Bookkeeping Database

Luca Tomassetti [University of Ferrara & INFN]

Oct. 7, 2009 – X SuperB General Meeting, SLAC

Summary

- Database Schema
- Implementation & Queries
- (public) test & (near) future developments
- Towards a Distributed Production Software

Database Schema Validation

Database Schema

- Sep 28th: SBK Meeting
  Validation of the proposed schema

- Main features:
  - Production
  - Full and Fast jobs
  - Merging
  - Software releases

- Open Questions:
  - Generators's Parameters
  - Machine / Generator / Input Files (FullSim)
  - Uniqueness of values

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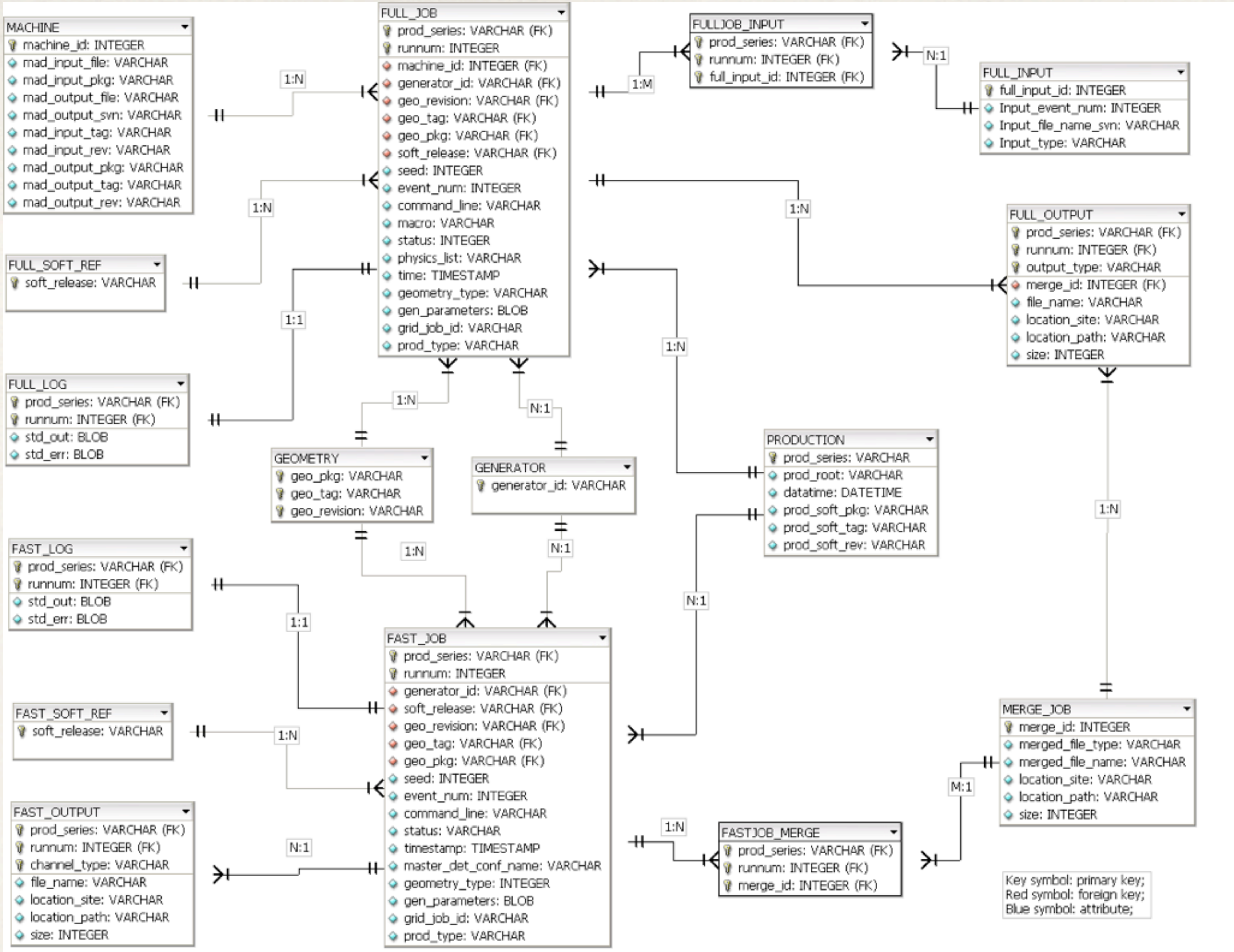
- Open Questions:
  - NSI Generators's Parameters
  - NSI Machine / Generator / Input Files (FullSim)
  - VI Uniqueness of values

NSI: Not So Important!
VI: Very Important!

Features



MACHINE
machine_id: INTEGER
mad_input_file: VARCHAR
mad_input_pkg: VARCHAR
mad_output_file: VARCHAR
mad_output_svn: VARCHAR
mad_input_tag: VARCHAR
mad_input_rev: VARCHAR
mad_output_pkg: VARCHAR
mad_output_tag: VARCHAR
mad_output_rev: VARCHAR

FULL_SOFT_REF
soft_release: VARCHAR

FULL_LOG
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
std_out: BLOB
std_err: BLOB

FULL_JOB
prod_series: VARCHAR (FK)
runnum: INTEGER
machine_id: INTEGER (FK)
generator_id: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
soft_release: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
macro: VARCHAR
status: INTEGER
physics_list: VARCHAR
time: TIMESTAMP
geometry_type: VARCHAR
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

FULLJOB_INPUT
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
full_input_id: INTEGER (FK)

FULL_INPUT
full_input_id: INTEGER
Input_event_num: INTEGER
Input_file_name_svn: VARCHAR
Input_type: VARCHAR

FULL_OUTPUT
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
output_type: VARCHAR
merge_id: INTEGER (FK)
file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

GEOMETRY
geo_pkg: VARCHAR
geo_tag: VARCHAR
geo_revision: VARCHAR

GENERATOR
generator_id: VARCHAR

PRODUCTION
prod_series: VARCHAR
prod_root: VARCHAR
datatime: DATETIME
prod_soft_pkg: VARCHAR
prod_soft_tag: VARCHAR
prod_soft_rev: VARCHAR

FAST_LOG
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
std_out: BLOB
std_err: BLOB

FAST_SOFT_REF
soft_release: VARCHAR

FAST_OUTPUT
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
channel_type: VARCHAR
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generator_id: VARCHAR (FK)
soft_release: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
status: VARCHAR
timestamp: TIMESTAMP
master_det_conf_name: VARCHAR
geometry_type: INTEGER
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

MERGE_JOB
merge_id: INTEGER
merged_file_type: VARCHAR
merged_file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

FASTJOB_MERGE
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
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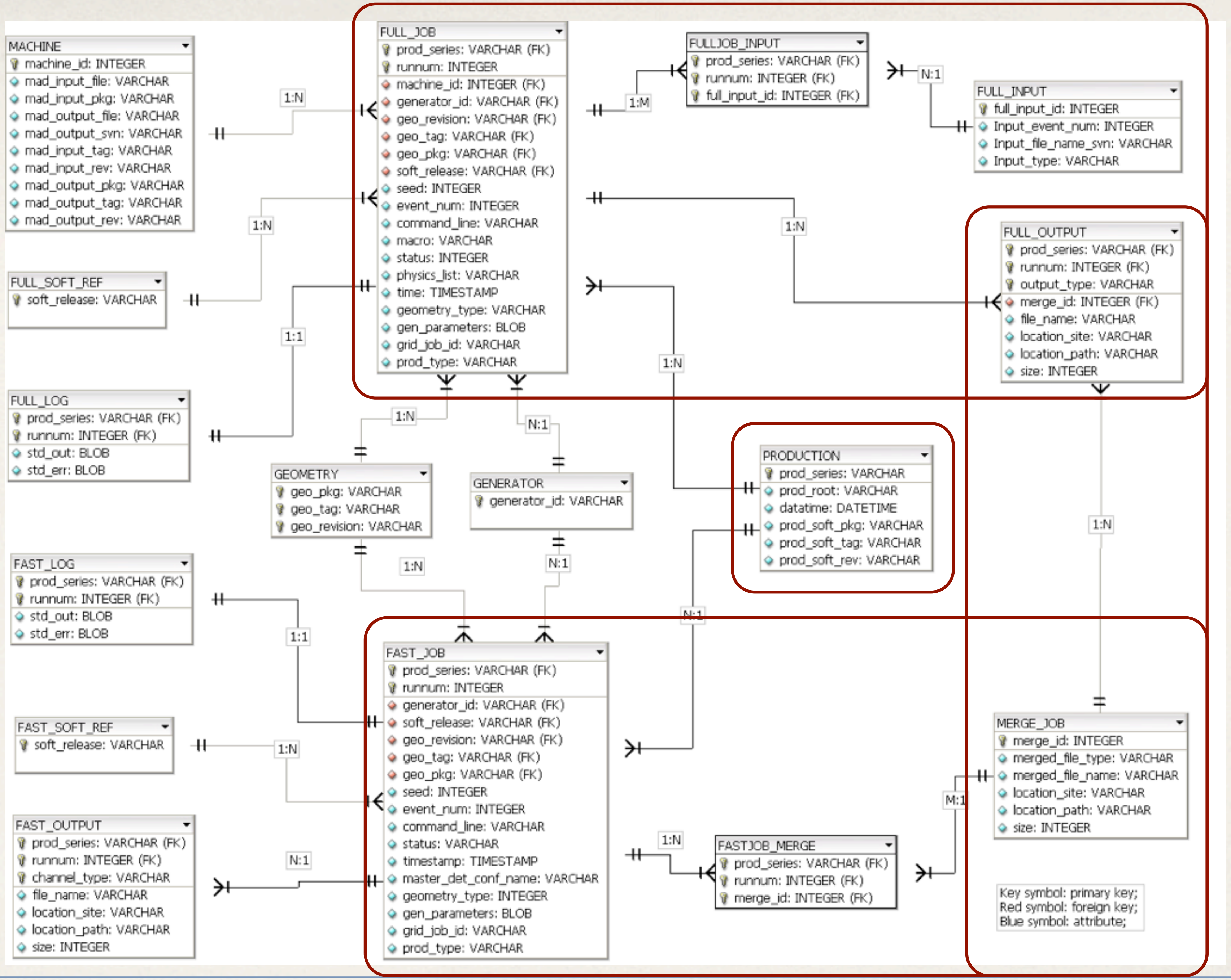
Key symbol: primary key;
Red symbol: foreign key;
Blue symbol: attribute;

Database Schema



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- channel_type: VARCHAR
- file_name: VARCHAR
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- location_path: VARCHAR
- size: INTEGER

FULL_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- machine_id: INTEGER (FK)
- generator_id: VARCHAR (FK)
- geo_revision: VARCHAR (FK)
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- Input_event_num: INTEGER
- Input_file_name_svn: VARCHAR
- Input_type: VARCHAR

FULL_OUTPUT
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- output_type: VARCHAR
- merge_id: INTEGER (FK)
- file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

PRODUCTION
- prod_series: VARCHAR
- prod_root: VARCHAR
- datatime: DATETIME
- prod_soft_pkg: VARCHAR
- prod_soft_tag: VARCHAR
- prod_soft_rev: VARCHAR

MERGE_JOB
- merge_id: INTEGER
- merged_file_type: VARCHAR
- merged_file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

FASTJOB_MERGE
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- merge_id: INTEGER (FK)

Key symbol: primary key;
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Blue symbol: attribute;

