

DYNAFED in Napoli

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Pre-GDB on DYNAFED

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Outline

- Global Dynafed for Belle II
- Dynafed+Cache R&D
- New Plug-in exercise for Dynafed

Global Dynafed Server for Belle II



#	STORGE NAME	HOSTNAME	TYPE
1	DESY-DE	dcache-belle-webdav.desy.de	DCACHE
2	GRIDKA-SE	f01-075-140-e.gridka.de	DCACHE
3	NTU-SE	bgrid3.phys.ntu.edu.tw	DCACHE
4	SIGNET-SE	dcache.ijs.si	DCACHE
5	UVic-SE	charon01.westgrid.ca	DCACHE
6	BNL-SE	dcblldoor01.sdcc.bnl.gov	DCACHE
7	Adelaide-SE	coepp-dpm-01.ersa.edu.au	DPM
8	CESNET-SE	dpm1.egee.cesnet.cz	DPM
9	CYFRONNET-SE	dpm.cyf-kr.edu.pl	DPM
10	Frascati-SE	atlasse.Infn.infn.it	DPM
11	HEPHY-SE	hephyse.oeaw.ac.at	DPM
12	Melbourne-SE	b2se.mel.coepp.org.au	DPM
13	Napoli-SE	belle-dpm-01.na.infn.it	DPM
14	ULAKBIM-SE	torik1.ulakbim.gov.tr	DPM
15	IPHC-SE	sbgse1.in2p3.fr	DPM
16	LAL	grid05.lal.in2p3.fr	DPM
17	CNAF-SE	ds-202-11-01.cr.cnaf.infn.it	STORM
18	ROMA3-SE	storm-01.roma3.infn.it	STORM
19	KEK-SE	Kek-se03.cc.kek.jp	STORM

Dynafed on CENTOS7 in the production cloud

<https://dynafed-prod01.na.infn.it/myfed>

VM 8 Cores 16GB RAM.

19 Storages

Proxy generated by a robot certificate

Testing

<https://dynafed-belle.na.infn.it/myfed/>

Federation Views

Two new views as been created

- **myfed/PerSite/** Shows the file systems of each storage separately (without aggregation)
- **myfed/belle/** Aggregation of all the directory /DATA/belle and /TMP/belle/

/myfed/PerSite/

Mode	Links	UID	GID	Size	Modified	Name
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	Adelaide
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	BNI
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	CESNET
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	CNAF
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	CYFRONET
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	DESY
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	Frascati
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	GRIDRA
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	HEPHY
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	IPHC
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	KEK
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	LAL
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	Melbourne
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	Napoli
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	ROMA3
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	SIGNET
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	ULAKBIM
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	Uvic

/myfed/belle/

Mode	Links	UID	GID	Size	Modified	Name
drwxrwxr-x	0	0	0	0	Fri, 23 Dec 2016 10:31:40 GMT	DATA
drwxrwxr-x	0	0	0	0	Thu, 24 Sep 2015 18:25:16 GMT	DC
drwxrwxr-x	0	0	0	0	Fri, 23 Mar 2018 13:20:50 GMT	DR3
drwxrwxr-x	0	0	0	0	Thu, 14 Jan 2016 08:10:56 GMT	Data
drwxrwxr-x	0	0	0	0	Fri, 29 Mar 2019 16:26:55 GMT	MC
drwxrwxrwx	0	0	0	0	Sat, 08 Jun 2019 01:44:56 GMT	Raw
drwxrwxrwx	0	0	0	0	Wed, 07 Jan 2015 05:00:56 GMT	data
drwxrwxr-x	0	0	0	0	Tue, 15 Mar 2016 22:01:49 GMT	ddm_test
drwxrwxr-x	0	0	0	0	Fri, 15 Jan 2016 05:22:02 GMT	group
-rwxrwxrwx	0	0	0	10	Mon, 20 Jun 2016 16:40:12 GMT	kfox-hello.txt
drwxrwxr-x	0	0	0	0	Tue, 15 Sep 2015 04:29:24 GMT	monitor
-rwxrwxrwx	0	0	0	108	Thu, 04 Jul 2019 09:05:34 GMT	occupancy.json
drwxrwxr-x	0	0	0	0	Tue, 31 Jan 2017 17:06:20 GMT	test
drwxrwxr-x	0	0	0	0	Sat, 07 Jul 2018 00:43:50 GMT	user
drwxrwxrwx	0	0	0	0	Wed, 22 Mar 2017 17:55:14 GMT	v

Dynafed + Cache R&D

Goal of the activity is to setup and test an HTTP Caching system and investigate how to integrate it in the HEP computing model.

- SCoRES GARR Project (finished 14 Feb 2019)
- IDDLs (Italian Distributed Data Lake for Science) INFN Internal project
- XDC (European project)

Silvio Pardi – Project Tutor for INFN-Napoli

Davide Michelino - XDC ex GARR

Bernardino Spisso – fellowship at INFN

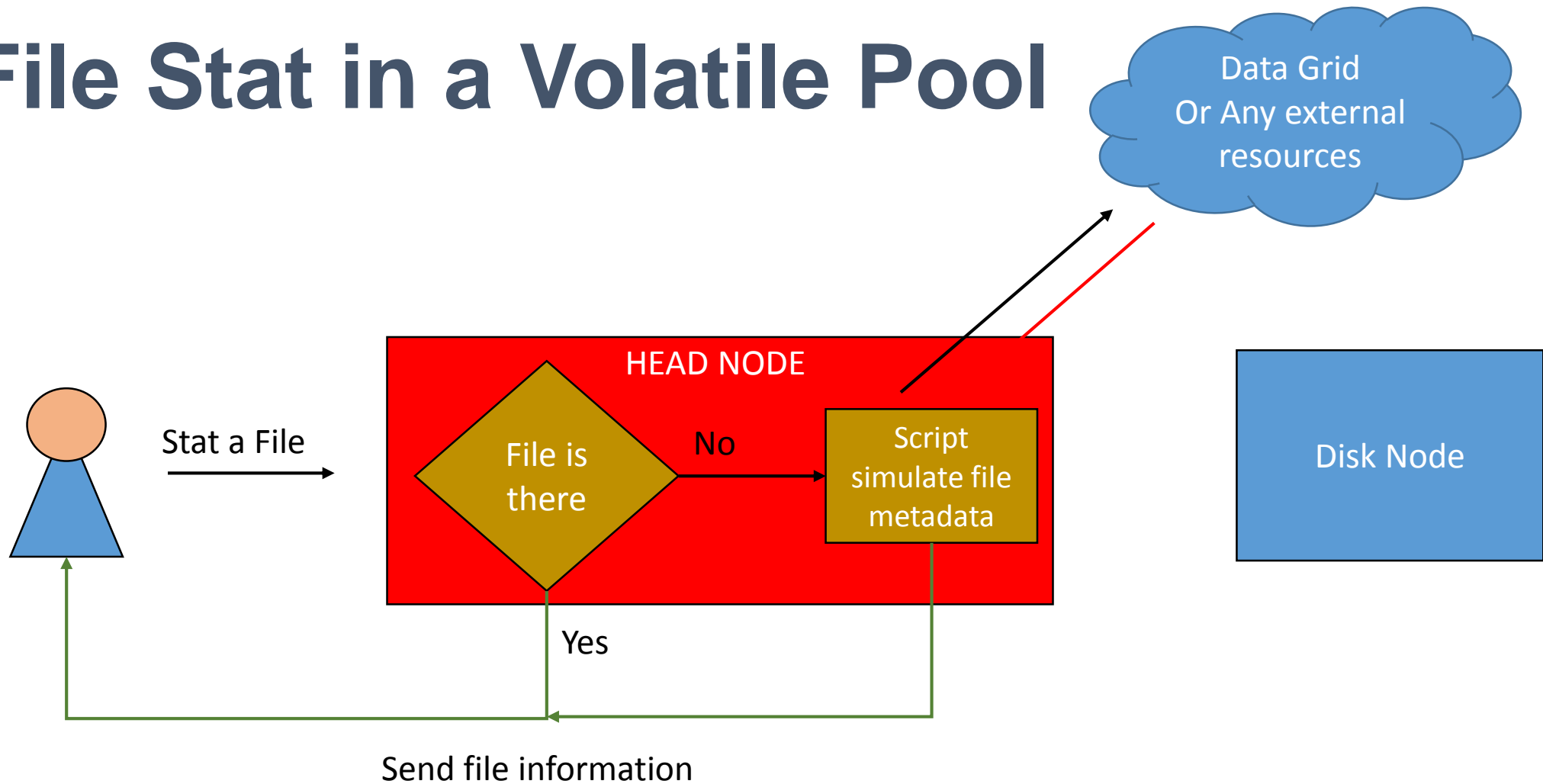
Concept of DPM Volatile Pool

A **Volatile Pool** is a special storage area in a DPM system that can download files from external sources when clients ask for them.

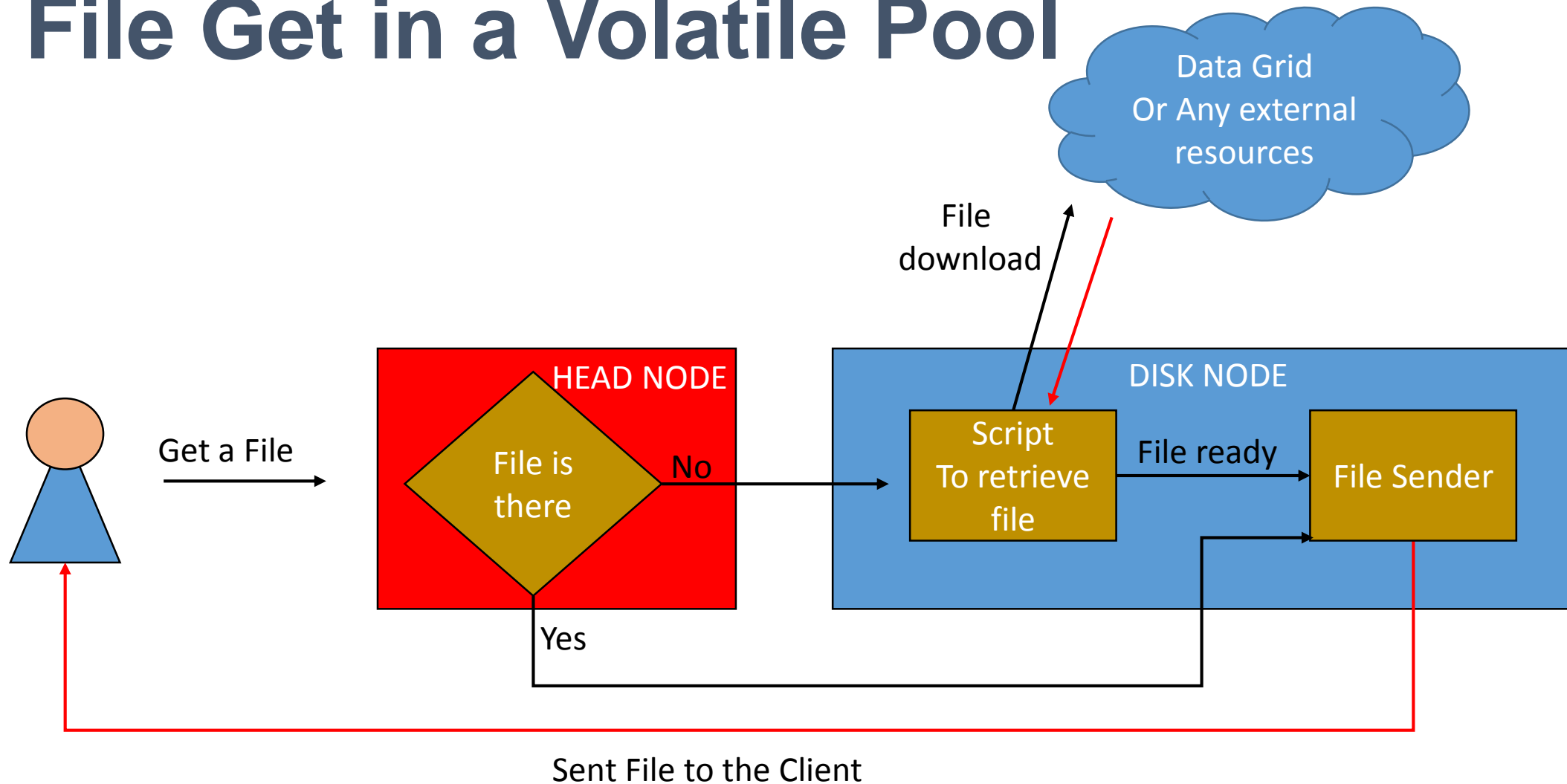
Two main scripts configurable by the system admin:

- **A script running on DPM head node that manages the stat operations**
- **A script running in Disk Nodes responsible to get file from external sources**

File Stat in a Volatile Pool



File Get in a Volatile Pool



Dynafed + Volatile Pool

-rwxrwxrwx	0	0	0	8.4G	Thu, 11 Feb 2016 18:41:21 GMT		10G_DC_097.dat
-rwxrwxrwx	0	0	0	9.8G	Thu, 11 Feb 2016 17:46:55 GMT		10G_DC_098.dat
-rwxrwxrwx	0	0	0	9.8G	Thu, 11 Feb 2016 17:50:56 GMT		10G_DC_099.dat
-rwxrwxrwx	0	0	0	9.8G	Thu, 11 Feb 2016 18:41:47 GMT		10G_DC_100.dat
-rw-rw-r--	0	0	0	10.9M	Sun, 10 Sep 2017 12:47:42 GMT		10MB-MGILL01
-rw-rw-r--	0	0	0	1023.0M	Wed, 13 Apr 2016 16:00:44 GMT		1G
drwxrwxrwx	0	0	0	0	Wed, 20 Jan 2016 22:13:37 GMT		
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 14:06:53 GMT		TEST-10GB-multi01
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 14:01:10 GMT		TEST-10GB-multi02
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 13:57:54 GMT		TEST-10GB-multi03
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 14:05:00 GMT		TEST-10GB-multi04
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 14:00:01 GMT		TEST-10GB-multi05
-rw-rw-r--	0	0	0	11.9G	Mon, 14 Nov 2016 14:05:51 GMT		TEST-10GB-multi06

Il file XML specificato apparentemente non ha un foglio di stile associato. L'albero del documento è mostrato di seguito.

```

--<metalink version="3.0" generator="lcgdm-dav" pubdate="Mon, 14 Nov 2016 14:01:10 GMT">
- <files>
- <file name="/belle-">
  <size>12778995712</size>
  - <resources>
  - <url type="https">
    https://recas-dpm-01.na.infn.it/dpm/na.infn.it/home/belle/cache/TEST-10GB-multi02
  </url>
  - <url type="https">
    https://dpm1.egee.cesnet.cz:443/dpm/cesnet.cz/home/belle/TMP/belle/user/spardi/testhttp/TEST-10GB-multi02
  </url>
  </resources>
  </file>
  </files>
</metalink>

```

Cache [0358_prod00000962](#)
[0360_prod00000962](#)

Real File

What happen if we aggregate a set of standard http endpoints with a DPM Volatile Pool?

When Dynafed stats a file, it receive always a positive answer from the Volatile Pool.

So that the metalink representing a file in Dynafed, will included always at least two links: the real URL, and the corresponding virtual copy in the cache (even if the latter does not exist yet)

Moreover thanks to the GeoPlugin, Dynafed prioritize the cache copy if the Volatile Pool is local to the Client or close to it.

This combination allow to create a cache system

Cache Implementation via DOME

Script on the Head Node:

The implemented script recognizes if the requested path is a file or a directory then reply to the client consequently. The plugin retrieve as well the size of the real copy of the file.

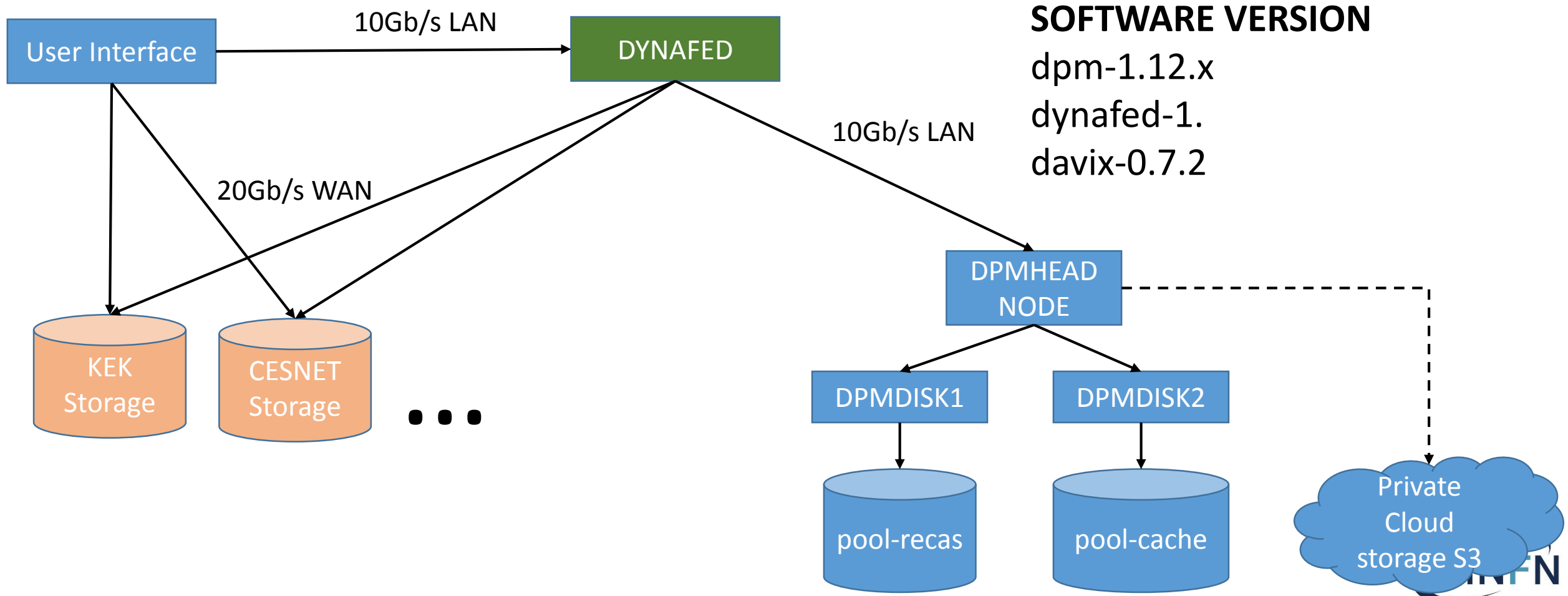
Script on the Disk Node:

When a file is not in the cache, the disk node download the requested file from the datagrid by resolving the location via Dynafed. (Using Robot Certificate registerd in the VO)

