CERN

Catalogue schema verification and migration tool

What is done and discussions to move forward

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The catalogue schema verification tool

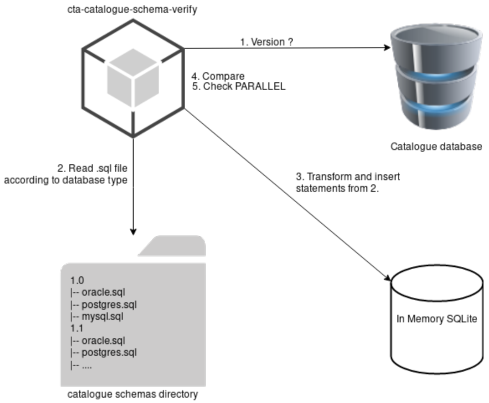
The catalogue schema migration tool

The catalogue schema verification tool

- What it does
  - Checks INDEX names
  - Checks TABLE names
  - Checks COLUMN names and types
  - Checks CONSTRAINT names
    $\Rightarrow$ NOT for MySQL
    $\Rightarrow$ NOT NOT NULL constraints for PostgreSQL
  - Display WARNING for Oracle PARALLEL TABLES
- What it does not
  - Does not check for triggers $\Rightarrow$ no triggers should be implemented in the Catalogue

The catalogue schema verification tool

- How does it work ?

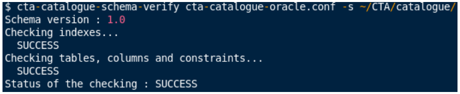


cta-catalogue-schema-verify
1. Version ?
4. Compare
5. Check PARALLEL
Catalogue database
2. Read .sql file according to database type
3. Transform and insert statements from 2.
In Memory SQLite
catalogue schemas directory

```
1.0
|-- oracle.sql
|-- postgres.sql
|-- mysql.sql
1.1
|-- oracle.sql
|-- postgres.sql
|-- ....
```

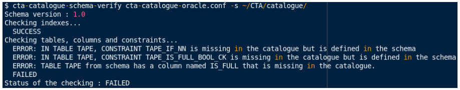
The catalogue schema verification tool

- The output



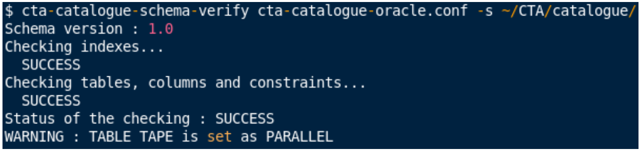
```
$ cta-catalogue-schema-verify cta-catalogue-oracle.conf -s ~/CTA/catalogue/
Schema version : 1.0
Checking indexes...
  SUCCESS
Checking tables, columns and constraints...
  SUCCESS
Status of the checking : SUCCESS
```

Schema verification SUCCESS



```
$ cta-catalogue-schema-verify cta-catalogue-oracle.conf -s ~/CTA/catalogue/
Schema version : 1.0
Checking indexes...
  SUCCESS
Checking tables, columns and constraints...
  ERROR: IN TABLE TAPE, CONSTRAINT TAPE_IF_NN is missing in the catalogue but is defined in the schema
  ERROR: IN TABLE TAPE, CONSTRAINT TAPE_IS_FULL_BOOL_CK is missing in the catalogue but is defined in the schema
  ERROR: TABLE TAPE from schema has a column named IS_FULL that is missing in the catalogue.
  FAILED
Status of the checking : FAILED
```

Missing IS_FULL column in table TAPE

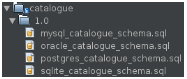


```
$ cta-catalogue-schema-verify cta-catalogue-oracle.conf -s ~/CTA/catalogue/
Schema version : 1.0
Checking indexes...
  SUCCESS
Checking tables, columns and constraints...
  SUCCESS
Status of the checking : SUCCESS
WARNING : TABLE TAPE is set as PARALLEL
```

Table TAPE has been set as PARALLEL

The catalogue schema verification tool

- What needs to be discussed
  - Where do we put the folder containing all the versions of the schema ?
    - Create a RPM of the cta-catalogue-schema-verify tool and stick the folder with it.
      $\Rightarrow$ This folder will be in the same place as the executable
    - Other ideas ?



```
catalogue
  1.0
    mysql_catalogue_schema.sql
    oracle_catalogue_schema.sql
    postgres_catalogue_schema.sql
    sqlite_catalogue_schema.sql
```

The database schema migration tool

- Problem to solve
  - Schema modifications $\Rightarrow$ new schema version !
    - Schema version format : MAJOR.MINOR
    - MAJOR changes ONLY if schema modifications are not backward compatible with previous schema version
  - How do we do catalogue schema migration from one version to the next one ?

The catalogue schema migration tool

- CASTOR's way of schema migration : PL/SQL file !
  - 1. Check database schema version
  - 2. Update tables, procedures, etc... (COMMIT after each update)
  - 3. Recompile all procedures, triggers...
    - If all is successful, update a table UpgradeLog with status COMPLETE
    - Else ROLLBACK current update and update UpgradeLog by increasing a failure counter, list the failed-to-compile objects

The catalogue schema migration tool

- What would change between one schema version and the next one ?
  - Creation/deletion/modification of tables, columns, constraints, sequences
  - Data changes within tables
  - Creation/deletion/modification of PL/SQL procedures

The catalogue schema migration tool

- The migration of the schema should
  - be idempotent
  - do verification before each update (e.g: does a column exists before updating its type ?)
  - be a step by step migration (one modification at a time)
  - be rollbackable
  - be traceable
  - be easy to execute
- The migration tool should be the same during the whole life of CTA

The catalogue schema migration tool

- What kind of tool should we use to migrate the catalogue schema from one version to the next one ?
  - Four ways
    - Use a framework/language-dependant library
    - Use an independent Database-Migration-Focused software
    - Develop a tool ourselves
    - Use simple PL/SQL scripts because after all, modifications will be little ones

The catalogue schema migration tool

- Use a framework/language-dependent library
  - Python (alembic), Ruby (Active Record)
  - No built-in support for Oracle databases ⇒ We would need to use an ORM (Object-relational mapping) tool and plug a migration framework to it.

The catalogue schema migration tool

- Use an independent Database-Migration-Focused software
  - Liquibase ▸ Link
  - Flyway ▸ Link

The catalogue schema migration tool

- Liquibase
  - Open-source command-line tool based on Java. Apache v2 License
  - Compatible with our 4 database types
  - Easy-to-use : *liquibase –changeLogFile=migration1.0To1.1.sql update*
  - changeLogFile = sql file for doing the migration + Liquibase-related metadata
  - Rollback changes
  - Adds two Liquibase-related tables to the database

The catalogue schema migration tool

- Flyway
    - Command-line tool based on Java. Apache v2 License
    - Compatible with our 4 database types
    - Easy-to-use : *flyway migrate*
    - Migration scripts have to be put in a specific folder. (Naming convention).
    - Adds one history table to the database : flyway_schema_history
    - A lot of functionalities only in PRO versions :-(

The catalogue schema migration tool

- Use simple PL/SQL scripts because after all, modifications will be little ones
    - What do you think ?

The catalogue schema migration tool

- Conclusion

Migration strategy	Pros	Cons
Framework/language-dependent lib	Use of exisiting lib to do migrations	No built-in support for Oracle
Database-Migration software	Easy migrations, well defined migration organization, Rollback	Timeline for our 4 databases support ? Changing technology might be difficult
Develop a tool ourselves	We depend on nobody except us	Time consuming. Safe ?
PL/SQL Scripts	Very easy to execute	Migration failure management

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