



Computing in Virgo

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Agenda

Virgo/EGO - Computing centres F2F

Tuesday, 16 January 2018 from **09:40** to **17:05** (Europe/Rome)
at **EGO (Council room)**

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Tuesday, 16 January 2018

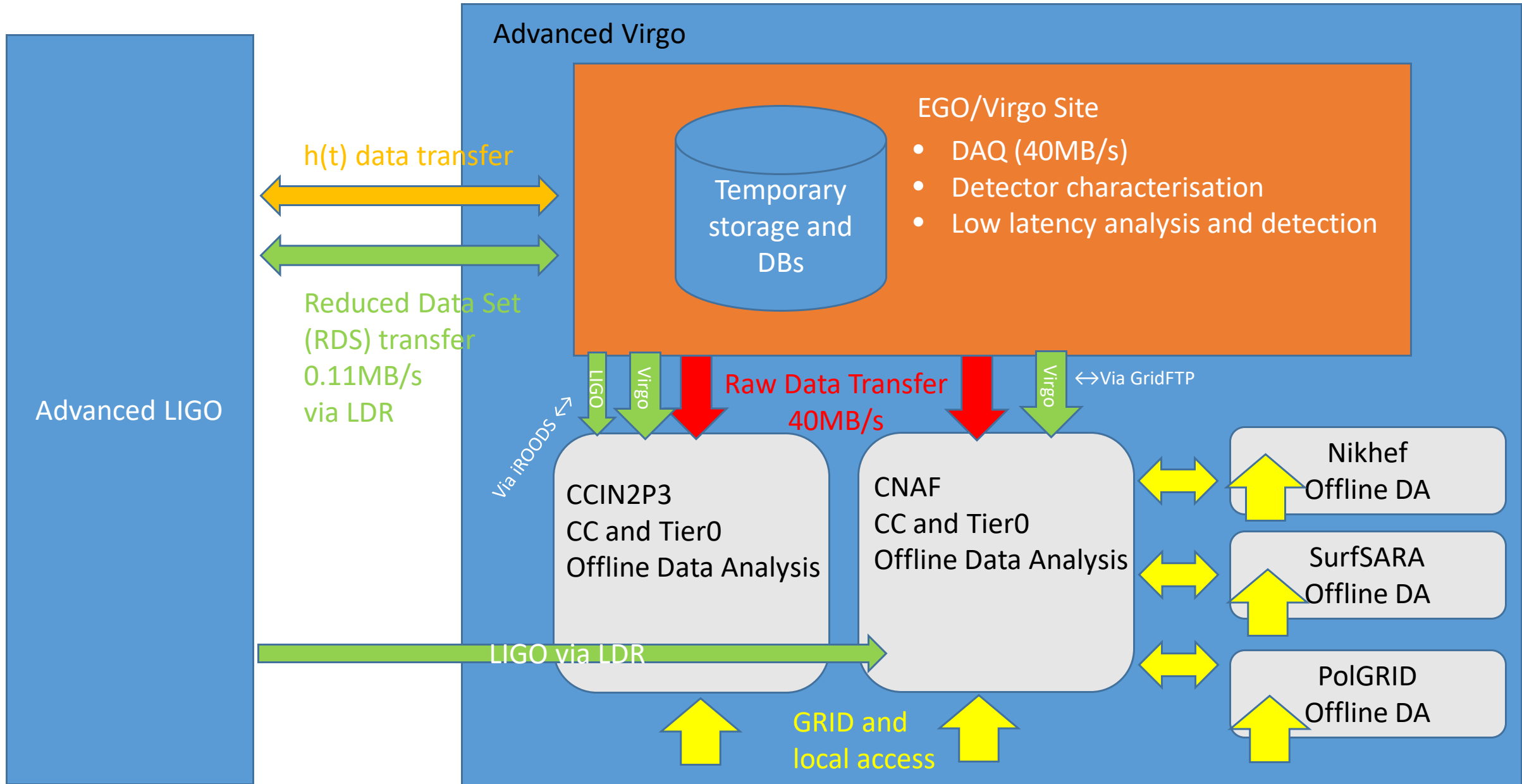
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| 10:30 - 10:50 | Motivations 20' Speaker: Michele Punturo | ▾ |
| 10:50 - 11:10 | CNAF recovery and Virgo data restoring 20' | ▾ |
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| 14:20 - 15:20 | Data transfer (to CCIN2P3 and CNAF) issues 1h0' Speaker: Livio Salconi | ▾ |
| 15:20 - 16:20 | Data Management (brainstorming on different options like Rucio, ad hoc solutions,) 1h0' Speakers: Luca Rei, Livio Salconi | ▾ |