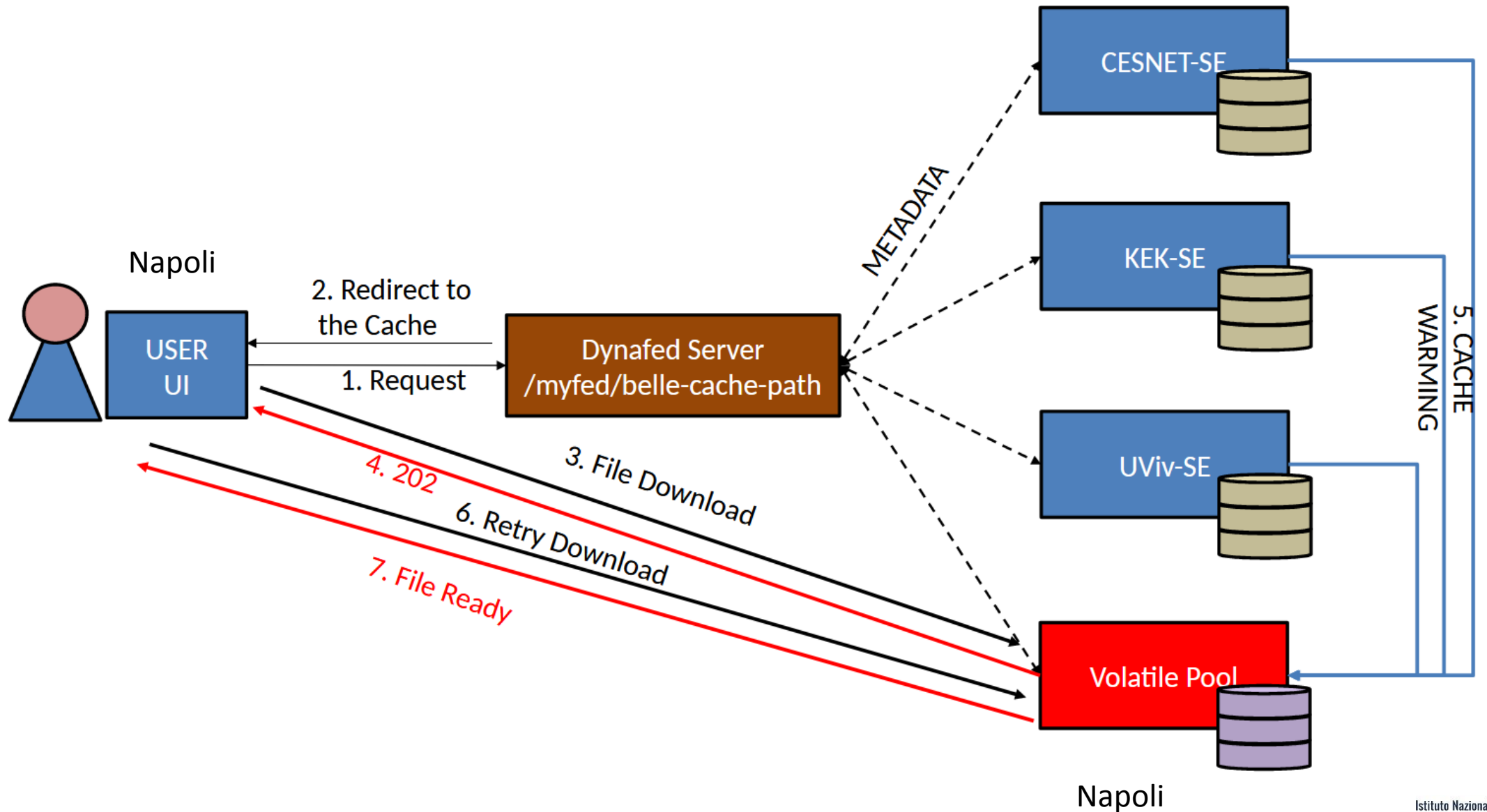
Client Behaviour

- If the file is not in cache or not ready yet, the client receives a 202 Message that ask for waiting.
- Davix or gfal clients will retry after a n-seconds (retry_delay) up to max_retry.
- Then the file will be downloaded from the volatile pool

The testbed



Implementation Detail



New filter Plugin exercise for Dynafed

Exercise done in the context of a BSC Thesis (not in production)

Develop two filter plugins for Dynafed able to prioritize replicas in a different way rather than the geographical distance between client and storage:

- **Price Plugin:** Which allows to associate an arbitrary weight to storages
- **Default Plugin:** Which allows to set an endpoint as default storage for the host of a network

The combined usage of those two plugins allows to design new scenarios

USE CASE Cloud Access



Object Storage Service Your ID ✕

Standard ▼

Capacity ? GB/Month = 2.30 €/month
= 0.02 €/gb/month i

Lifecycle Requests ? 1000 Requests = 0.00 €/month
= 0.004 €/1.000 requests

Outbound Traffic ? GB = 6.70 €/month
= 0.07 €/gb i

= 9.00 €/month

Your estimate

Object Storage Services

100 x obs	9.00 €
0 x osr	
100 x csto	

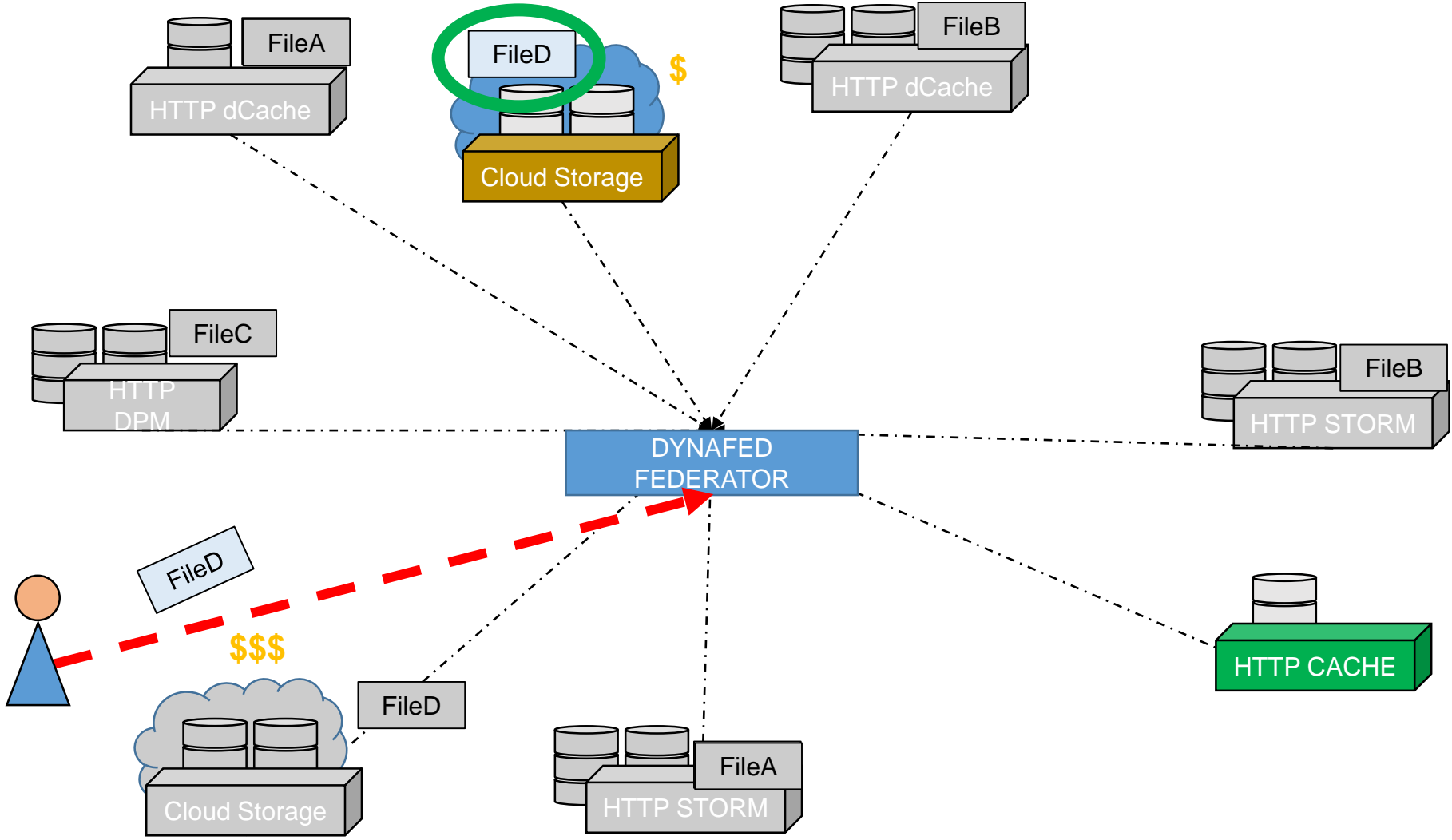
9.00 €

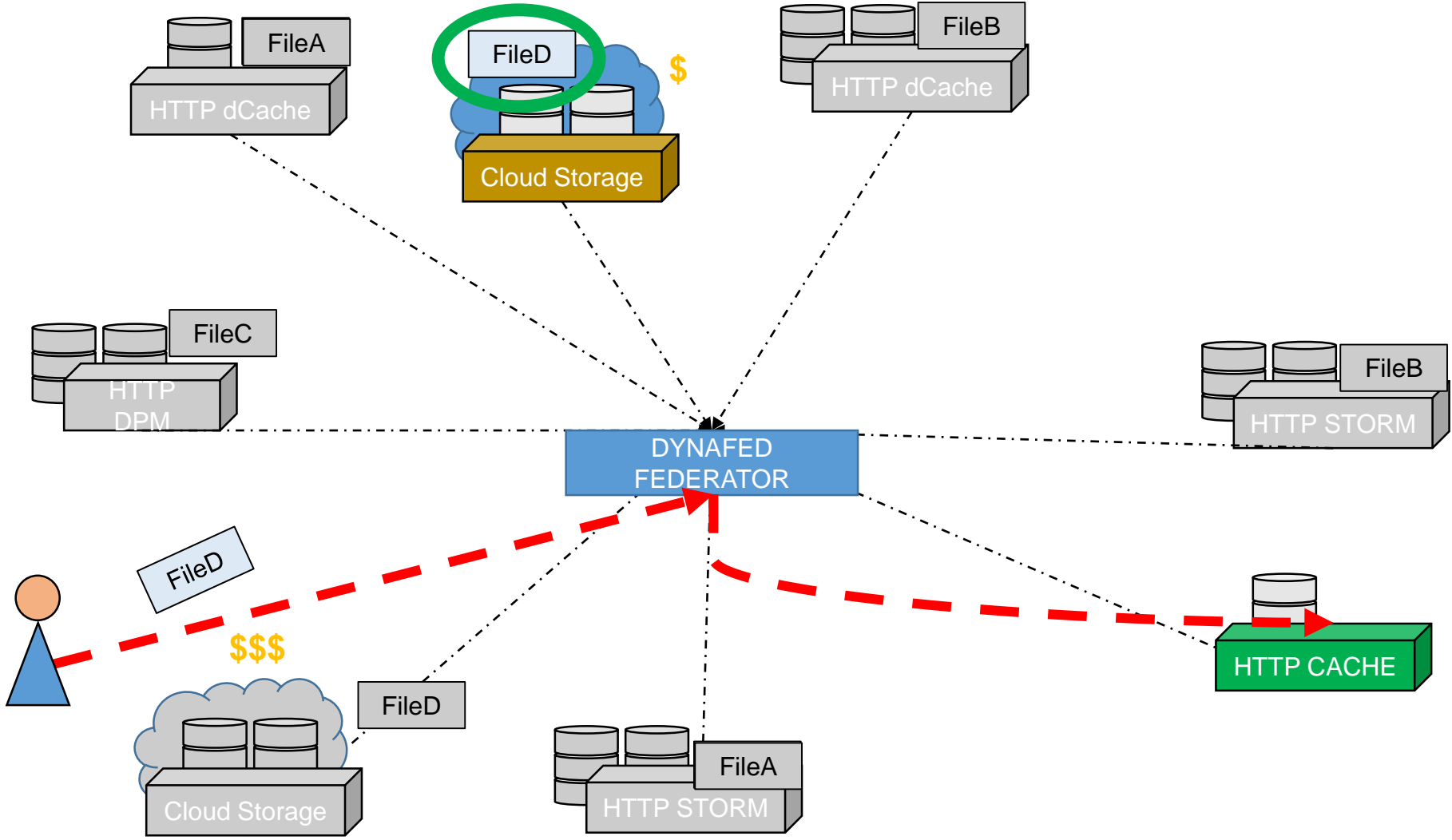
Estimated Open Elastic Price per month

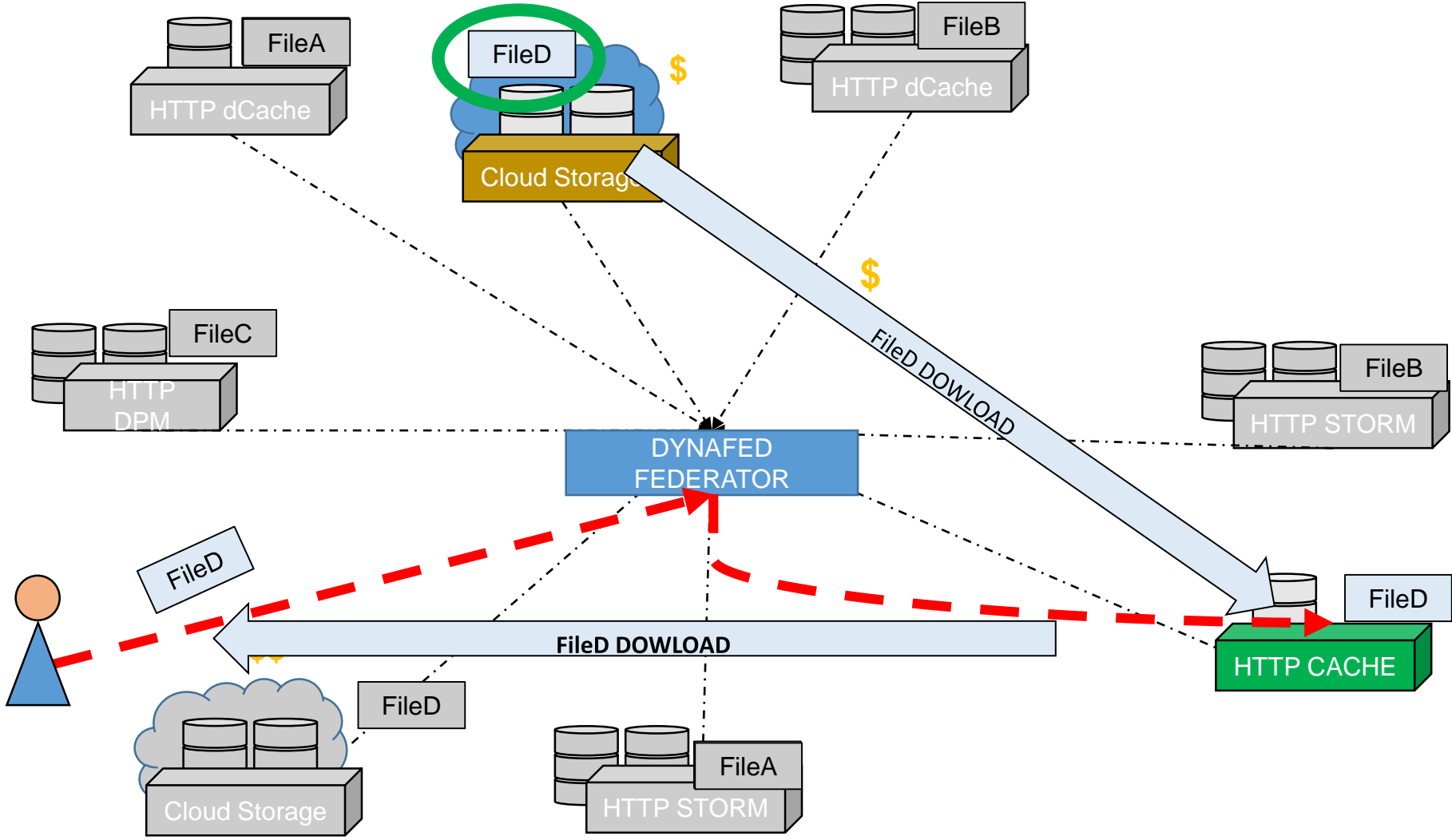
In the context of HNSC project we had the opportunity to simulate the cost of data access with a cloud storage.

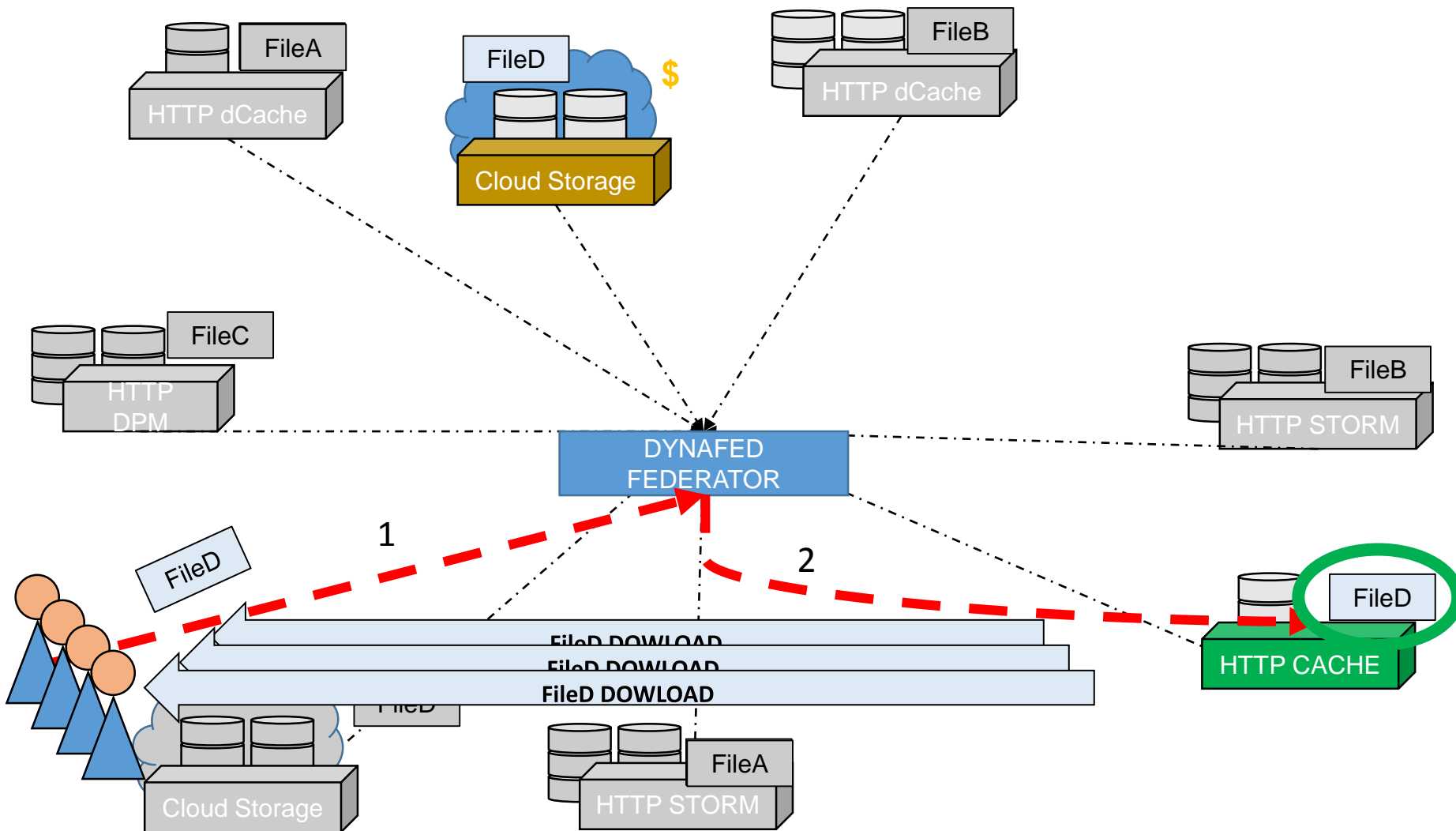
Copy 100GB of data from an S3 bucket may cost up to **6.7 Euro**

