1643,'ILD_o2_v06','SField01',1000),
(1644,'ILD_o2_v06','vxd07',20),
(1645,'ILD_o2_v06','set_simple_planar_sensors_01',230),
(1646,'ILD_o2_v06','maskX03',160),
(1647,'ILD_o2_v06','BeamCal08',650),
(1648,'ILD_o2_v06','SServices_O2_v00',1200) .....;
```

Change id number

CEPC_v00

SEcal_cepc

Table: ingredients

```
+-----------------+------------+
| Field           | Type       |
+-----------------+------------+
| id              | bigint(4)  |
| model           | char(80)   |
| sub_detector    | char(80)   |
| build_order     | bigint(4)  |
+-----------------+------------+-
```

Modify:
Id number
model_name
sub_detector name

User case 1

Table « sub_detector »

Table: sub_detector

```
mysql> select * from sub_detector where name="SEcal05";
+-----+---------+------+---------+------------------------------------------------+-----------+
| id  | name    | db   | driver  | description                                    | subdriver |
+-----+---------+------+---------+------------------------------------------------+-----------+
| 368 | SEcal05 | VOID | SEcal05 | A scalable ILD Ecal mixing Si and/or scintillator |
+-----+---------+------+---------+------------------------------------------------+-----------+
```

```
mysql>INSERT INTO `sub_detector` VALUES
      (374,’Ecal_cepc',
          'VOID',
          'SEcal_cepc',
          'A scalable CEPC Ecal mixing Si and/or scintillator','')
```

User case 1

Table « sharing »

```
Table: sharing
mysql> select * from sharing where driver="SEcal05";
+---------+-----------------------------------+--------------------------+
| driver  | parameter                         | driver_default_value |
+---------+-----------------------------------+--------------------------+
| SEcal05 | Ecal_Alveolus_Air_Gap     | 0.5                      |
| SEcal05 | Ecal_fiber_thickness          | 0.15                    |
| SEcal05 | Ecal_Si_thickness               | 0.5                      |
…………………………………………………
+---------+-----------------------------------+-------------------+
```

Set new values

```
INSERT INTO `sharing` VALUES
('SEcal_cepc','Ecal_fiber_thickness ','0.15'),
 ('SEcal_cepc','Ecal_Si_thickness ','0.5'),
………..
```

User case 1

Table « parameters »

Table: parameters

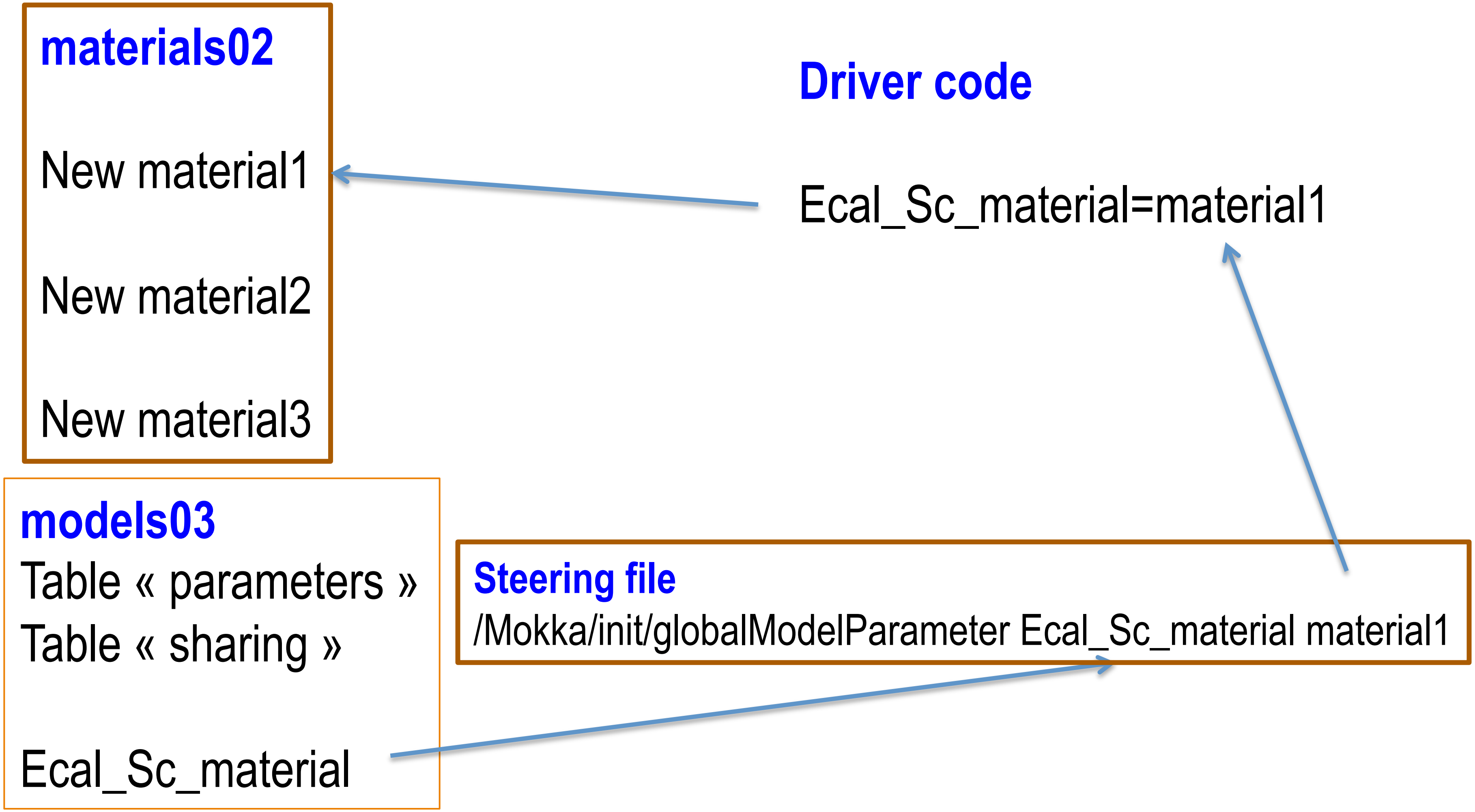
```
mysql> select * from parameters;
+------------------------------+------------------------------------+---------------------+
| name                         | description                        |   default_value     |
+------------------------------+------------------------------------+---------------------+
| Ecal_Alveolus_Air_Gap | Free space in alveolus             |          0.25       |
| Ecal_fiber_thickness         | Wall fiber thickness for the Ecal structure |0.2 |
| Ecal_Si_thickness            | Sensitive Si layer thickness |          0.5       |
.........................................................................................
+------------------------------+------------------------------------+---------------------+
```

Insert if only new parameters. Add them also into sharing table

Introduce new material into « materials02 » database

Add new scintillator materials

⇒ Should also add new parameters allowing us to choose the scintillator material in the steering file



materials02

New material1

New material2

New material3

Driver code

Ecal_Sc_material=material1

models03

Table « parameters »

Table « sharing »

Ecal_Sc_material

Steering file

/Mokka/init/globalModelParameter Ecal_Sc_material material1

Add new scintillator materials

0) Add the new material into your local database « materials02 » giving its name, nistName, density etc.