Aim of the meeting/process

1. Set-up a better coordination between Virgo and computing centres (CCs)
2. Arrive to the next science run (O3) having cured the fragilities that we discuss today
3. Simplify as much as possible the current infrastructure that involves EGO/Virgo and the CCs
4. Discuss possible new solutions for data management that could improve our data handling (move, replica, access, retrieving, ...) both at local and at remote level
5. Discuss problems and difficulties that are limiting our usage of the CCs for offline analysis
6. Stimulate interest in order to enlarge the Virgo computing team

O2 run vs O3

- O2 Run has been a scientific success, but also a crucial test for O3
 - < 1 Month of data
 - 110TB of recorded data
 - Few “monumental” detections
 - A series of small and not-so-small problems in the DAQ-Transfer-Storage chain that is a warning bell for O3
- O3 run:
 - 1 year of data taking
 - Expected start: Nov 2018
 - 1.3PBytes of continuously recorded data
 - “more than few” expected detection
 - Absolute reliability requested to DAQ, storage, data transfer, low latency analysis
 - Very short maintenance periods every week (few hours every week)

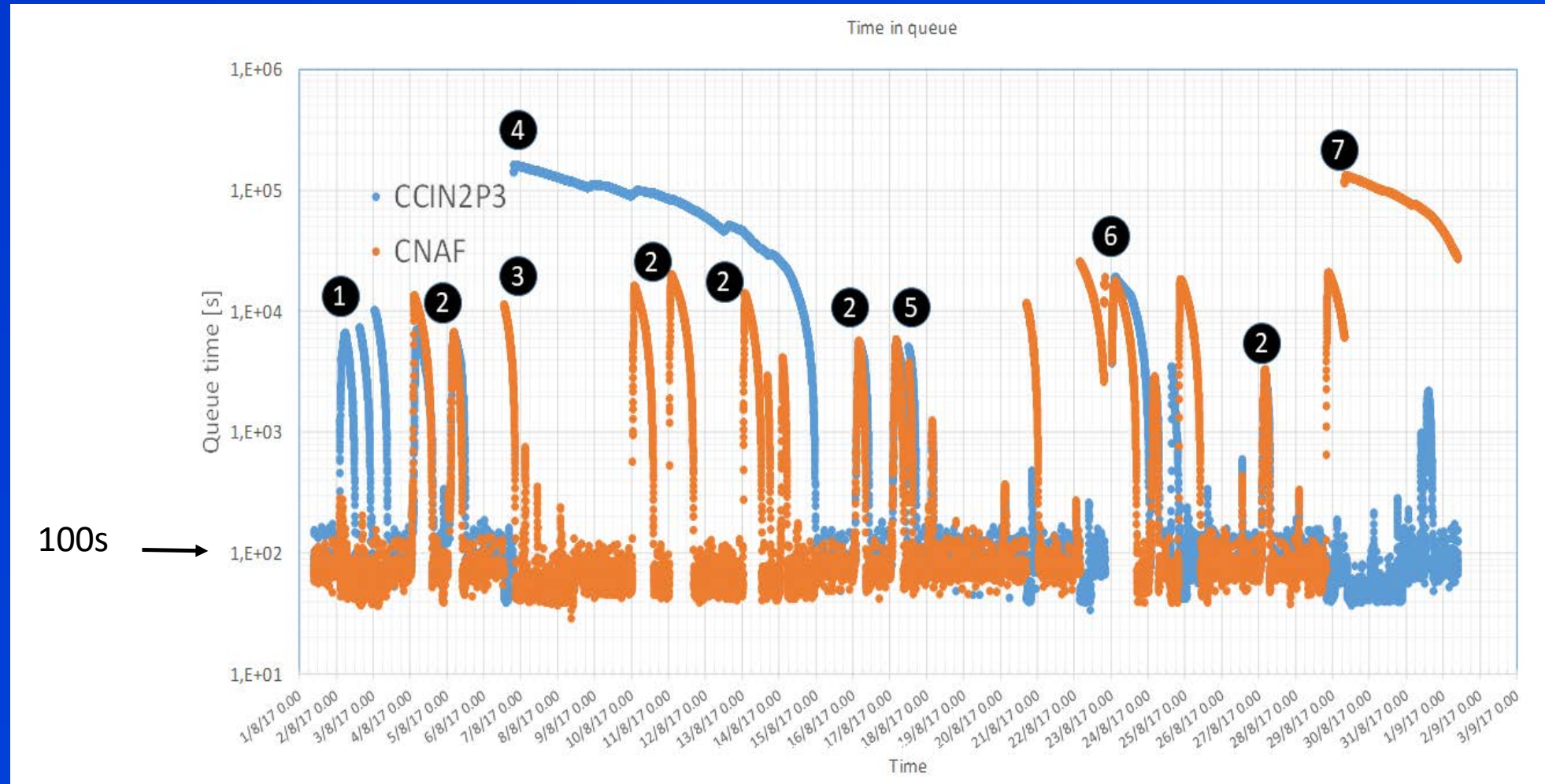


Preamble

- Data transfer
 - Virgo has a particular raw data storage configuration, having the Tier-0 remotely located in Lyon (CCIN2P3) and Bologna (CNAF)
 - At EGO site we have a circular buffer where data are overwritten every 5 months
 - Hence, data transfer reliability assumes a critical importance, mainly for O3 being the run duration expected to be longer than the current local buffer
 - EGO council “delayed” our request to enlarge the local storage
 - Before O2 we invested time and human resources to have a data transfer procedure allowing to be “in time” between data production and remote storing
 - The difficulties encountered by the data transfer during O2 are an excellent probe for fragilities of our global DAQ-Transfer-Storage system

O2 history

- It is interesting to depict the O2 history using as probe the performances of the Data Transfer
 - It is possible to highlight in this way the fragilities of the whole system and organisation

