# CLOUD INFRASTRUCTURE OF INP'S ASTANA BRANCH AND IT'S INTEGRATION WITH JINR CLOUD

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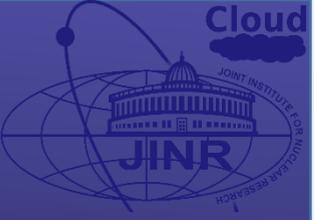
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# Institute of Nuclear Physics' Astana branch

The INP's Astana branch was founded with the purpose of forming an interdisciplinary scientific and research complex as a regional center of natural sciences and scientific and technical accompaniment for specialists training for Kazakhstan's nuclear industry. Complex is based on heavy-ion accelerator DC-60, put into effect in 2006.



In order to store and process data from the installation, to simplify access to application software, to use JINR's software and experiments data was decided to create a cloud infrastructure and integrate it with JINR cloud.

# Relevance

JINR participates in a large number of research projects, in many of which computer infrastructures are an important tool for obtaining significant scientific results.



In this connection, the pooling of JINR's computational resources and organizations from its member countries is an important and urgent task, the solution of which would significantly accelerate the conduct of scientific research.

# Integration of cloud infrastructures
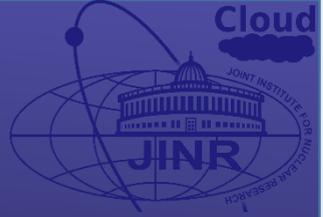
To unite the computational resources of the partner organizations of the JINR Member States for joint use to solve common problems, and to distribute peak loads between them, an "cloud bursting" model was chosen, for which the cloud team from JINR developed a special driver
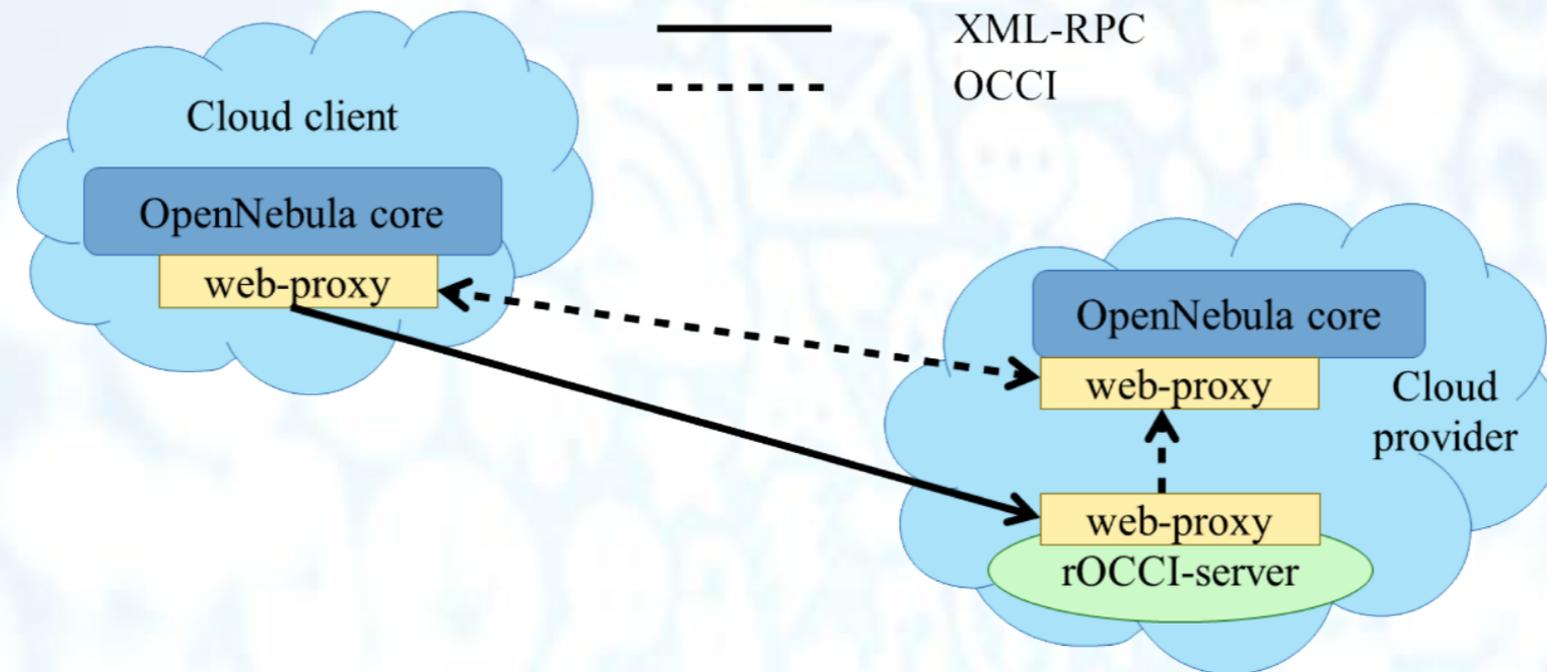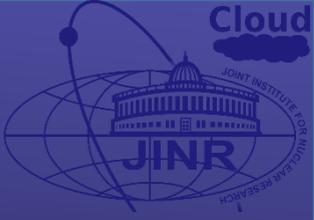


Driver allows you to integrate the JINR cloud with partner clouds that run either on the OpenNebula platform (and in this case you can enable monitoring of external cloud resources in real time) or on any other cloud platform that supports the Open Cloud Computing Interface (OCCI), for example OpenStack.
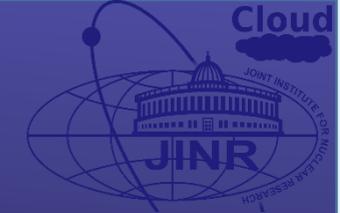
# Project implementation plan by years

1. Study of possible solutions for pooling resources (2017);
2. Purchase of equipment and construction of a test site for the selected solution (2017-2018);
3. Conducting training events for Kazakhstani specialists (2017-2018);
4. Integration of the resources into a single distributed information and computing environment (DICE) (2018);
5. Testing of the DICE (2018);
6. Involvement of potential participating organizations in the project (INP of the Republic of Kazakhstan, LN Gumilyov ENU, E. Buketov State University, Al-Farabi Kazakh National University, private companies) (2018-2019).