Database Schema

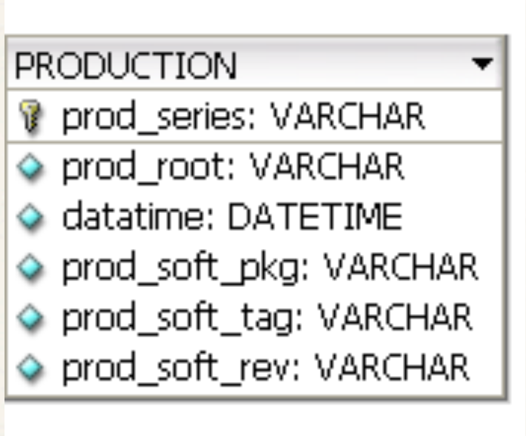
Production

- Each production is a row identified by the prod_series

- All stuff related to a production refers (from other tables) to the corresponding row by means of prod_series value

- prod_root:
  common to Full and Fast jobs

- datatime:
  launch of the production



PRODUCTION

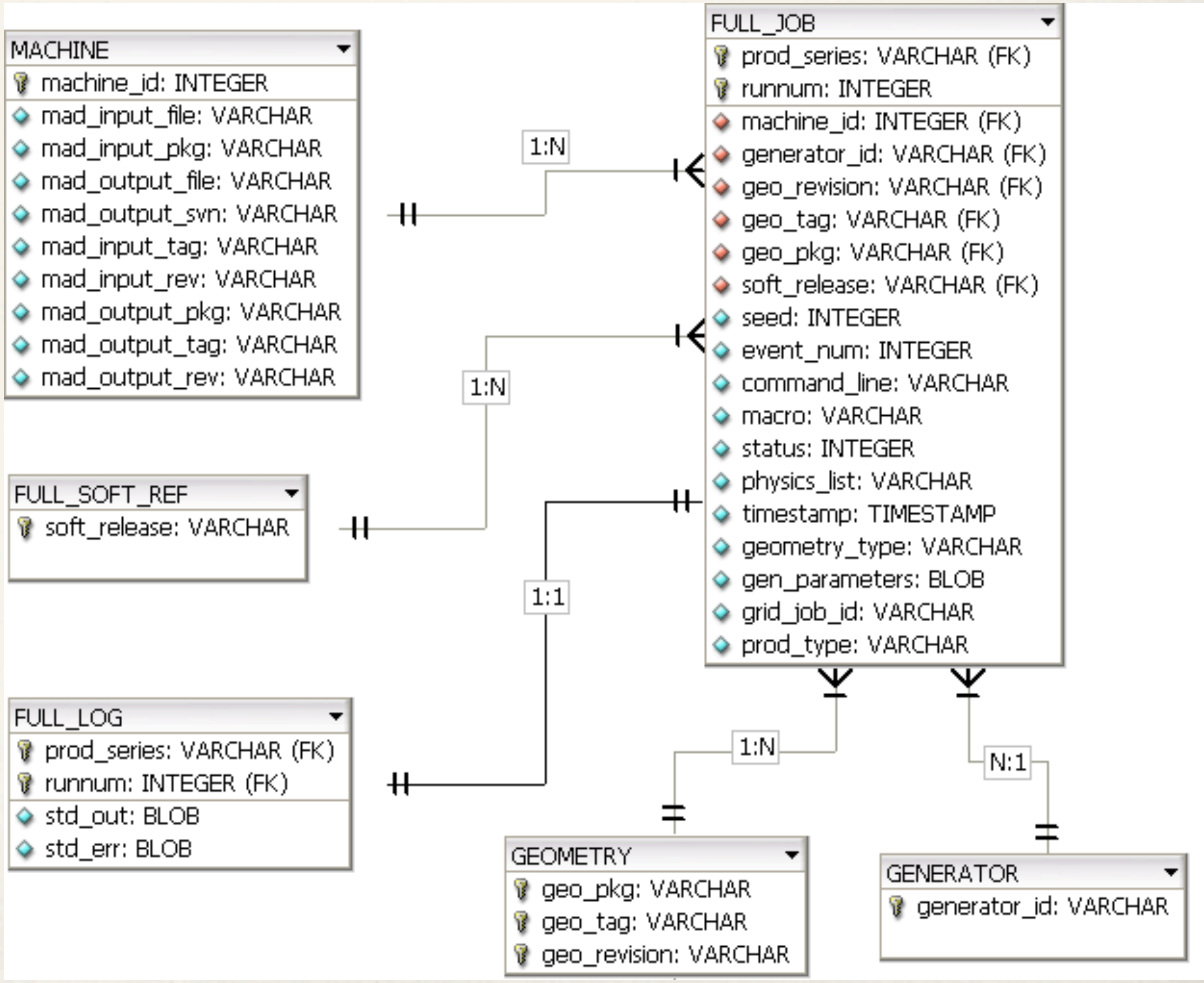
- prod_series: VARCHAR
- prod_root: VARCHAR
- datatime: DATETIME
- prod_soft_pkg: VARCHAR
- prod_soft_tag: VARCHAR
- prod_soft_rev: VARCHAR

Full Job

- prod_series AND runnum identify a job
  - Many job in a production
  - The same runnum in different productions

- machine_id
- generator_id
- geo_...
- soft_release

FK



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- geo_tag: VARCHAR (FK)
- geo_pkg: VARCHAR (FK)
- soft_release: VARCHAR (FK)
- seed: INTEGER
- event_num: INTEGER
- command_line: VARCHAR
- macro: VARCHAR
- status: INTEGER
- physics_list: VARCHAR
- timestamp: TIMESTAMP
- geometry_type: VARCHAR
- gen_parameters: BLOB
- grid_job_id: VARCHAR
- prod_type: VARCHAR

GEOMETRY
- geo_pkg: VARCHAR
- geo_tag: VARCHAR
- geo_revision: VARCHAR

GENERATOR
- generator_id: VARCHAR

Full Job

geometry_type: DG0, DG1, ... (as defined by the DGWG)

The "real" geometry is defined in the Geometry package

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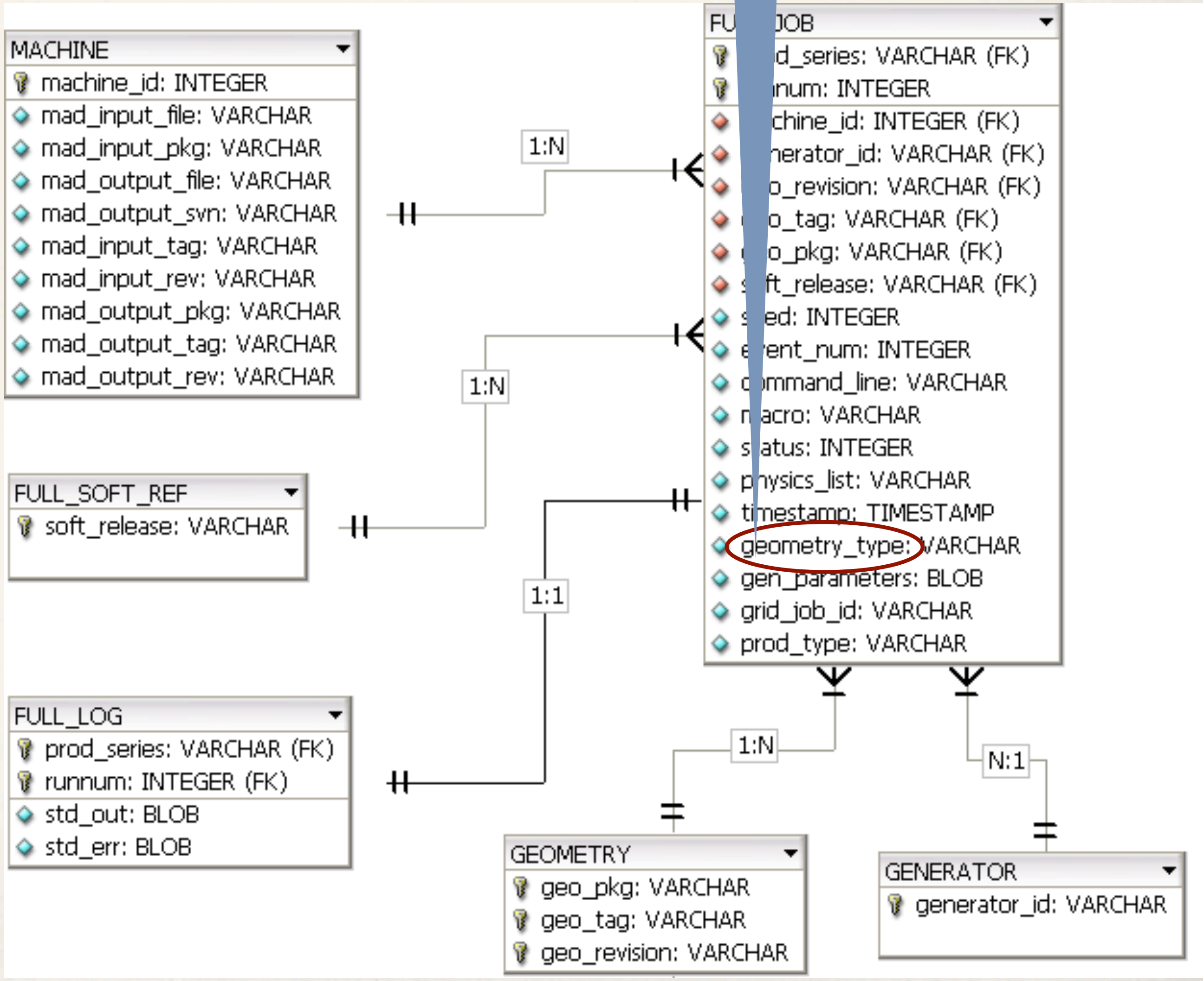
} FK