```
INSERT INTO `materials` VALUES
          (`name`, `nistName`, `density`, `temperature`, `pressure`, `state`)
```

state = enum('','undefined','solid','liquid','gas')

If there is no nistName add the material also into the table « components »

```
INSERT INTO `components` VALUES
                              (`material`, `component`, `nAtoms`, `fraction`)
```

Examples:

In table “materials”

```
          ('polystyrene','G4_POLYSTYRENE',NULL,NULL,NULL,NULL)
          ('nylon', '', 1.14, 0, 0, 'solid’),
```

In table « components »

```
          ('nylon','C',12,0),('nylon','H',22,0),('nylon','N',2,0),('nylon','O',2,0)
```

Add new scintillator materials

1) Introduce parameter « **Ecal_Sc_material** » in your local database models03 into the tables « parameters » and « sharing ».
This parameter will allow to change scintillator material in the steer file.

Table parameters

Default value

```
INSERT INTO `parameters` VALUES
('Ecal_Sc_material',’ Material for scintillator strips of Ecal',’ polystyrene')
```

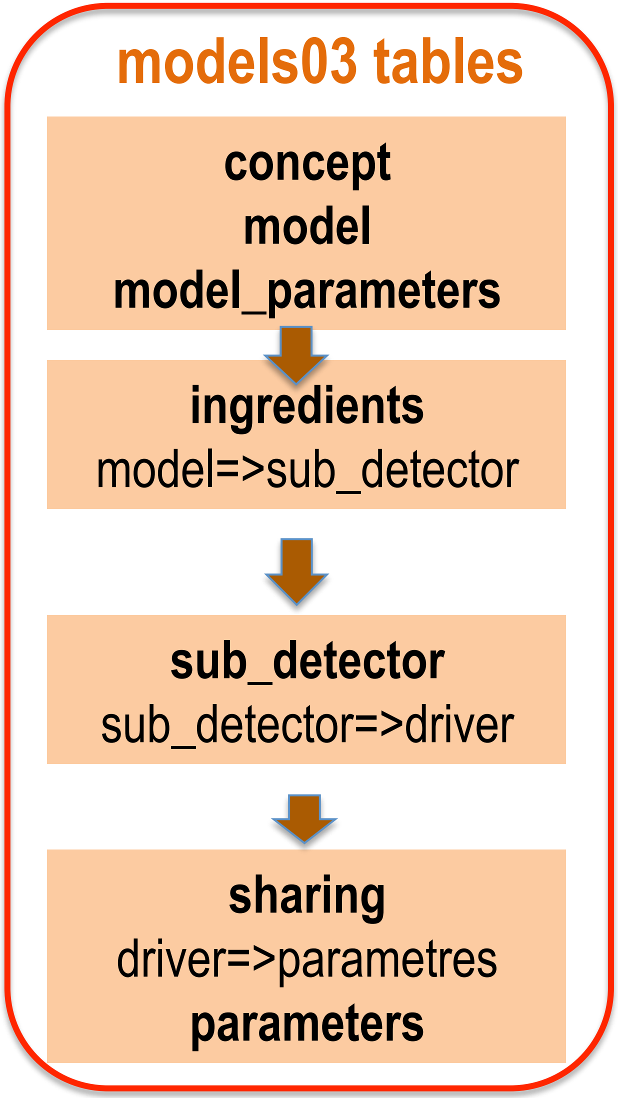
Table sharing

