

# Introduction to DIRAC Data Management System

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# Why do you need DMS?

- **“In the beginning God created the Files and the Storage. Now the LHC was empty, darkness was over the surface of the deep. And God said ‘let there be beam’, and there was beam.” Genesis 1:1**
- **And now you are left with a shitload of files and storages to manage, just by yourself, without His help.**

# Data Management in DIRAC

- **All here**
- **You can:**
  - Abstract data from its location
  - Access it in many ways
  - Describe it (datasets, metadata)
  - Replicate it
  - Remove it
  - Lose it..

# DMS concepts

- **After all, it's all about "Files"**
- **Logical File Name (LFN)**
  - Unique identifier within DIRAC of a file
  - No "physical" existence
  - Described as a path  
"/lhcb/user/c/chaen/holidays2018/sexyBeach.jpg"
  - Starts with the VO name
  - Belongs to a user/group
  - **ONLY** way to refer to a file for users and other DIRAC systems

# DMS concepts

- **StorageElement**

- Abstraction of storage endpoints
- Where physical copies of LFN are stored
- (LFN,SE): **ONLY** way to refer to a specific replica for users and other DIRAC systems

- **FileCatalog**

- Namespace of DIRAC, based on LFN
- Metadata, replicas, datasets, etc

# StorageElement

- **Protocol & technology agnostic**
  - Based on plugins
- **Late URL resolution:**
  - (LFN,SE) is all you need
  - Physical move of SE are easy to handle, just configuration
- **All the definition is in the CS**
  - Configuration [details](#)

# StorageElement Config

```
CERN-EOS
{
  BackendType = eos # backend type of storage element
  SEType = T0D1 # Tape or Disk SE
  UseCatalogURL = True # used the stored url or generate it (default False)
  ReadAccess = True # Allowed for Read if no RSS enabled
  WriteAccess = True # Allowed for Write if no RSS enabled
  CheckAccess = True # Allowed for Check if no RSS enabled
  RemoveAccess = True # Allowed for Remove if no RSS enabled
  GFAL2_SRM2 # Protocol section
  {
    Host = srm-eoslhcb.cern.ch
    Port = 8443
    PluginName = GFAL2_SRM2 # If different from the section name
    Protocol = srm # primary protocol
    Path = /eos/lhcb/grid/prod # base path
    Access = remote
    SpaceToken = LHCb-EOS
    WUrl = /srm/v2/server?SFN=
  }
}
```

# StorageElement advanced

- **BaseStorageElement**
  - Factorize the configuration for common options (host, port, etc)
- **StorageElementGroup**
  - Group storages together, useful for big DM operations
- **Multi-protocol**
- **Accounting**
  - generalize SpaceToken concept
  - Plugin system (e.g. WLCG json accounting)



# StorageElement conclusion

- **Works for all protocols**
  - SRM2, xroot, gsiftp, https, etc
  - It's just a plugin
- **Works for “standard” storage technologies**
  - DPM, EOS, dCache, etc
- **Works for “special” storage technologies**
  - ECHO, CTA
  - It's just another plugin

# FileCatalog advanced

- **Configuration details**
- **Multiple catalogs**
  - Doable, and done (LHCb)
  - One catalog is the Master
- **Conditional FC**
  - Only use a given catalog under certain conditions
  - Conditions use plugins and Boolean algebra
  - *Use catalog if group = “user” and “holidayPictures” not in lfn*
- ***Exactly what you want to migrate to another catalog (totally random example: Rucio)***

# DFC

- **DIRAC comes with its own catalog**
  - Guess what DFC stands for...
- **Just like any other DIRAC service**
- **Full replica and metadata catalog**
  - Very useful for high level description “*data from run 1235 under condition Y*”
- **Complete doc [here](#)**