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- ed: INTEGER
- ent_num: INTEGER
- ommand_line: VARCHAR
- acro: VARCHAR
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- physics_list: VARCHAR
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- grid_job_id: VARCHAR
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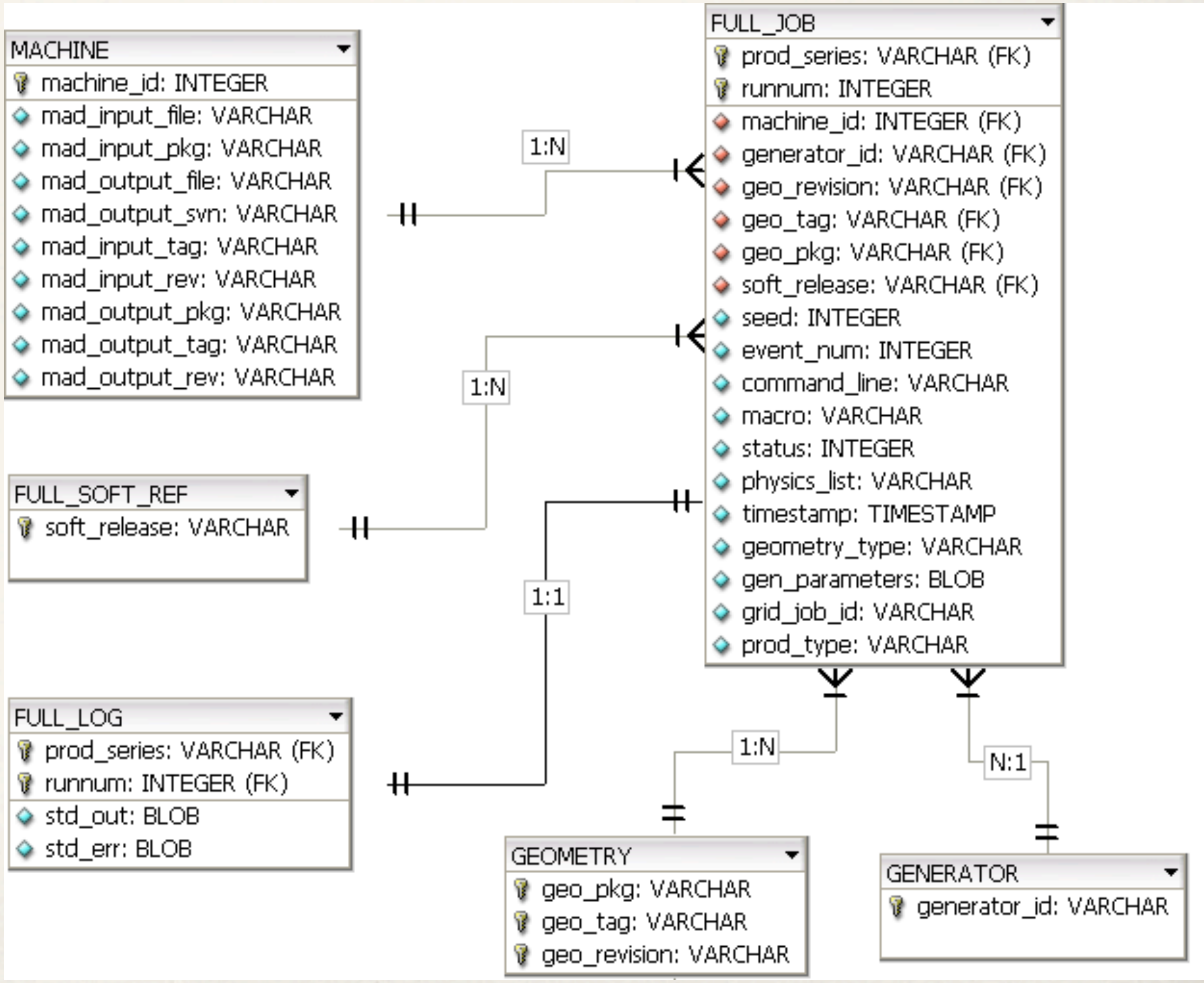

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Full Job

prod_type: A (Machine BG), B (Physics BG), C (BG Physics), D (Physics)

Sub-classification? e.g. A1: Touschek, A2: Beam, A3: Track... B1: Bha-bha to neutrons,...

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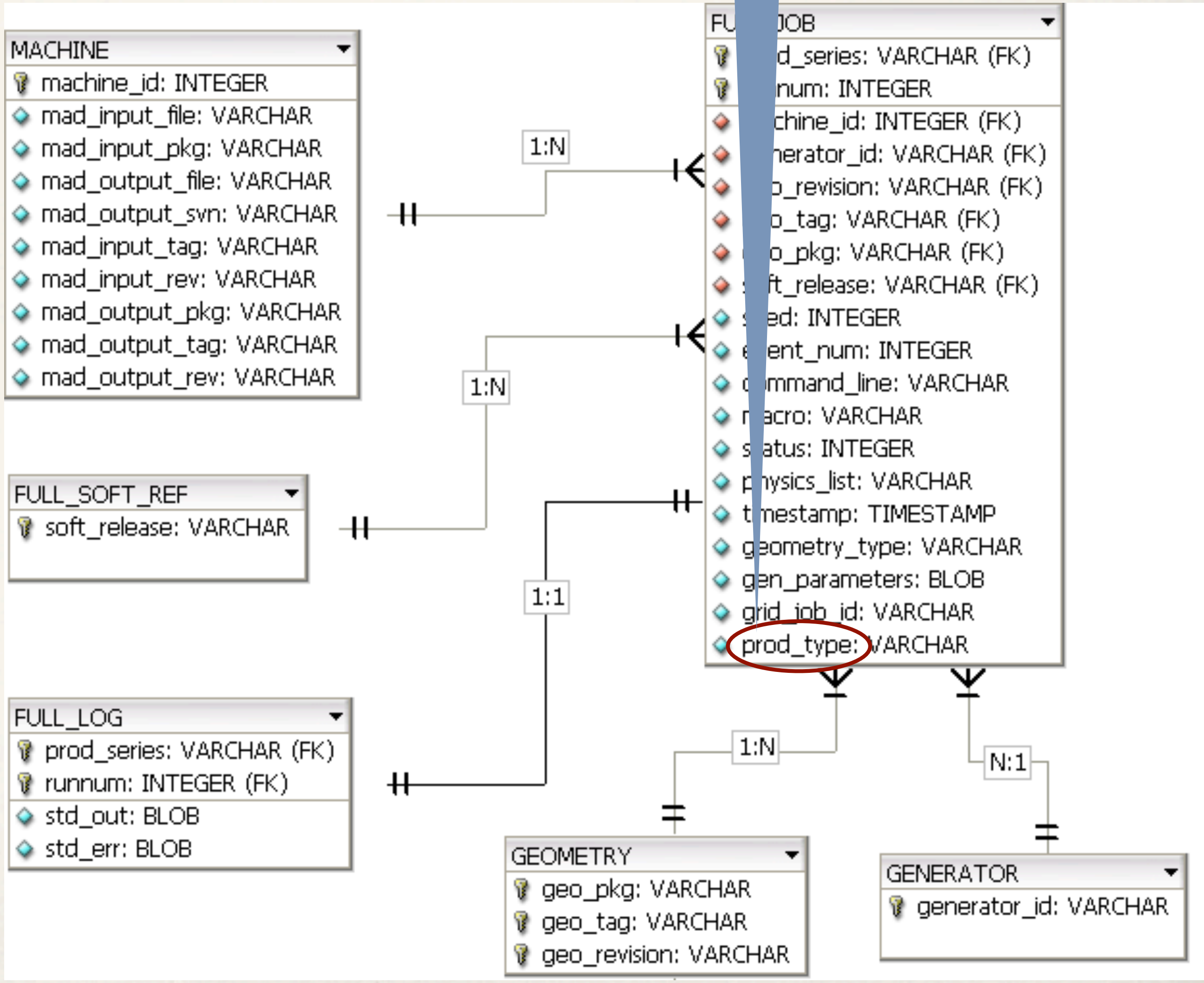

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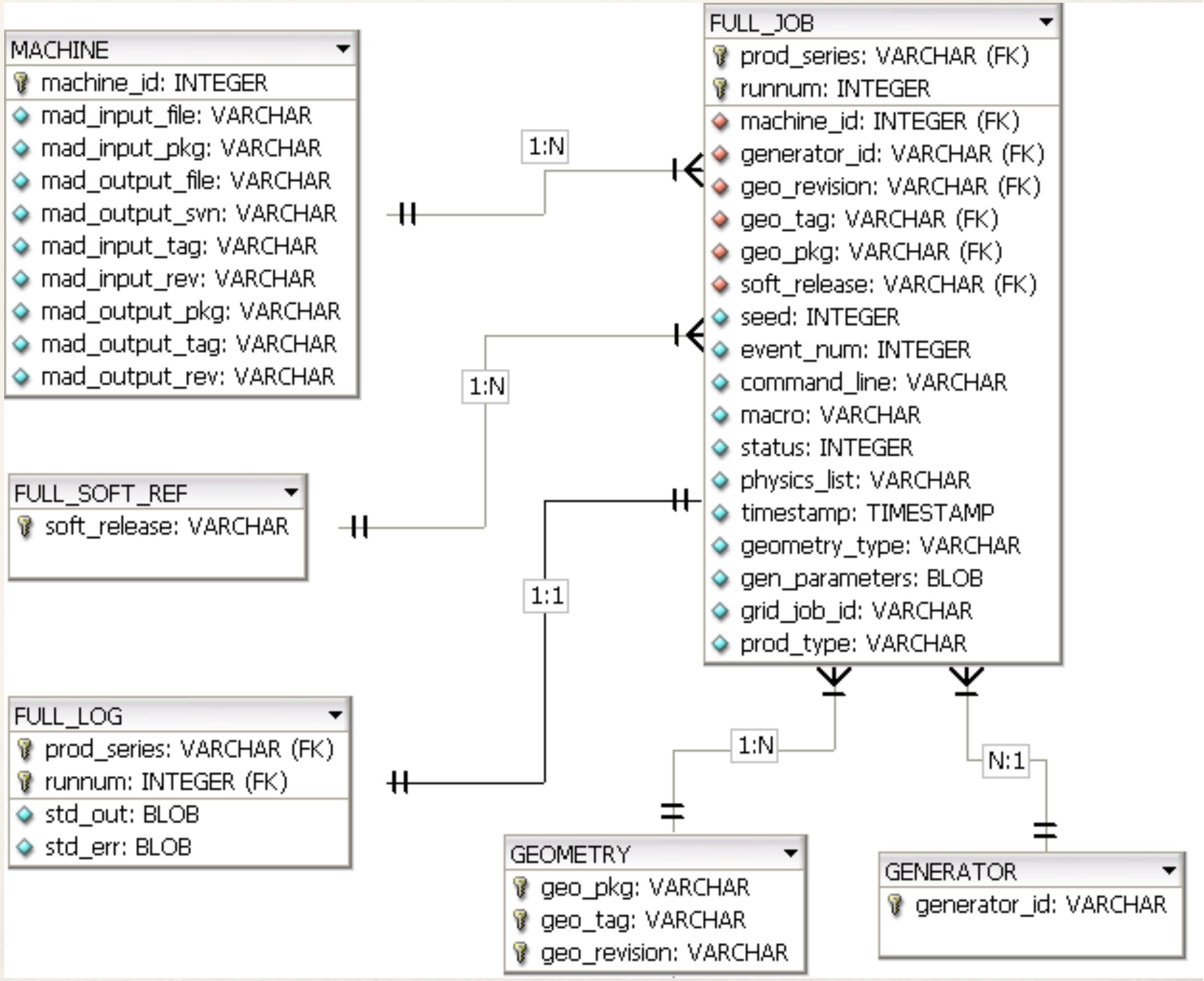

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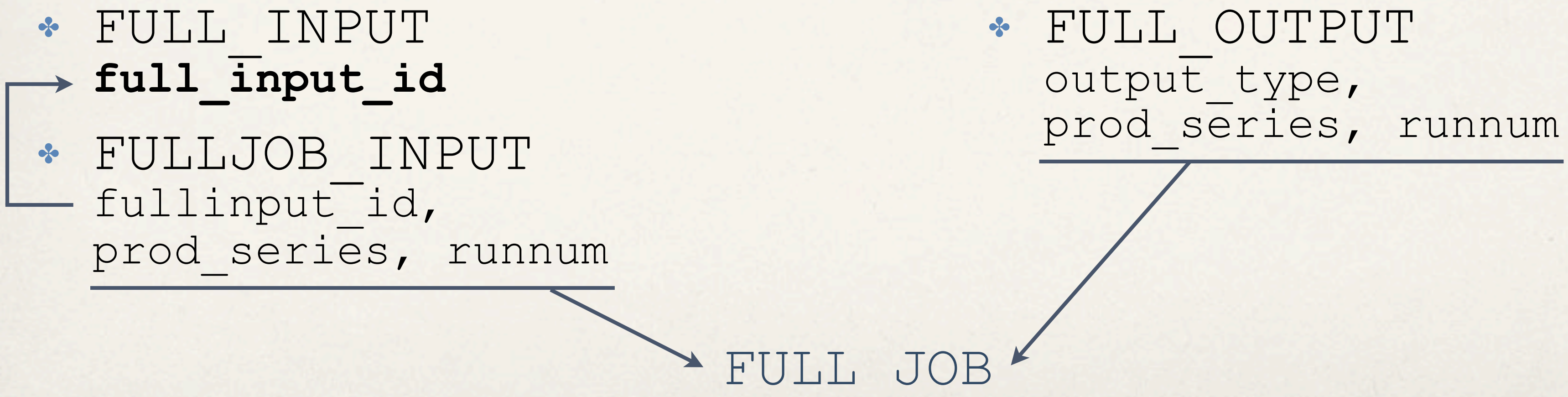
GENERATOR
- generator_id: VARCHAR

Full Job I/O

- Input files:
  - Many per job
    (0,N)
  - The same input file for many jobs
    (1, M)

- Output files:
  - Many per job
    (1,N), typically 2
  - A given output file is produced by one and only one job



- Two tables:
  - FULL_INPUT
    full_input_id
  - FULLJOB_INPUT
    fullinput_id,
    prod_series, runnum

- One table:
  - FULL_OUTPUT
    output_type,
    prod_series, runnum

FULL_JOB

Full Job I/O

NOW: “input for fast”, “hits”
exaustive list?