```
INSERT INTO `sharing` VALUES (’driver_name','Ecal_Sc_material',
NULL)
```

Conclusion

Different cases:

- New Subdet, but no params in the db
- Same subdet, only new params
- etc



models03 tables

concept
model
model_parameters

ingredients
model=>sub_detector

sub_detector
sub_detector=>driver

sharing
driver=>parametres
parameters

Materials in
materials02 database

cnrs
advancing the frontiers

l'X
ÉCOLE
POLYTECHNIQUE
UNIVERSITÉ PARIS-SACLAY

MOKKA

東京大学
THE UNIVERSITY OF TOKYO

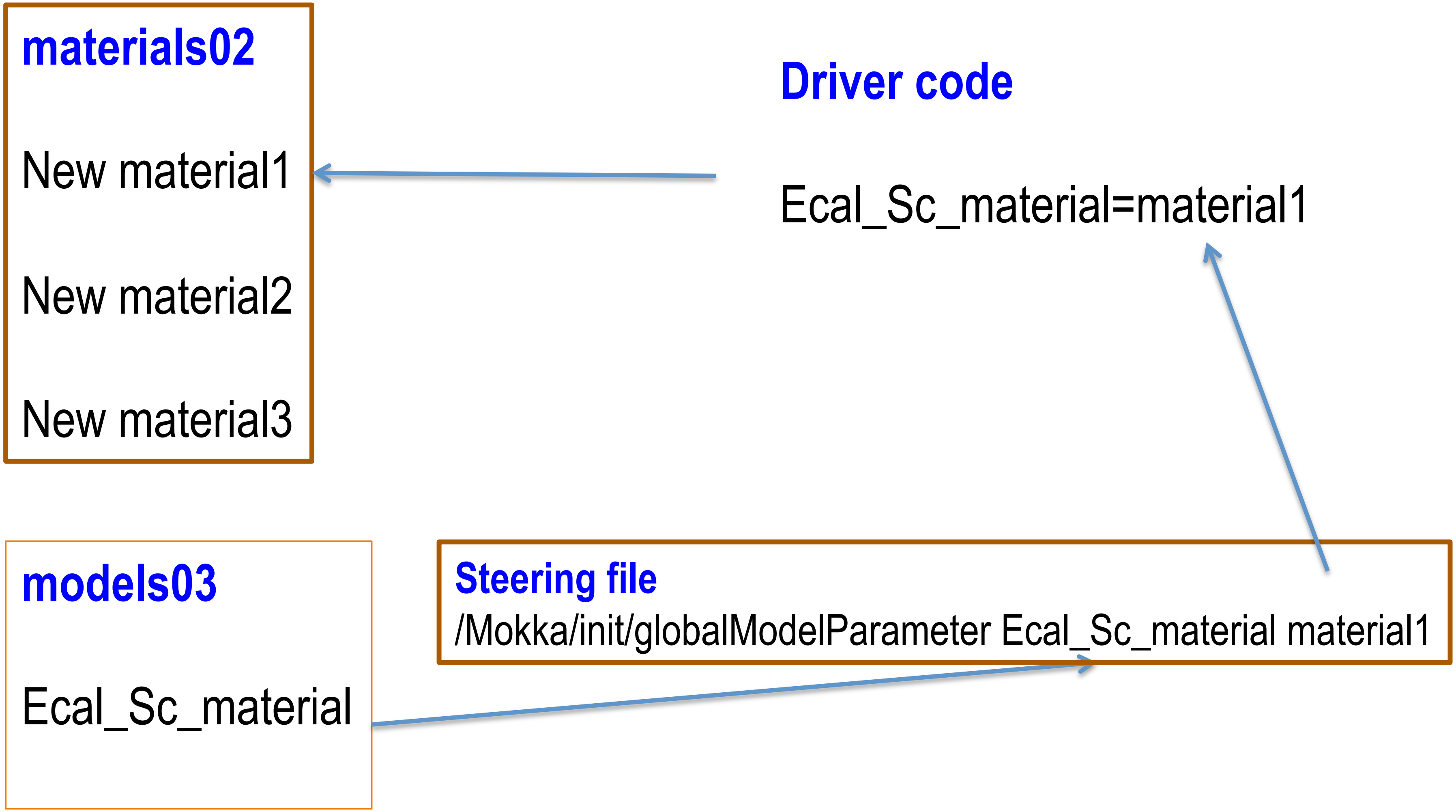
DESY

UNIVERSITY OF
CAMBRIDGE

Exercices

Add new scintillator materials

⇒ Should also add new parameters allowing us to choose the scintillator material in the steering file



materials02

New material1

New material2

New material3

Driver code

Ecal_Sc_material=material1

models03

Ecal_Sc_material

Steering file

```
/Mokka/init/globalModelParameter Ecal_Sc_material material1
```

Add new scintillator materials

0) Add the new material into your local database « materials02 » giving its name, nistName, density etc.

```
INSERT INTO `materials` VALUES
        (`name`, `nistName`, `density`, `temperature`, `pressure`, `state`)
```

state = enum('','undefined','solid','liquid','gas')

If there is no nistName add the material also into the table « components »

```
INSERT INTO `components` VALUES
                        (`material`, `component`, `nAtoms`, `fraction`)
```

Examples:

In table “materials”

```
        ('polystyrene','G4_POLYSTYRENE',NULL,NULL,NULL,NULL)
        ('nylon', '', 1.14, 0, 0, 'solid’),
```

In table « components »

```
        ('nylon','C',12,0),('nylon','H',22,0),('nylon','N',2,0),('nylon','O',2,0)
```

Add new scintillator materials

3) Introduce parameter « Ecal_Sc_material » in the driver code
We assume your driver has the same class structure like the SEcal04/05 driver

