

Software and computing contributions for HK

October 17th 2019

Computing: 20 M hours.CPU

→variable quota fraction is used (<50%)

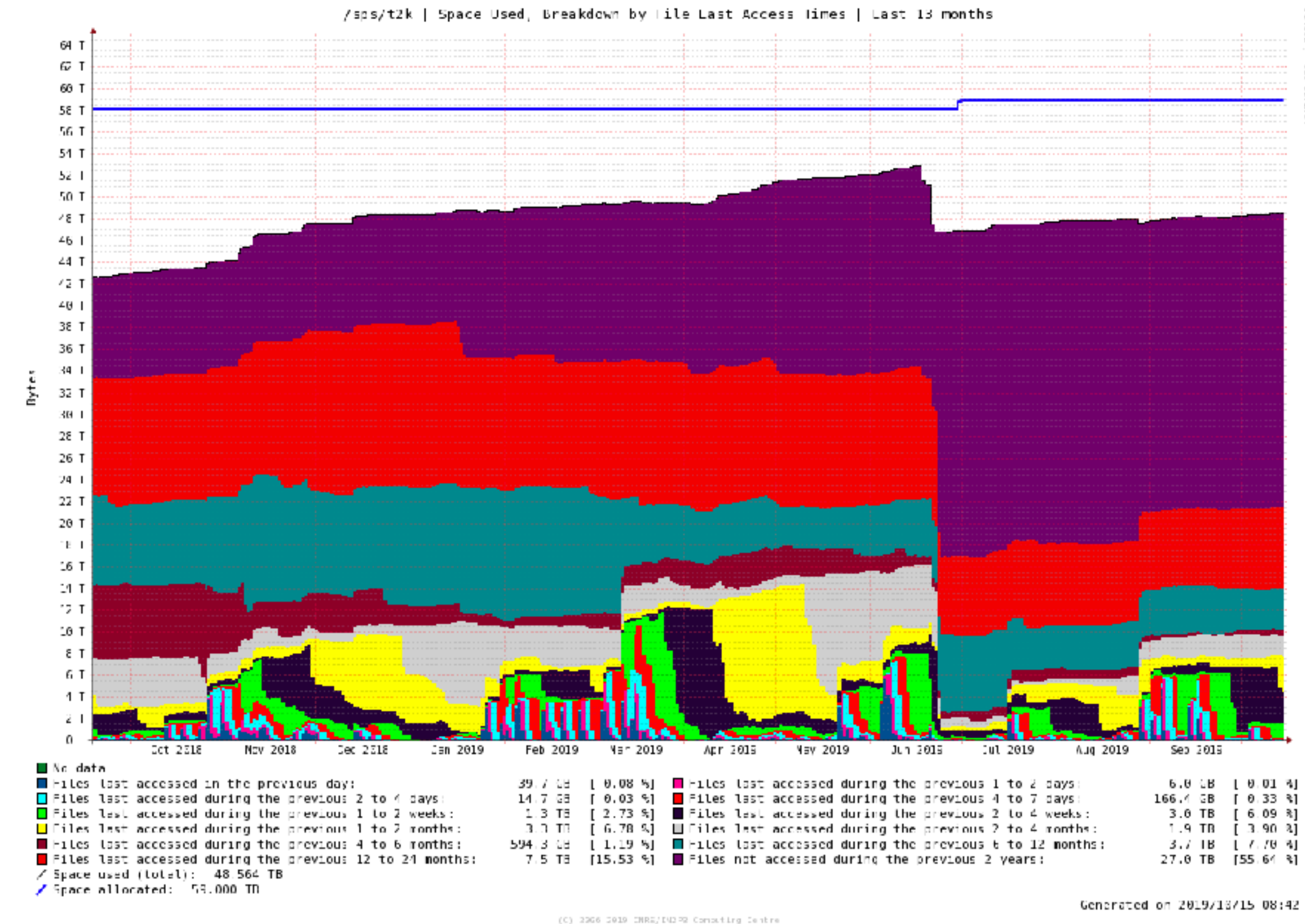
Storage at CC-IN2P3: 59 TB

→suppression of some old files

Locally stored prod. files: 27 TB

→"free and share resources" policy

→As more space is efficiently shared/used, requests for space will be easier!