- Input files:
  - Many per job (0,N)
  - The same input file for many jobs (1, M)

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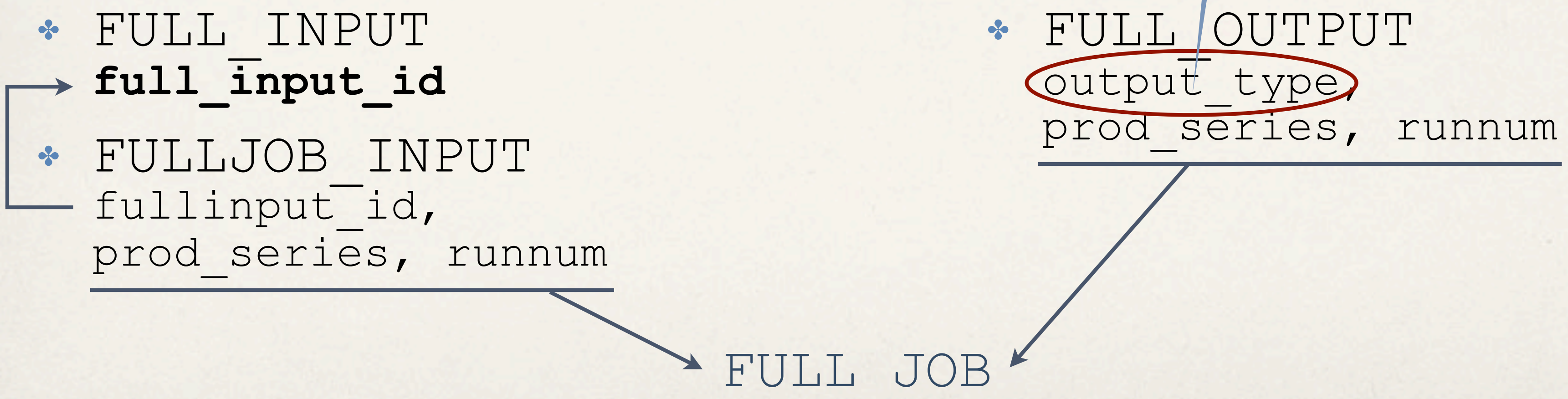

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FULL_JOB

Full Job I/O

- Input files:
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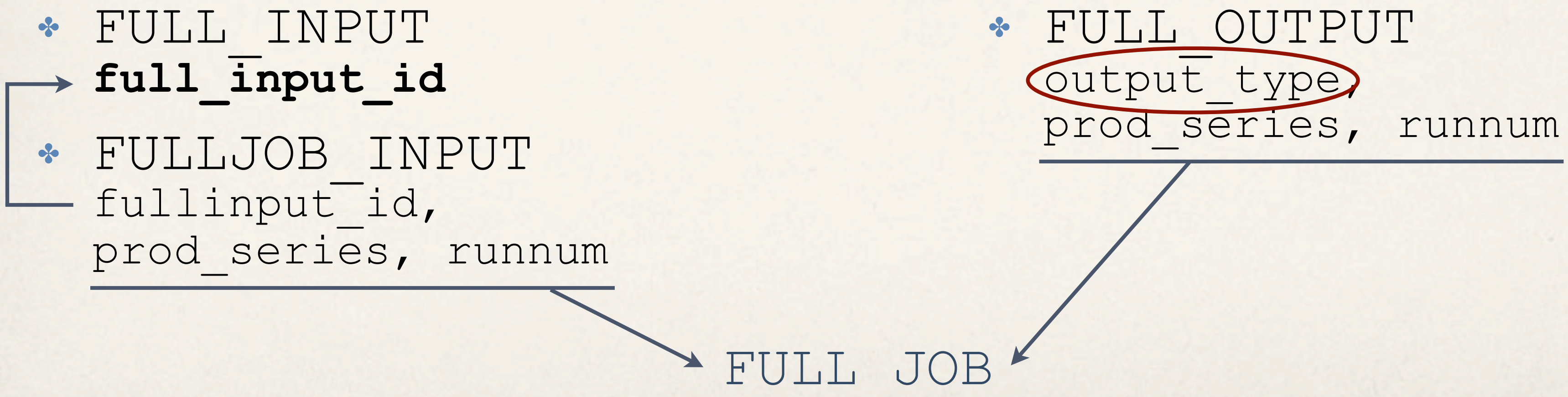


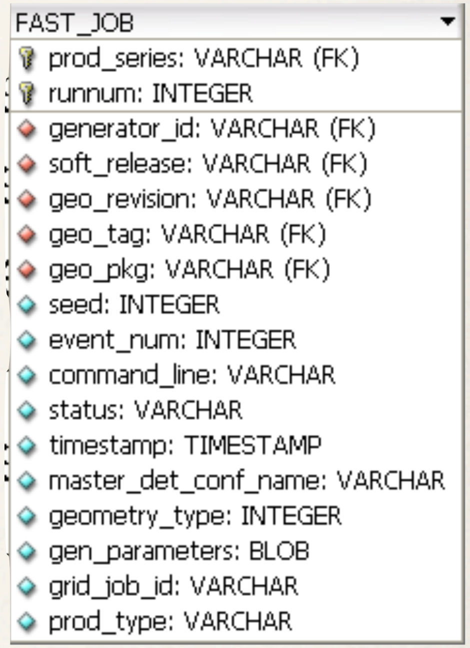
- `FULL_INPUT`
  `full_input_id`
- `FULLJOB_INPUT`
  `fullinput_id,`
  `prod_series, runnum`

- `FULL_OUTPUT`
  `output_type,`
  `prod_series, runnum`

`FULL_JOB`

Fast Job

- The same philosophy as Full Job
- Differences in input/output files
- Explicit reference to the master detector configuration file
  (which is anyway in the Geometry package)
- `prod_type`: FastSim; do we need deeper classification ?

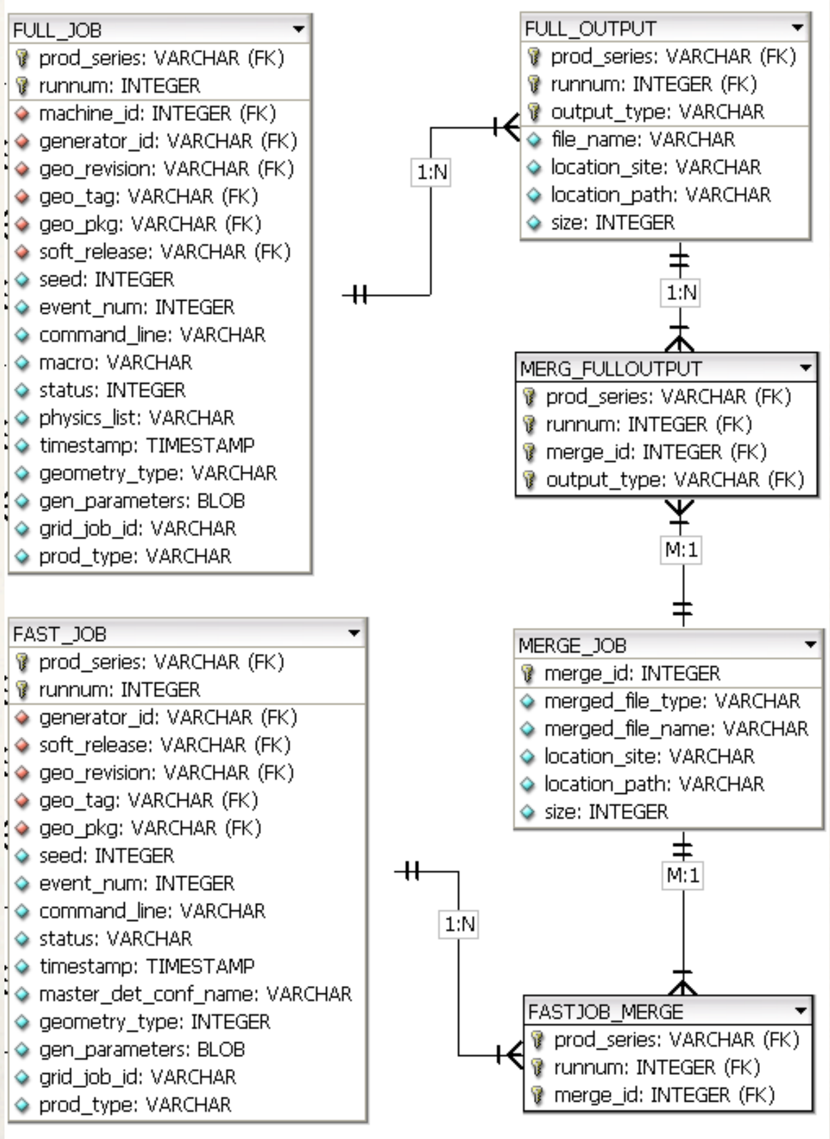


FAST_JOB

prod_series: VARCHAR (FK)
runnum: INTEGER
generator_id: VARCHAR (FK)
soft_release: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
status: VARCHAR
timestamp: TIMESTAMP
master_det_conf_name: VARCHAR
geometry_type: INTEGER
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

Fast Job I/O

- Fastsim uses (one or more) **merge** files as input
- The same merge file can be used by many Fast jobs
- Two tables:
  - `MERGE_JOB` **`merge_id`**
  - `FASTJOB_MERGE` `merge_id, prod_series, runnum`



FULL_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- machine_id: INTEGER (FK)
- generator_id: VARCHAR (FK)
- geo_revision: VARCHAR (FK)
- geo_tag: VARCHAR (FK)
- geo_pkg: VARCHAR (FK)
- soft_release: VARCHAR (FK)
- seed: INTEGER
- event_num: INTEGER
- command_line: VARCHAR
- macro: VARCHAR
- status: INTEGER
- physics_list: VARCHAR
- timestamp: TIMESTAMP
- geometry_type: VARCHAR
- gen_parameters: BLOB
- grid_job_id: VARCHAR
- prod_type: VARCHAR

FULL_OUTPUT
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- output_type: VARCHAR
- file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

MERG_FULLOUTPUT
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- merge_id: INTEGER (FK)
- output_type: VARCHAR (FK)

FAST_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- generator_id: VARCHAR (FK)
- soft_release: VARCHAR (FK)
- geo_revision: VARCHAR (FK)
- geo_tag: VARCHAR (FK)
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- seed: INTEGER
- event_num: INTEGER
- command_line: VARCHAR
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- grid_job_id: VARCHAR
- prod_type: VARCHAR

MERGE_JOB
- merge_id: INTEGER
- merged_file_type: VARCHAR
- merged_file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

FASTJOB_MERGE
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
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Fast Job I/O