(Cloud T-system in Germania)









USE CASE Cloud Access

Configurazione PRICE Plugin

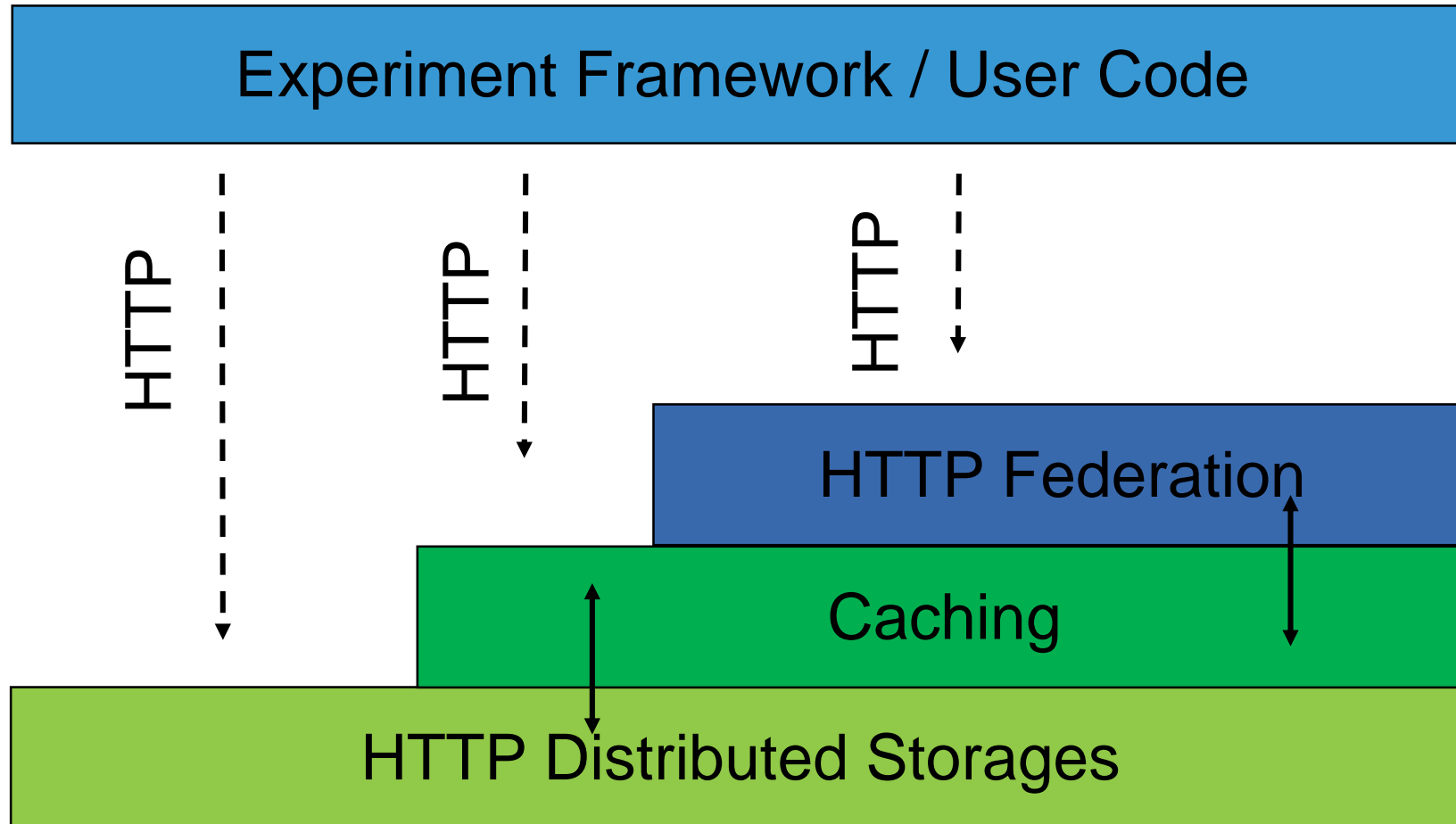
recas-dpm-01.na.infn.it	0.20 (CACHE)
dcache-belle-webdav.desy.de	0.40
kek2-se03.cc.kek.jp	0.50
dcache.ijs.si	0.50
charon01.westgrid.ca	0.50
dpm1.egee.cesnet.cz	0.50
davide.obs.otc.t-systems.com	0.80

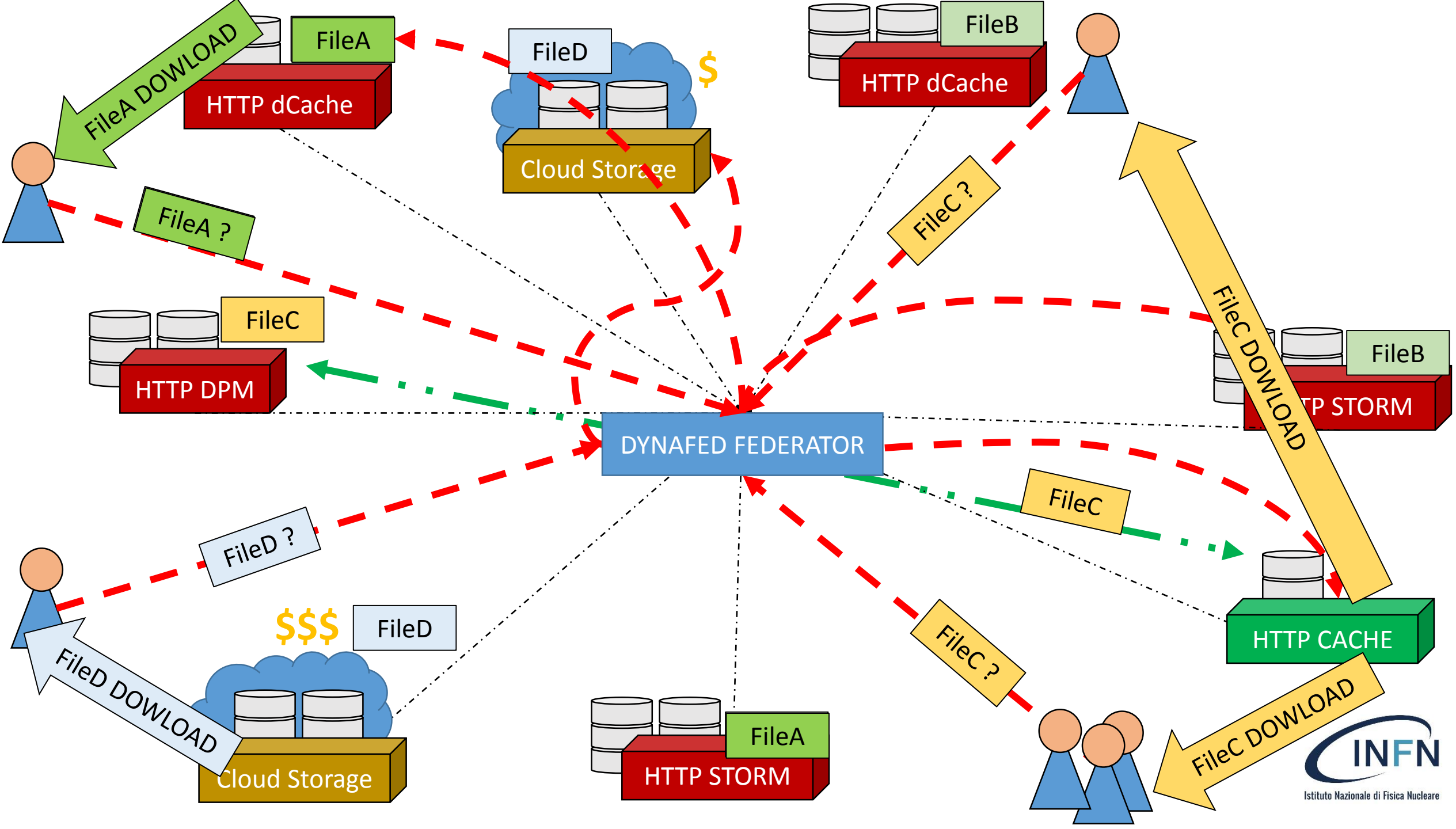
Configurazione Default Plugin

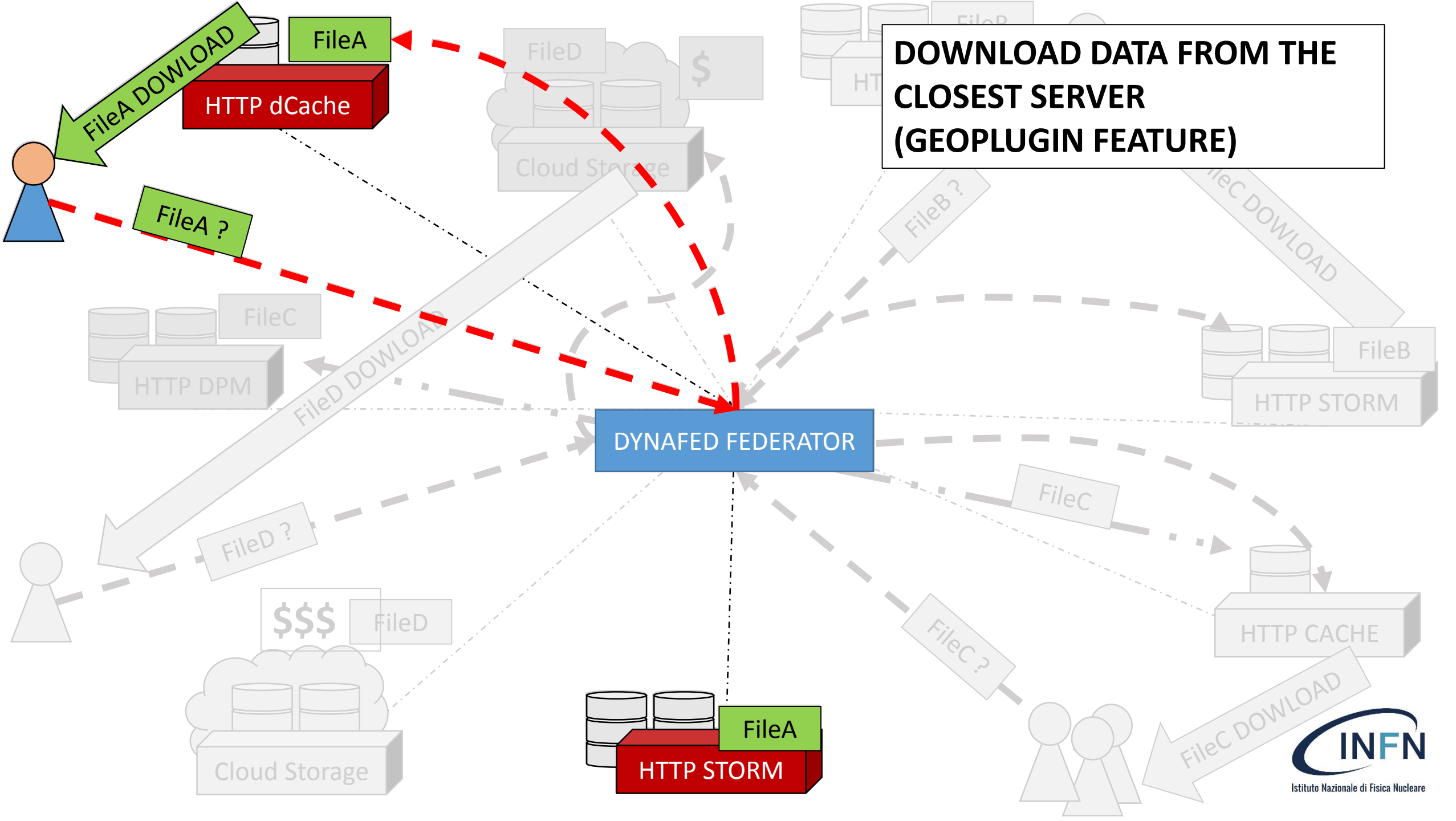
131.169.168	recas-dpm-01.na.infn.it (DESY Network)
79.23.	kek2-se03.cc.kek.jp

	Total Size (GB)	Plugin	First Access Cost	II Access	III access
CLOUD	100	GeoIP	6,7 €	6,7 €	6,7 €
SCORES-CACHE	100	GeoIP+Price/Default	6,7 €	0	0