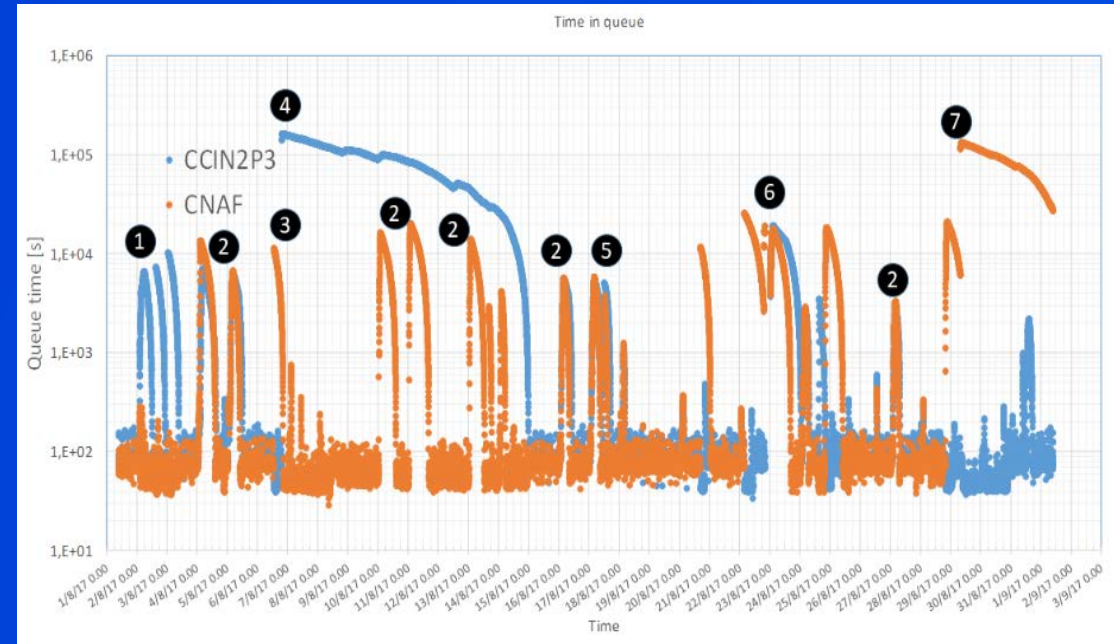


Analysis of the «delays»

- If the time in queue of a file is $< 100s$, the pipeline is «in time», if $>100s$ we accumulate delay, that needs to be recovered by over-performance of the data transfer system and WAN link
- Problem (1):
 - Data Transfer toward Lyon was hanging; problem due to some iRods commands that where not responding. Tuning of the of the procedure allowed to keep the data transfer alive, although the command were still hanging
 - Livio will go deeper in this point
- Problem (2)
 - Almost every midnight the DT (mainly toward CNAF) was slowing down
 - Delay easily recovered in few hours, but it is still unclear if it is due to resources competition at the site or at CNAF
 - Livio will go deeper in this point

Analysis of the «delays»

- Problem (3)
 - The Grid certificate used to transfer data toward CNAF expired
 - This is an issue mitigated before the run thanks to the CNAF support but still present

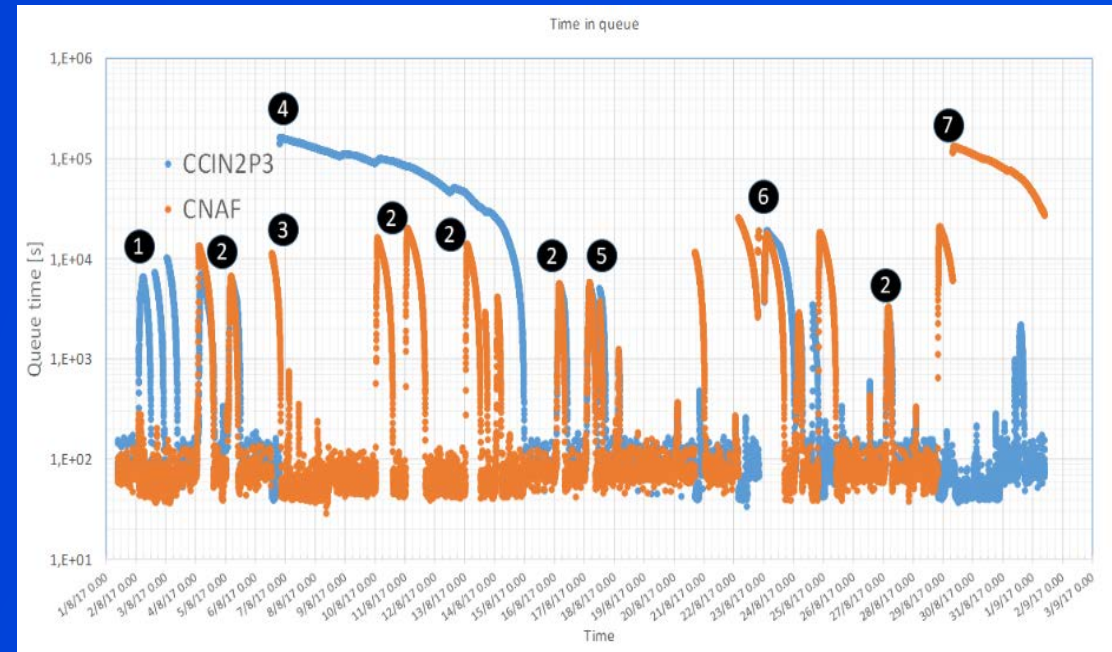


- The workaround proposed by CNAF extends the lifetime of the certificate to one week, but its effective expiration seems slightly undefined and it is a “workaround” instead of a solution
- We need to negotiate a “permanent” solution