- Fastsim uses (one or more) **merge** files as input
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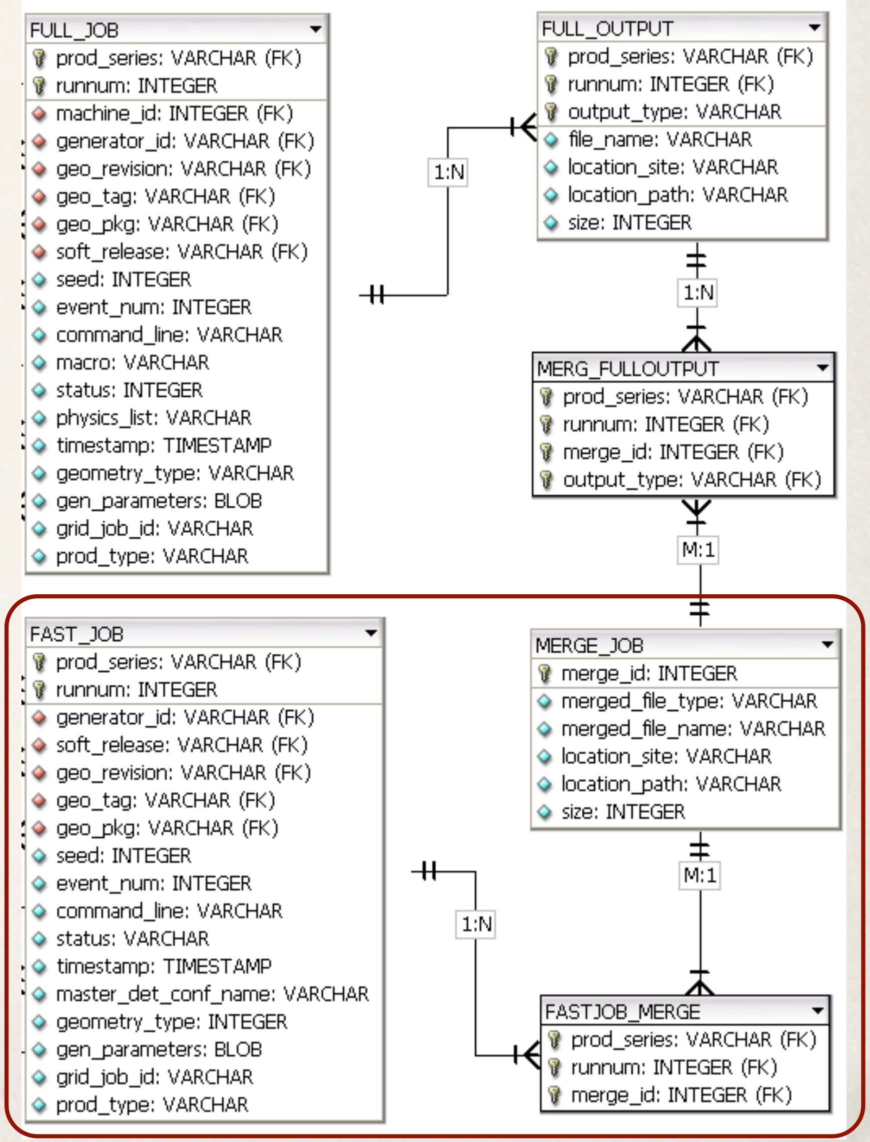
- Two tables:
  - MERGE_JOB
merge_id
  - FASTJOB_MERGE
merge_id,
prod_series, runnum



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MERGE_JOB
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- merged_file_type: VARCHAR
- merged_file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

FASTJOB_MERGE
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- merge_id: INTEGER (FK)

Fast Job I/O – Merge files

- A Merge file consists of many Fullsim Output files (of the same type, i.e. produced by the same generator)
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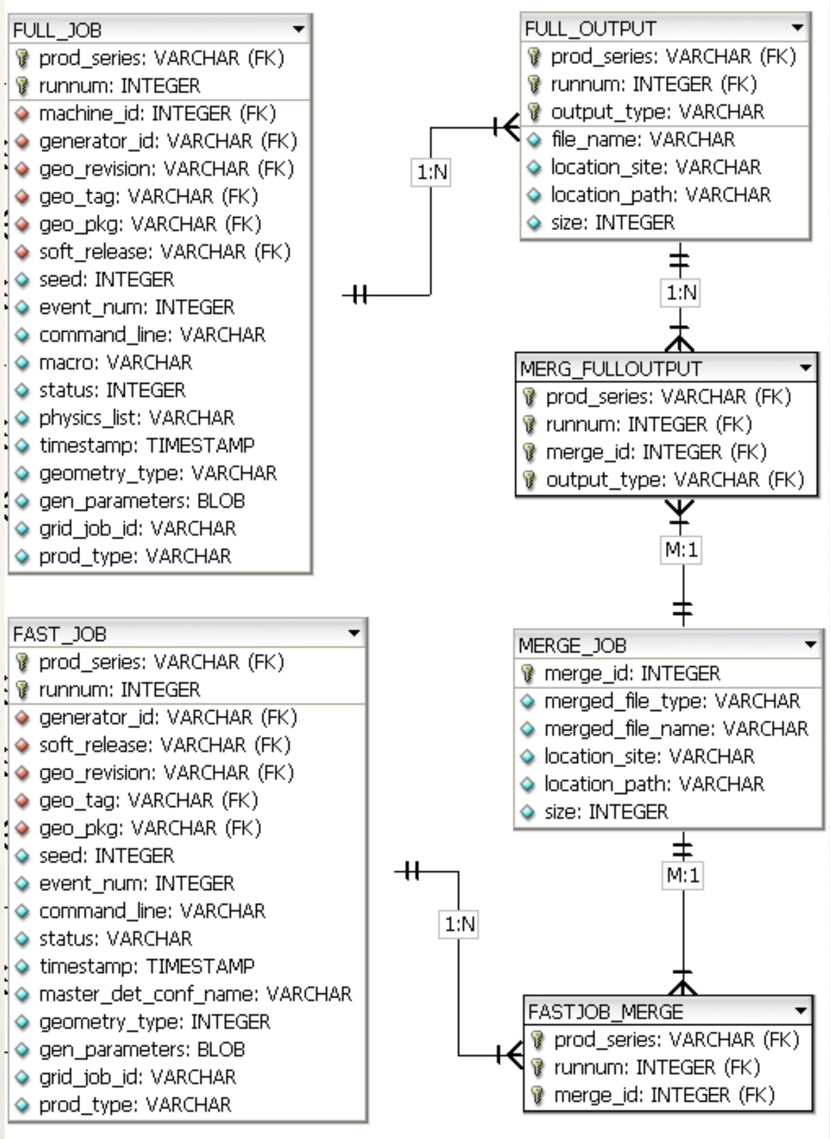

FULL_JOB
prod_series: VARCHAR (FK)
runnum: INTEGER
machine_id: INTEGER (FK)
generator_id: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
soft_release: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
macro: VARCHAR
status: INTEGER
physics_list: VARCHAR
timestamp: TIMESTAMP
geometry_type: VARCHAR
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

FULL_OUTPUT
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
output_type: VARCHAR
file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

MERG_FULLOUTPUT
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
merge_id: INTEGER (FK)
output_type: VARCHAR (FK)

FAST_JOB
prod_series: VARCHAR (FK)
runnum: INTEGER
generator_id: VARCHAR (FK)
soft_release: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
status: VARCHAR
timestamp: TIMESTAMP
master_det_conf_name: VARCHAR
geometry_type: INTEGER
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

MERGE_JOB
merge_id: INTEGER
merged_file_type: VARCHAR
merged_file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

FASTJOB_MERGE
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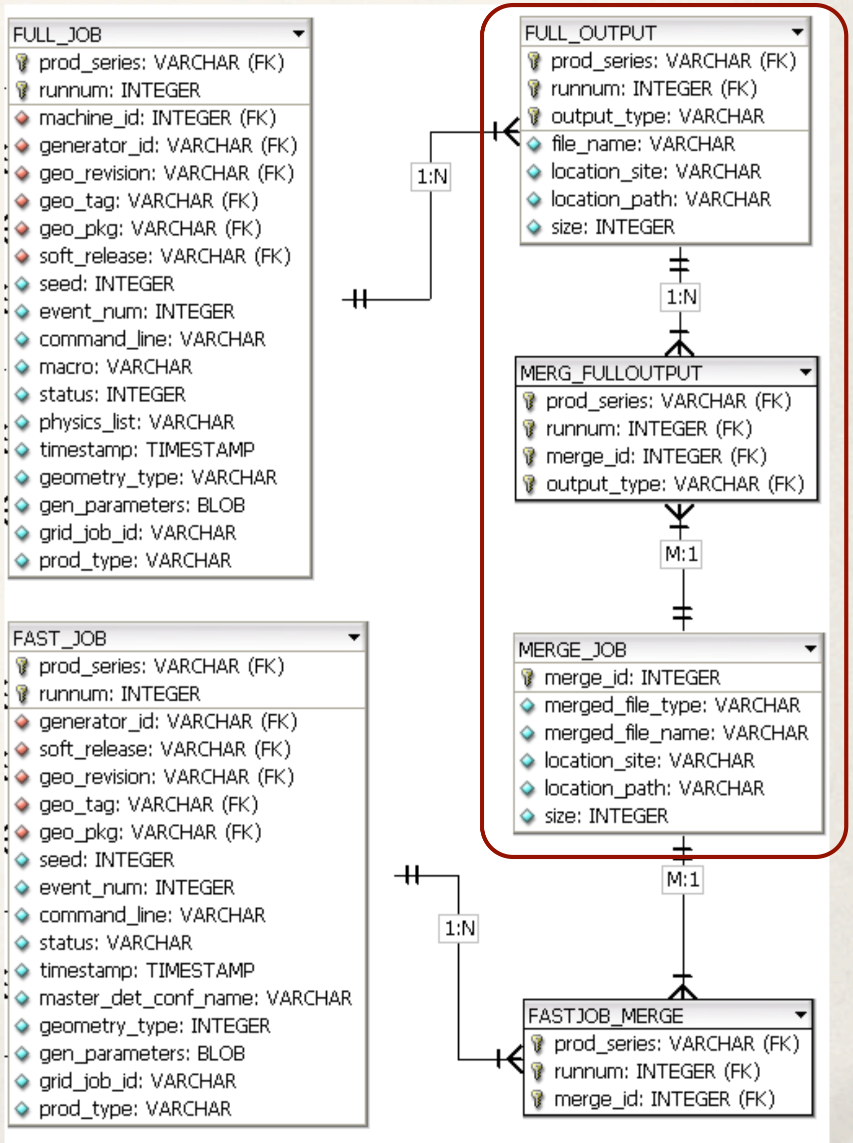