Integration of computing resources into DIRAC

- sharing computing time (progressively) to meet production needs
- share storage for production files (>50% current storage)

Request for more storage

- additional 73TB granted for storage of computing results

New computing model (thanks to JENNIFER-II)

- Docker/Singularity image-based job submission for production
 - Already used by PNNL people for Belle-II/Project 8 (maybe others)
- (More) tools to facilitate user DIRAC experience
 - unique entry point for job submission

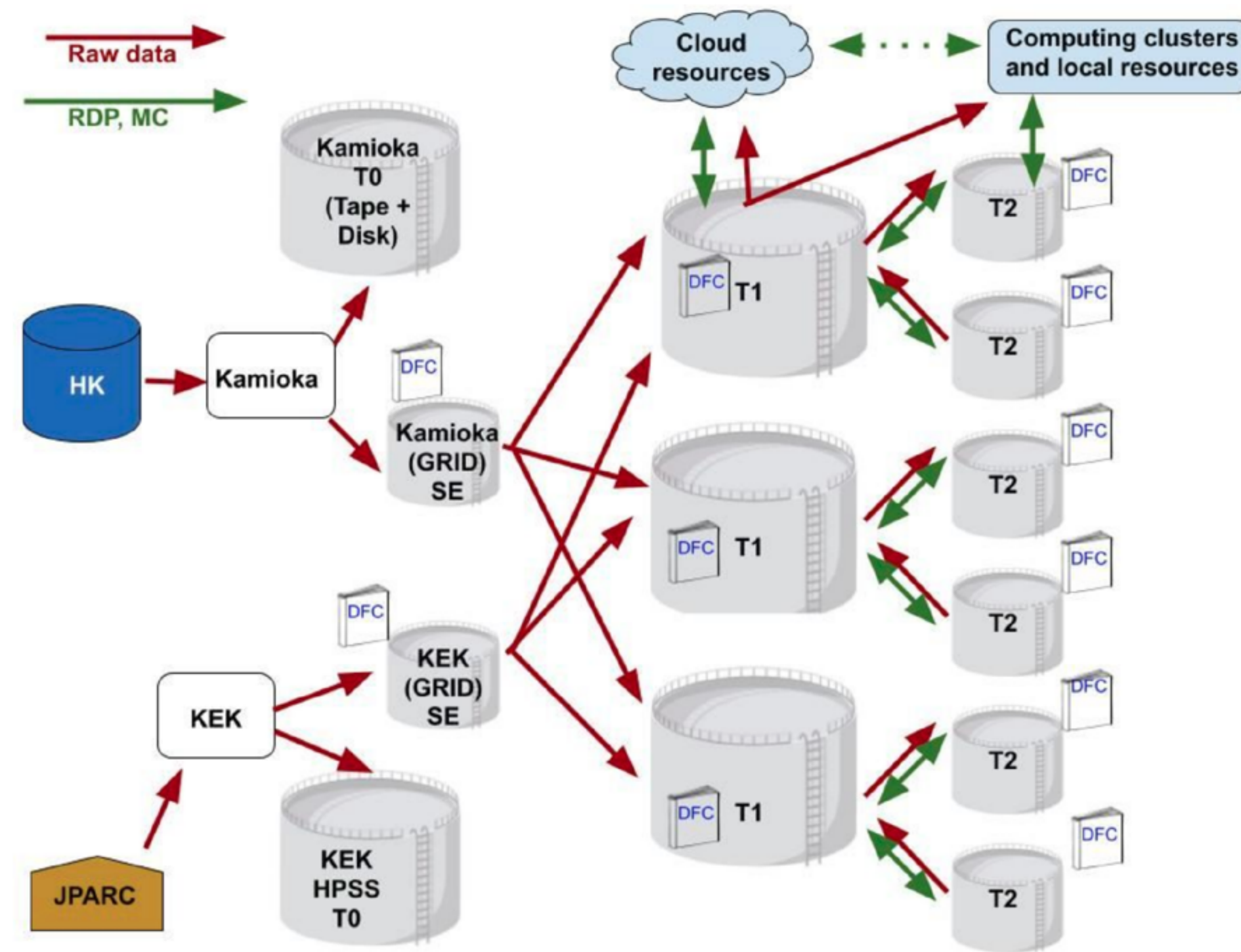
Model description: [here](#)