```
G4bool SEcal06::Setup(const CGAGeometryEnvironment &theGeometryEnvironment) {

Ecal_Sc_material = theGeometryEnvironment.GetParameterAsString("Ecal_Sc_material");
if(Ecal_Sc_material == "polystyrene") {
        ScStripMaterial = CGAGeometryManager::GetMaterial("polystyrene");
} else
{  if(Ecal_Sc_material == "new_material") {
        ScStripMaterial = CGAGeometryManager::GetMaterial("new_material_v1");
 } else {
        Control::Abort("SEcal06: invalid Sc material name.",
        MOKKA_ERROR_BAD_GLOBAL_PARAMETERS); } }
}
............}
```

Param in the steer file

Param in the db

Backup slides

Detector concept

Detector_concept="LDC", model="LDC01"

```
mysql> select * from ingredients where model="LDC01";
+-----+-------+--------------+-------------+
| id  | model | sub_detector | build_order |
+-----+-------+--------------+-------------+
| 361 | LDC01 | SEcal01      |         200 |
| 362 | LDC01 | SHcal01      |         300 |
| 363 | LDC01 | SCoil01      |         400 |
| 364 | LDC01 | SYoke01      |         500 |
| 365 | LDC01 | STpc01       |         100 |
| 366 | LDC01 | mask04       |          60 |
| 367 | LDC01 | ftd01        |          40 |
| 368 | LDC01 | tube01       |           0 |
| 369 | LDC01 | sit00        |          30 |
| 370 | LDC01 | LumiCalS     |          50 |
| 371 | LDC01 | vxd00        |          20 |
| 374 | LDC01 | SField01     |        1000 |
+-----+-------+--------------+-------------+
```

Detector_concept="LDC Extended", model="LDC01_05Sc"

```
mysql> select * from ingredients where model="LDC01_05Sc";
+-----+------------+--------------+-------------+
| id  | model      | sub_detector | build_order |
+-----+------------+--------------+-------------+
| 708 | LDC01_05Sc | vxd01        |          20 |
| 739 | LDC01_05Sc | maskX01      |         120 |
| 710 | LDC01_05Sc | tpc08        |         200 |
| 711 | LDC01_05Sc | sit01        |          30 |
| 713 | LDC01_05Sc | SEcal02      |          90 |
| 714 | LDC01_05Sc | SHcal03      |         300 |
| 729 | LDC01_05Sc | SCoil01      |         400 |
| 730 | LDC01_05Sc | yoke03       |         500 |
| 741 | LDC01_05Sc | SLcal01      |         600 |
| 738 | LDC01_05Sc | tubeX01      |         100 |
| 736 | LDC01_05Sc | SFtd02       |          40 |
| 740 | LDC01_05Sc | SField01     |        1000 |
| 742 | LDC01_05Sc | etd00        |         250 |
+-----+------------+--------------+-------------+
```

Hierarchy of subdetector parameters initialization

The order which Mokka initialize a key parameter before launching the a super driver construction is the following:

1) default values found in the parameters table;

2) the value found in the model_parameters table, if a model-parameter association is found in this table;

3) the value found in the setup_parameters table, if a setup-parameter association is found in this table;

4) the value set by a /Mokka/init/globalModelParameter command if the parameter name matches.

5) the value set by a previous super driver construction, if both super drivers share the parameter and if the previous super driver changed the parameter value.

Initialization of parameters from the db

Parameters and the default values are given in four tables:

- parameters	default_value	4
- sharing	driver_default_value	3
- model_parameters	default_value	2
- setup_parameters	value	1

Example: parameters for SEcal05 subdetector from model ILD_o2_v06

Parameter Ecal_fiber_thickness (existing only for ecal)

Table	sharing	0.15
	parameters	0.2

Final value when constructing subdet SEcal05 => **0.15**

Parameter Ecal_Tpc_gap (used for all subdetectors)

Table	model_parameters	35
	sharing	NULL
	parameters	20.0

Final value when constructing SEcal05 subdet => **35**

Default values in parameters and sharing

- If starting new detector concept, new model, etc for a given parameter set the same values in the table « parameters » and in the table « sharing » or « parameters » and « model_parameters ».

- Later when the code will evoluate and when creating a new driver, if it is needed change the value in « sharing » table for this parameter but keep always the previous value in « parameters » table because all the drivers need these values.

Frist steps

- Connect to the db

```
 mysql -h pollin1.in2p3.fr -uconsult –p
```

All users can connect with the user name « consult ». This allows to read all databases informations.

```
mysql -h llrmokka.in2p3.fr -u consult -pconsult -e 'show databases;' > outdb
```

- See all databases names

```
mysql> show databases;
```

- See databases containing models

```
mysql> use models03;
mysql> show tables;
+--------------------+
| Tables_in_models03 |
+--------------------+
| detector_concept   |
| ingredients        |
| model              |
| model_parameters   |
| parameters         |
| scripts            |
| setup              |
| setup_parameters   |
| sharing            |
| sub_detector       |
| tmp_databases      |
+--------------------+
```

Modesl03 database presentation

- Explore particular table in the db **models03**

It's an user responsibility to compose coherent models avoiding sub detector overlaps.