FULL_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- machine_id: INTEGER (FK)
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- geo_pkg: VARCHAR (FK)
- soft_release: VARCHAR (FK)
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- command_line: VARCHAR
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- physics_list: VARCHAR
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- merged_file_name: VARCHAR
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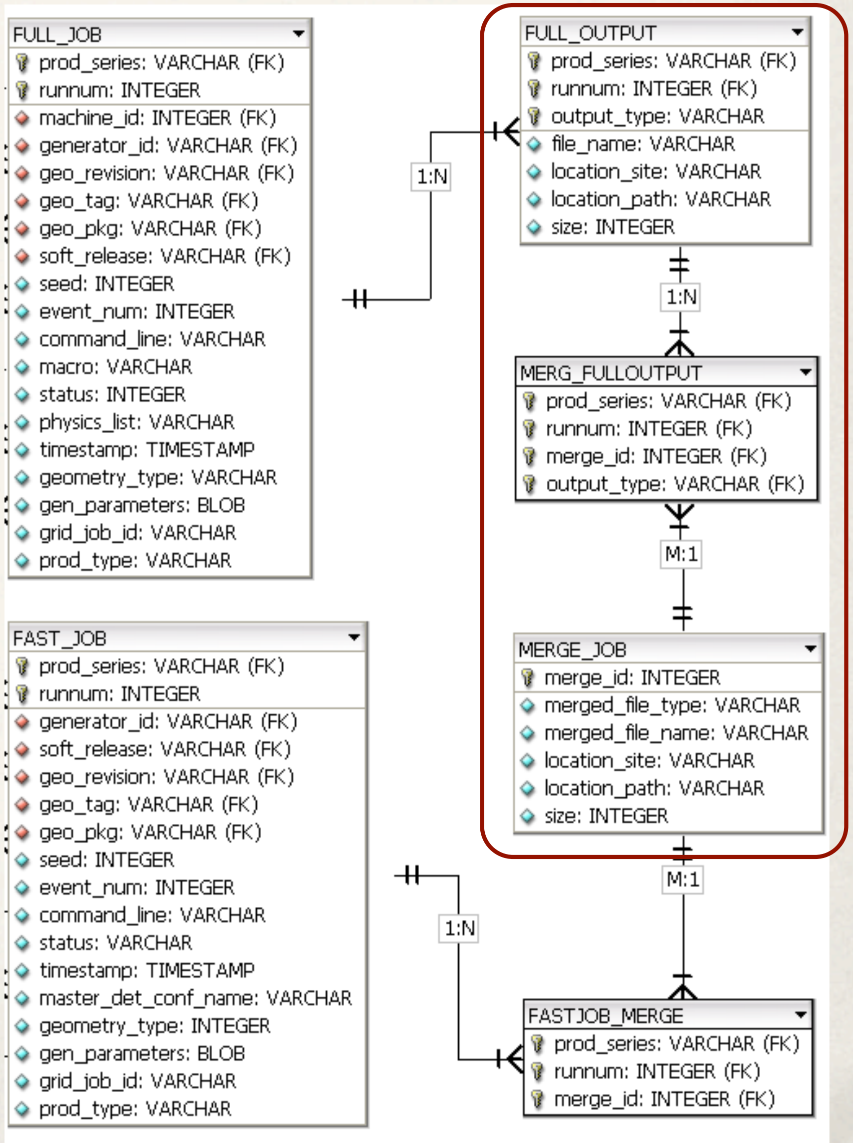

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- prod_series: VARCHAR (FK)
- runnum: INTEGER
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- location_path: VARCHAR
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- runnum: INTEGER (FK)
- merge_id: INTEGER (FK)
- output_type: VARCHAR (FK)

MERGE_JOB
- merge_id: INTEGER
- merged_file_type: VARCHAR
- merged_file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

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- prod_series: VARCHAR (FK)
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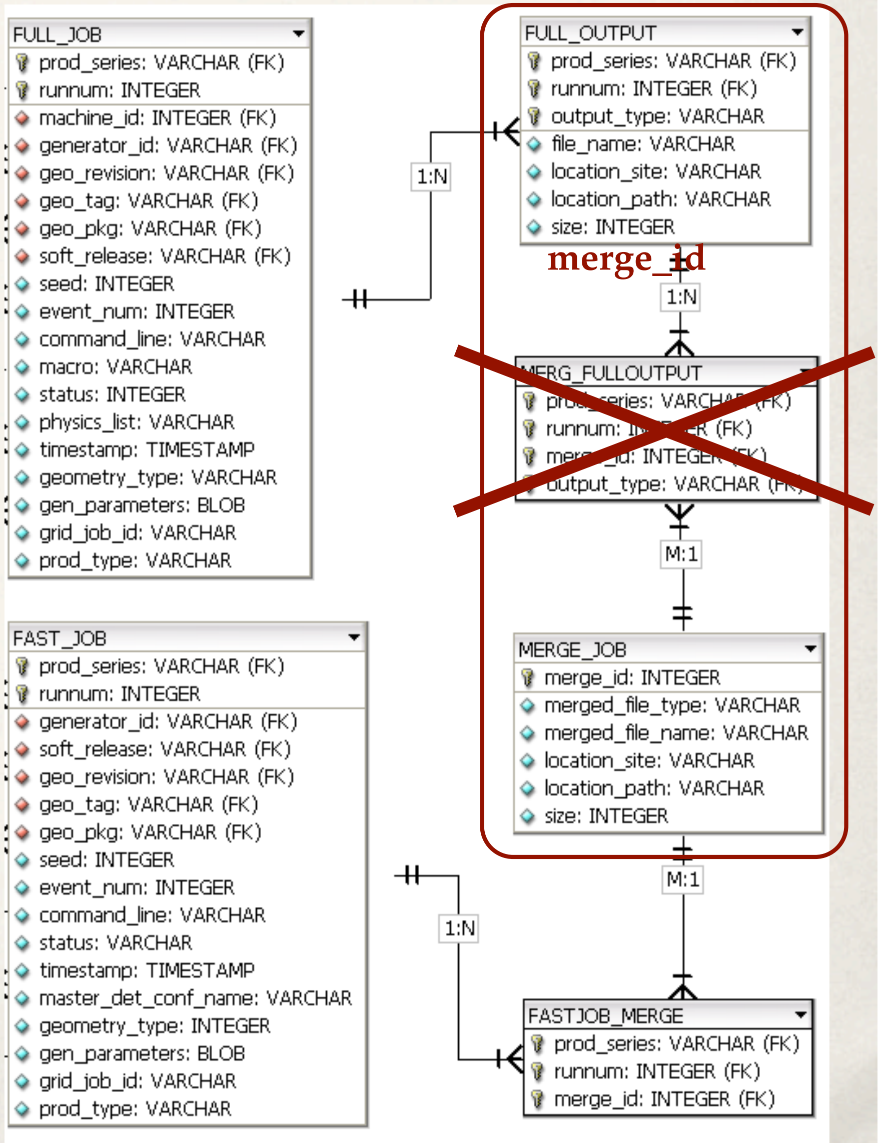

FULL_JOB
prod_series: VARCHAR (FK)
runnum: INTEGER
machine_id: INTEGER (FK)
generator_id: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
soft_release: VARCHAR (FK)
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prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
output_type: VARCHAR
file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

~~MERG_FULLOUTPUT~~
~~prod_series: VARCHAR (FK)~~
~~runnum: INTEGER (FK)~~
~~merge_id: INTEGER (FK)~~
~~output_type: VARCHAR (FK)~~

FAST_JOB
prod_series: VARCHAR (FK)
runnum: INTEGER
generator_id: VARCHAR (FK)
soft_release: VARCHAR (FK)
geo_revision: VARCHAR (FK)
geo_tag: VARCHAR (FK)
geo_pkg: VARCHAR (FK)
seed: INTEGER
event_num: INTEGER
command_line: VARCHAR
status: VARCHAR
timestamp: TIMESTAMP
master_det_conf_name: VARCHAR
geometry_type: INTEGER
gen_parameters: BLOB
grid_job_id: VARCHAR
prod_type: VARCHAR

MERGE_JOB
merge_id: INTEGER
merged_file_type: VARCHAR
merged_file_name: VARCHAR
location_site: VARCHAR
location_path: VARCHAR
size: INTEGER

FASTJOB_MERGE
prod_series: VARCHAR (FK)
runnum: INTEGER (FK)
merge_id: INTEGER (FK)

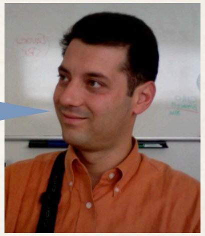
Fast Jo

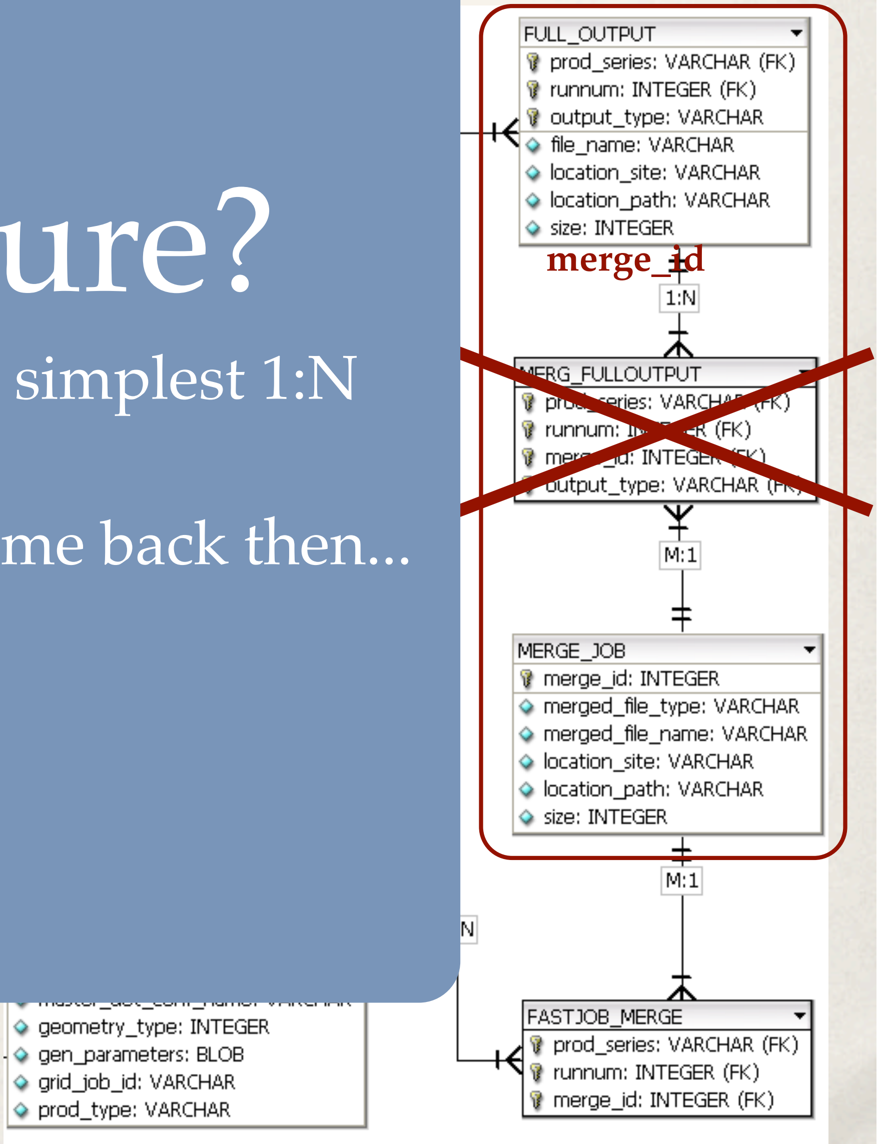
- A Merge fi Fullsim Ou (of the sam by the sam
- ~~A Fullsim (used in ma~~
- A Fullsim (used in on files

Are You sure?