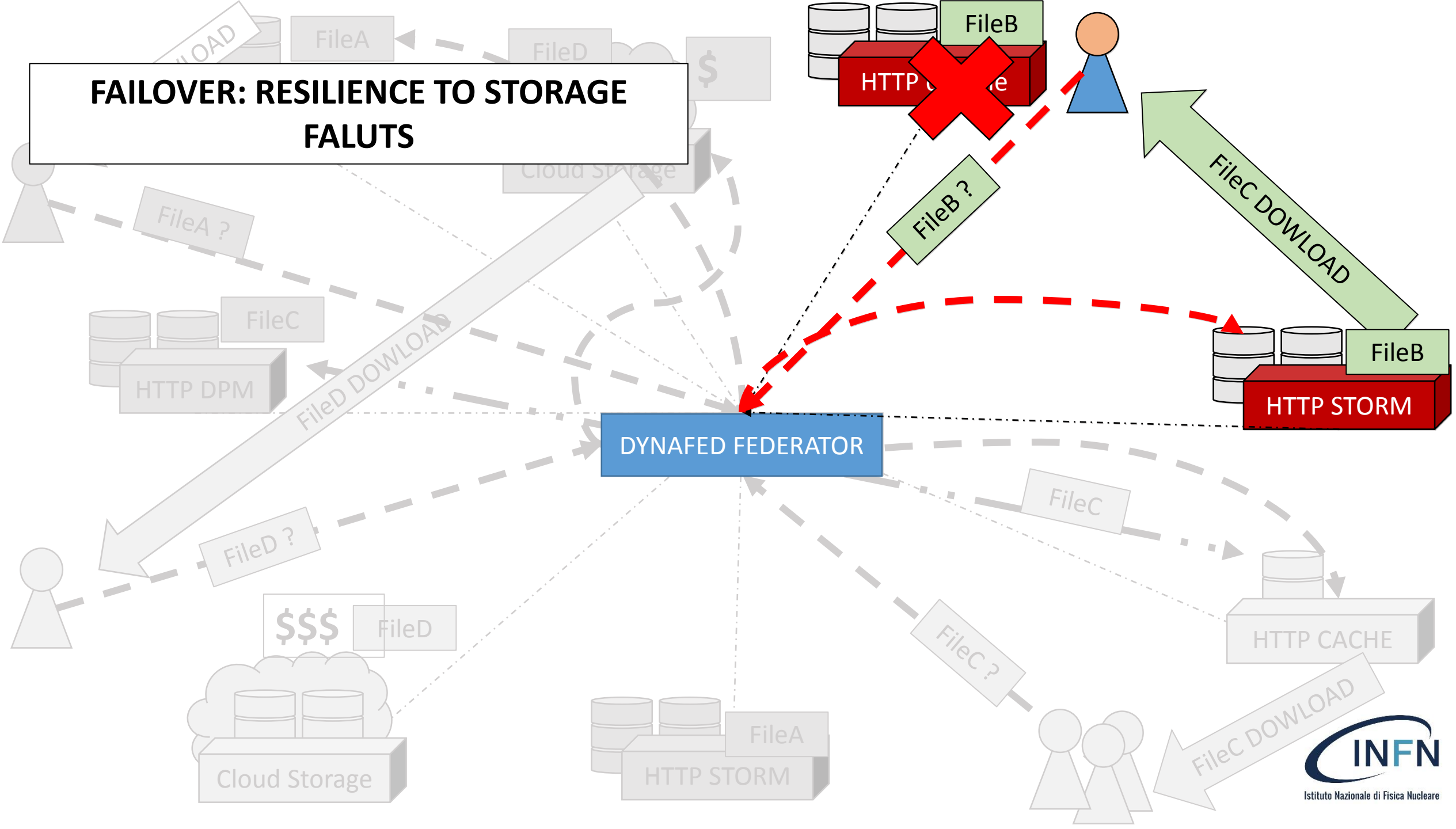
Cache Architecture

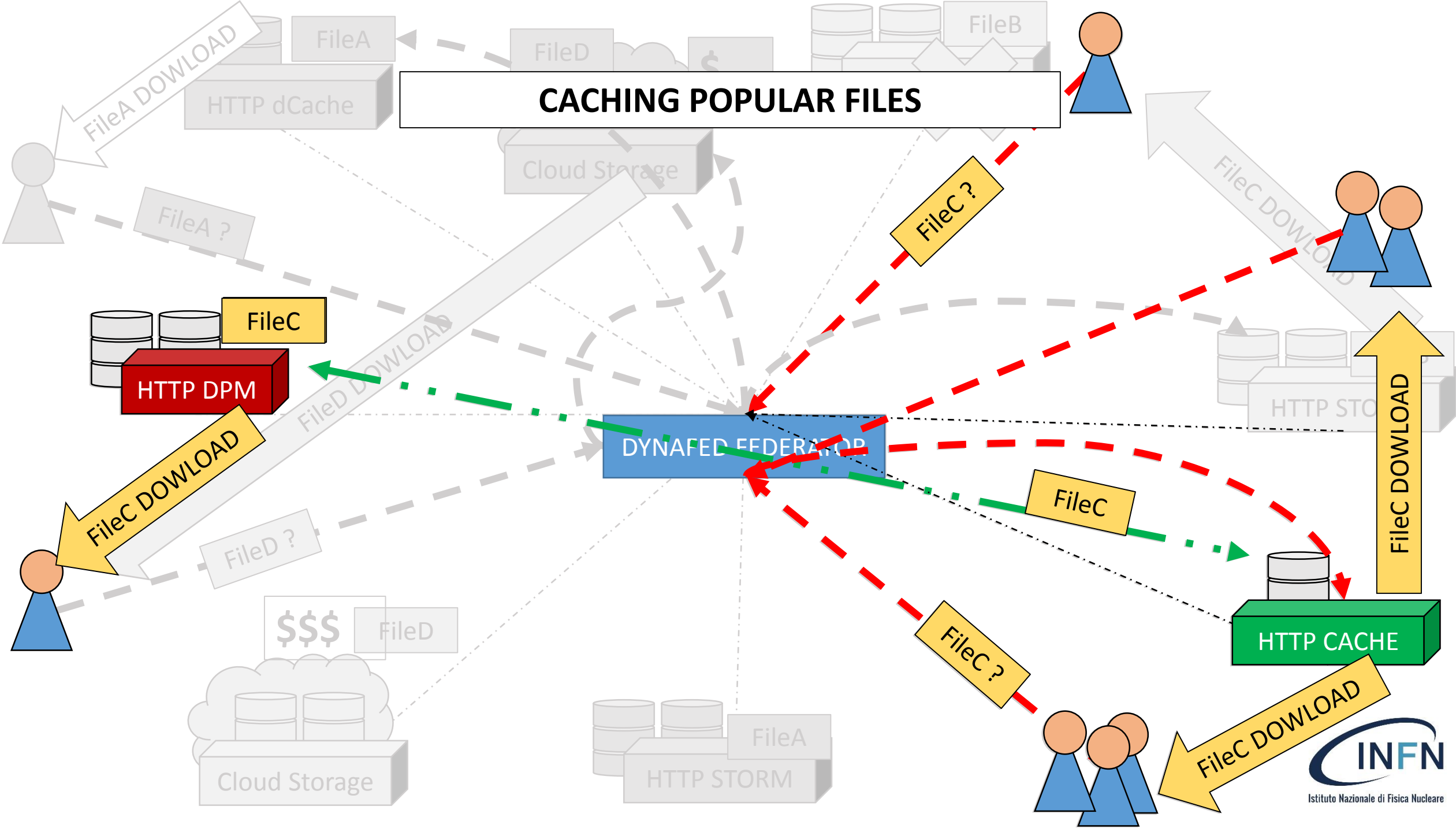




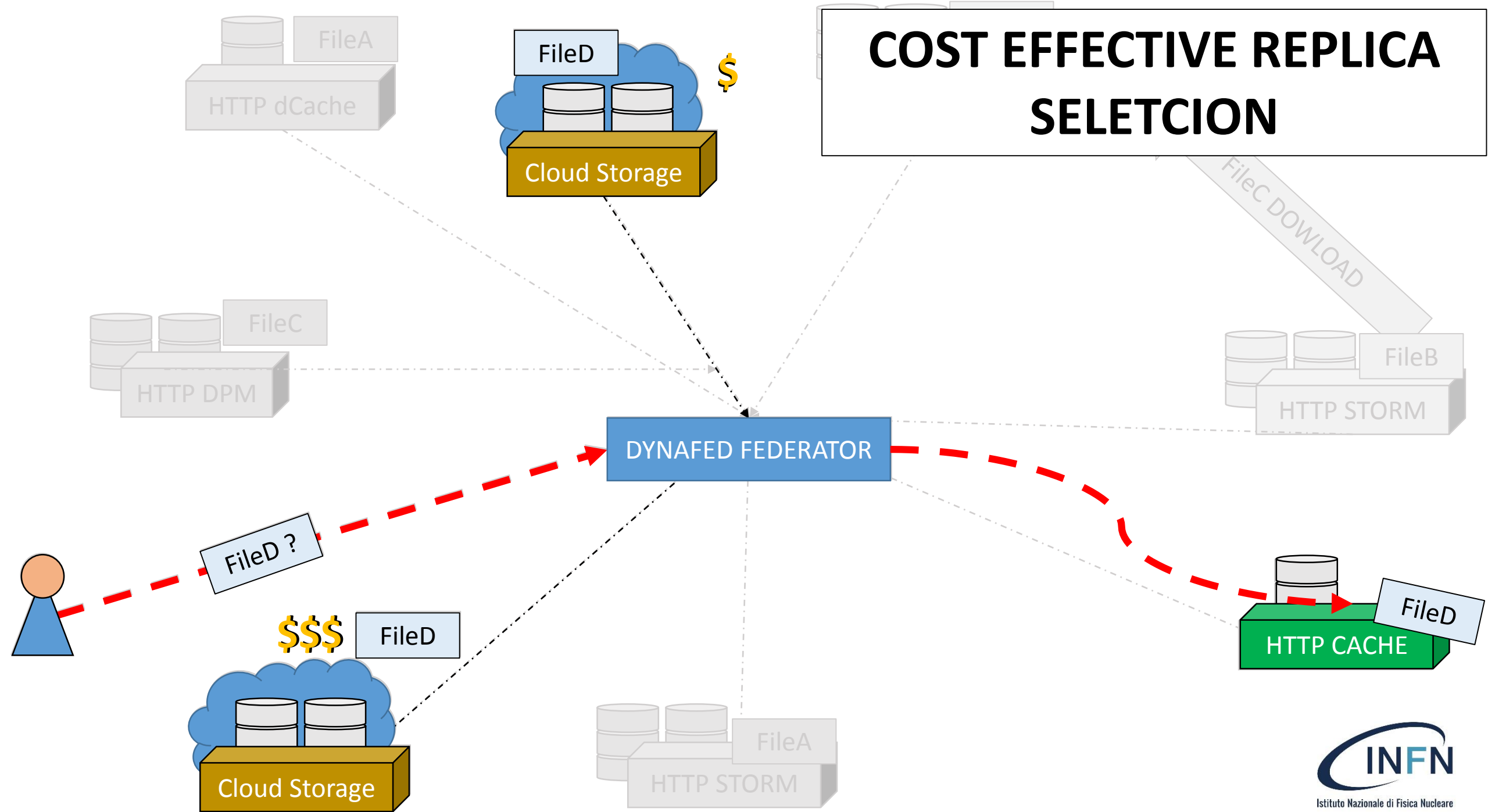


FAILOVER: RESILIENCE TO STORAGE FALUTS





COST EFFECTIVE REPLICA SELECTION



Dynafed consideration

Fast filesystem browsing

Fast redirection

Easy view to see the full file system

No specific effort required from the Site point of view

Dynafed usage consideration

How to integrate a global Dynafed server in HEP Computing Model and Framework?

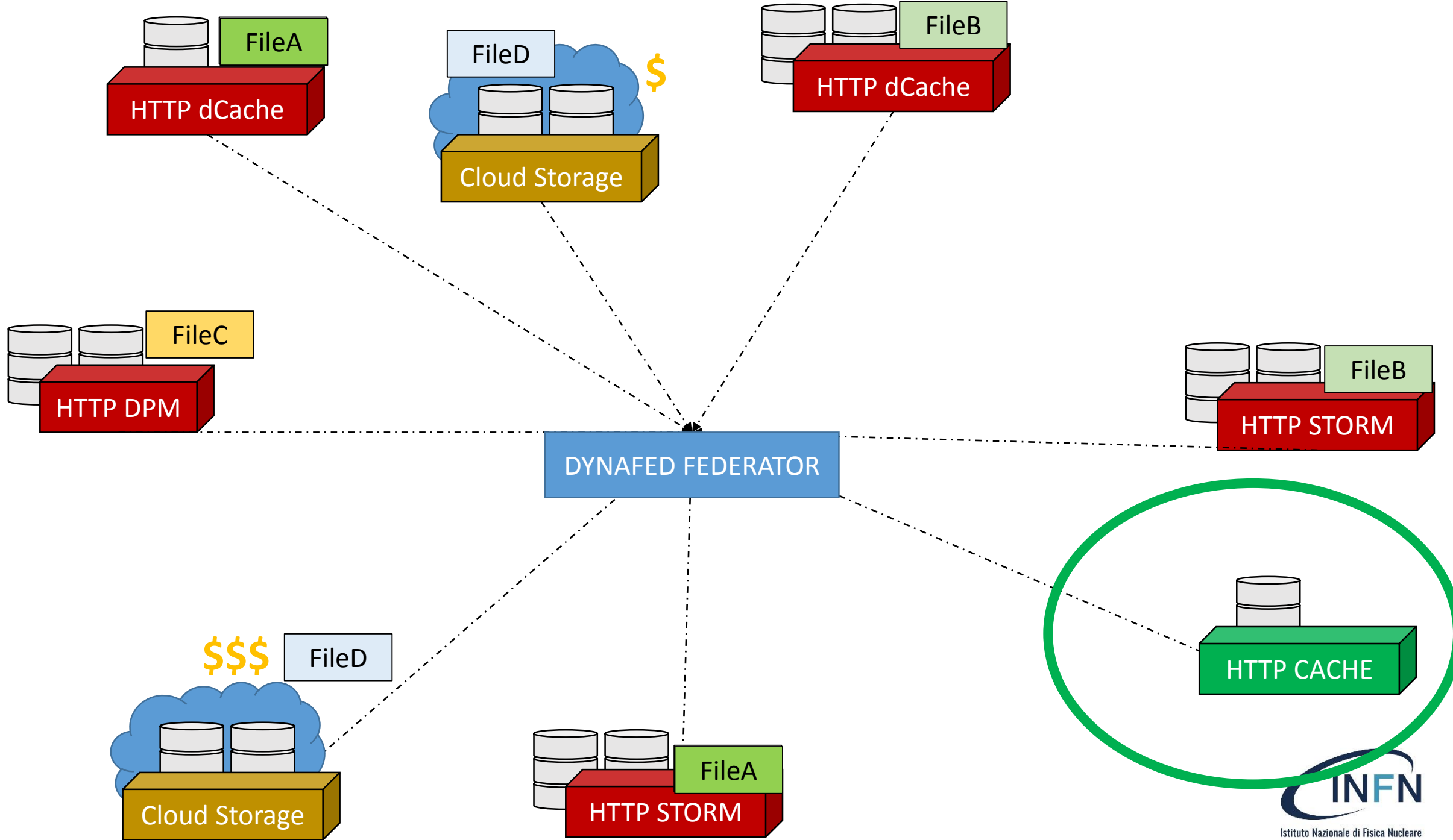
Which configuration should be used: Read/Write? Only Read?

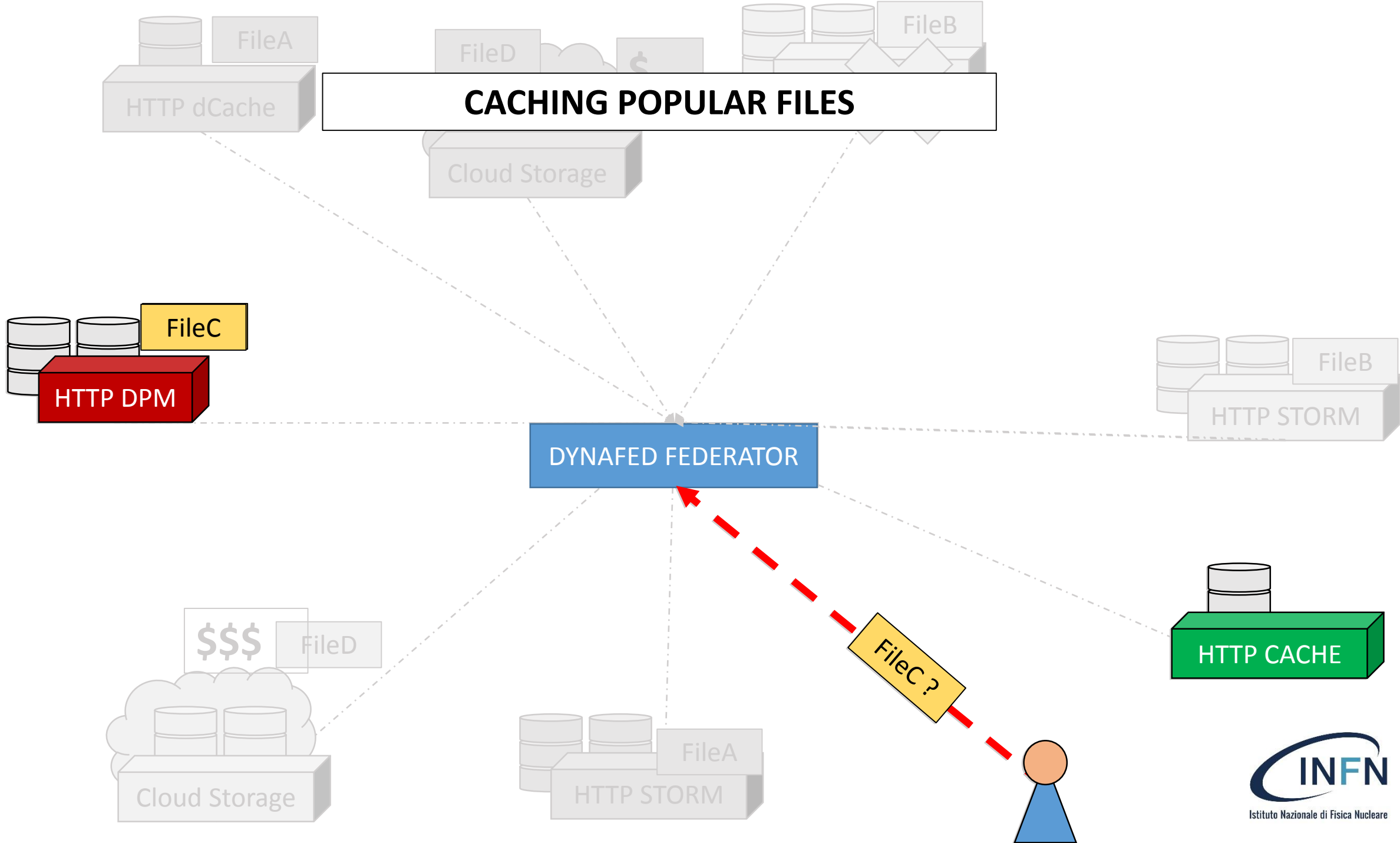
Interaction with logical file catalogue?

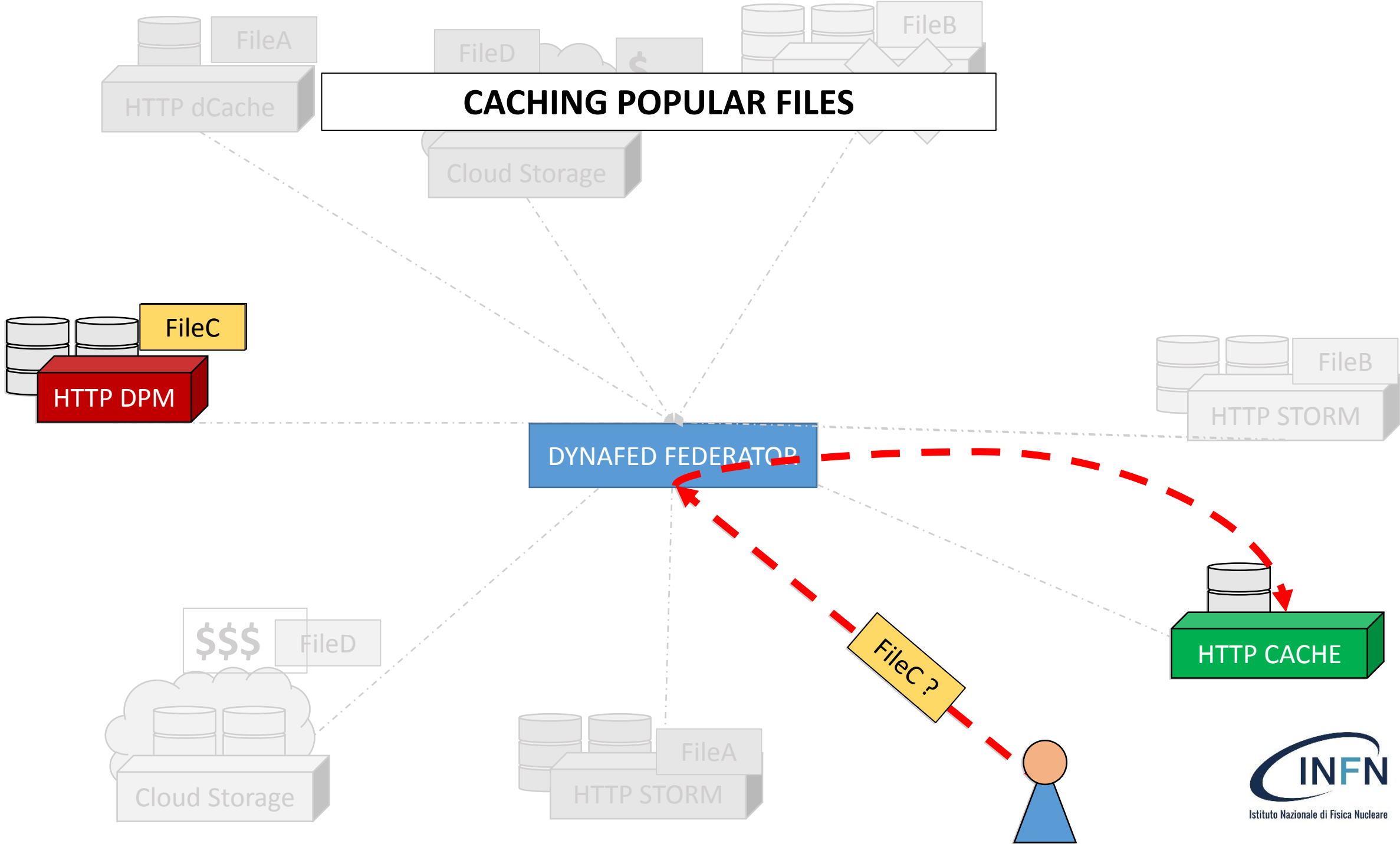
Dynafed filter plugin extension:

In principle is possible to create new filter plugins with a low/medium effort, but we should understand how much intelligence we want to add in Dynafed.