Analysis of the «delays»

- Problem (4)

- The transfer toward the tapes in CCIN2P3 was too slow and the disk buffer saturated blocking the DT
- Problem seems solved at CCIN2P3

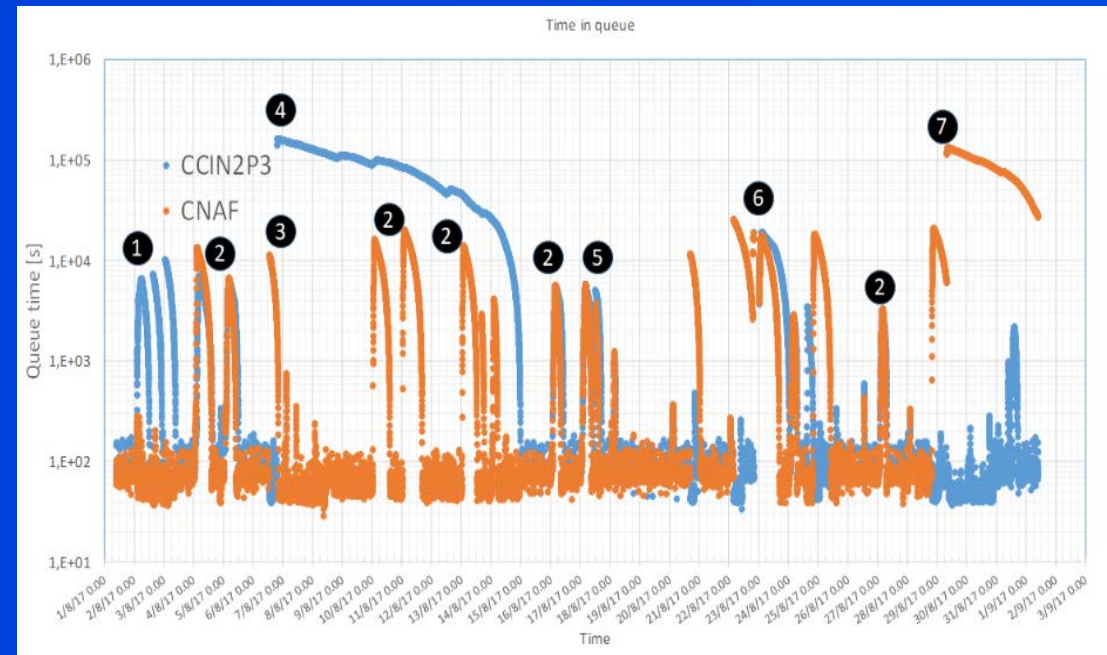


- Problem (7)

- Very similar problem at CNAF
- The transfer from disk to tape at CNAF was too slow and the DT toward Bologna hanged

