International Conference on Advanced Scientific Computing
ICASC 2024
23 - 25 October 2024

RO-LCG CURRENT STATUS AND STRATEGY

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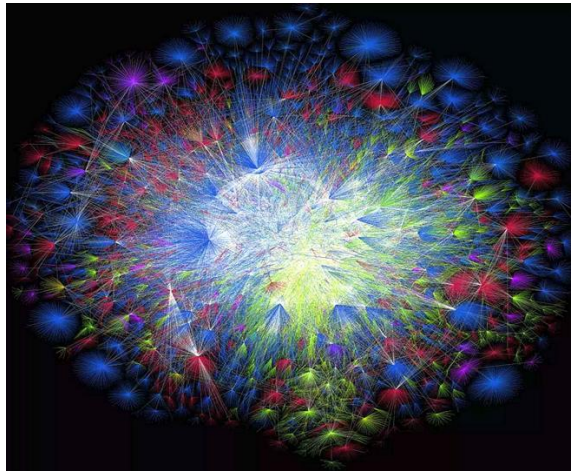
ANNIVERSARIES THIS YEAR



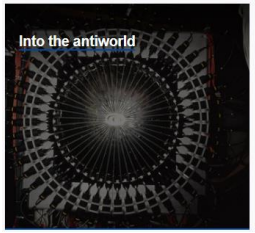
1954-2024

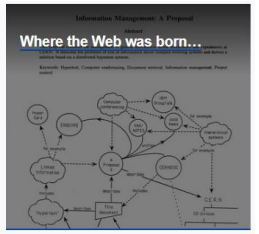
ANI CERN

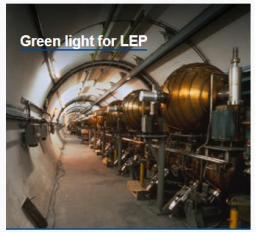
70 YEARS OF CERN (1954)

https://cern70.cern/

RO participation in 3 major LHC experiments

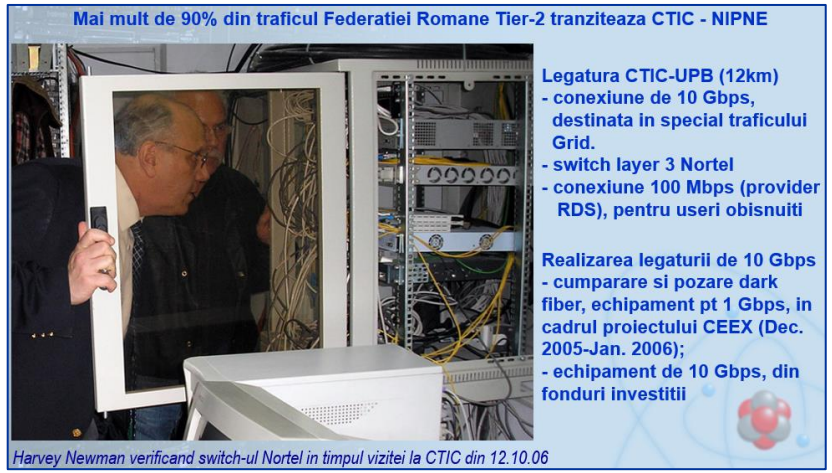






35 YEARS OF WORLD WIDE WEB (1989)

https://webfoundation.org/about/vision/history-of-the-web/



18th CELEBRATION OF THE RO-LCG (March 2006)

https://lcg.ifin.ro

Conclusion of the WLCG Memorandum of Understanding between CERN and ANCS

ROMANIAN TIER-2 FEDERATION

PARTNERS: 3 institutes, 2 universities

- ‘Horia Hulubei’ NIRD in Physics and Nuclear Engineering (IFIN-HH) - coordinator
- Space Science Institute - INFLPR Subsidiary (ISS)
- NIRD for Isotopic and Molecular Technology, Cluj (ITIM)
- ‘Alexandru Ioan Cuza’ University, Iasi (UAIC)
- National Science and Technology Politehnica Bucharest (UNSTPB)

