

Introduction to DIRAC Data Management System

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9th DIRAC Users Workshop
14/05/19

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
- **Fully integrated to RSS (see Federico's talk)**
- **Interface for space occupancy**
- **All the definition is in the CS**
 - Configuration [details](#)

StorageElement advanced

- **BaseStorageElement**
 - Factorize the configuration for common options (host, port, etc)
- **StorageElementGroup**
 - Group storages together, useful for big DM operations
- **Multi-protocol:**
 - Copy from A to B guaranteed, no matter what
- **Accounting**
 - generalize SpaceToken concept
 - Plugin system (soon thanks to Belle II)

FileCatalog advanced

- **Configuration details**
- **Multiple catalogs**
 - Doable, and done (LHCb)
 - One catalog is the Master
 - Involves consistency checks
- **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*

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](#)**

DMS tutorial tomorrow



You see, in this world there's two kinds of experiment, my friend: those with a DataManager and the very small ones.

BACKUP SLIDES

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=
  }
}
```



- Additional information to classify directory/file content with a key/value store
- Can be set per directory or per file
- Directory metadata inherited in sub-directories, must be unique in hierarchy
- Can be anything (text, numbers)
- Can be used to find files via script or for transformations

- In the *dirac-dms-filecatalog-cli*: `help meta`
- Create a new key: `meta index`
- Set a value: `meta set`
- Get the metadata for lfn or directory: `meta get`
- Find LFNs:
 - ▶ *dirac-dms-filecatalog-cli*: `find`
 - ▶ The command *dirac-dms-find-lfns*

- **Highly configurable**
- **One Service, many backends**
 - Aspect oriented: 1 manager for Files, 1 for Folders, 1 for permissions, etc
- **Two main sets of managers**
 - Standard: full features, most used
 - LHCb: untested (=unsupported) features (metadata & datasets), optimized for performance, scaling & consistency

Let's get our hands dirty

- **What you need**

- 2 SEs:

- Just configuration lines in /Resources/StorageElements
 - DIRAC has its own SE implementation if you need a toy

- DFC:

- 1 service + its configuration
 - A database
 - Declare it as a Catalog in /Resources/FileCatalogs

Let's get our hands dirty

```
$dirac-dms-add-file /lhcb/user/c/chaen/sexyBeach.jpg sexyBeach.jpg CERN-USER
Successfully uploaded sexyBeach.jpg to CERN-USER (1.1 seconds)

$dirac-dms-replicate-lfn /lhcb/user/c/chaen/sexyBeach.jpg RAL-USER
Successful :
RAL-USER :
  /lhcb/user/c/chaen/sexyBeach.jpg :
    register : 0.553272008896
    replicate : 9.3123319149