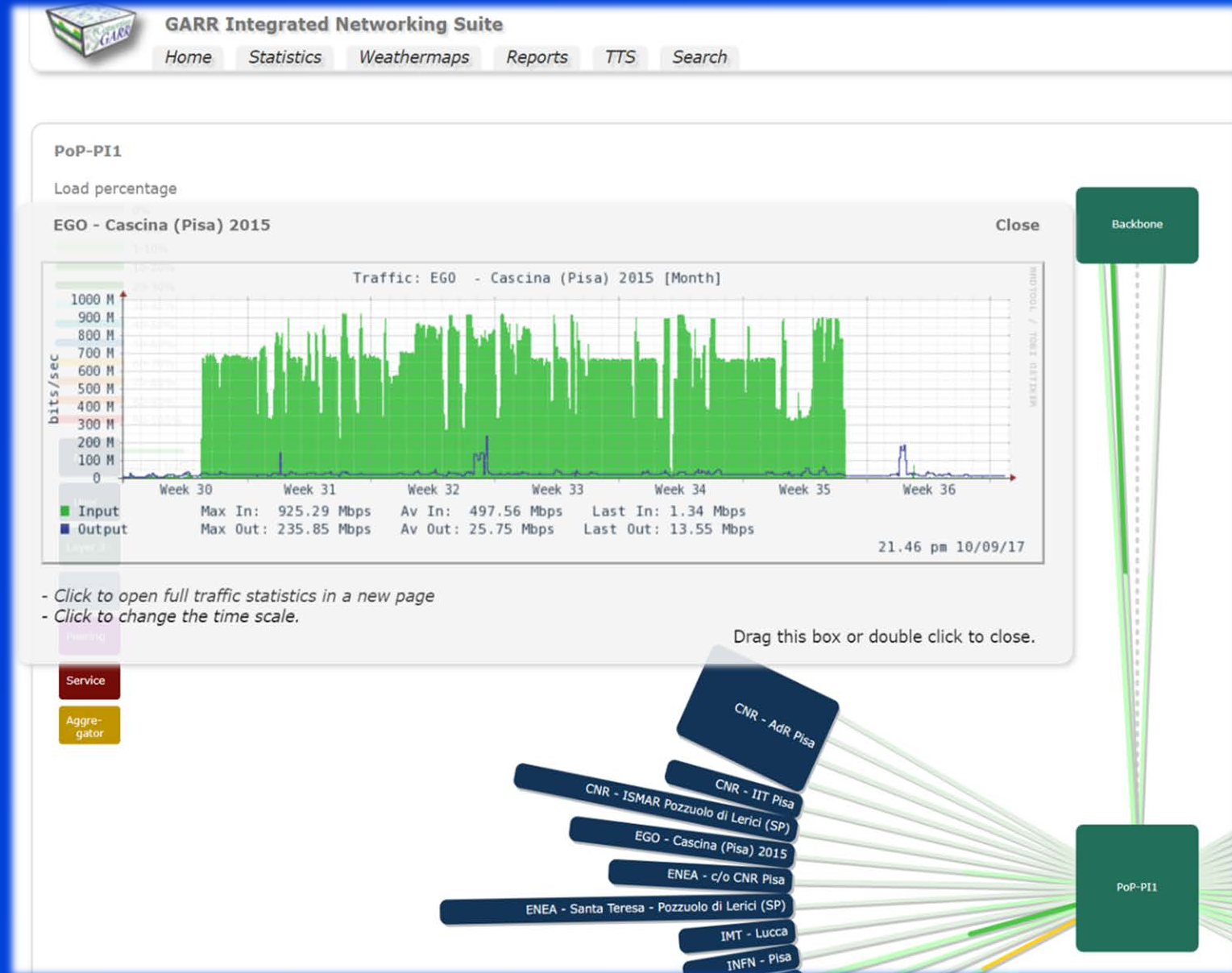
Analysis of the «delays»

- Problem (5) and Problem (6) are “local” problems related to the storage and the firewall (not subjects for today’s discussion)