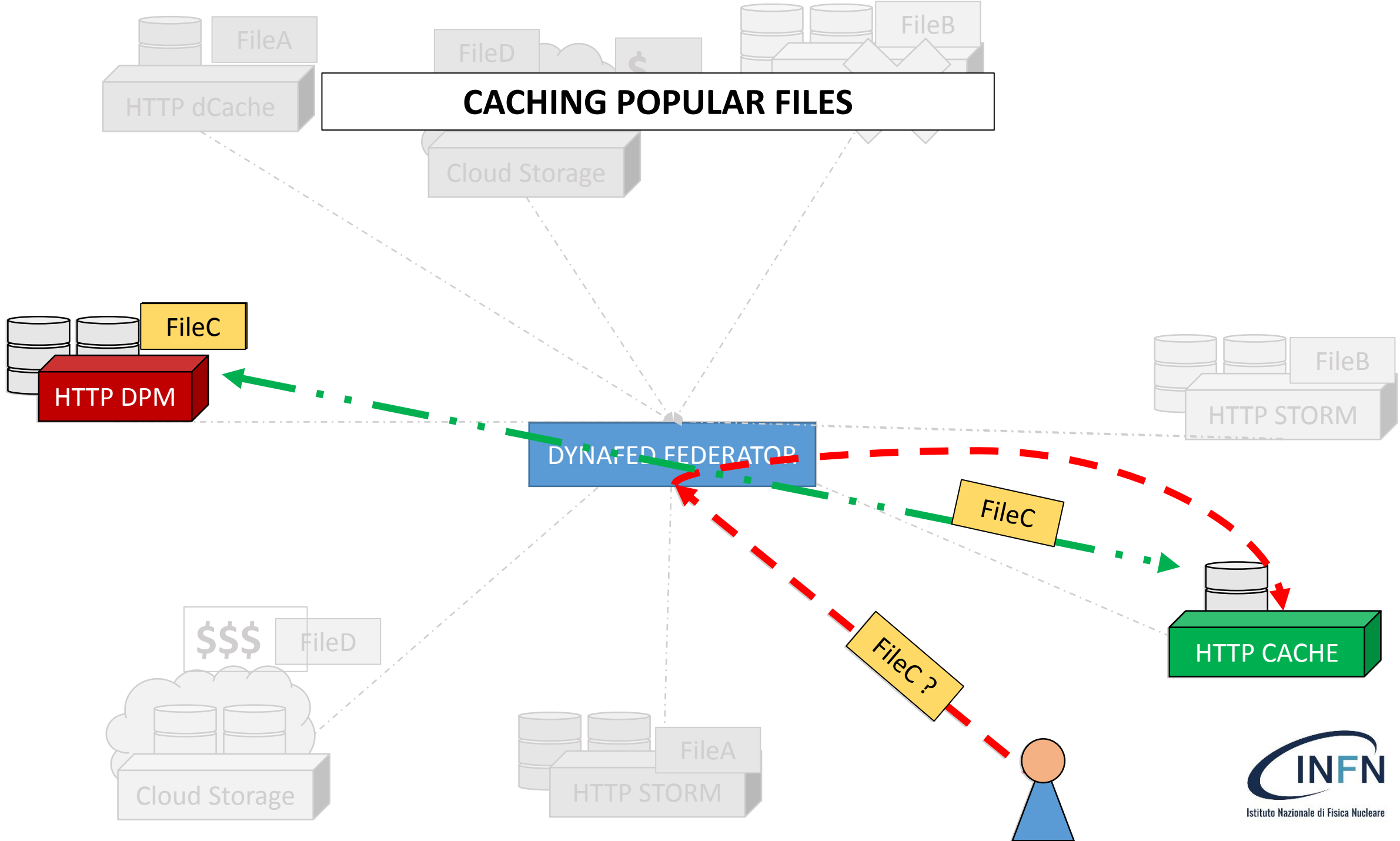
BACKUP

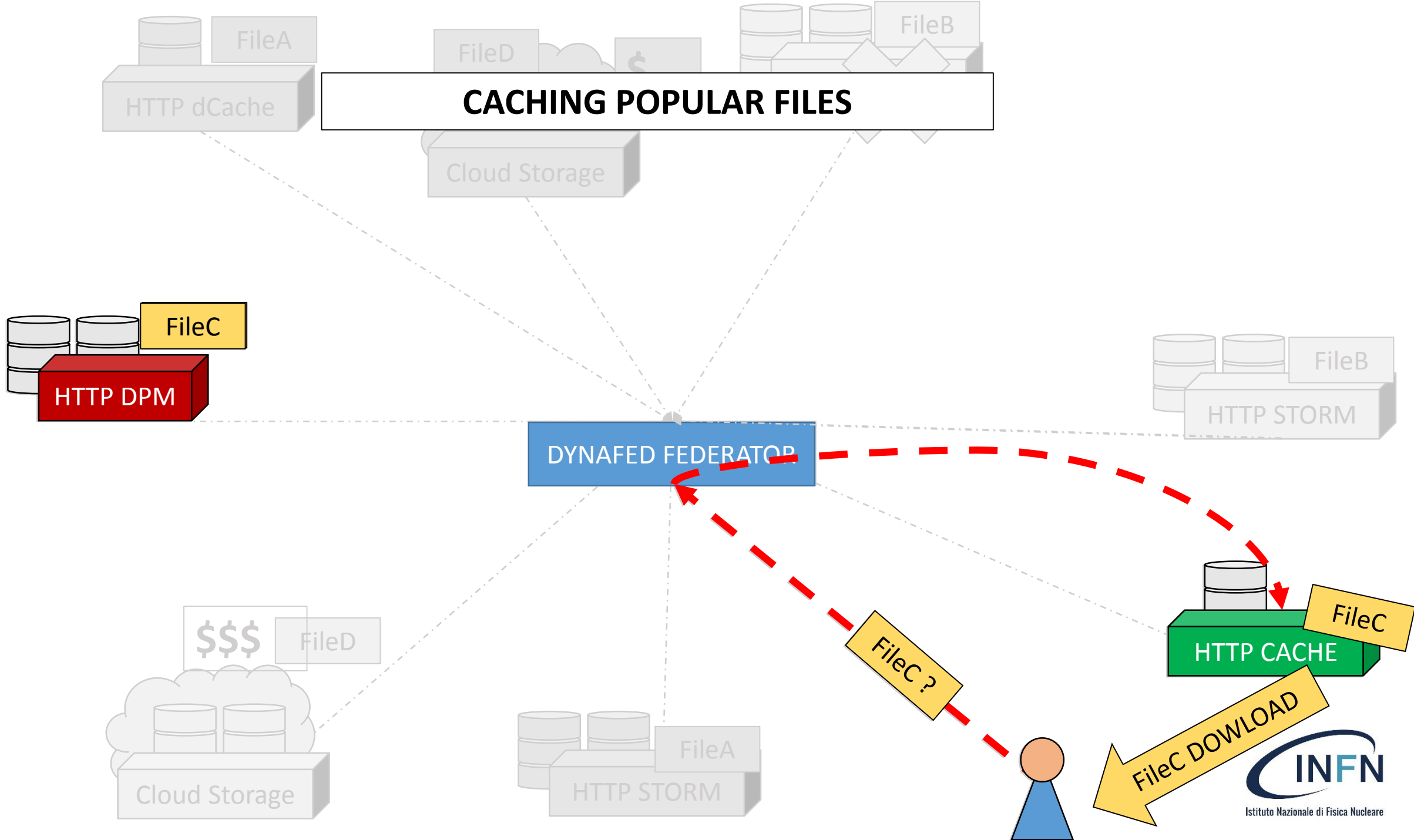


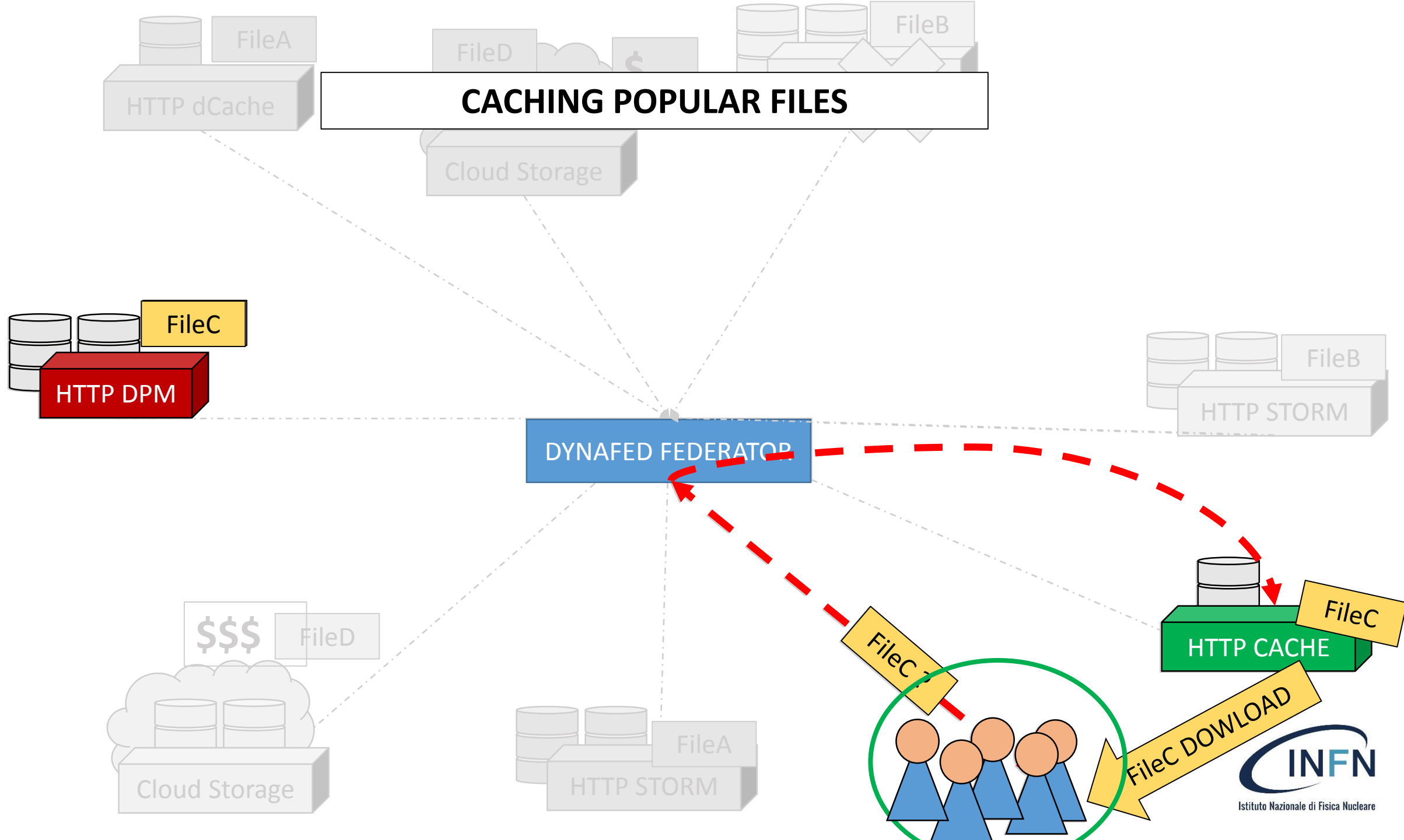




CACHING POPULAR FILES







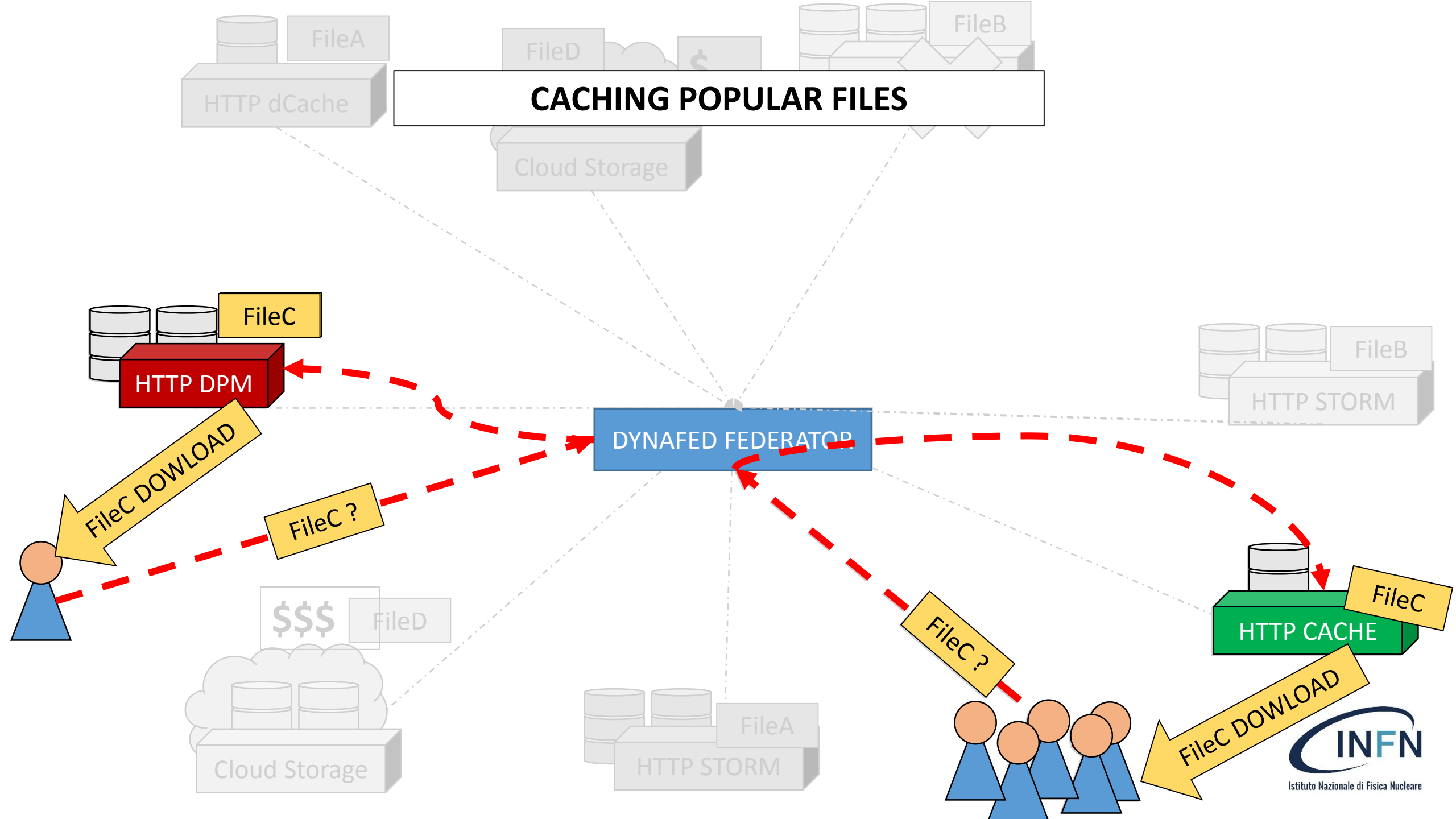
CACHING POPULAR FILES

DYNAFED FEDERATOR

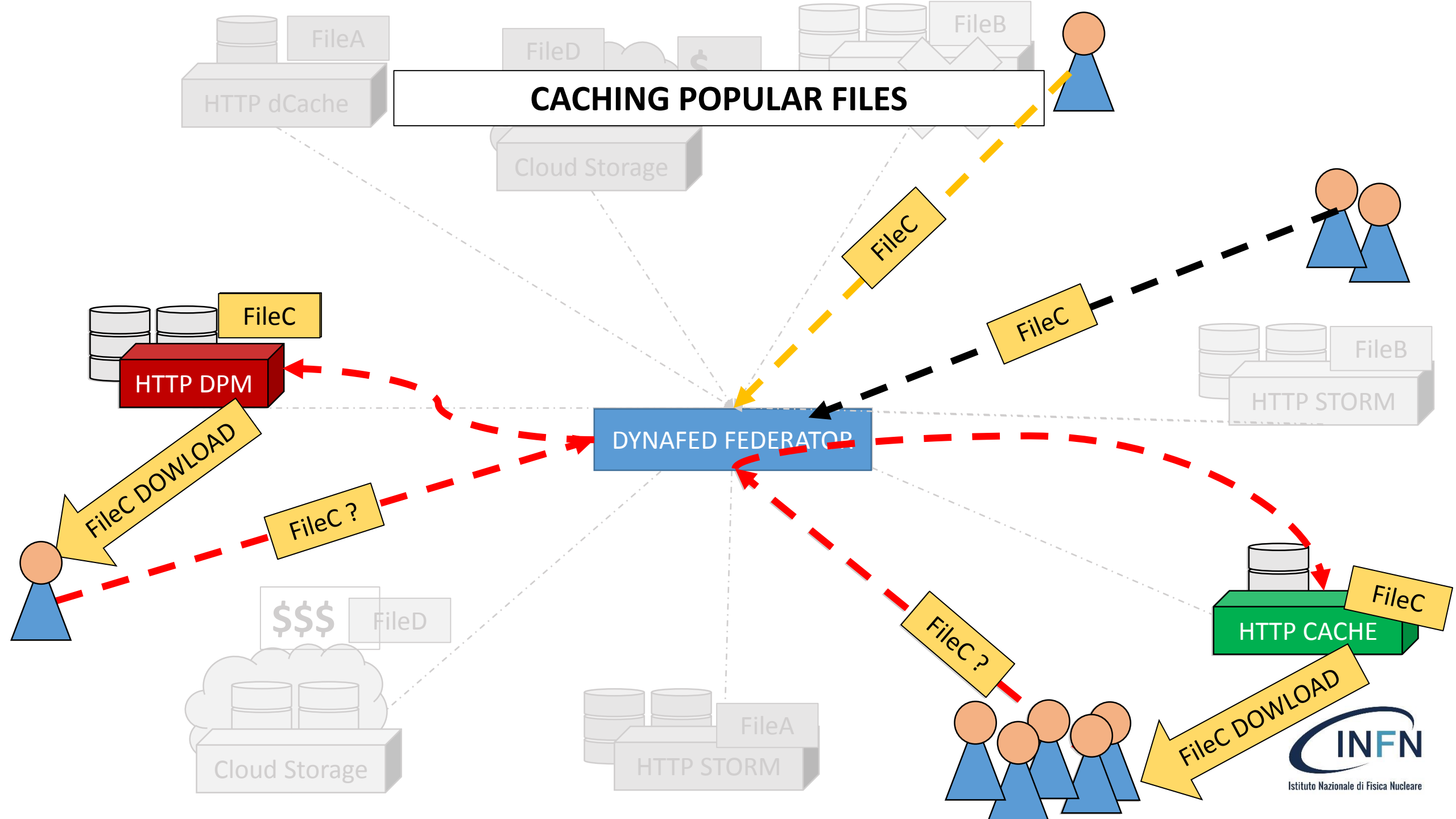
HTTP CACHE

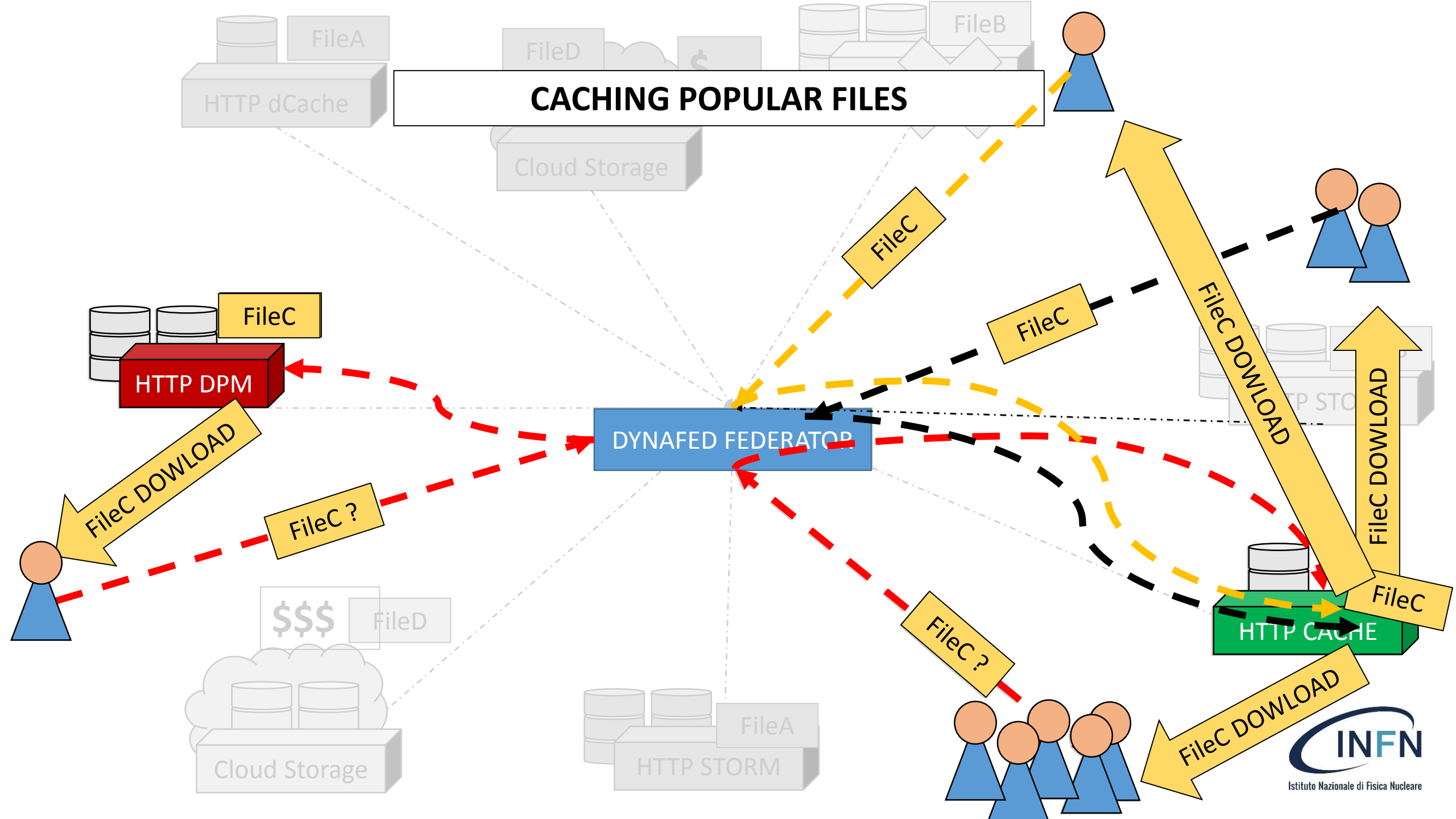
FileC DOWNLOAD

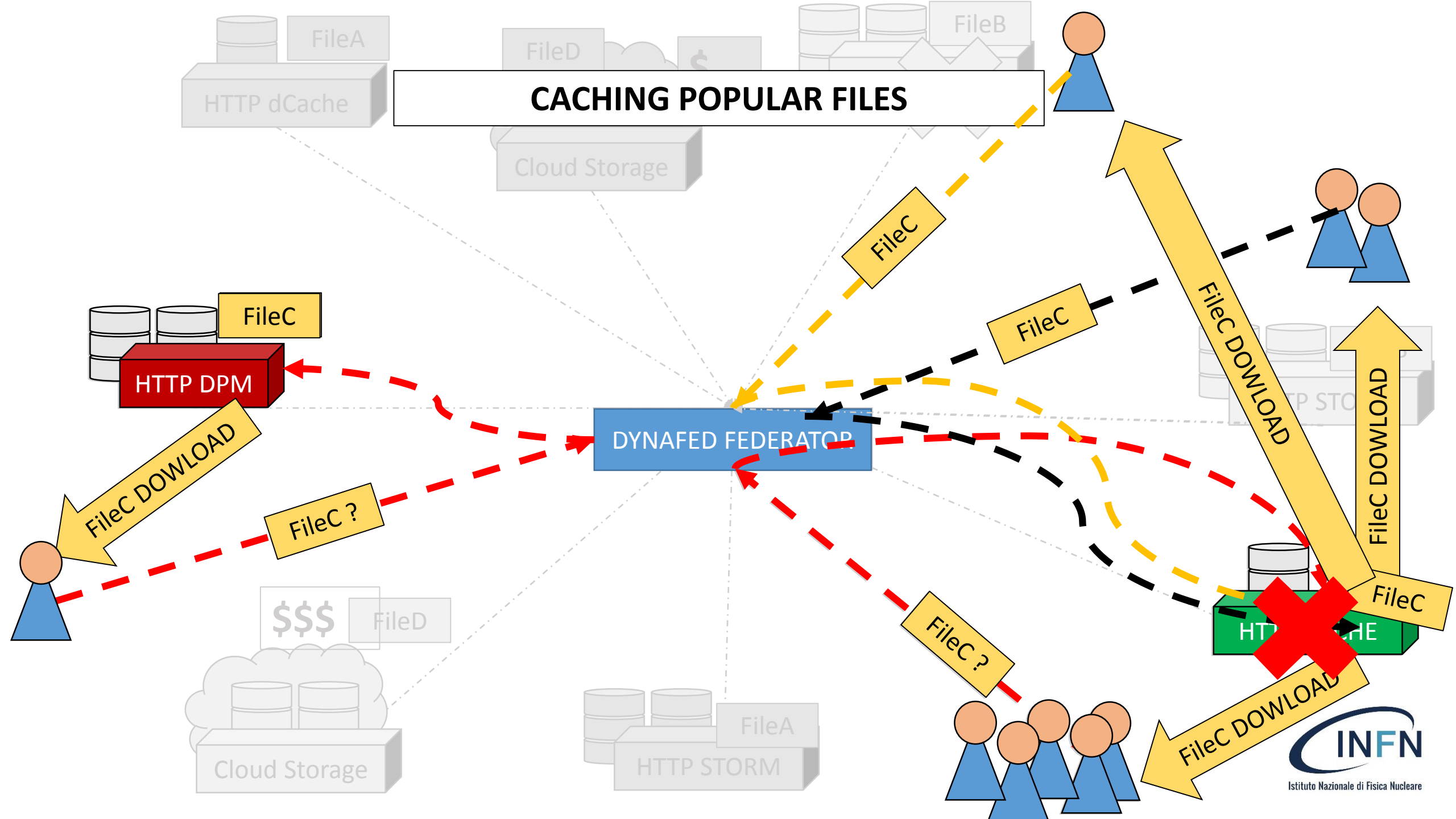
CACHING POPULAR FILES

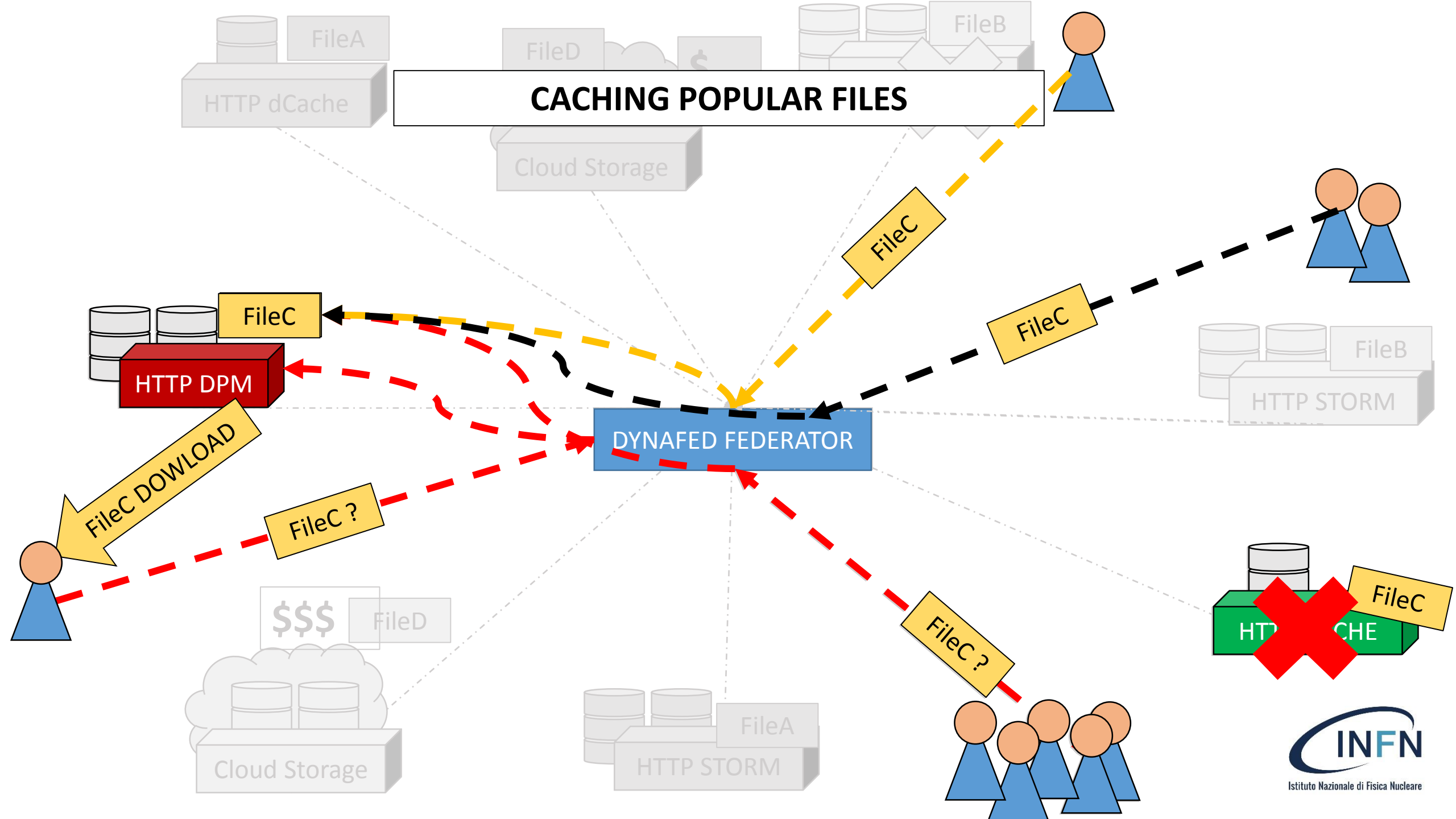


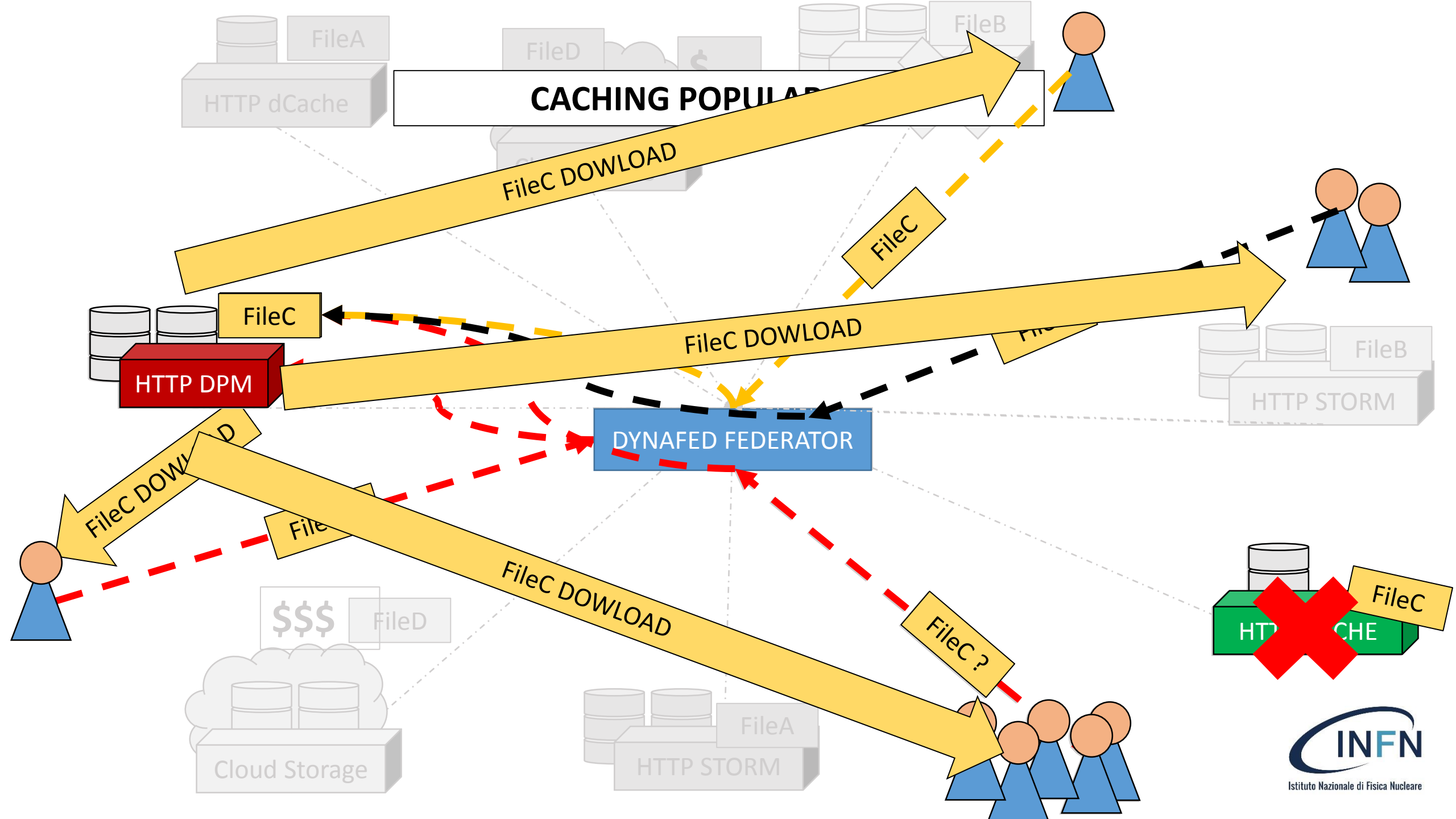
CACHING POPULAR FILES











This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<metalink xmlns="http://www.metalinker.org/" xmlns:lcgdm="LCGDM:" version="3.0" generator="lcgdm-dav" pubdate="Thu, 07 Jun 2018 10:30:36 GMT">
<files>
  <file name="/belle/">
    <size>711396759</size>
    <resources>
      <url type="https">
        https://recas-dpm-01.na.infn.it/dpm/na.infn.it/home/belle/cache1/Raw/e0002/cosmic/r00013/sub00/cosmic.0002.00013.HLT3.f00000.root
      </url>
      <url type="https">
        https://dcbldoor01.sdcc.bnl.gov:443/pnfs/sdcc.bnl.gov/data/bellediskdata/DATA/belle/Raw/e0002/cosmic/r00013/sub00/cosmic.0002.00013.HLT3.f00000.root
      </url>
      <url type="https">
        https://kek2-se03.cc.kek.jp:8443/belle/DATA/belle/Raw/e0002/cosmic/r00013/sub00/cosmic.0002.00013.HLT3.f00000.root
      </url>
    </resources>
  </file>
</files>
```

RAW DATA FILE - METALINK IN THE FULL VIEW

**VOLATILE POLL
FIRST IN THE LIST**



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<metalink xmlns="http://www.metalinker.org/" xmlns:lcgdm="LCGDM:" version="3.0" generator="lcgdm-dav" pubdate="Thu, 07 Jun 2018 10:30:36 GMT">
<files>
  <file name="/nocach">
    <size>711396759</size>
    <resources>