```
mysql> describe model;
+-----------------+-------------------------+------+-----+---------+-------+
| Field           | Type                    | Null | Key | Default | Extra |
+-----------------+-------------------------+------+-----+---------+-------+
| name            | varchar(80)             | NO   | PRI |         |       |
| description     | varchar(255)            | NO   |     |         |       |
| detector_concept | varchar(100)           | NO   |     |         |       |
| model_status    | enum('unstable','frozen') | NO   |     | unstable |       |
+-----------------+-------------------------+------+-----+---------+-------+

mysql> select * from model;
mysql> select * from model where name="ILD_o2_v06";
+------------+------------------------------------------+-----------------+-----------------------------------------+
| name       | description                                               | detector_concept | model_status |
+------------+------------------------------------------+-----------------+-----------------------------------------+
| ILD_o2_v06 | ILD simulation reference Model using SD HCal |          ILD          | unstable    |
+------------+------------------------------------------+-----------------+-----------------------------------------+
```

mysql> select * from detector_concept where name=«ILD»;

```
+------+-------------------------+--------------+--------------+--------------| name | description            | world_box_hx | world_box_hy |
world_box_hz | tracker_region_rmax | tracker_region_zmax | calorimeter_region_rmax | calorimeter_region_zmax |
+------+-------------------------+--------------+--------------+--------------
| ILD  | The ILD detector concept |        9000 |        9000 |       14000 |            1842 |            2500 |                 3490 |
4044 |
+------+-------------------------+--------------+--------------+--------------
```

Wich subdetectors are included in the model

mysql> describe ingredients;

```
+--------------+-----------+------+-----+---------+----------------+
| Field        | Type      | Null | Key | Default | Extra          |
+--------------+-----------+------+-----+---------+----------------+
| id           | bigint(4) | NO   | PRI | NULL    | auto_increment |
| model        | char(80)  | NO   |     |         |                |
| sub_detector | char(80)  | NO   |     |         |                |
| build_order  | bigint(4) | NO   |     | 0       |                |
+--------------+-----------+------+-----+---------+----------------+
mysql> select * from ingredients where model="ILD_o2_v06";
+------+------------+------------------------------+-------------+
| id   | model      | sub_detector                 | build_order |
+------+------------+------------------------------+-------------+
| 1633 | ILD_o2_v06 | LHcal01                      |         120 |
| 1634 | ILD_o2_v06 | tpc10_01                     |         200 |
| 1635 | ILD_o2_v06 | ftd_simple_staggered_02      |         220 |
| 1636 | ILD_o2_v06 | SEcal05                      |          90 |
| 1637 | ILD_o2_v06 | SHcalRpc01                   |         110 |
| 1638 | ILD_o2_v06 | SCoil03                      |         400 |
| 1639 | ILD_o2_v06 | yoke05                       |         500 |
| 1640 | ILD_o2_v06 | LumiCalV                     |         100 |
| 1641 | ILD_o2_v06 | tubeX06                      |         150 |
| 1642 | ILD_o2_v06 | sit_simple_planar_sensors_03 |         210 |
| 1643 | ILD_o2_v06 | SField01                     |        1000 |
| 1644 | ILD_o2_v06 | vxd07                        |          20 |
| 1645 | ILD_o2_v06 | set_simple_planar_sensors_01 |         230 |
| 1646 | ILD_o2_v06 | maskX03                      |         160 |
| 1647 | ILD_o2_v06 | BeamCal08                    |         650 |
| 1648 | ILD_o2_v06 | SServices_O2_v00             |        1200 |
+------+------------+------------------------------+-------------+
```

vxd07	SEcal05	LumiCalV	SHcalRpc01	LHcal01	tubeX06	maskX03	tpc10_01	sit_simple_planar_sensors_03	ftd_simple_staggered_02	set_simple_planar_sensors_01	SCoil03	yoke05	BeamCal08	SField01	SServices_O2_v00
20	90	100	110	120	150	160	200	210	220	230	400	500	650	1000	1200

Describe the sub-detector

```
mysql> describe sub_detector;
+-------------+--------------+------+-----+---------+----------------+
| Field       | Type         | Null | Key | Default | Extra          |
+-------------+--------------+------+-----+---------+----------------+
| id          | int(4)       | NO   | PRI | NULL    | auto_increment |
| name        | varchar(80)  | NO   |     |         |                |
| db          | varchar(80)  | NO   |     |         |                |
| driver      | varchar(20)  | NO   |     |         |                |
| description | varchar(255) | NO   |     |         |                |
| subdriver   | varchar(100) | NO   |     |         |                |
+-------------+--------------+------+-----+---------+----------------+

mysql> select name from sub_detector;
```

Table sub_detector

```
mysql> select * from sub_detector where name="vxd07";
+-----+---------+---------+----------+----------------+----------+
| id  | name  | db      | driver    | description   | subdriver |
+-----+----------+---------+----------+-----------------+----------+
| 346 | vxd07 | vxd07 | SVxd04 | vxd dl update | vxd04     |
+-------+---------+---------+----------+----------------+----------+
```

Database: vxd07

Driver: SVxd04

Subdriver: vxd04

```
+--------------------+
| Tables_in_models03 |
+--------------------+
| detector_concept   |
| ingredients        |
| model              |
| model_parameters   |
| parameters         |
| scripts     (no more used) ????    check   |
| setup              |
| setup_parameters   |
| sharing            |
| sub_detector       |
| tmp_databases      |
+--------------------+
```

We can get a first approch to the models03 database philosophy with these 4 tables.