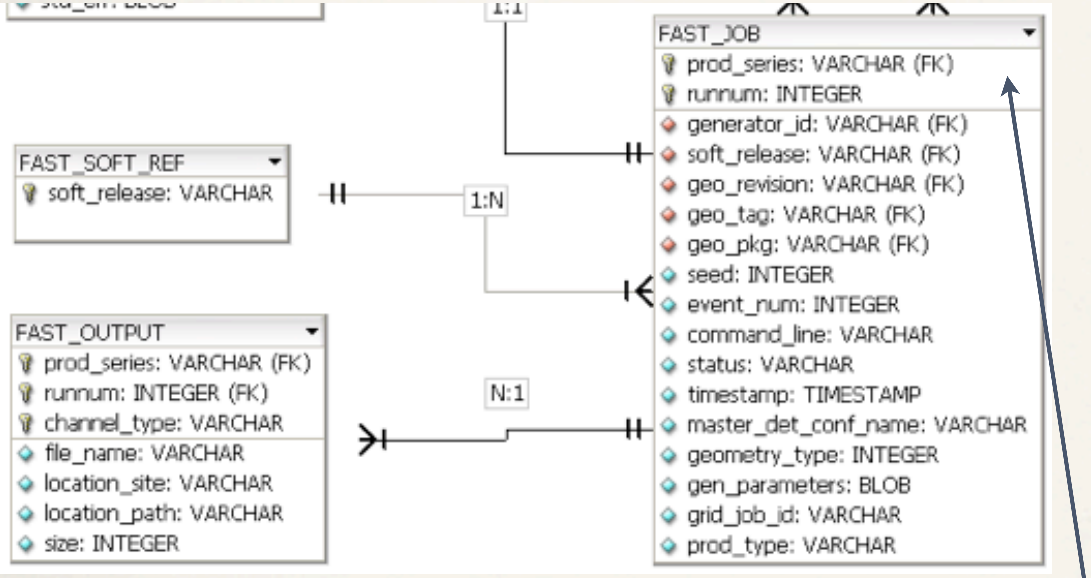
The N:M case includes the simplest 1:N

It will be more difficult to come back then...





Fast Job I/O – Output files



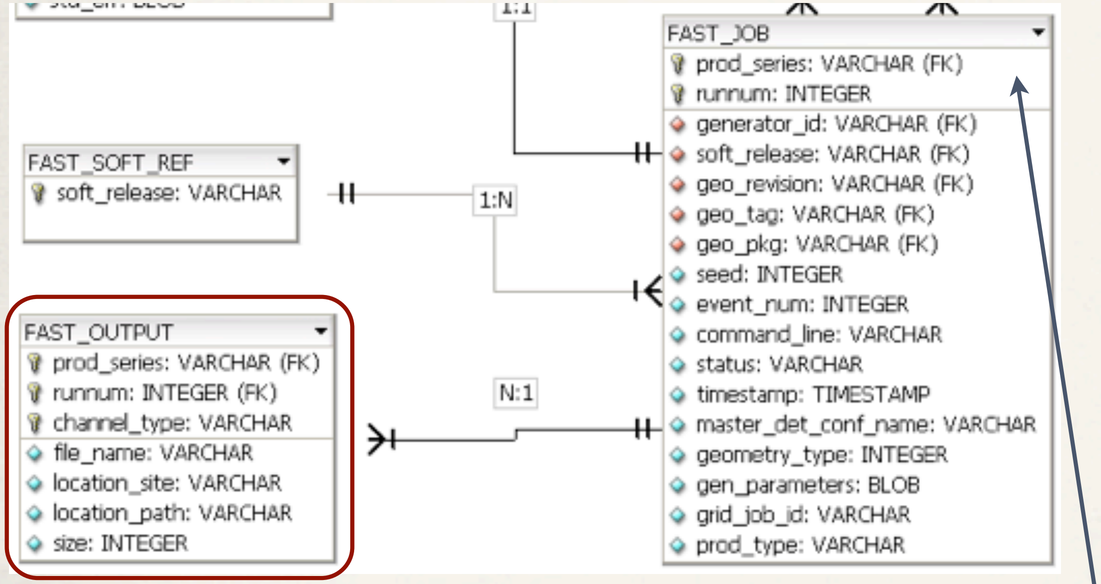
FAST_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- generator_id: VARCHAR (FK)
- soft_release: VARCHAR (FK)
- geo_revision: VARCHAR (FK)
- geo_tag: VARCHAR (FK)
- geo_pkg: VARCHAR (FK)
- seed: INTEGER
- event_num: INTEGER
- command_line: VARCHAR
- status: VARCHAR
- timestamp: TIMESTAMP
- master_det_conf_name: VARCHAR
- geometry_type: INTEGER
- gen_parameters: BLOB
- grid_job_id: VARCHAR
- prod_type: VARCHAR

FAST_SOFT_REF
- soft_release: VARCHAR

FAST_OUTPUT
- prod_series: VARCHAR (FK)
- runnum: INTEGER (FK)
- channel_type: VARCHAR
- file_name: VARCHAR
- location_site: VARCHAR
- location_path: VARCHAR
- size: INTEGER

- Output files:
  - Many per job (1,N), *at most one per physical channel*
  - A given output file is produced by one and only one job
- One table:
  - `FAST_OUTPUT`
    `channel_type, prod_series, runnum`

Fast Job I/O – Output files



FAST_JOB
- prod_series: VARCHAR (FK)
- runnum: INTEGER
- generator_id: VARCHAR (FK)
- soft_release: VARCHAR (FK)
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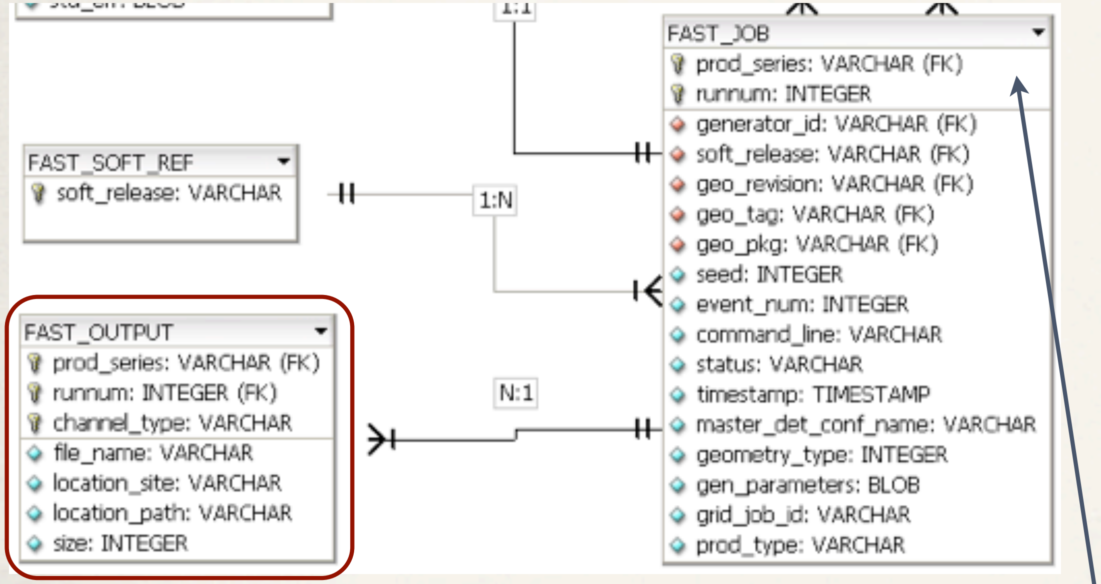

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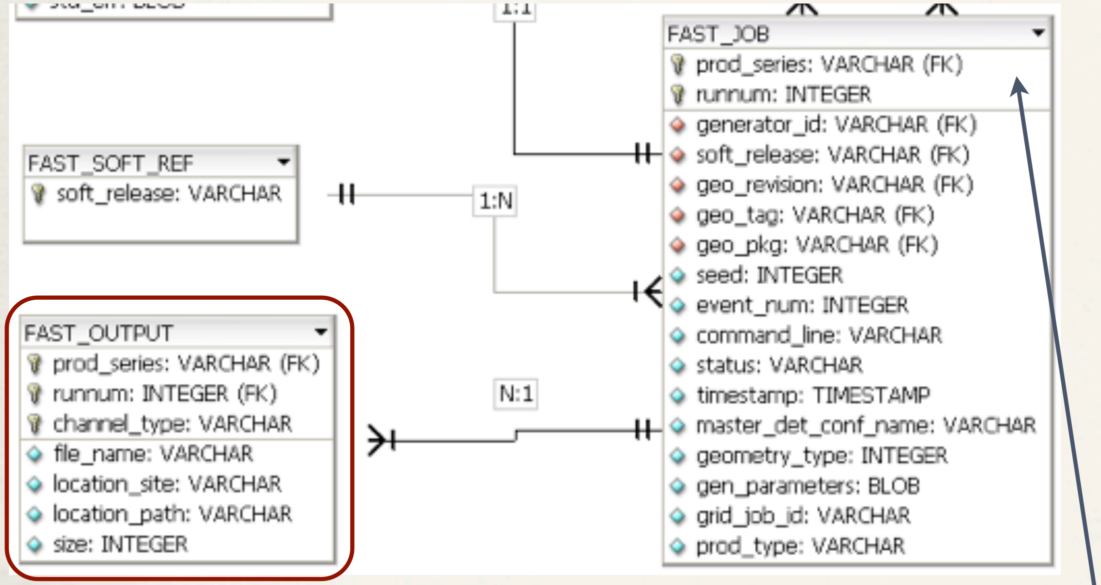
    `channel_type, prod_series, runnum`

physical channels
naming, list, ...

Fast Job I/O – Output files



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  - A given output file is produced by one and only one job
- One table:
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    `channel_type, prod_series, runnum`

Software Release

- Packaging of Fullsim and Production will move to a release based schema (Fastsim already is)

- Geometry packages are “inside” the releases;
self-consistent packages independent from the sim pkg.

- We just need to know which release has been used (for fast/full)
⇒ geometry package determined

- At the moment (no release, yet) is necessary to specify which geometry package has been used on a per job basis.

Open Questions

Generators

- We have many (possible) generators
- A job uses one and only one generator
- A generator has a set of parameters (and their values can vary)
- The generator's parameters values are job dependent

➡ `gen_parameters` is in the Job table

➡ we may store default values in the Generator table
and when needed the new values in the Job table

Machine / Generators / Input Files

- Background's simulation with FullSim is already modeled
- Something can be improved in the logic and/or schema in order to reduce redundancy
  - mad_output_file in the Machine table
  - Input files for the Fullsim
- Discussion with Andrea Di Simone & Manuela Boscolo in progress

Uniqueness

- `prod_series` ➟ identifier of a Production:
  who's giving names? Besides strictly checking it, how to avoid duplicates?

- `runnum` ➟ identifier of a Job within a Production:
  who assign it? Cross numbering between Full & Fast, yes or no?

- `full_input_id` ➟ identifier of an input file for Fullsim
  autoincrement, time-related? only if db centralized; ?

- `merge_id` ➟ identifier of a merged file
  how to assign it? merge job doesn't exist yet... we must take care of it

First Implementation & Queries

MySQL testing

- The presented Relational Schema has been implemented with MySQL RDBMS at Ferrara [Cinzia Luzzi made the job!]