INSTITUTION / DEPARTMENT	GRID CENTRE	SUPPORTED VOs
IFIN-HH / Dept. of Hadron Physics (DFH)	NIHAM	ALICE
IFIN-HH / Dept. of Computational Physics and Information Technology (DFCTI)	RO-07-NIPNE	ALICE, ATLAS, LHCb
ISS / Centre of Space Sciences and Technologies	RO-13-ISS	ALICE
ITIM / Computing Centre	RO-14-ITIM	ATLAS
UAIC / Dept. of Digital Communication	RO-16-UAIC	ATLAS
UNSTPB / National Centre for Information Technology (NCIT)	RO-03-UPB	ALICE

RO-CERN NETWORK AND THE CERN-CONNECT PROJECT

"Improving the reliability and resilience of the data network for supporting the national contribution to the CERN's scientific program"

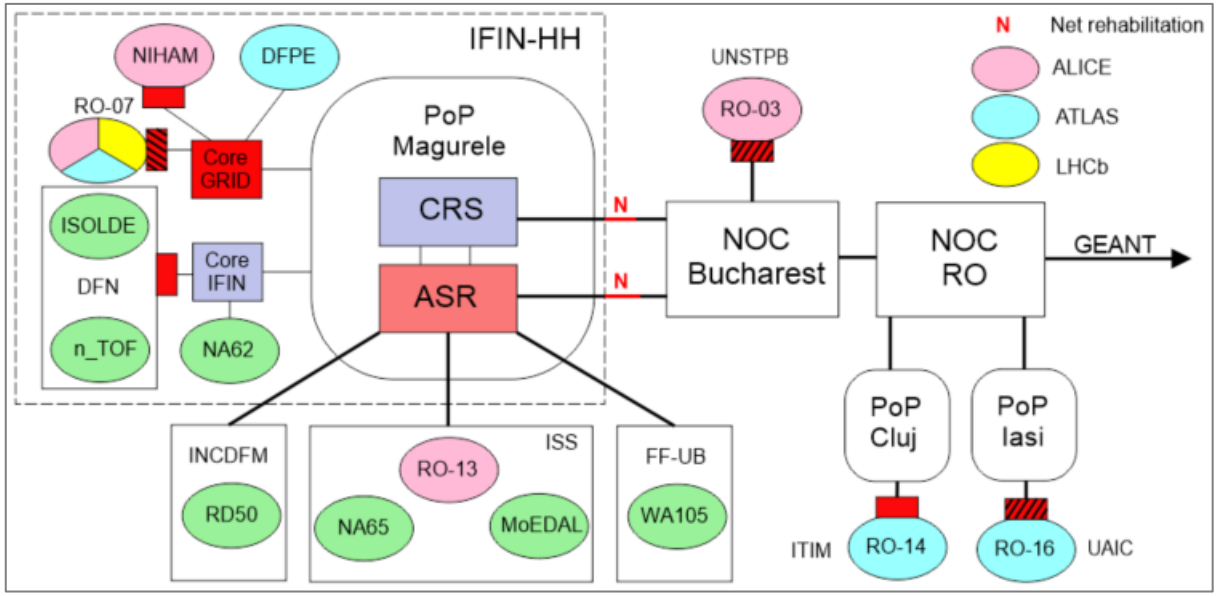
OBJECTIVE: strengthening of the national participation in CERN experiments by investments in high tech networking equipment to be used in common by the CERN-RO research teams.