      <url type="https">
        https://dcbldoor01.sdcc.bnl.gov:443/pnfs/sdcc.bnl.gov/data/bellediskdata/DATA/belle/Raw/e0002/cosmic/r00013/sub00/cosmic.0002.00013.HLT3.f00000.root
      </url>
      <url type="https">
        https://kek2-se03.cc.kek.jp:8443/belle/DATA/belle/Raw/e0002/cosmic/r00013/sub00/cosmic.0002.00013.HLT3.f00000.root
      </url>
    </resources>
  </file>
</files>
```

RAW DATA FILE - METALINK IN NOCACHE VIEW

Tests done at Napoli

- Global Dynafed
- Global Dynafed + DPM Volatile Pool (Cache)
- Those tests imply the usage of an non-SRM storage

N.B. Tests has be done with the previous version of DIRAC

Configuration Manager

View as Text Download Reload

- Napoli-DAVS-ext-SE
 - BackendType = dpm
 - AccessProtocols = davs
 - WriteProtocols = https
 - RegistrationProtocols = https
 - ReadAccess = Active
 - WriteAccess = Active
 - RemoveAccess = Active
- AccessProtocol.https
 - Host = belle-dpm-01.na.infn.it
 - Port = 443
 - PluginName = GFAL2_HTTPS
 - Protocol = https
 - Path = /dpm/na.infn.it/home/belle/DAVS
 - Access = remote
- AccessProtocol.davs
 - Host = dynafed-belle.na.infn.it
 - Port = 443
 - PluginName = GFAL2_HTTPS
 - Protocol = davs
 - Path = /myfed/
 - Access = remote
 - IgnoreChecksum = True
- KEK-DAVS-ext-SE
- DESY-DAVS-ext-SE
- StorageElementGroups

CONFIGURATION EXAMPLE

- BackendType = dpm
- AccessProtocols = **davs**
- WriteProtocols = **https**
- RegistrationProtocols = **https**

For Read access:

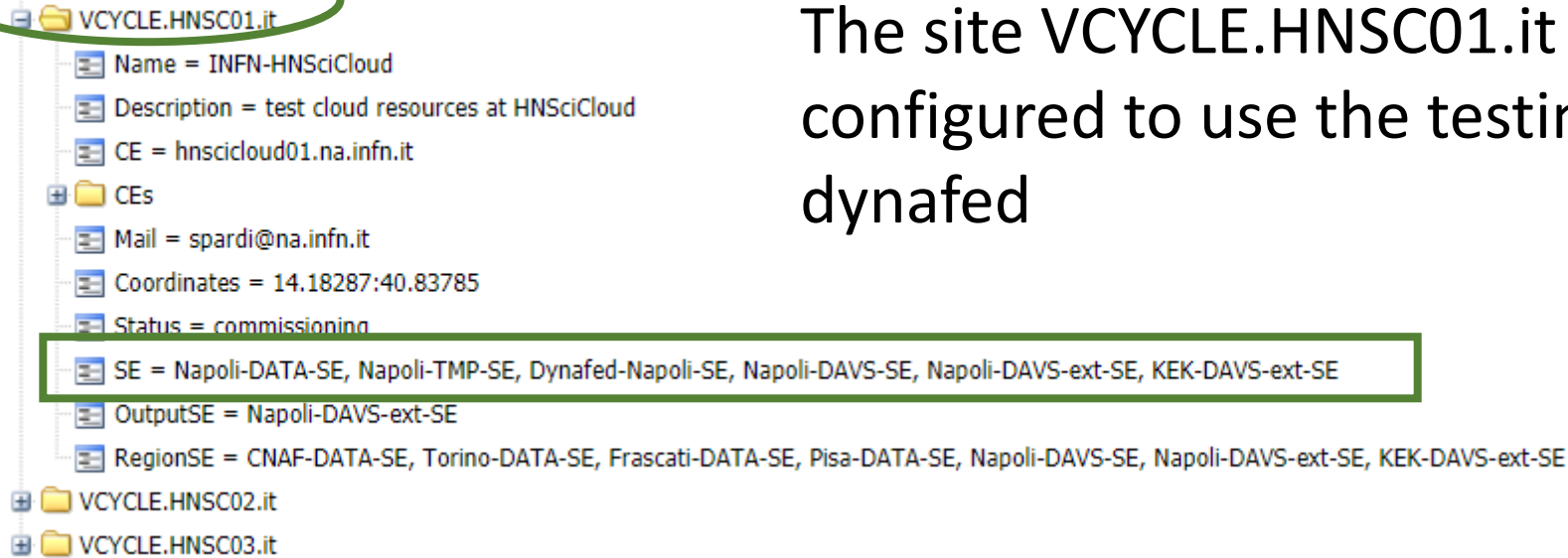
- Host = **dynafed-belle.na.infn.it**
- PluginName = GFAL2_HTTPS
- Protocol = https

For Write access:

- Host = **belle-dpm-01.na.infn.it**
- Protocol = **davs**
- Path = **/myfed/**
- IgnoreChecksum = **true**

How to use this object?

