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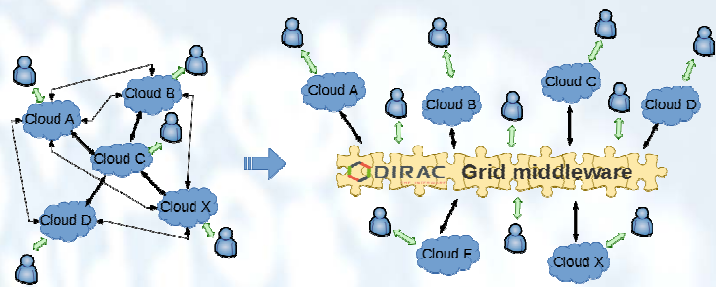
The integration of resources of the JINR Member State organizations in a unified distributed information and computing environment is an important and topical task, the solution of which would significantly accelerate scientific research. This paper describes the distributed cloud infrastructure deployed on the basis of the resources of the Laboratory of Information Technologies of the Joint Institute for Nuclear Research (JINR) and some JINR Member State organizations. It explains the motivation of this work, the approach it is based on, gives outline plans for using the created infrastructure.

Clouds integration (1/2)



To join resources for solving common tasks as well as to distribute a peak load across resources of partner organizations

Clouds integration (2/2)



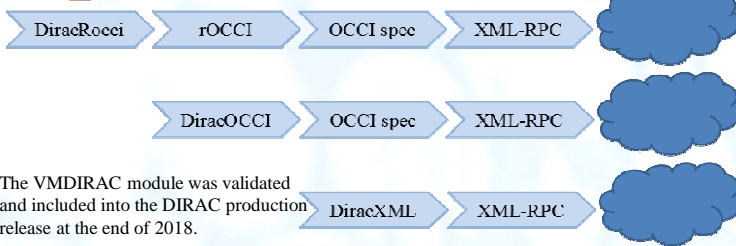
Cloud bursting approach:
- poor scalability
- hard to maintain

Grid middleware (interware) – DIRAC:
- good scalability
- easier to maintain
- DIRAC services are deployed at the JINR cloud

VMDIRAC module for OpenNebula

- ☑️ CLOUD
- ☑️ CLOUD.JINR.ru
- ☑️ CLOUD.IPANAS.az
- ☑️ CLOUD.PRUE.ru
- ☑️ CLOUD.TESTNEBULA.ru
- ☑️ CLOUD.NU.kz

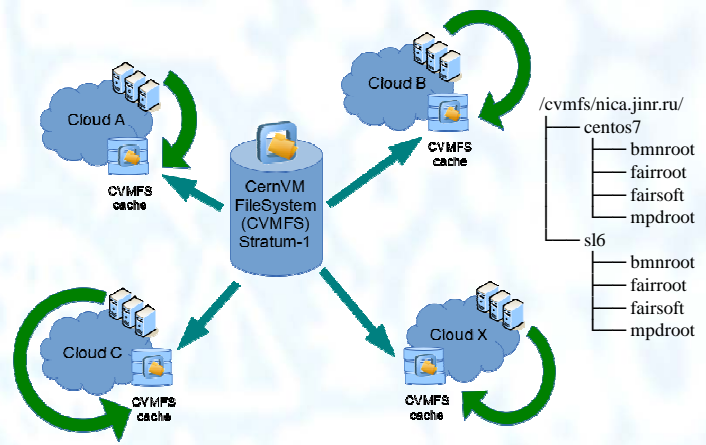
VMDIRAC module for the OpenNebula-based cloud integration into DIRAC using native OpenNebula XML-RPC API



The VMDIRAC module was validated and included into the DIRAC production release at the end of 2018.

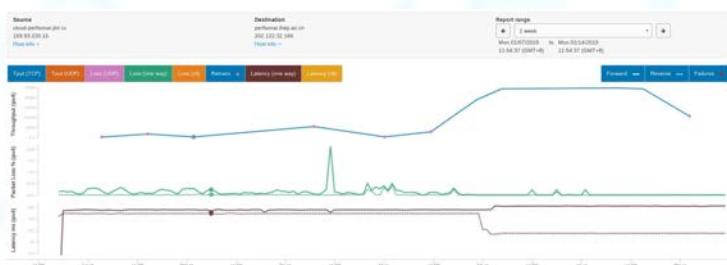
Migration from OCCE to the Opennebula XML-RPC endpoint secured with SSL

Experiments software distribution model



PerfSONAR

To monitor the network connectivity of the participants
<http://cloud-perfsonar.jinr.ru>



JINR neutrino computing platform



Latest publications

- Ye. Mazhitova et al. Cloud infrastructure of INP'S Astana branch - PE "NULITS" and its integration with distributed JINR cloud infrastructure // «The XXII International Scientific Conference of Young Scientists and Specialists (AYSS-2018)», EPJ Web Conf. Vol. 201, 2019, pp. 1-5. doi:https://doi.org/10.1051/epjconf/201920105003.
- V. Korenkov et al. Clouds of JINR, University of Sofia and INRNE — current state of the project // The 8th International Conference "Distributed Computing and Grid-technologies in Science and Education" (GRID'2018), CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2267, 2018, pp. 248-251.
- A.V. Baranov et al. New features of the JINR cloud // The 8th International Conference "Distributed Computing and Grid-technologies in Science and Education" (GRID'2018), CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2267, 2018, pp. 257-261.
- V. Korenkov, N. Kutovskiy, N. Balashov, V. Dimitrov, R. Hristova, K. Kouzmov, S. Hristov Clouds of JINR, University of Sofia and INRNE Join Together // The 26th Symposium on Nuclear Electronics and Computing (NEC'2017), CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2023, 2017, pp. 122-128.
- N. Balashov, A. Baranov, Ye. Mazhitova, N. Kutovskiy, R. Semenov JINR member states Cloud Infrastructure // The 26th Symposium on Nuclear Electronics and Computing (NEC'2017), CEUR Workshop Proceedings, ISSN: 1613-0073, vol. 2023, 2017, pp. 202-206.