O1. Improving the resilience of the connection to the NREN for CERN-RO experiments. (PoP Magurele)

O2. Improving the local networks connections to the RoEduNet backbone. (100 Gbps switches)

O3. Improving network physical safety at the border of the Magurele Platform domain. (FO link @ Magurele)

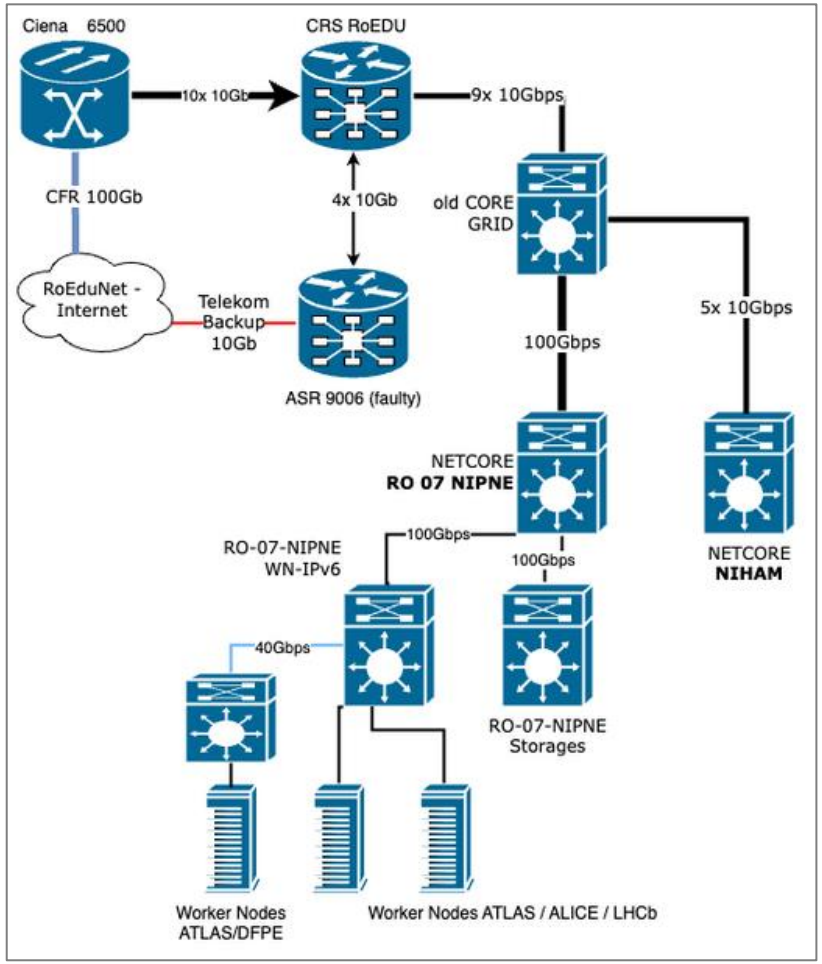
O4. Implementation and testing of a centralized system for monitoring the availability of the RO-CERN network nodes.



Above: **RO-CERN NETWORK**

the shaded rectangles denote the switches that are not purchased from CERN-CONNECT's budget, but from alternative sources