The site VCYCLE.HNSC01.it in Validation DIRAC has been configured to use the testing http endpoint, included dynafed



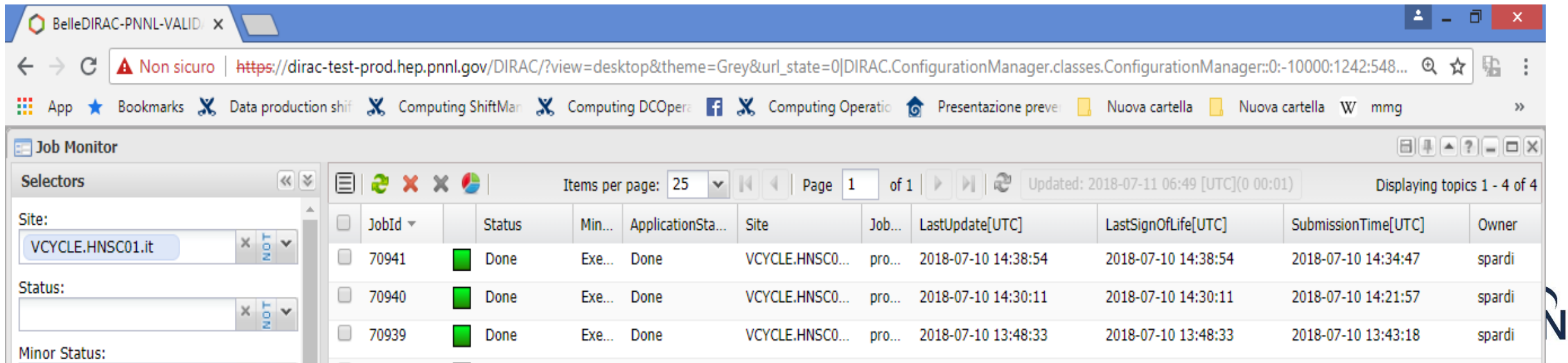
We created a set of datasets locally with basf2 then we copied and registered it on KEK-DAVS-SE storage via **gb2_ds_put** command.

How to use this object?

Submit jobs to DIRAC via gbasf2 , taking advantage from the cache.

Early results:

In a protected environment, we replicated datasets to KEK-DAVS-SE and then we ran a set of simple analysis on HNSC resources (in Eurpe), reading files from the http storage via Dynafed, using the volatile pool feature as well, experiencing the caching effect.



The screenshot shows a web browser window with the URL https://dirac-test-prod.hep.pnnl.gov/DIRAC/?view=desktop&theme=Grey&url_state=0. The browser's address bar indicates a non-secure connection. The page title is "Job Monitor". The interface includes a "Selectors" panel on the left with a dropdown menu set to "VCYCLE.HNSC01.it". The main content area displays a table of job results with the following columns: JobId, Status, Min..., ApplicationSta..., Site, Job..., LastUpdate[UTC], LastSignOfLife[UTC], SubmissionTime[UTC], and Owner. The table shows three jobs, all with a status of "Done" and a green progress indicator. The jobs are listed as follows:

JobId	Status	Min...	ApplicationSta...	Site	Job...	LastUpdate[UTC]	LastSignOfLife[UTC]	SubmissionTime[UTC]	Owner
70941	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 14:38:54	2018-07-10 14:38:54	2018-07-10 14:34:47	spardi
70940	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 14:30:11	2018-07-10 14:30:11	2018-07-10 14:21:57	spardi
70939	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 13:48:33	2018-07-10 13:48:33	2018-07-10 13:43:18	spardi

How to use this object?

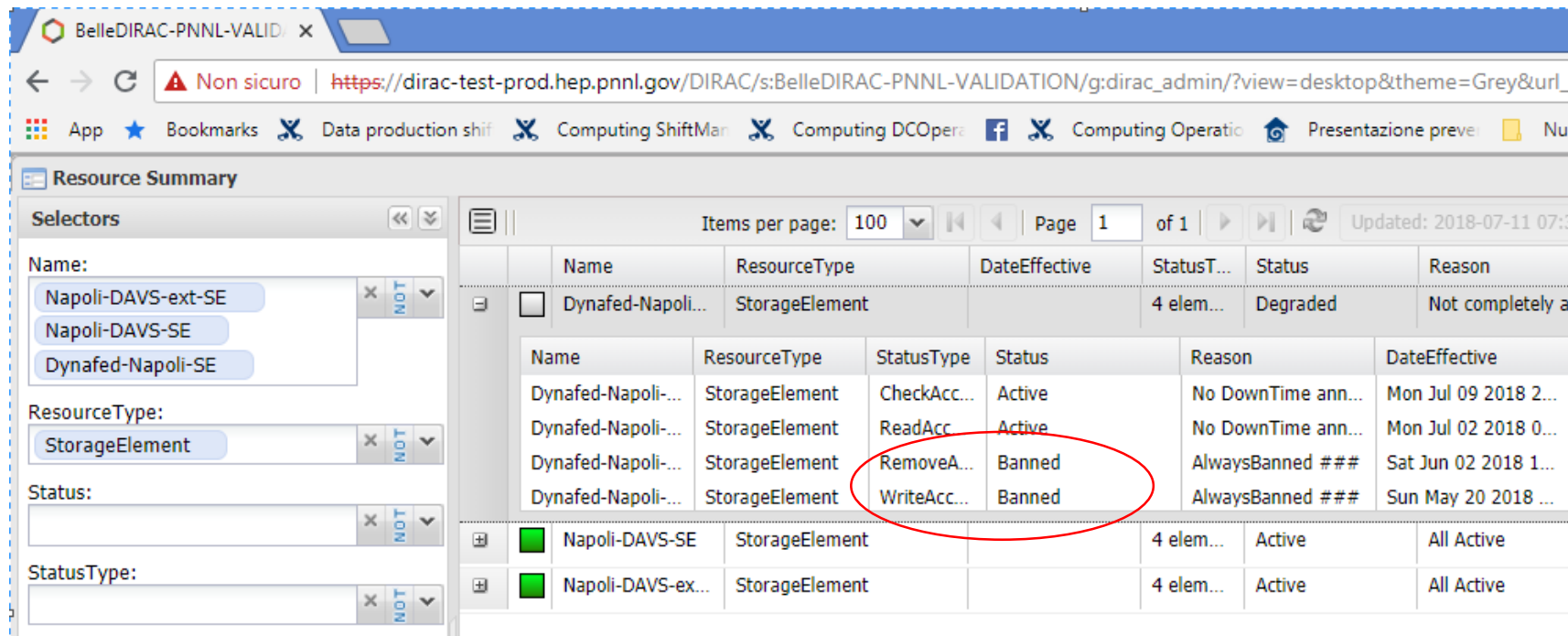
Ongoing test are focussed on three main use-cases:

- DAVS protocol in DIRAC
- DAVS + Dynafed + DIRAC
- DAVS + Dynafed + DPM Volatile Pool (Cache) + DIRAC

How to use this object?

Using the DIRAC Validation server of Belle II we are investigating different approaches:

- Register the Volatile Pool among SEs (in that case we loss the benefit of dynafed)
- Register dynafed as a Storage (In that case DIRAC loss the control in writing)
- Make a special configuration for the HTTP endpoints registered in DIRAC in order to be used directly in writing and through Dynafed in reading.



The screenshot shows the DIRAC Validation server interface. The main content is a table titled "Resource Summary" with columns: Name, ResourceType, DateEffective, StatusT..., Status, and Reason. The table is filtered to show "StorageElement" resources. A red circle highlights the "RemoveAcc..." and "WriteAcc..." status types for the "Dynafed-Napoli..." entries.

Name	ResourceType	DateEffective	StatusT...	Status	Reason
Dynafed-Napoli...	StorageElement		4 elem...	Degraded	Not completely a
Dynafed-Napoli...	StorageElement		CheckAcc...	Active	No DownTime ann...
Dynafed-Napoli...	StorageElement		ReadAcc...	Active	No DownTime ann...
Dynafed-Napoli...	StorageElement		RemoveAcc...	Banned	AlwaysBanned ###
Dynafed-Napoli...	StorageElement		WriteAcc...	Banned	AlwaysBanned ###
Napoli-DAVS-SE	StorageElement		4 elem...	Active	All Active
Napoli-DAVS-ex...	StorageElement		4 elem...	Active	All Active

How to use this object?

The site VCYCLE.HNSC01.it in PNNL DIRAC has been configured to use the testing http endpoint, included dynafed

VCYCLE.HNSC01.it

- Name = INFN-HNSciCloud
- Description = test cloud resources at HNSciCloud
- CE = hnscloud01.na.infn.it
- CEs
 - Mail = spardi@na.infn.it
 - Coordinates = 14.18287:40.83785
 - Status = commissioning
 - SE = Napoli-DATA-SE, Napoli-TMP-SE, Dynafed-Napoli-SE, Napoli-DAVS-SE, Napoli-DAVS-ext-SE, KEK-DAVS-ext-SE
 - OutputSE = Napoli-DAVS-ext-SE
 - RegionSE = CNAF-DATA-SE, Torino-DATA-SE, Frascati-DATA-SE, Pisa-DATA-SE, Napoli-DAVS-SE, Napoli-DAVS-ext-SE, KEK-DAVS-ext-SE

VCYCLE.HNSC02.it

VCYCLE.HNSC03.it

We created a set of datasets locally with basf2 then we copied and registered it on KEK-DAVS-SE storage via **gb2_ds_put** command.

How to use this object?

Submit jobs to DIRAC via gbasf2, taking advantage from the cache.

Early results:

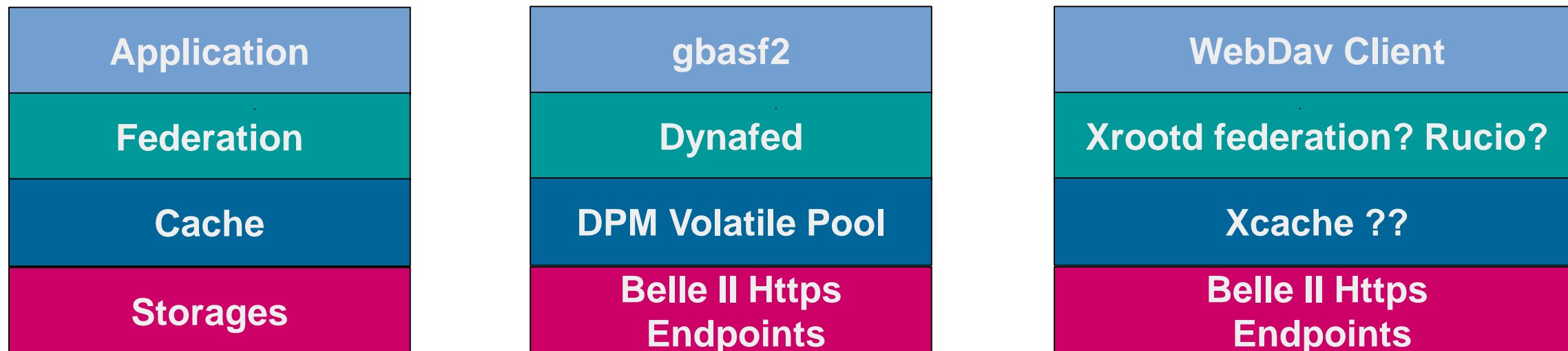
In a protected environment, we replicated datasets to KEK-DAVS-SE and then we ran a set of simple analysis on HNSC resources, reading files from the http storage via Dynafed, using the volatile pool feature as well, experiencing the caching effect.

The screenshot shows a web browser window with the following details:

- Browser tabs: BelleDIRAC-PNNL-VALID
- Address bar: https://dirac-test-prod.hep.pnnl.gov/DIRAC/?view=desktop&theme=Grey&url_state=0|DIRAC.ConfigurationManager.classes.ConfigurationManager:0:-10000:1242:548...
- Page title: Job Monitor
- Site filter: VCYCLE.HNSC01.it
- Table of jobs:

JobId	Status	Min...	ApplicationSta...	Site	Job...	LastUpdate[UTC]	LastSignOfLife[UTC]	SubmissionTime[UTC]	Owner
70941	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 14:38:54	2018-07-10 14:38:54	2018-07-10 14:34:47	spardi
70940	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 14:30:11	2018-07-10 14:30:11	2018-07-10 14:21:57	spardi
70939	Done	Exe...	Done	VCYCLE.HNSC0...	pro...	2018-07-10 13:48:33	2018-07-10 13:48:33	2018-07-10 13:43:18	spardi

Dynafed and Cache: Model and implementation



Two challenges: User HTTP in the application workflow and implement a caching system

Current Status and ongoing activities

Up to now we mainly focussed on creating a working testbed, overcoming the issues and investigating how to introduce the cache element in the belle II computing model.

Last part 3 months of the SCoRES project will be dedicated in doing performance and resilience tests that should be ready by the end of February 2018 together with the characterization of the testbed.

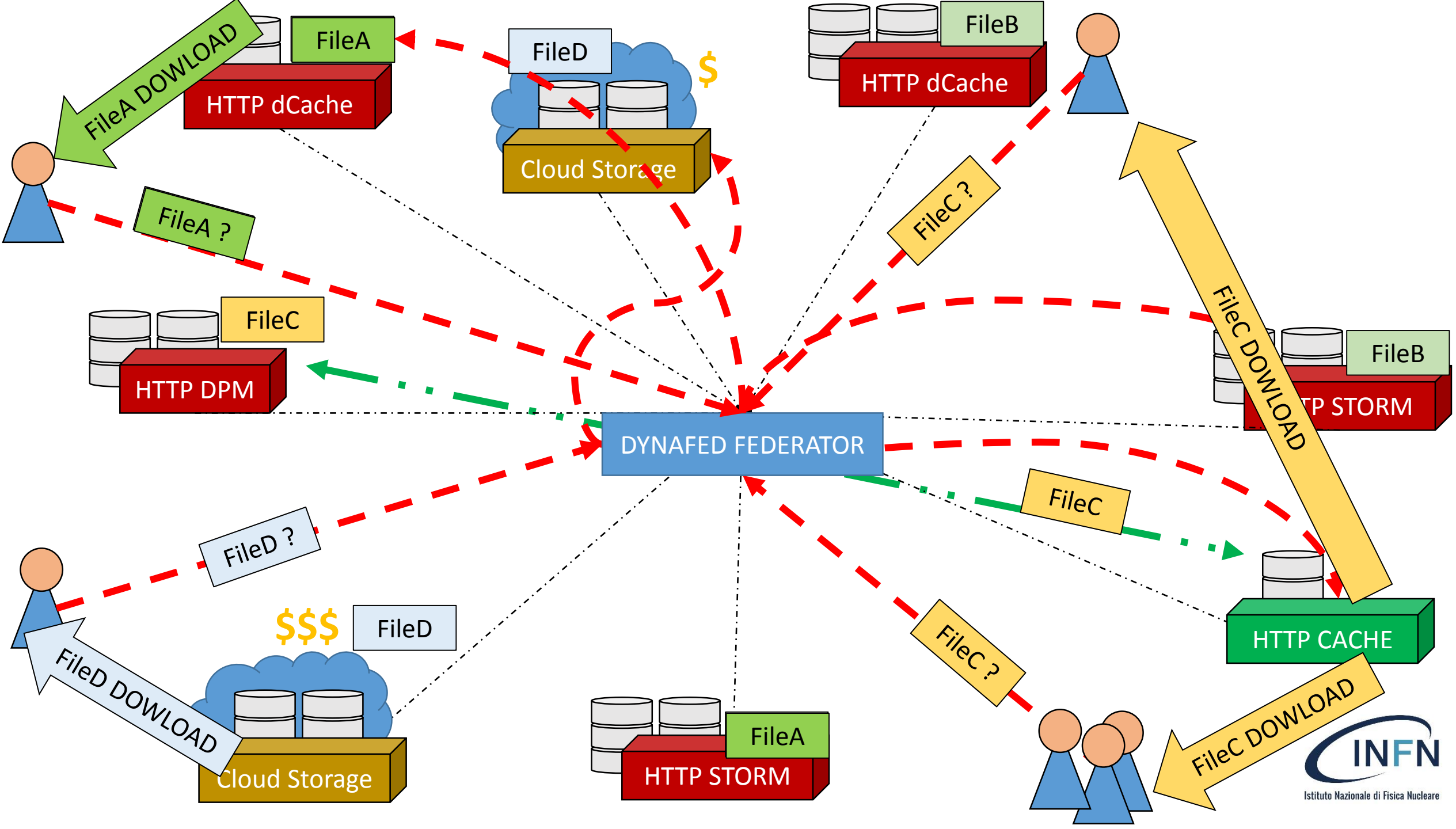
Additional Initiatives

The ATLAS Team at INFN-Napoli is working with similar technologies in the context of ATLAS using Volatile Pool in combination with RUCIO. Preliminary results have been presented at CHEP18, more detailed and results will be presented soon.

There are currently a set of new initiatives submitted in different context in Italy to support activities related this topic:

Included a research project named “HTTP in Physics (HTTPhy)” submitted within the national call PRIN 2017 (result expected by the end of the year).

I.Bi.S.Co. (Infrastructure for Big Data and Scientific Computing) is a new proposal submitted by several Italian institutions (including INFN and University Federico II) in the contest of the National CALL for datacenter extension.



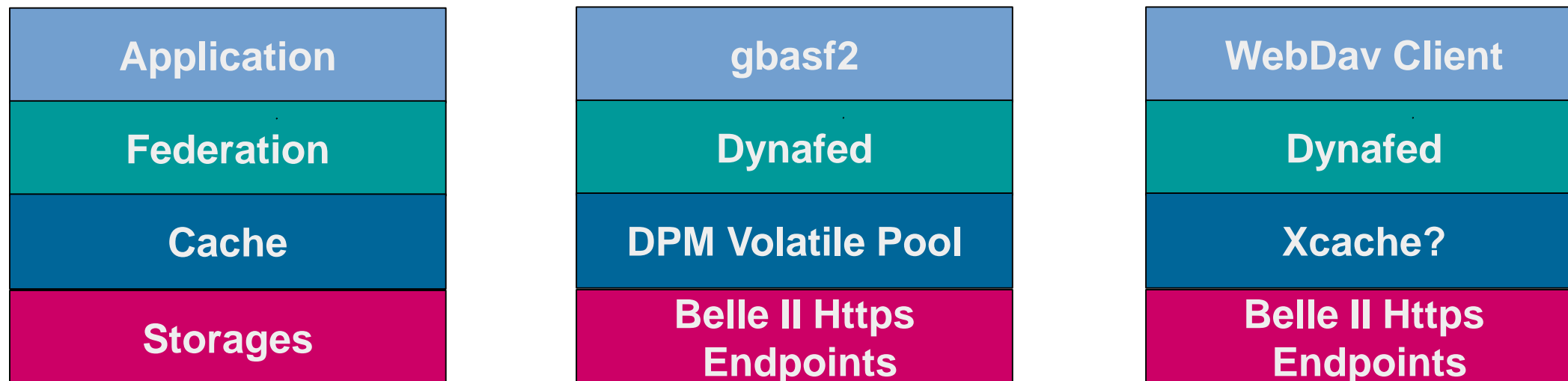
Preliminary Tests Details (File Download)

As preliminary test, we download from a **User Interface in Napoli** a set of Belle II files, stored in CESNET, KEK and UVic . Each file set is downloaded three times as follow:

- File Download using the direct link to the remote storage
- File Download using Dynafed with Cold cache
- File Download using Dynafed with Warm cache

Tests have been performed using files of different size: 50MB, 1GB

Dynafed and Cache: Model and implementation



Test this model in Belle II require two steps:

- **Implement the caching system**
- **Study how to use HTTP/DAV in the application workflow**

DYNAFED

Dynamic Federations system.