Resources shared via DIRAC

Software shared via CVMFS

iRODS for data transfer between clusters

Very similar to Belle-II's
Similar issues with other
experiments (LSST, CTA...)
→ obvious synergies



Resources shared over 17 countries

First 10 years of operations:

→ 25 PB (data + MC — mostly FD)

→ 8800 MCPU.hours

(minimal with one copy of each file)

Each T1 site don't hold all data

→ replica on at least one T1 site and one T2 site

→ cloud computing?

	Construction (MC, 7y)	
Detector	CPU hrs	Storage (TB) (One copy of each file)
Hyper-K (FD)	20M	500
INGrid	0.13M	7
ND280	19.2M	2250
IWCD	97M	52
Flux	KEKCC	15
Total	133.43M	2,824 (~2.8 PB)

	Data Taking (Data, 10y)	Data Taking (MC, 10y)	
Detector	Data Storage (TB) (One copy of each file)	MC CPU hrs	MC Storage (TB) (One copy of each file)
Hyper-K (FD)	18,300 + 140 reduced	25M	500
INGrid	226	0.51M	26
ND280	669	42.2M	4,950
IWCD	620	684M	367
Flux	N/A	KEKCC	15
Total	19,815 (~19.9 PB)	751.71M	5,858 (~5.9 PB)

Dirac for Data management system

CC-IN2P3 is already Tier1 for LHC (WLCG)

→ infrastructure available, need resources

Could we become Tier 1 for HK?

→ Conveners think this would be appropriate...

Use of tape for long term storage: virtually very very large!

→ Store low-rate access data on tape (raw data/data acquired during construction?)

→ Build-up requests for storage needed by production

Setup and maintain tools for job submission and data managements

→ DIRAC file catalog, web interface, job submission for production...

→ A lot of expertise within IN2P3 (DIRAC core developers etc)

→ Useful for other IN2P3 experiments

Backup

File replication details

Detector	Numbers of file copies		
	Construction (MC)	Data Taking (raw data)	Data Taking (MC/RDP)
HK FD	$\text{Tier1}_{\text{HK}} + n \text{ Tier2}_{\text{HK}}$	$\text{Tier0}_{\text{HK}} + 2 \text{ Tier1}_{\text{HK}}$	$\text{Tier1}_{\text{HK}} + n \text{ Tier2}_{\text{HK}}$
INGrid	$\text{Tier1}_{\text{IN}} + n \text{ Tier2}_{\text{IN}}$	$\text{Tier0}_{\text{IN}} + 2 \text{ Tier1}_{\text{IN}}$	$\text{Tier1}_{\text{IN}} + n \text{ Tier2}_{\text{IN}}$
ND280	$\text{Tier1}_{\text{ND}} + n \text{ Tier2}_{\text{ND}}$	$\text{Tier0}_{\text{ND}} + 2 \text{ Tier1}_{\text{ND}}$	$\text{Tier1}_{\text{ND}} + n \text{ Tier2}_{\text{ND}}$
IWCD	$\text{Tier1}_{\text{WC}} + n \text{ Tier2}_{\text{WC}}$	$\text{Tier0}_{\text{WC}} + 2 \text{ Tier1}_{\text{WC}}$	$\text{Tier1}_{\text{WC}} + n \text{ Tier2}_{\text{WC}}$
Flux	$\text{Tier1}_{\text{F1}} + n \text{ Tier2}_{\text{F1}}$	$\text{Tier0}_{\text{F1}} + 2 \text{ Tier1}_{\text{F1}}$	$\text{Tier1}_{\text{F1}} + n \text{ Tier2}_{\text{F1}}$

Table 2: File replication for the Hyper-K raw data, RDP and MC production for the construction and data taking periods. Tier0 sites are in Japan, whilst Tier1 and Tier2 are overseas. Different labels indicate the tiers for the different detectors.