Wide Area Network

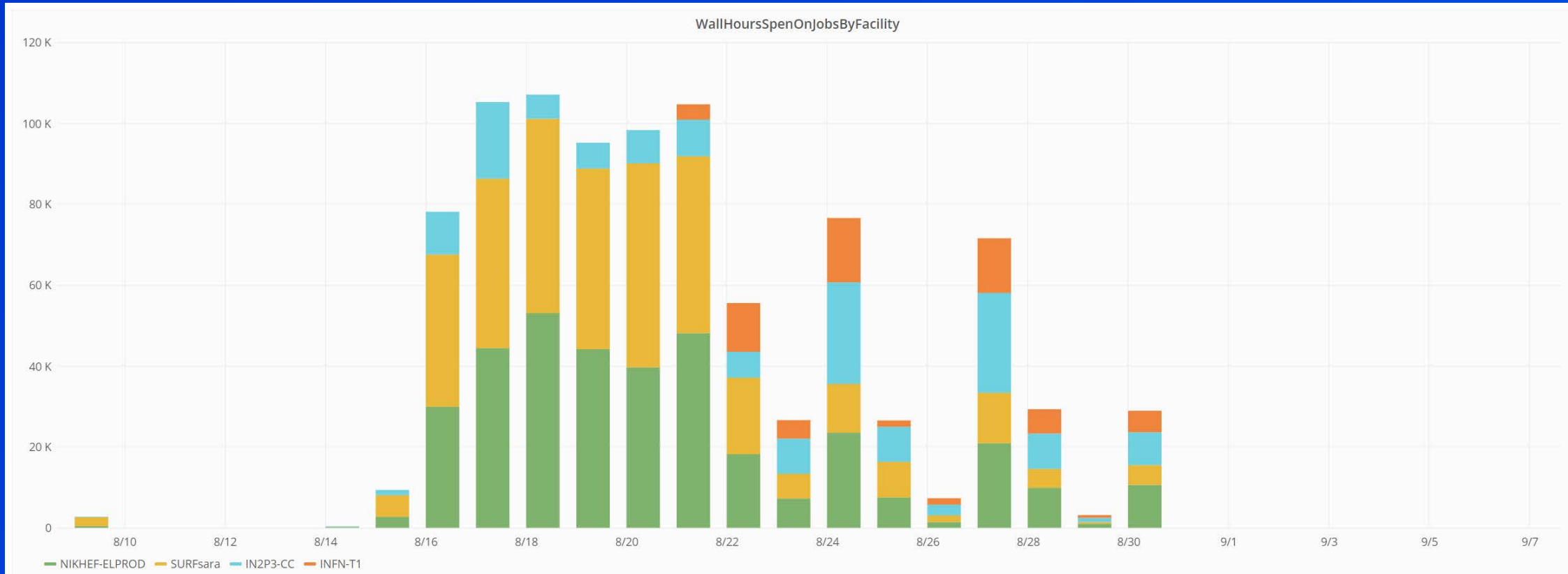
- Every time a DT delay need to be recovered the DT machinery has to over-perform.
- The limit that in O2 we never reached, but we approached very closely is the WAN limit: 1Gb/s
 - We operated for long periods at 90-95% of the bandwidth
 - This is risky and limiting for O3 and an upgrade of the network has been requested



OFFLINE

O2 offline analysis computing

- Running via GRID LV pipelines in Virgo computing center is no more a technical issue (at least for pyCBC)



But the reduced use by LV pipeline is an human resources and organisation issue

Computing power: future needs

- CNAF is the only computing centre used as preferential resource by a Virgo “heavy” pipeline (CW Roma)
- CCIN2P3 and Nikhef are used mainly through OSG when needed
 - CCIN2P3 this year has been used few times more than expected without OSG
 - Detchar will be (probably) a relevant user of CCIN2P3 for O3
- Nikhef has been used almost exclusively by OSG users
 - Major difficulties encountered by Virgo Roma people to run their jobs in Nikhef
- Quite difficult in this condition to predict the future needs
- O3 will last for 1 year and Virgo should be in science mode for all O3
- Impact of the Virgo presence on CW pipelines Virgo is relatively small, but for the coherent analysis we could have:
 - HLV, HL, HV, LV ... 4 times O2
- The impact of this increment on Virgo resources depends on Virgo analysts actions:
 - Are they running heavy pipelines on Virgo resources?
 - What is limiting the use of Virgo resources?

Computing power: plan

- The plan is to keep for 2018 about the current power (and disk) at CNAF
 - Disk is (was) currently at 85% but with some optimisation we can work
- In 2019 we need a jump since the beginning of the year

CNAF

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|-------|-------|------------------------|------------------------|-------|-------|-------|
| Disk (TB) | 445 | 592 | 656 | 720 656 | 720 | 720 | 720 ? |
| CPU (HS06) | 10000 | 25000 | 36000 30000 | 78000 30000 | 78000 | 78000 | 78000 |

- In CCIN2P3 we “predict” in 2018 the same energy consumed in 2017

~~30000~~ 30000
40000 for 1 month

- In Nikhef we should keep the current power (25kHS06) and surfSARA is unclear to me
- In 2018 we should be able to access via EGI Taiwan (10kHS06)

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