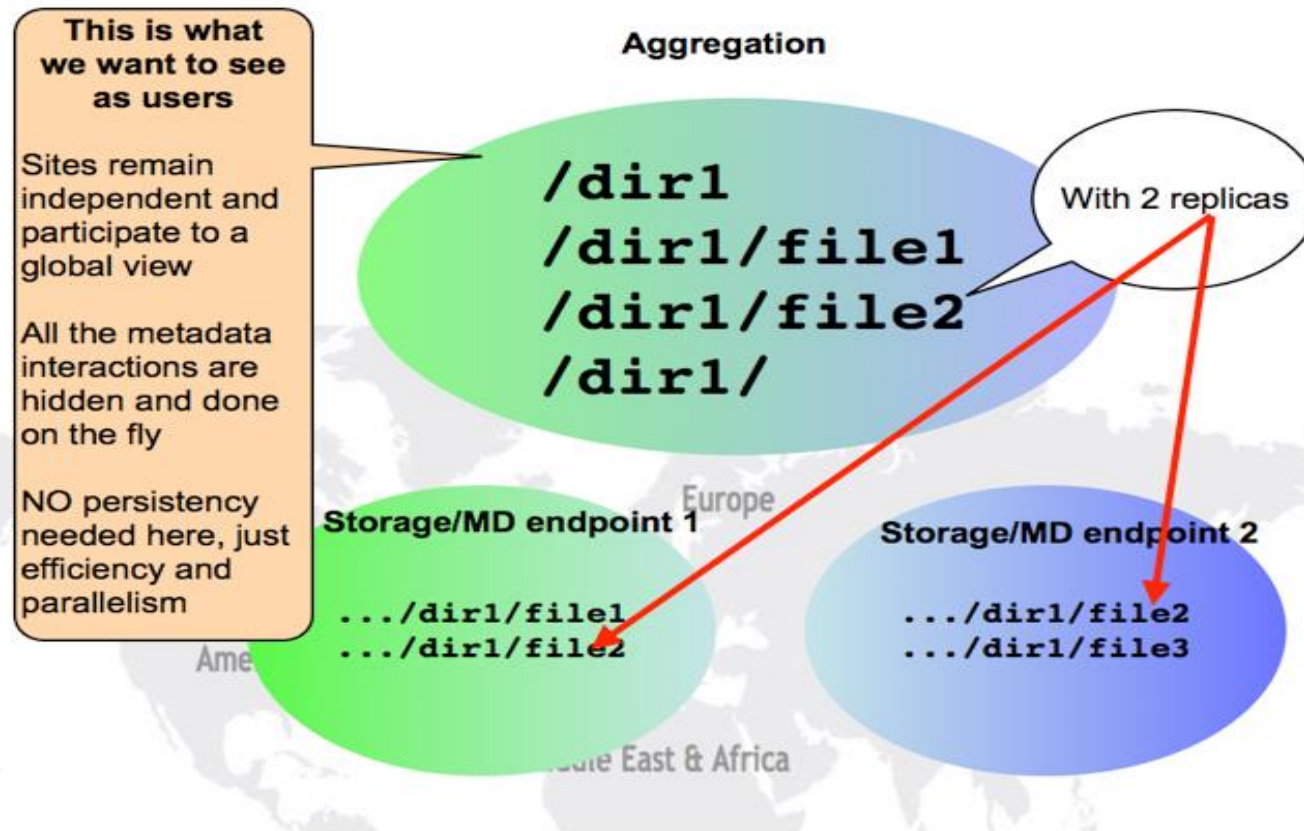
It can aggregate namespaces of different type of storages

- HTTP/Webdav Storage
- S3 storage
- NFS
- LFC
- Others

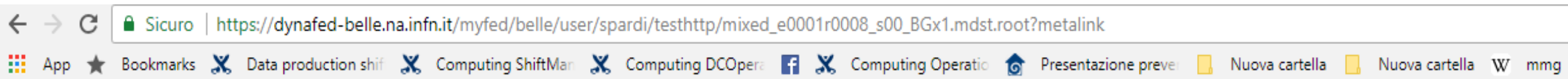
Storage aggregation is made on the fly
File metadata are cached on the Dynafed machine.

For the client point of view, Dynafed works as a redirector:

When a client ask for a file to it will be redirect the one of the available replicas.



Dynafed file representation: Metalink





This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<metalink xmlns="http://www.metalinker.org/" xmlns:lcgdm="LCGDM:" version="3.0" generator="lcgdm-dav" pubdate="Wed, 13 Apr 2016 13:49:21 GMT">
  <files>
    <file name="/belle/">
      <size>11528882</size>
      <resources>
        <url type="https">
          https://kek2-se03.cc.kek.jp:8443/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
        <url type="https">
          http://bgrid3.phys.ntu.edu.tw:2880/pnfs/phys.ntu.edu.tw/home/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
        <url type="https">
          https://b2se.mel.coepp.org.au:443/dpm/mel.coepp.org.au/home/belle/bellescratchdisk/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
        <url type="https">
          https://dpm.cyf-kr.edu.pl:443/dpm/cyf-kr.edu.pl/home/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
        <url type="https">
          https://hephyse.oeaw.ac.at:443/dpm/oeaw.ac.at/home/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
        <url type="https">
          https://dpm1.egee.cesnet.cz:443/dpm/cesnet.cz/home/belle/TMP/belle/user/spardi/testhttp/mixed_e0001r0008_s00_BGx1.mdst.root
        </url>
      </resources>
    </file>
  </files>
</metalink>
```

Browser window showing the URL `https://dynafed-belle.na.infn.it/myfed/`. The address bar indicates a secure connection (Sicuro). The browser's bookmark bar contains several entries, including "Data production shif", "Computing ShiftMan", "Computing DCOper", "Computing Operatio", "Presentazione preve", and two "Nuova cartella" entries.

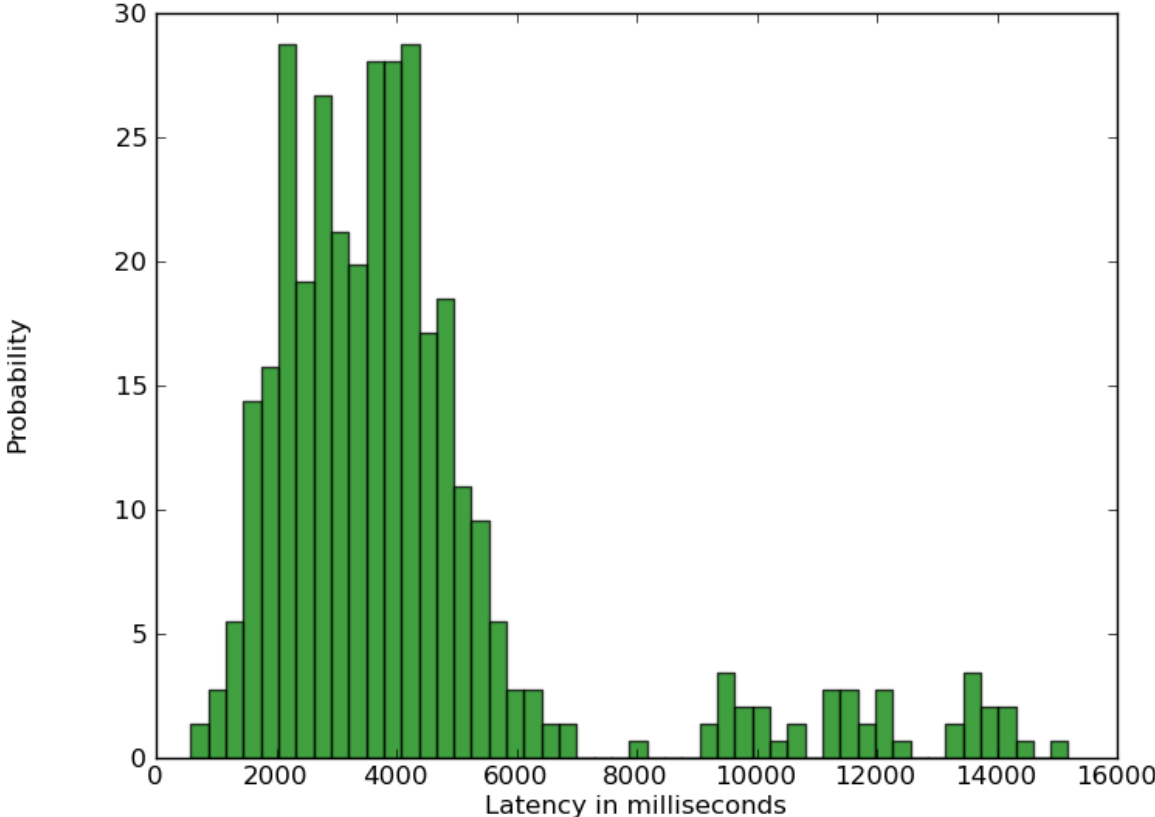
/myfed/

Mode	Links	UID	GID	Size	Modified	Name
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	 belle
drwxrwxrwx	0	0	0	0	Thu, 01 Jan 1970 00:00:00 GMT	 belle-nocache

Grid-Hammer - Stat operations

Cold

davs: latency distribution for a stat operation, 50 threads, files 0-500



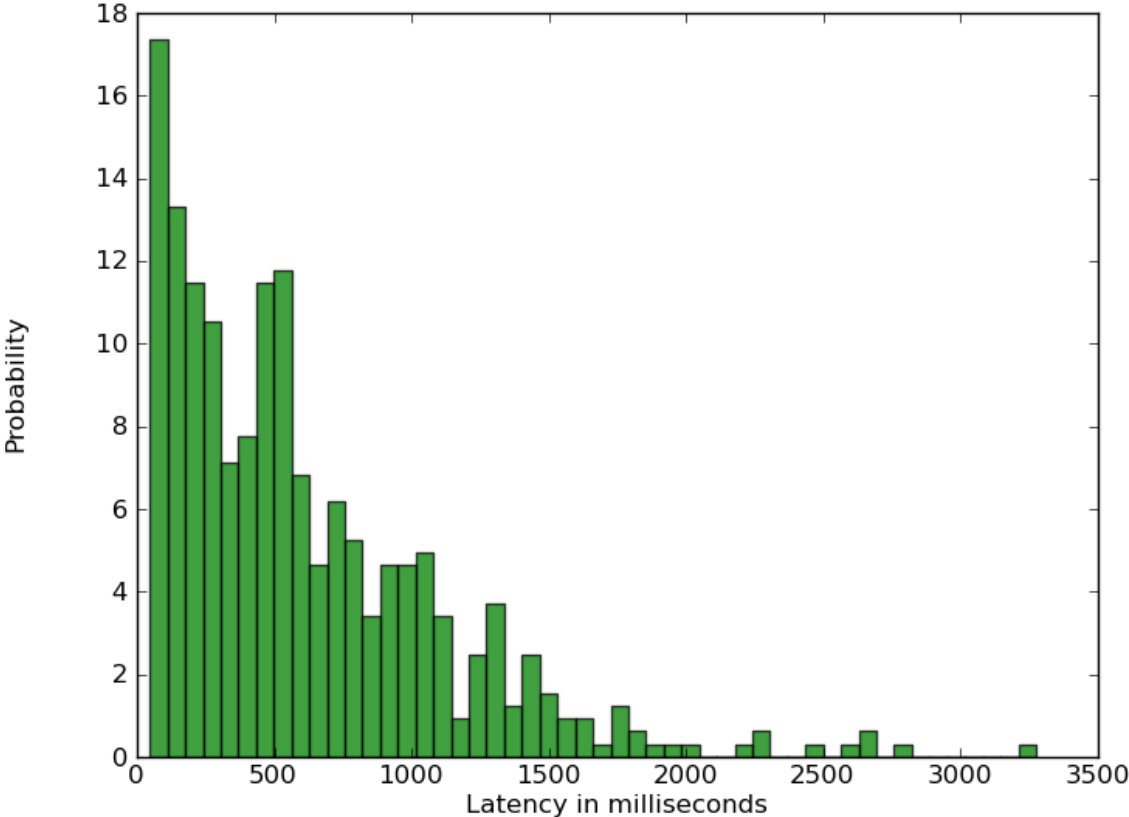
Rate: 11.64 Hz

No errors

Min 0.58 Max 15.19

Warm

davs: latency distribution for a stat operation, 50 threads, files 0-500



Rate: 79.24 Hz

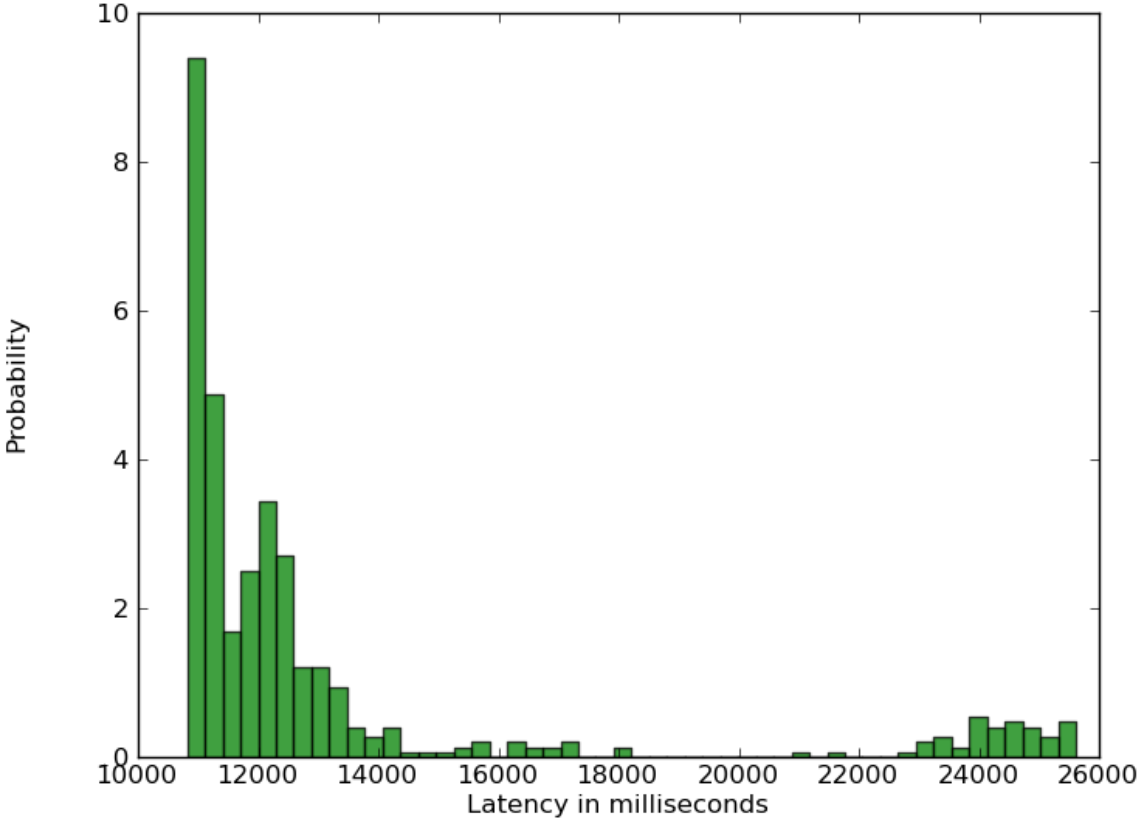
No errors

Min 0.05 Max 3.27

Grid-Hammer - Read operations

Cold cache

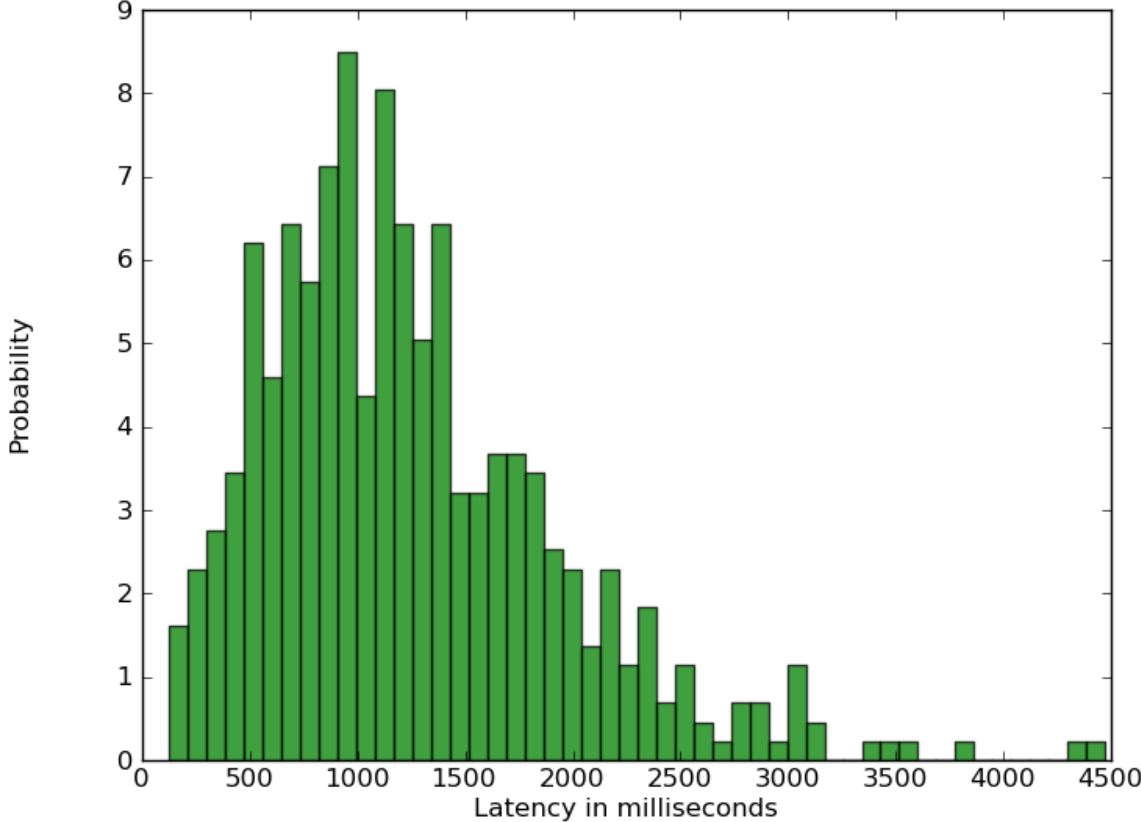
davs: latency distribution for a read operation, 50 threads, files 0-500



Min 10.82 Max 25.62

Warm cache

davs: latency distribution for a read operation, 50 threads, files 0-500



Min 0.12 Max 4.47