NETWORK UPGRADES @ MAGURELE

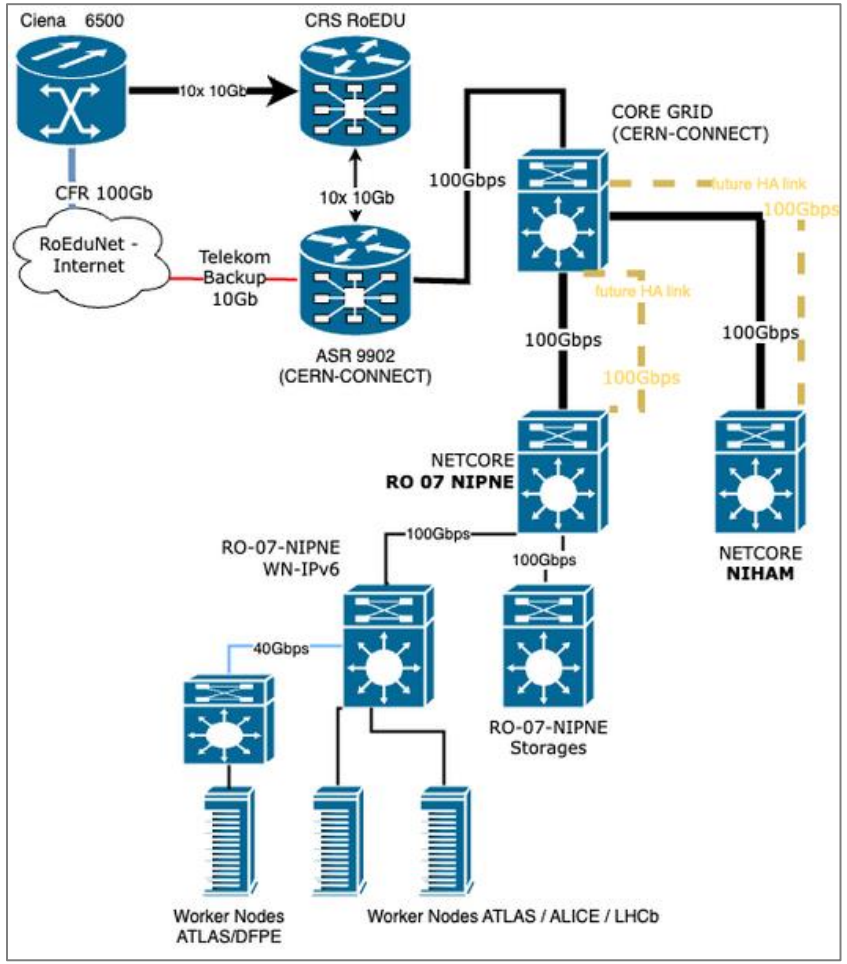


Data network at Magurele

Left: before CERN-CONNECT upgrade

Right: after CERN-CONNECT upgrade

(2024)



GRID COMPUTING RESOURCES

Offering more than 16.000 CPU cores and 24 PB disk storage capacity, its computing power used being of more than 155.000 HS06 units, RO-LCG is at national level **the HTC infrastructure with the largest concentration of resources dedicated to scientific computing for RDI**

Right: Storage (in PiB) used vs. offered to alice by Tier1s and the most significant 22 Tier2 centres, as published by MonALISA at the end of September 2024.

SITE	alice		atlas		lhcb		Total	
	used	allocated	used	allocated	used	allocated	used	allocated
NIHAM	3.477	3.825					3.477	3.825
RO-03-UPB	7.716	8.378					7.716	8.378
RO-07-NIPNE	915	1.139	2.833	4.210	50	400	3.748	5.349
RO-13-ISS	5.000	5.654					5.000	5.654
TOTAL	17.107	18.996	2.833	4.210	50	400	19.940	23.206

Average storage capacity offered by the RO-LCG centres to all three VOs between Jan.-Aug. 2024, expressed in PB units on the CRIC site (https://wlcg-cric.cern.ch/

SITE	alice		atlas		lhcb		Total	
	used	allocated	used	allocated	used	allocated	used	allocated
NIHAM	3.463	3.825					3.463	3.825
RO-03-UPB	8.706	9.280					8.706	9.280
RO-07-NIPNE	856	1.139	3.322	4.210	52	400	4.177	5.349
RO-13-ISS	5.270	5.673					5.270	5.673
TOTAL	18.295	19.917	3.322	4.210	52	400	21.616	24.127

Storage capacity (in PB) offered by the RO-LCG centres to all three VOs in Aug. 2024.

UNSTPB: its storage capacity ranks first, respectively 4th in the ranking of all alice Tier 2s / Tier 1s

It is connected to RoEduNet at 200 Gbps.

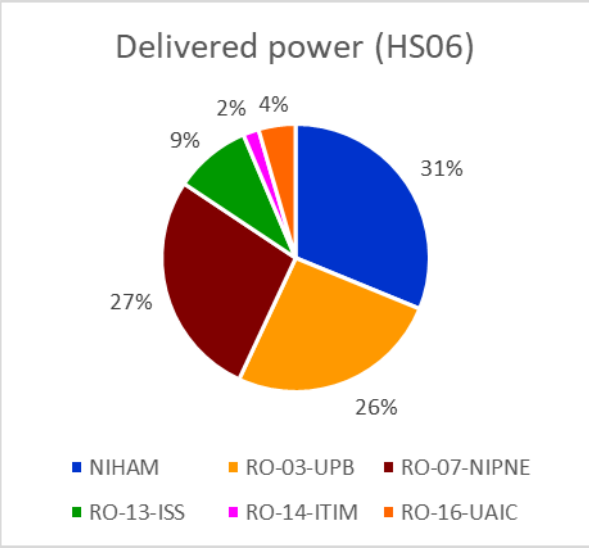
It can simultaneously run up to 6.700 job slots (66.649 HS06) for limited periods of time (e.g. Sep.)

