

Discussion of object vs source table queries and data distribution

William O'Mullane

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1 Introduction

Writing concise and testable requirements is very difficult. Writing requirements in 2005 for a system to run in 2022 is extremely difficult but is the case for DM. Assumptions are made about requirements and how to implement them, but the perspective of the requirement writer and implementer are usually not identical. Over a long period this could diverge significantly and choices made years ago may not be so valid anymore. So we should continually challenge requirements and ensure they are still valid and that we are interpreting them correctly.

2 The catalog access question

The DataBase requirements are in LDM-555.

2.1 Current approach to catalog interaction SQL/ Qserv

Qserv is a custom massively parallel database built by LSST(SLAC) for LSST. This is built on the assumption (requirement) that astronomy on the catalog will be done as queries. Qserv provides SQL access (with limited sub queries) to all catalogs - including visits e.g. force photometry/light curves as depicted in Figure 1. Some implementation remains for Qserv e.g.: Python integration, MYDB, Authentication.

2.1.1 Fundamental questions

1. Will scientists mainly (90-95%) query Object catalogue?
2. Is this what users expect ? To express correlations etc in SQL ? Machine learning in SQL¹?
3. Have scientists simply not yet been trained to think that is possible ?

¹Machine learning can be done in SQL <http://madlib.incubator.apache.org/>

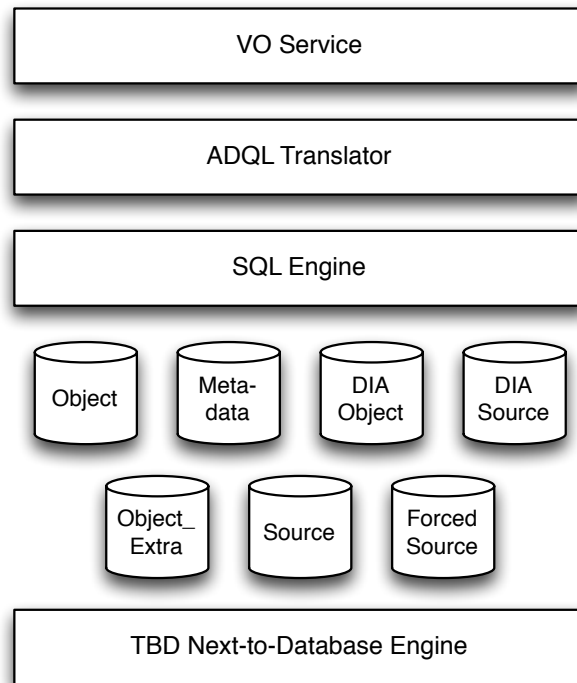


FIGURE 1: Qserv architecture as envisioned in LDM-135 and currently being implemented

2.2 Heterogeneous Data Access

A more heterogeneous approach could be followed if we assume that most SQL like queries would be on the Object catalog - or perhaps even the Object Lite catalog. Then the source and other large tables would be stored in something like parquet files and accessed with one of the map reduce type systems such as Hadoop or Dask. This is depicted in Figure 2.

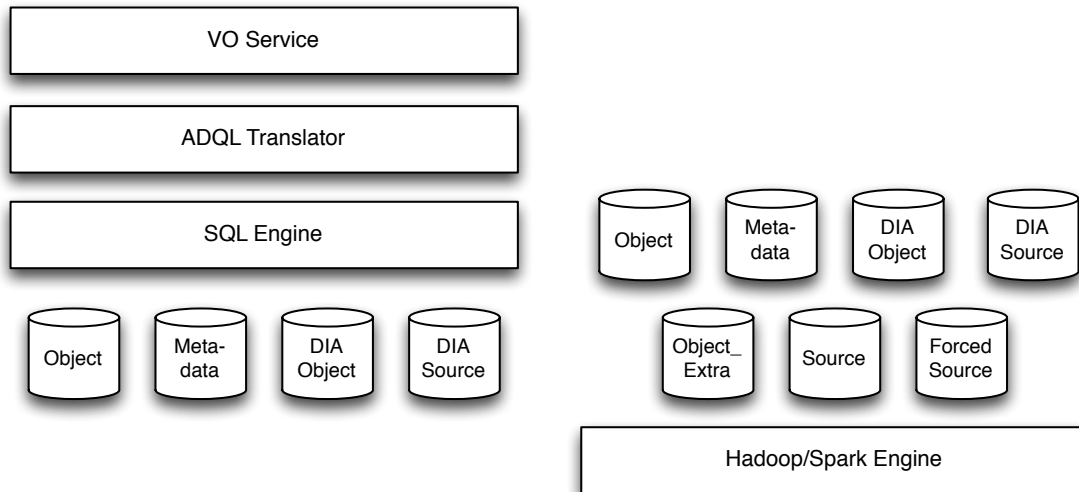


FIGURE 2: Heterogeneous catalog access with SQL for the Object Catalog but files only from Sources

We have to be clear SQL would then be restricted to what could fit in a DB (PetaByte DBs are possible today) There are a few astronomy oriented database implementations which could handle the 40TB Object Lite catalog e.g. Sqlserver or Postgress. These also have implementations for MYDB and CO protocols like TAP.

MYDB would then be MYDB .. not in HADOOP or Dask - it would be queriable of course.

There may be a slightly higher cost on hardware for this approach as it will be less efficient for the source table access.

2.2.1 Fundamental questions

1. What are potential user expectations SQL all the way down ?
DM has been collecting use case in DMTN-086 - non of which would require generalized queries against source. All go via the object table.

2. Or something more imperative ?

A References

References

[LDM-555], Becla, J., 2017, *Data Management Database Requirements*, LDM-555, URL <https://ls.st/LDM-555>

[LDM-135], Becla, J., Wang, D., Monkewitz, S., et al., 2017, *Data Management Database Design*, LDM-135, URL <https://ls.st/LDM-135>

[DMTN-086], Slater, C., 2018, *Next-to-the-Database Processing Use Cases*, DMTN-086, URL <https://dmtn-086.lsst.io>,
LSST Data Management Technical Note

B Acronyms used in this document

Acronym	Description
DB	DataBase
DM	Data Management
LDM	LSST Data Management (Document Handle)
LSST	Large Synoptic Survey Telescope
PST	Project Science Team
PSTN	Project Science Technical Note
Qserv	Proprietary LSST Database system
SLAC	No longer an acronym; formerly Stanford Linear Accelerator Center
SQL	Structured Query Language
TAP	Table Access Protocol