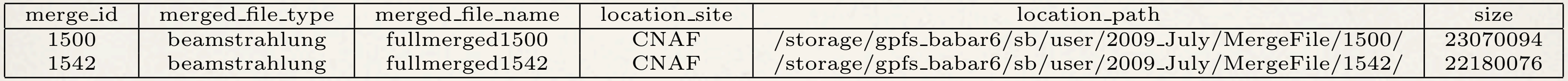
- Scripts have been used to populate the database with data “taken” from previous production (July test)

- Queries of interest have been developed and executed on the schema as a functionality test

Queries

- Retrieve all merge files used by a specific Fastsim Job
  (so we must identify the job by its runnum and prod_series)

```
SELECT MERGE_JOB.* FROM MERGE_JOB NATURAL JOIN FASTJOB_MERGE
NATURAL JOIN FAST_JOB AS FAST WHERE FAST.runnum = 1021 AND
FAST.prod_series = ‘2009_July’;
```

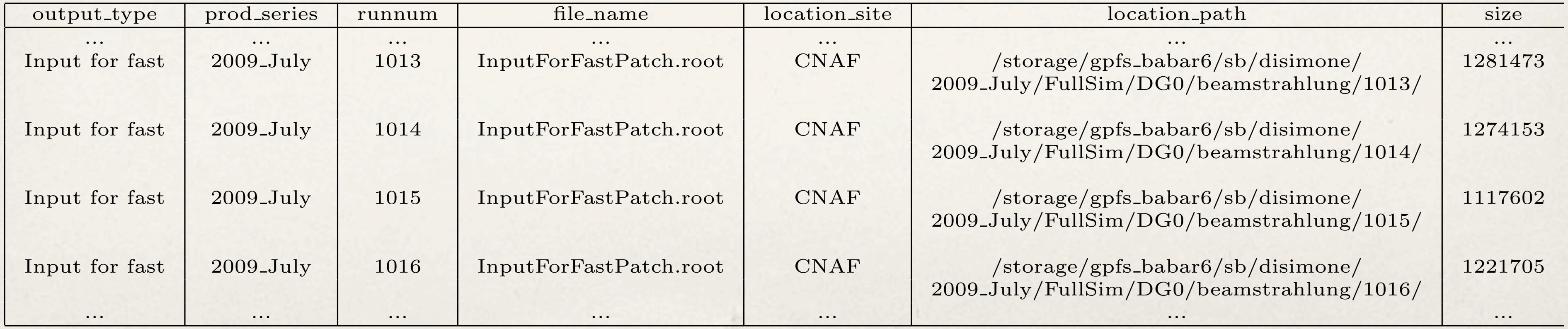


merge_id	merged_file_type	merged_file_name	location_site	location_path	size
1500	beamstrahlung	fullmerged1500	CNAF	/storage/gpfs_babar6/sb/user/2009_July/MergeFile/1500/	23070094
1542	beamstrahlung	fullmerged1542	CNAF	/storage/gpfs_babar6/sb/user/2009_July/MergeFile/1542/	22180076

Queries

- Retrieve all Fullsim Output files used (via merge files) by a specific Fastsim Job

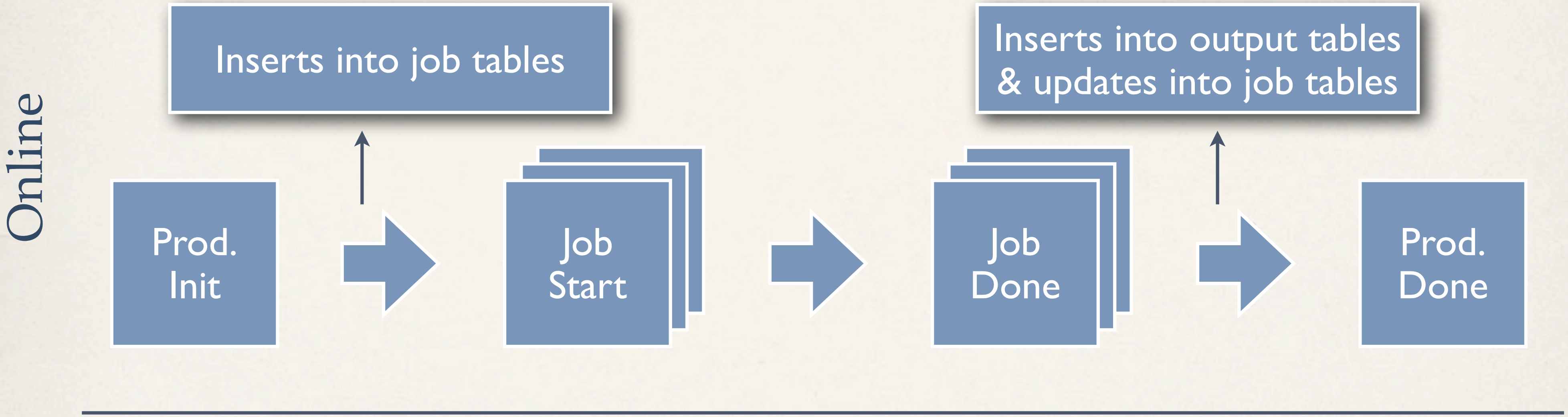
```
SELECT FO.* FROM MERGE_JOB AS M, MERGE_FULLOUTPUT AS MFO,
FULL_OUTPUT AS FO, FASTJOB_MERGE AS FJM, FAST_JOB AS F WHERE
M.merge_id = MFO.merge_id AND MFO.runnum = FO.runnum AND
MFO.prod_series = FO.prod_series AND MFO.output_type =
FO.output_type AND M.merge_id = FJM.merge_id AND FJM.runnum =
F.runnum AND FJM.prod_series = F.prod_series AND F.runnum = 1200
AND F.prod_series = ‘2009_July’;
```



output_type	prod_series	runnum	file_name	location_site	location_path	size
...	...	...	...	...	...	...
Input for fast	2009_July	1013	InputForFastPatch.root	CNAF	/storage/gpfs_babar6/sb/disimone/2009_July/FullSim/DG0/beamstrahlung/1013/	1281473
Input for fast	2009_July	1014	InputForFastPatch.root	CNAF	/storage/gpfs_babar6/sb/disimone/2009_July/FullSim/DG0/beamstrahlung/1014/	1274153
Input for fast	2009_July	1015	InputForFastPatch.root	CNAF	/storage/gpfs_babar6/sb/disimone/2009_July/FullSim/DG0/beamstrahlung/1015/	1117602
Input for fast	2009_July	1016	InputForFastPatch.root	CNAF	/storage/gpfs_babar6/sb/disimone/2009_July/FullSim/DG0/beamstrahlung/1016/	1221705
...	...	...	...	...	...	...

Queries

- Queries of that type have to be included in the production software layer in order to populate the database and monitor the production



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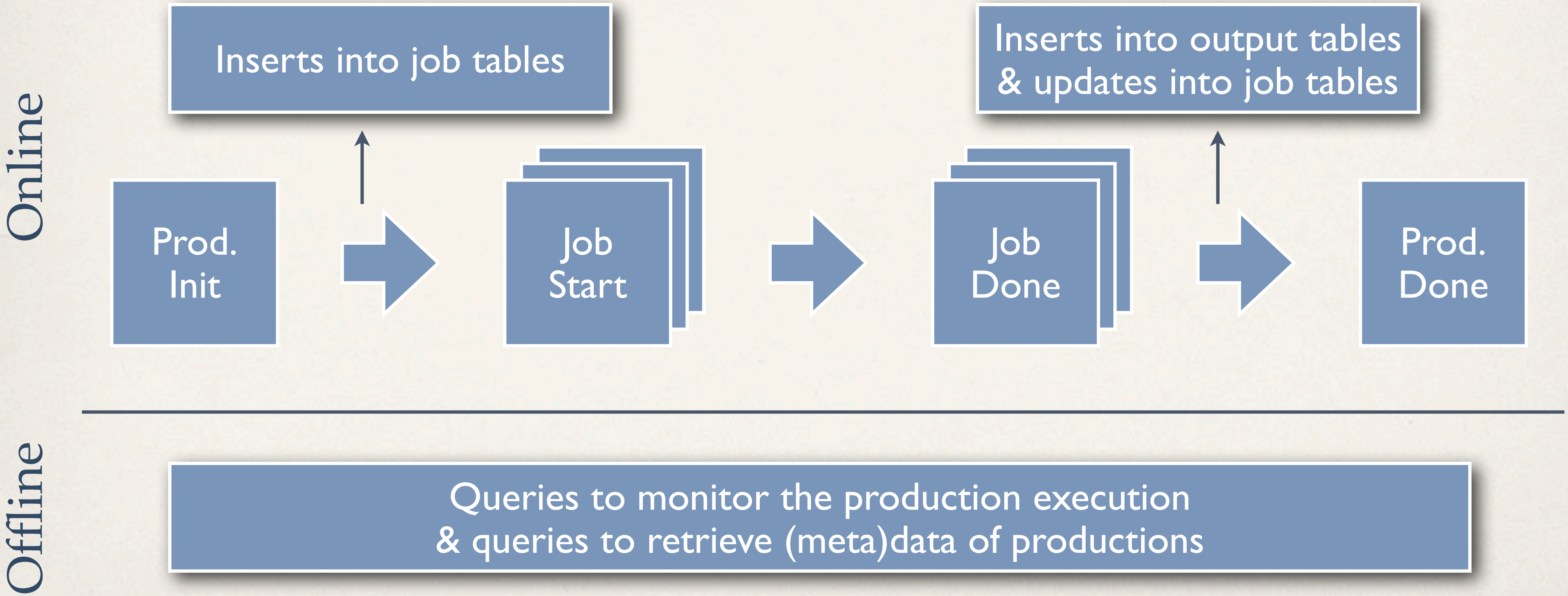

Online

Inserts into job tables

Inserts into output tables & updates into job tables

Prod. Init

Job Start

Job Done

Prod. Done

Offline

Queries to monitor the production execution & queries to retrieve (meta)data of productions

Future Developments

Deployment at CNAF

- Schema will be deployed at CNAF in the next few weeks
- Basic Web interface

  offline

  - A prototype of production monitor
  - parametric queries to retrieve (meta)data of productions
  - Mysql + PHP + Apache
- Production Web-UI

  online

  - Web form + PHP
  - Executes the production initialization
  - Provides the interface to the database

Deployment at CNAF

- Schema will be deployed at CNAF in the next few weeks

offline

- Basic Web interface
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  - parametric queries to retrieve (meta)data of productions
  - Mysql + PHP + Apache

it may be postponed

online

- Production Web-UI
  - Web form + PHP
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  - Provides the interface to the database

we are already going towards
a distributed production software

Distributed Production

Works to do

[where the Database is involved]

Web-UI

- Production Initialization Script
  - Web form to be used by the production manager
  - Strict check on user input:
    - Production data (e.g. prod_series, prod_root, prod_software)
    - Production type, Number of jobs
    - Jobs data (e.g. seeds, generators, number of events, geometry_type, input files, ...)
    - TAG, ARCH, RELEASE_WORKDIR, ...
  - Mysql + PHP + Apache at CNAF
  - It will populate the database init
  - It will provide a macro for jobs submission (GANGA) start

- Pre- & Post- Job Scripts
  - They take care of updates into the database before and after job execution
    - status changes, ...
    - output files metadata
  - HTTP based service
  - Exception detection
  - Python

Works to do

[where the Database is involved]

Fullsim should be ok
Fastsim has inputs "hard coded"
It will be necessary to separate things

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    - Jobs data (e.g. seeds, generators, number of events, geometry_type, input files, ...)
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Works to do

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    - TAG, ARCH, RELEASE_WORKDIR, ...
  - Mysql + PHP + Apache at CNAF
  - It will populate the database init
  - It will provide a macro for jobs start submission (GANGA)

- Pre- & Post- Job Scripts
  - They take care of updates into the database before and after job execution
    - status changes, ...
    - output files metadata
  - HTTP based service
  - Exception detection
  - Python

See Armando’s talk for details

Conclusions

- Database schema is ready, validated, implemented and tested
- Some (minor) refinements are under discussion
- Deployment will be ready by the end of October
- Interactions with Production Software have been modeled (see Armando's talk)
- Coding will start soon...
- ...ready for January 2010 production!