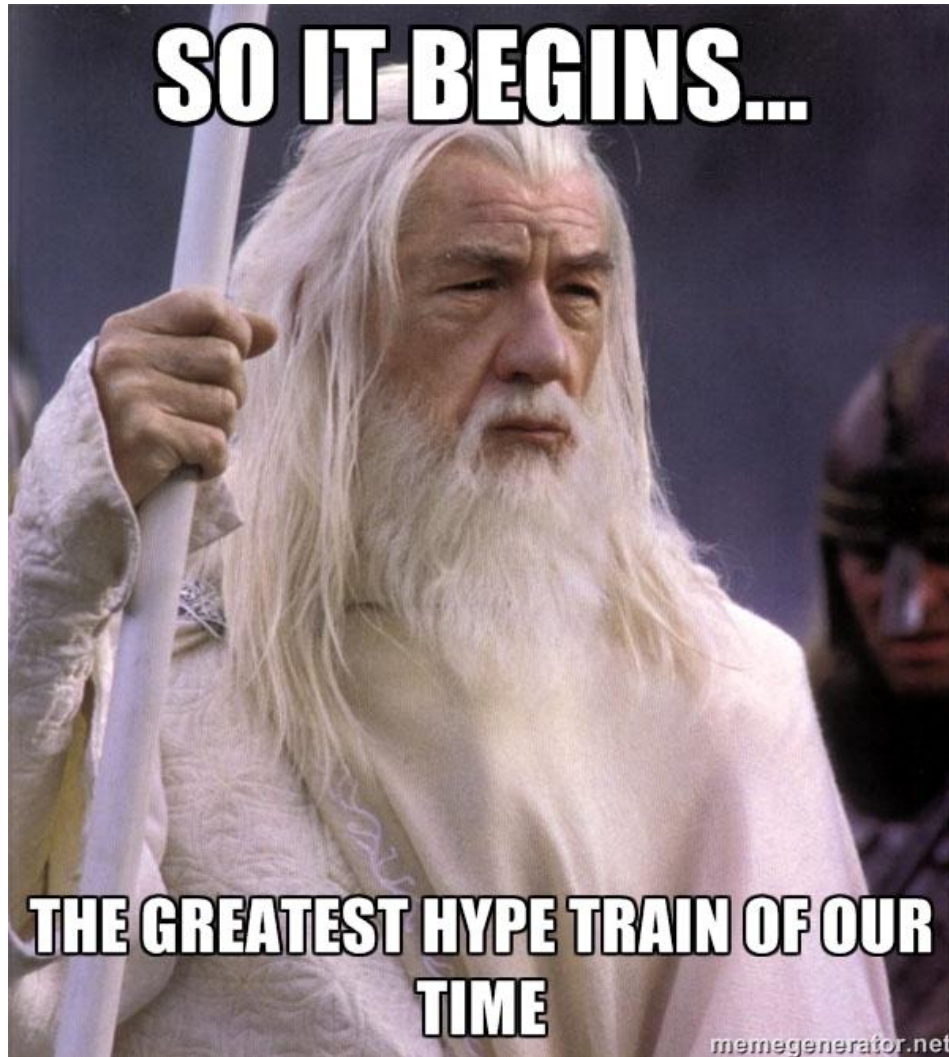
# FTS support

- **Used for large scale DM transfers**
  - <https://fts.web.cern.ch/fts/>
- **Copies the files from where you tell it to where you tell it to**
- **Obviously supported in DIRAC for all TPC transfers (doc [here](#))**
  - Scales (multiple agents possible)
  - MultiVO
- **Recent addon: plugins, to customize a lot of things ([doc](#))**

# How you drive the DM

- **Request Management System (RMS)**
  - Doc [here](#), older presentation [here](#)
  - Basically an asynchronous TODO list for anything, including transfers, removals, replications, etc
  - Feeds the FTS system
- **Transformation System (TS)**
  - Doc [here](#), older presentation [here](#)
  - Contains your workflow logic, based on plugins
  - Feeds the RMS

# Time for the hot topics



**Thanks to the 523 different working groups representing about 46833 ( $\mp 3\%$ ) FTE who came up with some of these concepts. Without them, I would have less slides**

# Multihop: let's get things straight!



# CTA (not the telescope)

- **CASTOR replacement**
- **Their ideal scenario:**
  - ALWAYS hop through EOS, never use CTA directly
- **Clearly not our ideal scenario**
  - It's a grid storage, so it must be usable to/from everywhere
- **Luckily, everybody is good willed**
- **Support in DIRAC**
  - In prod for LHCb
  - Yes, but...