```
mysql> describe model_parameters;
+---------------+-------------+------+-----+---------+-------+
| Field         | Type        | Null | Key | Default | Extra |
+---------------+-------------+------+-----+---------+-------+
| model         | varchar(80) | NO   | PRI | 0       |       |
| parameter     | varchar(80) | NO   | PRI | 0       |       |
| default_value | varchar(80) | NO   |     | 0       |       |
+---------------+-------------+------+-----+---------+-------+
```

- 3 rows in set (0.00 sec)

```
mysql> select * from model_parameters where model="ILD_o2_v03";
+------------+----------------------------------+---------------+
| model      | parameter                        | default_value |
+------------+----------------------------------+---------------+
| ILD_O2_v03 | Coil_extra_size                  | 1522          |
| ILD_O2_v03 | Coil_Yoke_radial_clearance       | 250           |
| ILD_O2_v03 | Ecal_Barrel_halfZ                | 2350          |
| ILD_O2_v03 | Ecal_endcap_extra_size           | 60.8          |
| ILD_O2_v03 | Ecal_support_thickness           | 9.3           |
| ILD_O2_v03 | Ecal_Tpc_gap                     | 35            |
| ILD_O2_v03 | Field_nominal_value              | 3.5           |
| ILD_O2_v03 | Hcal_back_plate_thickness        | 15            |
| ILD_O2_v03 | Hcal_Coil_additional_gap         | 29.5          |
| ILD_O2_v03 | Hcal_Ecal_gap                    | 30            |
| ILD_O2_v03 | Hcal_endcap_center_box_size      | 700.0         |
| ILD_O2_v03 | Hcal_endcap_ecal_gap             | 15            |
| ILD_O2_v03 | Hcal_endcap_sensitive_center_box | 0.0           |
| ILD_O2_v03 | Hcal_endcap_zmin                 | 2670.7        |
| ILD_O2_v03 | Hcal_nlayers                     | 48            |
| ILD_O2_v03 | Hcal_sensitive_model             | RPC2          |
| ILD_O2_v03 | ILC_Main_Crossing_Angle          | 14            |
| ILD_O2_v03 | Lcal_inner_radius                | 80.0          |
| ILD_O2_v03 | Lcal_outer_radius                | 195.2         |
| ILD_O2_v03 | Lcal_z_begin                     | 2505.0        |
| ILD_O2_v03 | Lcal_z_thickness                 | 135.6         |
| ILD_O2_v03 | TPC_inner_radius                 | 329           |
| ILD_O2_v03 | TPC_outer_radius                 | 1808          |
| ILD_O2_v03 | TUBE_crossing_angle              | 14            |
| ILD_O2_v03 | TUBE_opening_angle               | 0.07876       |
| ILD_O2_v03 | VXD_active_silicon_thickness     | 0.05          |
| ILD_O2_v03 | VXD_inner_radius                 | 16            |
| ILD_O2_v03 | VXD_length_r1                    | 62.5          |
| ILD_O2_v03 | VXD_radius_r1                    | 16            |
| ILD_O2_v03 | VXD_radius_r3                    | 37            |
| ILD_O2_v03 | VXD_radius_r5                    | 58            |
| ILD_O2_v03 | VXD_side_band_electronics_width  | 0.5           |
| ILD_O2_v03 | VXD_support_ladder_02            | "graphite"    |
| ILD_O2_v03 | VXD_support_ladder_thickness     | 0.134         |
| ILD_O2_v03 | Yoke_endcap_inner_radius         | 300           |
| ILD_O2_v03 | Yoke_thickness                   | 2550          |
+------------+----------------------------------+---------------+
```

These are general parameters for the model.

```
mysql> describe parameters;
+---------------+--------------+------+-----+---------+-------+
| Field         | Type         | Null | Key | Default | Extra |
+---------------+--------------+------+-----+---------+-------+
| name          | varchar(100) | NO   | PRI |         |       |
| description   | varchar(200) | NO   |     |         |       |
| default_value | varchar(100) | NO   |     |         |       |
+---------------+--------------+------+-----+---------+-------+
3 rows in set (0.00 sec)

mysql> select * from parameters where name="Lcal_z_begin";
+--------------+----------------+---------------+
| name         | description    | default_value |
+--------------+----------------+---------------+
| Lcal_z_begin | LumiCal z begin | 3050          |
+--------------+----------------+---------------+
```

Sharing parameters

```
mysql> describe sharing;
+----------------------+--------------+------+-----+---------+-------+
| Field                | Type         | Null | Key | Default | Extra |
+----------------------+--------------+------+-----+---------+-------+
| driver               | varchar(100) | NO   | PRI |         |       |
| parameter            | varchar(100) | NO   | PRI |         |       |
| driver_default_value | varchar(100) | YES  |     | NULL    |       |
+----------------------+--------------+------+-----+---------+-------+
mysql> select * from sharing where driver="SVxd04";
+--------+----------------------------------------+----------------------+
| driver | parameter                              | driver_default_value |
+--------+----------------------------------------+----------------------+
| SVxd04 | VXD_width_r1                           | NULL                 |
| SVxd04 | VXD_width_r3                           | NULL                 |
| SVxd04 | VXD_width_r5                           | NULL                 |
| SVxd04 | VXD_length_r1                          | NULL                 |
| SVxd04 | VXD_length_r3                          | NULL                 |
| SVxd04 | VXD_length_r5                          | NULL                 |
| SVxd04 | VXD_inner_radius                       | NULL                 |
| SVxd04 | VXD_radius_r3                          | NULL                 |
| SVxd04 | VXD_radius_r5                          | NULL                 |
| SVxd04 | VXD_side_band_electronics_thickness    | NULL                 |
| SVxd04 | VXD_side_band_electronics_width        | NULL                 |
| SVxd04 | VXD_side_band_electronics_option       | NULL                 |
| SVxd04 | VXD_end_ladd_electronics_option        | NULL                 |
| SVxd04 | VXD_end_ladd_electronics_half_length   | NULL                 |
| SVxd04 | VXD_end_ladd_electronics_thickness     | NULL                 |
| SVxd04 | VXD_radius_r1                          | NULL                 |
| SVxd04 | VXD_foam_spacer_thickness              | NULL                 |
| SVxd04 | VXD_flex_cable_thickness               | NULL                 |
| SVxd04 | VXD_metal_traces_thickness             | NULL                 |
| SVxd04 | VXD_foam_spacer_material               | NULL                 |
| SVxd04 | VXD_active_silicon_thickness           | NULL                 |
| SVxd04 | VXD_cryostat_option                    | NULL                 |
| SVxd04 | VXD_layer_gap                          | NULL                 |
| SVxd04 | VXD_active_side_band_electronics_option | NULL                 |
+--------+----------------------------------------+----------------------+
```

Setup parameters

