

Introduction to DUNE Database Group

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DB Group Mission

The DUNE DB group in collaboration with Fermilab computing professionals is responsible for provision, maintenance, and operation of databases based on collaboration needs^{*}.

What we do:

- Determine what databases are needed (with collaboration input)
- Design and implement databases
 - Based on requirements documents
- Provide interfaces to databases – APIs, web interfaces
- Provide documentation (and user support)

What we don't do:

- Independently develop schema for databases
- Provide tools beyond interfaces (we will consult, however)

**This talk is focused on ProtoDUNE databases. DUNE databases will benefit from ProtoDUNE experience and may look somewhat different.*

DB Group Mission continued

A key element of the DB group mission is to provide offline users with a robust, easy to understand interface that will scale to the needs of DUNE and operate on any supported platform (HTC or HPC).

The approach we are taking for ProtoDUNE utilizes an unstructured database (uconDB) to hold a “master store” of metadata from all databases, allowing for maximal flexibility. A subset of the uconDB will be available to offline users through a light-weight relational DB.

What is stored in the Databases

To first order we store **metadata**, or information describing the “experiment data”. Experiment data can refer to physics data or specialized data (taken to help with understanding the experiment or understanding the data – eg. pulser data for calibration).

Sources of metadata include:

- DAQ configuration parameters
- Beam instrumentation information
- Slow control and monitoring instrument values
- Data quality flags
- Derived calibration constants

Some small amount of metadata will be stored with the (raw) experiment data (eg. trigger bits) and this may also be stored in a database depending on granularity and need.

Hardware Database

The hardware database is a special case in that it more directly describes detector components rather than experiment data – although it can be connected to data – i.e. through hardware configuration.

Hardware DB contents may be linked to DAQ configuration and also used to maintain a history of the DUNE detectors and all of the parts comprising them.

The hardware database is nearly fully operational and Paul will say a bit more about this in his talk.

ProtoDUNE Databases

Run Configuration DB

- DAQ configuration files stored for each run – collected and sent to uconDB

Slow Control DB

- ProtoDUNE device values stored at high rate giving $O(10 \text{ GB})/\text{day}$ – subset to be moved to uconDB (intermediate SC DB may be used, but this needs to be studied)

IFBeam DB

- Beam-related device metadata stored in IFBeam DB – subset moved to uconDB

Offline Calibration DB

- Calibration constants derived from data

Data Quality DB

- Filled from DQM system?

ProtoDUNE Databases

uconDB (master store of metadata)

- Contains both time-indexed and run-indexed metadata. Run-based metadata stored in JSON “blobs” so no schema required.

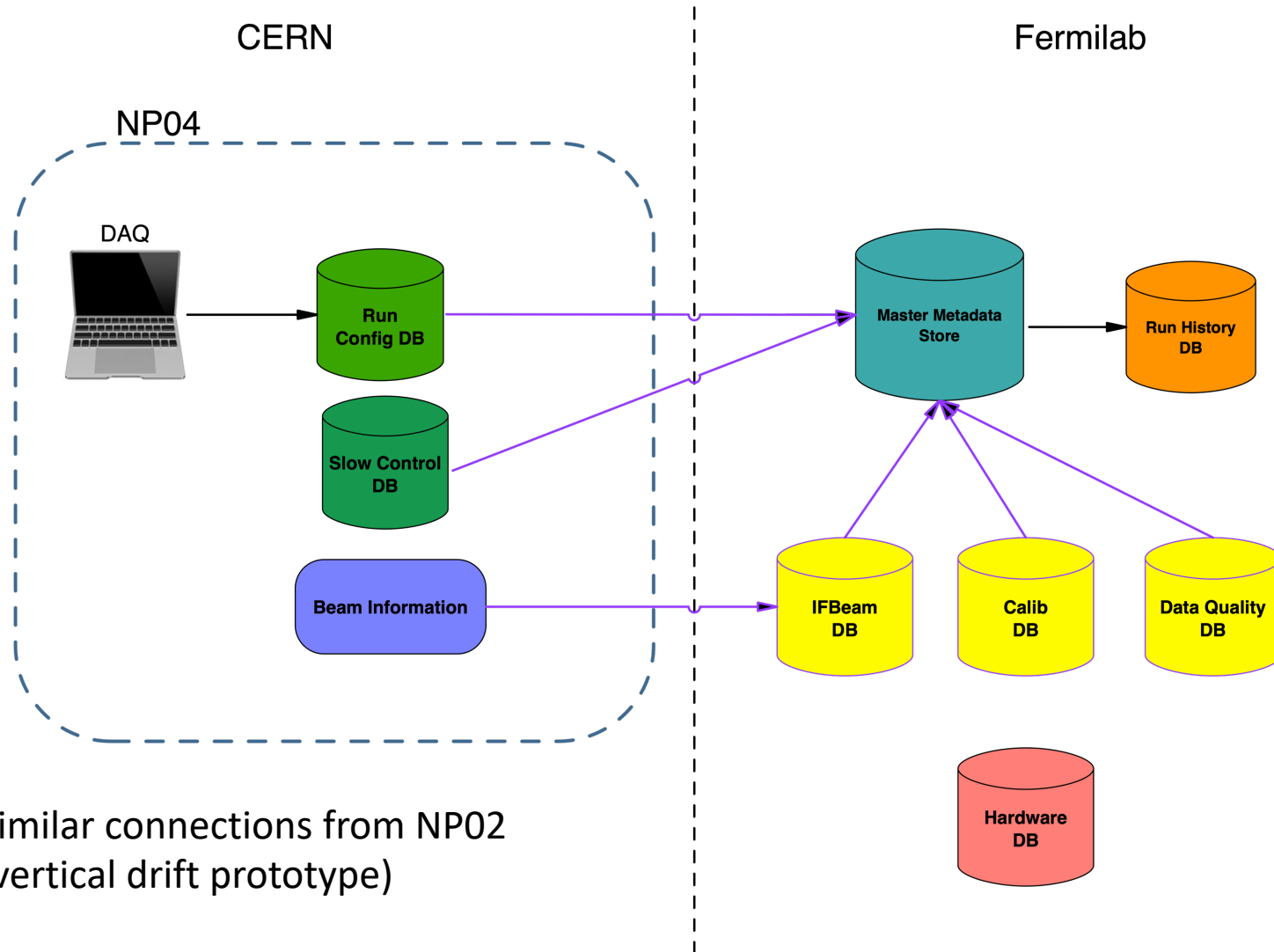
Run history DB

- Subset of uconDB storing metadata fields requested by users allowing fast queries – interface for user access.

Hardware DB

- All hardware component information.

ProtoDUNE Database System



ProtoDUNE Database Status

Database	Requirements Complete?	Status
Hardware	Yes	Production-ready once PID DB complete (late Jan)
Run Configuration	No	Most infrastructure in place but needs some mods needed
IFBeam	Not for DUNE	Complete (exercised during Run I)
Slow Controls	No	Not started
Calibration	No	Not started
Data Quality	No	Not started
uconDB	No	In place and tested but restructuring needed
Run History	No	In place and needs table(s) to be defined

There are several APIs still to be written or improved as well.

Where to find information

Database wiki: <https://wiki.dunescience.org/wiki/Databases>

uconDB: <https://cdcvs.fnal.gov/redmine/projects/ucondb/wiki/UConDBDoc>

IFBeam: https://cdcvs.fnal.gov/redmine/attachments/18084/LBNE_IFBeamDB.pptx

HWDB: <https://cdcvs.fnal.gov/redmine/projects/components-db/wiki>