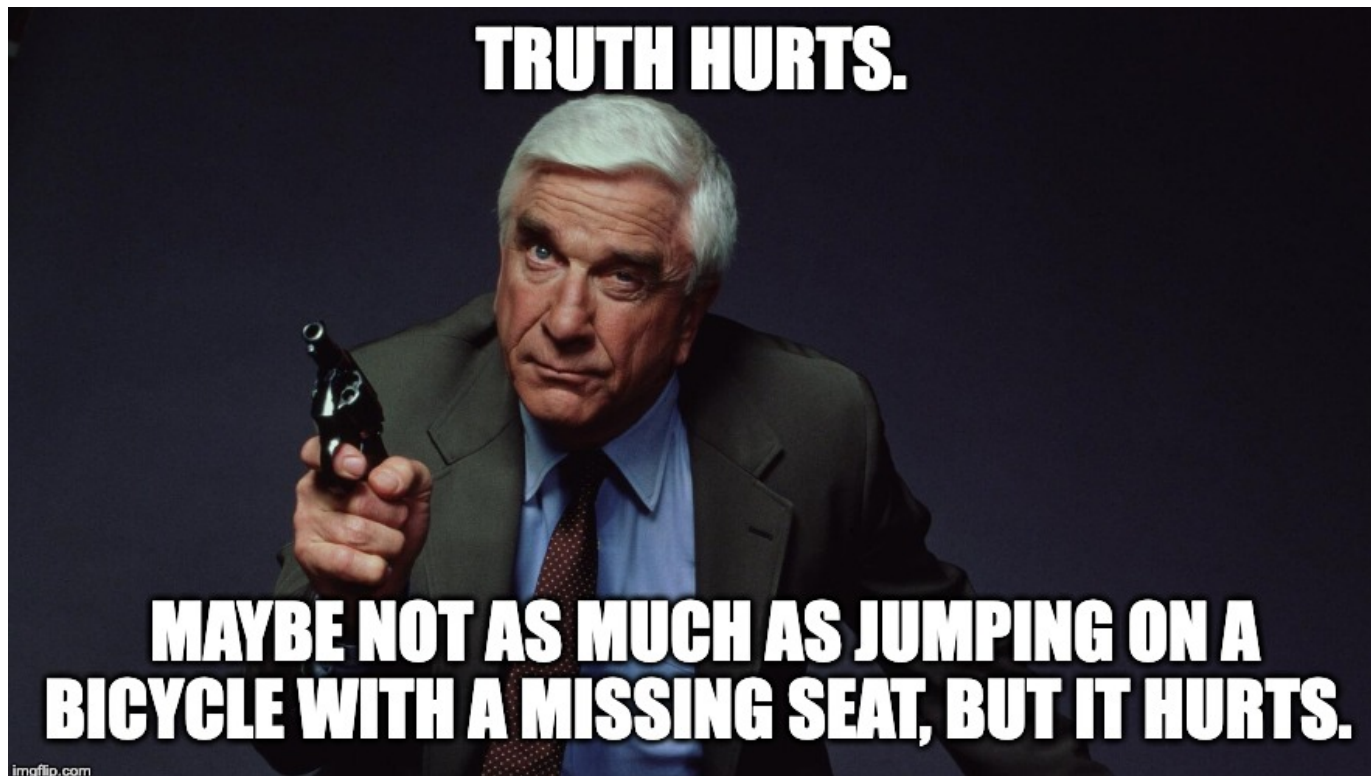


# CTA in DIRAC

- **Needs a special SE plugin (not a big deal)**
  - Basically, xroot with staging
  - See [here](#)
- **FTS replication**
  - Stage with xroot, transfer with https
  - Requires a hook on their side for cache eviction
  - More details [here](#)
  - Only until Storage providers implement https staging

# Data lake

- ???
- I am willing to pay a beer to anyone who explains me **ANYTHING** concrete about that



# Few more remarks

- **DIRAC provides a lot of building blocks**
  - Very easy to customize for your own workflow
  - That's what extensions are for (Belle II, ILC, LHCb, etc)
- **We clearly suck at documenting what exists**
  - Help us by simply asking !

# Few more remarks (2)

- **DIRAC DMS aims at being**
  - pragmatic
    - Anti bingo bullshit lobbyist
  - not Operation-FTE hungry
    - LHCb: 110 PB for a fraction of an FTE
  - Very modular
    - HTTPs TPC: 2 weeks from 0 to 100% adoption for disk storage (found quite a few xroot bug on the way)
- **Corollary: you should be pragmatic too and not hope for a “smart” software that will “magically” do and solve everything for you**

**Questions ?  
(yes, even the  
hype ones :-) )**