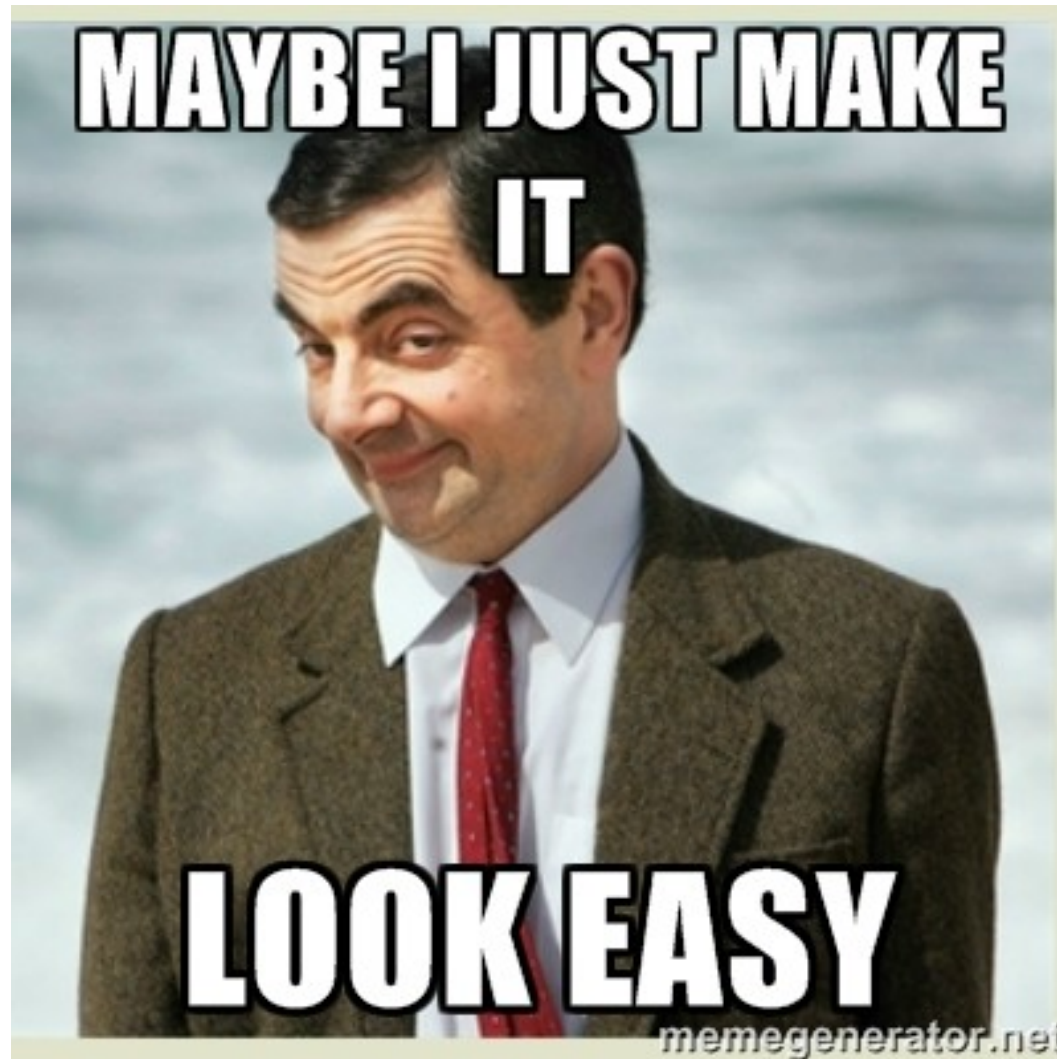
$dirac-dms-lfn-replicas /lhcb/user/c/chaen/sexyBeach.jpg
Successful :
  /lhcb/user/c/chaen/sexyBeach.jpg :
    CERN-USER : srm://srm-eoslhcb.cern.ch:8443/srm/v2/server?SFN=/eos/lhcb/grid/user/lhcb/user/c/chaen/sexyBeach.jpg
    RAL-USER : srm://srm-lhcb.gridpp.rl.ac.uk:8443/srm/managerv2?SFN=/castor/ads.rl.ac.uk/prod/lhcb/user/c/chaen/sexyBeach.jpg

$dirac-dms-lfn-metadata /lhcb/user/c/chaen/sexyBeach.jpg
Successful :
  /lhcb/user/c/chaen/sexyBeach.jpg :
    Checksum : 25bb9869
    ModificationDate : 2018-05-18 12:21:23
    Owner : chaen
    Size : 1298
    [...]

$dirac-dms-pfn-metadata /lhcb/user/c/chaen/sexyBeach.jpg RAL-USER
Getting replicas for 1 files : completed in 5.8 seconds
Getting SE metadata of 1 replicas : completed in 1.1 seconds
Successful :
  /lhcb/user/c/chaen/sexyBeach.jpg :
    RAL-USER :
      Accessible : True
      Cached : 1
      Checksum : 25bb9869
      [...]

$dirac-dms-remove-files /lhcb/user/c/chaen/sexyBeach.jpg
Removing 1 files : completed in 4.1 seconds
Successfully removed 1 files
```

You're done!



You're done!

- **It REALLY is that easy**
- **With this setup:**
 - User can play with their files
 - Jobs can have input/output data
 - Etc
- **But you would struggle for the management of big amount of data...**

**DataManager
knighting
ceremony tonight
at the bar !**