AliEn SE		Catalogue statistics	
SE Name	Tier	Size	Usage
8. FZK - SE	1	17.73 PB	94.33%
7. CNAF - SE	1	12.17 PB	75.6%
24. NDGF - DCACHE	1	9.385 PB	72.06%
5. CCIN2P3 - SE	1	8.115 PB	89.01%
34. RRC_KI_T1 - EOS	1	5.272 PB	61.6%
17. KISTI_GSDC - EOS	1	3.662 PB	73.67%
33. RAL - CEPH	1	2 PB	51.78%
36. SARA - DCACHE	1	1.867 PB	77.17%
18. KISTI_GSDC - SE2	1	1.446 PB	39.32%
25. NDGF - DCACHE_TEST	1	10 MB	0.002%
44. UPB - EOS	2	8.242 PB	86.18%
10. GSI - SE2	2	7 PB	88.76%
12. ISS - EOS	2	5.053 PB	84.41%
31. Poznan - EOS	2	4 PB	57.4%
29. ORNL - EOS	2	3.964 PB	74.5%
22. LBL_HPCS - EOS	2	3.48 PB	84.46%
26. NIHAM - EOS	2	3.397 PB	89.57%
23. Legnaro - SE	2	3.276 PB	79.9%
4. Catania - SE	2	3 PB	89.85%
32. Prague - SE	2	2.7 PB	65.99%
9. GRIF - EOS	2	2.391 PB	73.68%
1. Bari - SE	2	2.09 PB	86.39%
3. Bratislava - SE	2	2.039 PB	78.95%
2. Birmingham - EOS	2	1.794 PB	37.73%
20. Kosice - EOS	2	1.714 PB	93.73%
39. Torino - SE2	2	1.646 PB	76.48%
14. JINR - EOS	2	1.39 PB	53.38%
16. KFKI - SE	2	1.258 PB	85.75%
19. Kolkata - EOS2	2	1.124 PB	46.21%
21. LBL_HPCS - AF_EOS	2	1.092 PB	34.84%
15. KFKI - EOS	2	1.066 PB	81.78%
27. NIPNE - EOS	2	1.011 PB	69.12%

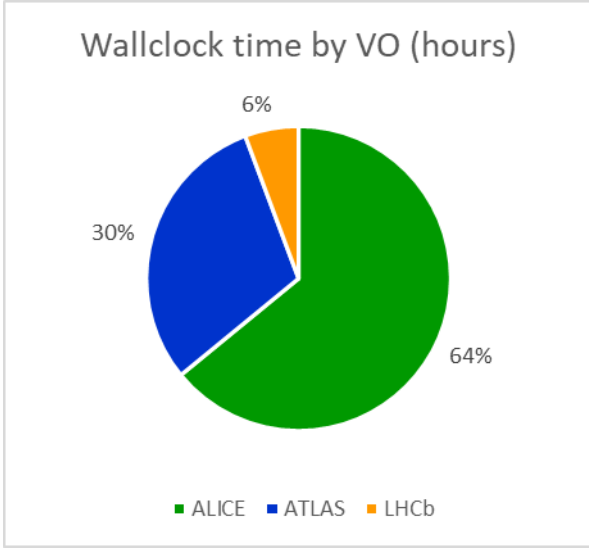
RO-LCG ACHIEVEMENTS JAN.-SEP. 2024

- The wallclock work delivered by RO-LCG between Jan.-Sep. 2024 exceeded 593 MHS06*hours.
- With a Grid production of 71 Mhours wallclock time (logical cores * hours), that represents 3,2% of the total provided by the 27 national Tier2s for ALICE, ATLAS and LHCb, RO-LCG **ranks 8th worldwide**.
- RO-LCG offers today 24 PB of storage, **ranking first worldwide** among the national Tier2s with respect to the disk capacity dedicated to ALICE (18 PetaBytes, of which 85% are currently used).