# Completed work
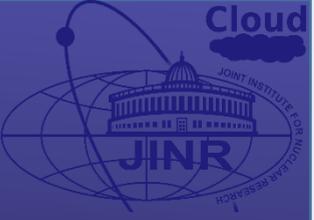
In 2017:

- prepared and signed protocol with the Astana branch of the INP on joint work in the field of creation and development of a common information space of existing ones, which provides an opportunity for data exchange between the JINR Member States and JINR collaborating international organizations;

- studied existing solutions for building a distributed information and computing environment (DICE), chosen a solution based on the OpenNebula platform;

- conducted organizational and training activities for specialists from Kazakhstan, including the implementation of OpenNebula and the use of the resources of the DICE.
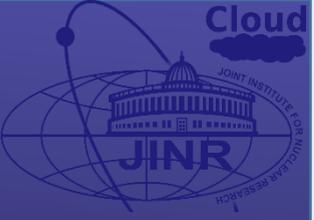
# Completed work

- To build a test site and create a JINR DICE, server hardware was purchased.
- The equipment was delivered to Kazakhstan (February 2018).
- Currently, the equipment is installed and the work is underway to install software to create the cloud infrastructure and directly integrate it with the JINR cloud.



| Наименование | Кол |
|---|---|
| S26361-K1566-V401 Серверное шасси PY RX2540 M2 8x 2.5' expandable 'Rack based server 19'' (2U), BU without processor and RAM, without hot plug power supply module, 5 hot plug fans redundant; RMK optional; dual systemboard for Xeon DP processor and 24 slots for registered DDR4 ECC RAM; iRMC S4 onboard server management incl. graphics controller and 10/100/1000MBit Service LAN port, DynamicLoM mit 2x/4x 1/10 Gbit Ethernet LAN optional, RAID0/1-Controller for 4 SATA-HDDs onboard, Modular 8-Port RAID Controller optional; 1 bay 5.25'' x 1.6'' for backup devices, 8 drive bays for hot plug 2.5'' SAS/SATA drives expandable; ServerView Suite Software Pack | 4 |
| S26361-F3933-E160 Процессор Intel Xeon E5-2660v4 14C/28T 2.00 GHz | 8 |
| S26361-F3849-E100 Cooler Kit 2nd CPU | 4 |
| S26361-F3694-E10 Идентификатор заводской сборки Independent Mode Installation | 8 |
| S26361-F3934-E515 Модуль памяти 32GB (1x32GB) 2Rx4 DDR4-2400 R ECC | 32 |
| S26361-F2495-E440 Config 4: 8x 2.5'' HDD | 4 |
| S26361-F5618-E64 Жесткий диск SSD SATA 6G 64GB DOM N H-P | 4 |
| S26361-F5531-E560 Жесткий диск HD SAS 12G 600GB 15K HOT PL 2.5' EP | 8 |
| S26361-F3842-E1 Контроллер PRAID CP400i | 4 |
| S26361-F3961-E202 Сетевой адаптер FC Ctrl 8Gb/s 2 Chan LPe12002 MMF LC LP | 4 |
| S26361-F5302-E401 Адаптер PLAN EM 4x1Gb T OCl14000-LOM interface | 4 |
| S26361-F2735-E175 Монтажный набор Rack Mount Kit F1 CMA QRL LV | 4 |
| S26361-F4530-E10 Монтажный набор Mounting of RMK in symmetrical racks | 4 |
| S26361-F2735-E82 Кабель Rack Cable Arm 2U | 4 |
| S26361-F3301-E100 Наклейка Made in Germany sticker | 4 |
| S26361-F1452-E140 Набор документов Region-kit Europe | 4 |
| S26361-F1790-E311 Лицензия eLCM Activation License | 4 |
| S26361-F1790-E243 Ключ активации iRMC advanced pack | 4 |
| S26113-F574-E13 Блок питания Modular PSU 800W platinum hp | 8 |
| T26139-Y1968-E100 Кабель питания Cable powercord rack, 4m, black | 8 |
| S26361-F3120-E40 serial port option | 4 |
| FSP:GN3S20Z00RUSV2 Сертификат на сервисную поддержку TP 3y OS,9x5,NBD Rt | 4 |
| ИБП 3000ВА APC "Smart-UPS X 3000" | 1 |

# Conclusion

- The possible ways of integrating territorially distributed computing resources are explored.

- A solution is chosen based on combining cloud infrastructures using the "cloud bursting" model.

- A complex of training events for specialists from Kazakhstan on creating cloud platforms based on OpenNebula and using the resources of distributed information and computing environments was organized and conducted.

- As a prototype, a testing ground was deployed at the equipment currently available in Astana branch of the Institute of Nuclear Physics.

# References

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2. Baranov A.V. et al. Approaches to cloud infrastructures integration, Computer Research and Modeling, **8**, 3, 583-590 (2016).

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Thanks for attention!