```
mysql> describe setup_parameters;
+-----------+--------------+------+-----+---------+-------+
| Field     | Type         | Null | Key | Default | Extra |
+-----------+--------------+------+-----+---------+-------+
| setup     | varchar(100) | NO   | PRI |         |       |
| parameter | varchar(100) | NO   | PRI |         |       |
| value     | varchar(100) | NO   |     |         |       |
+-----------+--------------+------+-----+---------+-------+
mysql> select * from  setup_parameters;
+-------+---------------------+--------+
| setup | parameter           | value  |
+-------+---------------------+--------+
| TB30  | configuration_angle | 30.0   |
| TB10  | configuration_angle | 10.0   |
| TB00  | configuration_angle | 0.0    |
| TB40  | configuration_angle | 40.0   |
| TB20  | configuration_angle | 20.0   |
| TB45  | configuration_angle | 45.0   |
| TB00  | shift_module1       | 0.0    |
| TB00  | shift_module3       | 0.0    |
| TB10  | shift_module1       | -9.7   |
| TB10  | shift_module3       | 12.15  |
| TB20  | shift_module1       | -19.95 |
| TB20  | shift_module3       | 25.05  |
| TB30  | shift_module1       | -31.65 |
| TB30  | shift_module3       | 39.7   |
| TB40  | shift_module1       | -46.0  |
| TB40  | shift_module3       | 57.75  |
| TB45  | shift_module1       | -54.8  |
| TB45  | shift_module3       | 68.8   |
| TB00  | dist_hcal_tcmt      | 333    |
| TB10  | dist_hcal_tcmt      | 125    |
| TB20  | dist_hcal_tcmt      | 125    |
| TB30  | dist_hcal_tcmt      | 125    |
| TB40  | dist_hcal_tcmt      | 125    |
| TB45  | dist_hcal_tcmt      | 125    |
+-------+---------------------+--------+
mysql> select * from  setup;
+------+--------------------------------------------+
| name | description                                |
+------+--------------------------------------------+
| TB30 | Calice Test Beam with setup angle of 30 degrees |
| TB00 | Calice Test Beam with setup angle of 0 degrees  |
| TB10 | Calice Test Beam with setup angle of 10 degrees |
| TB20 | Calice Test Beam with setup angle of 20 degrees |
| TB40 | Calice Test Beam with setup angle of 40 degrees |
| TB45 | Calice Test Beam with setup angle of 45 degrees |
+------+--------------------------------------------+
mysql> describe tmp_databases;
+------------+------------------+------+-----+---------+-------+
| Field      | Type             | Null | Key | Default | Extra |
+------------+------------------+------+-----+---------+-------+
| name       | varchar(200)     | NO   | PRI |         |       |
| connection | int(11)          | NO   |     | 0       |       |
| time_stamp | int(10) unsigned | NO   |     | 0       |       |
+------------+------------------+------+-----+---------+-------+
3 rows in set (0.00 sec)

mysql> select name from tmp_databases;
+----------+
| name     |
+----------+
| TMP_DB00 |
| TMP_DB01 |
……….
```

These databases could be seen after connecting to pollin1 server.

```
mysql> select * from tmp_databases where name="TMP_DB30";
+----------+------------+------------+
| name     | connection | time_stamp |
+----------+------------+------------+
| TMP_DB30 |    2388363 | 1400431665 |
+----------+------------+------------+
```

??????? connection

Tables

```
| Tables_in_models03 |
+--------------------------+
| detector_concept     |
| ingredients              |
| model                    |
| model_parameters     |
| parameters               |
| scripts                  |
| setup                    |
| setup_parameters     |
| sharing                  |
| sub_detector            |
| tmp_databases          |
+--------------------------+
```

Ingredients

```
+-----------------+-------------+
| Field             | Type        |
+-----------------+-------------+
| id                  | bigint(4) |
| model            | char(80)  |
| sub_detector | char(80)  |
| build_order    | bigint(4) |
+-----------------+-------------+-
```

model

```
+---------------------+-----------------------------+
| Field                   | Type                             |
+---------------------+-----------------------------+
| name                   | varchar(80)                   |
| description          | varchar(255)                  |
| detector_concept | varchar(100)                  |
| model_status       | enum('unstable','frozen') |
+---------------------+-----------------------------+
```

model_parameters

```
+------------------+----------------+
| Field            | Type           |
+------------------+----------------+
| model            | varchar(80) |
| parameter      | varchar(80) |
| default_value | varchar(80) |
+-------------------+---------------+
```

parameters