Distribution of accounted power on centres



Distribution of wallclock time on VOs



PREPARING FOR HL-LHC GRID

LHC Provisional Long-term Schedule

Bernd Panzer-Steindel, CTO CERN/IT

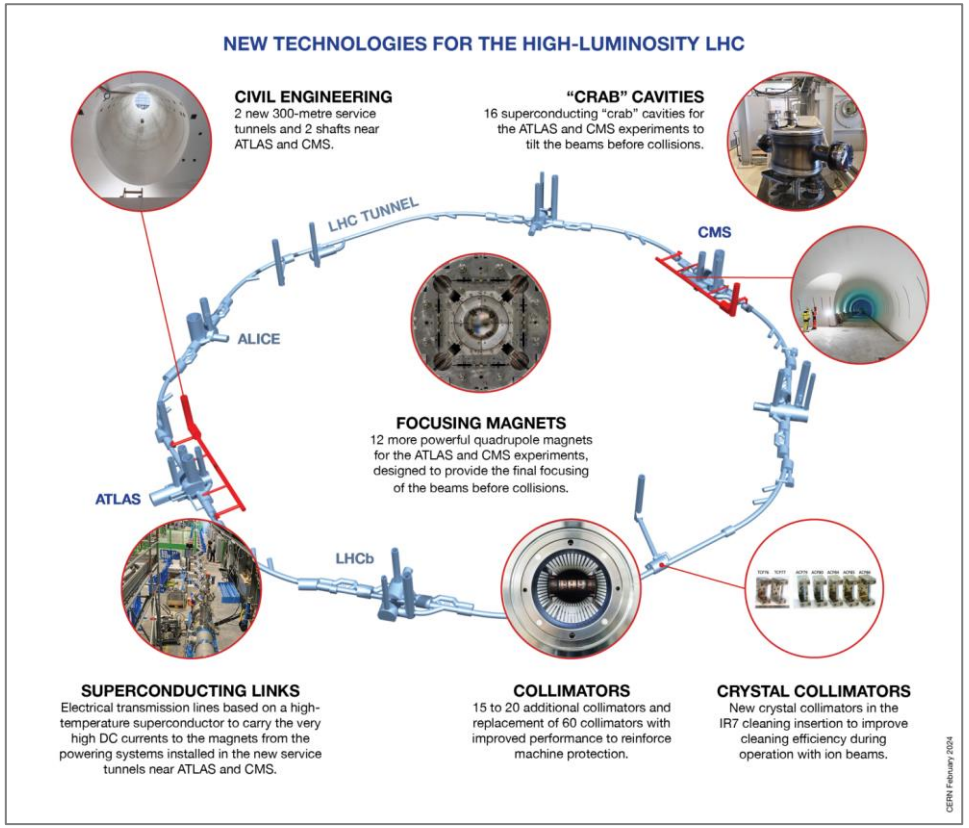
WLCG should:

1) support the current production regime in Run 3 and LS3

2) to cope in Run 4 with 10 times more data and 5 times more pileup and events size,

3) while assuming that the annual budget remains close to current values

RO-LCG should adapt to this evolution



WLCG STRATEGY 2024-2027

DIRECTIONS: 1) continuing to evolve and optimize current operations to provide highly available resources for the LHC experiments; 2) reducing the cost, energy consumption, and carbon footprint of computing by using multiple paradigms (Grid, public or private clouds, HPCs), and various CPU architectures (x86, ARM, GPU...); 3) modernising tools and services, taking advantage of existing, non-HEP specific but well supported software; 4) ensuring continuity and seamless evolution through a programme of data challenges and improved monitoring; 5) increasing collaboration with other communities and benefiting from synergies with other initiatives that develop large-scale computing infrastructures; 6) reviewing the structure and governance of WLCG in order to optimize them.

RELEVANT TASKS: 1) tools and services modernisation for ensuring technical sustainability of the WLCG infrastructure; 2) development of a structure for testing innovation, based on the model of data challenges; 3) a technical roadmap (TDR) will be ellaborated for upgrading LCG in time to be useful for the start of Run 4; 4) the hardware and market trends will be monitored globally and at national level; 5) a multi-year resource planning procedure will be developed; 6) WLCG will set up mechanisms to collect, organise and expose information about site capabilities (compute, storage, network); 7) investigating technical solutions used to integrate cloud resources with WLCG; 8) investigating existing solutions to integrate HPC centres in WLCG; 9) facilitating the development of the offline software and advance benchmarking and accounting for heterogeneous compute architectures; 10) regularly reviewing the interaction and interdependency with EGI/OSG and strengthening coordination across the three organizations; 11) encouraging the necessary offline software improvements to make the best use of the infrastructure; 12) reviewing WLCG governance to better support WLCG strategy (in particular CB should discuss cases of federations not delivering to WLCG as expected, or about new policies for pledging resources); 13) reducing the carbon footprint, facilitating the use of more energy-efficient hardware and promoting a sustainability plan; 14) identifying and reviewing risks and mitigations; 15) increasing the impact of WLCG on science and society, training, and outreach.

RO-LCG STRATEGY 2024-2027

The strategic objective of the Federation for the period 2024-2027 is its evolution towards the status of a "medium sized data centre" of the WLCG, that will provide reliable Grid computing services for the research conducted at the ALICE, ATLAS and LHCb experimentsText

SPECIFIC OBJECTIVES

S1. Adapting the RO-LCG infrastructure to the WLCG's directions of development towards the future distributed computing support of the HL-LHC

S2. Consolidating local computing facilities and improving their integration into the WLCG

S3. Enhancing provision of high-quality services of processing, simulation and data for ALICE, ATLAS and LHCb experiments

S4. Maintaining RO-LCG's contribution to the WLCG at the level of a medium-size Tier 2

S5. Adopting new techology and boosting software development

S6. Development and consolidation of highly-qualified human resources

S7. Increasing the visibility of the Romanian contribution to the WLCG collaboration

S8. Attracting alternative funding sources for the implementation of the RO-LCG strategy.

A FEW TASKS

T1.1. Upgrading the RoEduNet – GEANT connection's overall bandwidth from 100 to 200 Gbps.
To be planned asap, requested next year together with AARNIEC RoEduNet from the decision makers / funding authorities and, hopefully, performed in the first years of LS3.

T1.2. Implementing a coordinated system of perfSONAR tests and analysis of throughput and latency within the whole RO-LCG network. Term: 2025

T1.3. Improving network reliability by upgrading the bandwidth of the sites' backup links. Medium term.

T1.5. Technical-financial analysis of the opportunity and feasibility of realizing the ALICE Tier 1 centre.

T4.1. Accurate measurements of the computing power of the RO-LCG centres. Term: annually.

T4.2. Monitoring hardware and market trends (according to WLCG task 4 listed in Sec. 2.3). Annually.

T4.3. (Multi-)annual elaboration of the procurement plan on the basis of the Financial Model

T5.4 Participation in the WLCG structure for testing innovation, based on the model of data challenges (e.g. DC26)

T6.1 All RO-LCG partners will devise and implement a coherent, long-term plan of measures regarding the provisioning and preserving the human resources necessary for the maintenance and operation of the Grid infrastructure

T8.1. Computing a flat funding budget for medium-term capital investments on the basis of a rigorous analysis.

T8.2. Estimating the necessary budget for the possible implementation of an ALICE Tier 1 centre

T8.3. Discuss with the funding agencies the possibility to activate a separate funding process for

preparing the HL-LHC computing stage and/or for having access to alternative funding sources.

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THANK YOU FOR YOUR ATTENTION !

INCDTIM Cluj-Napoca, 23.10.2024