```
+-----------------+------------------+
| Field             | Type              |
+-----------------+------------------+
| name             | varchar(100) |
| description     | varchar(200) |
| default_value | varchar(100) |
+-------------------+----------------+
```

setup_parameters

```
+--------------+-----------------+
| Field         | Type              |
+--------------+-----------------+
| setup         | varchar(100) |
| parameter | varchar(100) |
| value         | varchar(100) |
+---------------+-----------------+
```

sharing

```
+-------------------------+-----------------+
| Field                        | Type            |
+--------------------------+-----------------+
| driver                       | varchar(100) |
| parameter                 | varchar(100) |
| driver_default_value | varchar(100) |
+---------------------------+-----------------+
```

Sub_detector

```
+---------------+----------------+
| Field          | Type             |
+---------------+----------------+
| id               | int(4)           |
| name          | varchar(80)   |
| db              | varchar(80)   |
| driver         | varchar(20)   |
| description | varchar(255) |
| subdriver     | varchar(100) |
+----------------+-----------------+
```

Useful mysql commands

- Connect to the db

```
mysql –h pollin1.in2p3.fr -uconsult –p
```

All users can connect with the user name « consult ». This allows to read all databases informations.

- See all databases names

```
mysql> show databases;
```

- See databases containing models

```
mysql> use models03;
mysql> show tables;
```

Useful mysql commands

- Explore particular table in the db **models03**

```
mysql> describe model;

mysql> select * from model;
mysql> select * from model where name="ILD_o2_v06";
```

- Print in a log file the result of request

Useful if the user does not have rights to connect to the server where is installed the db:

```
mysql -h llrmokka -uconsult -p -e' show databases; use models03; select * from model where name="ILD_o2_v06";' > outdb
```

Particular db tpc10_01 for tpc10 subdet from ILD_o2_v06 model

```
 mysql -uconsult -pconsult -e'use tpc10_01; show tables'
+--------------------+
| Tables_in_tpc10_01 |
+--------------------+
| cathode            |
| endplate_mixture   |
| global             |
| innerWall          |
| outerWall          |
| readout            |
+--------------------+
 mysql -uconsult -pconsult -e'use tpc10_01; select * from global;'
+--------------+--------------------+--------------------+-------------+-----------+-----------+------------+------------+---------
| dr_InnerWall | dr_InnerServiceArea | dr_OuterServiceArea | dr_OuterWall | dz_Cathode | dz_Readout |
dz_Endplate | chamber_Gas | sensitive_threshold_eV |
+--------------+--------------------+--------------------+-------------+-----------+-----------+------------+------------+--------
|           25 |                 30 |                 30 |          60 |      0.06 |        25 |        100 | TDR_gas    |                 32
```

Particular db tpc10_01 for tpc10 subdet from ILD_o2_v06 model

From models03

```
G4bool TPC10::ContextualConstruct(const CGAGeometryEnvironment &env, G4LogicalVolume *worldLog){
….
const G4double dzTotal          = 2.0 * env.GetParameterAsDouble("TPC_Ecal_Hcal_barrel_halfZ");
const G4double rInner           = env.GetParameterAsDouble("TPC_inner_radius") * mm;
const G4double rOuter           = env.GetParameterAsDouble("TPC_outer_radius") * mm;
const G4double padHeight        = env.GetParameterAsDouble("TPC_pad_height") * mm;
const G4double padWidth         = env.GetParameterAsDouble("TPC_pad_width") * mm;
const G4double TPCMaxStepLength = env.GetParameterAsDouble("TPC_max_step_length") * mm;
G4double tracking_tpc_ecal_gap = env.GetParameterAsDouble("Ecal_Tpc_gap") * mm;;

  // Geometry parameters from the geometry environment and from the database
Database *db = new Database(env.GetDBName());
db->exec("SELECT * FROM `global`;");
db->getTuple();
const G4double dr_InnerWall       = db->fetchDouble("dr_InnerWall") * mm;
const G4double dr_InnerServiceArea = db->fetchDouble("dr_InnerServiceArea") * mm; const G4double
dr_OuterServiceArea = db->fetchDouble("dr_OuterServiceArea") * mm;  const G4double dr_OuterWall       =
db->fetchDouble("dr_OuterWall") * mm;
const G4double dz_Readout        = db->fetchDouble("dz_Readout") * mm;
        }
```

Particular db tpc10_01 for tpc10 subdet from ILD_o2_v06 model

Useful mysql commands mysqldump

```
Usage: mysqldump [OPTIONS] database [tables]
OR     mysqldump [OPTIONS] --databases [OPTIONS] DB1 [DB2 DB3...]
OR     mysqldump [OPTIONS] --all-databases [OPTIONS]
For more options, use mysqldump --help
```

- Dump all databases

```
mysqldump -h hostserver -uconsult -p --all-databases > dumpLocalDB
```

Options –all-databases and –A dump all tables in all databases.

- Dump particular database

```
mysqldump –h hostserver -uconsult -p models03 > localDB
```

- Dump to xml file

```
mysqldump models03 --xml -h hostserver –u consult -p > models03.xml
```

- mysqldump: Got error: 1044: Access denied for user 'consult'@'%' to database 'CCoil01' when using LOCK TABLES

```
-bash-3.2$ mysqldump –A --skip-lock-tables –h hostserver -u consult -p >
polllin1-12-11-2012.sql
```