Contribution ID: **110** Type: **Poster**

"Plasma and Fusion Cloud"Data Analysis Environment

Wednesday, 17 July 2024 15:40 (1h 30m)

At the National Institute for Fusion Science (NIFS), "Plasma and Fusion Cloud"concept is currently underway. This concept is aims to establish a data analysis environment not only fusion plasma experiment, but other fields that transcends the boundaries of disciplines among universities in Japan, promoting the reuse of results such as experimental data obtained from existing experiments and analysis programs that have been developed.

The Open Data Server [1], which is part of this initiative, is already in operation, and data collected from LHD experiments are now available to the public.

These data were collected and analyzed during 25 cycles of experiments and are registered in the analysis server as analytical data, totaling more than 20 million items of data from 1,000 different measurements.

The data is being made open not only to LHD experimenters but also to a wide range of related fields such as fusion research, plasma physics, and condensed matter physics, as well as to the information science field as big data for research promotion.

In addition, the Open Data Server will provide a variety of data, not limited to fusion experiments, and is currently releasing not only LHD experimental data but also data obtained from the Aurora Observation Project [2].

For data analysis in LHD experiments, AutoAna is used to automate the launch of analysis programs. These programs are executed in containers using Docker, and by increasing or decreasing the number of execution containers as necessary, quasi-real-time analysis is realized during the discharge cycle. Container execution is performed by more than 20 PCs, but there are problems with proper allocation of computing resources, maintainability, scalability, etc. To solve this problem, we are planning to run containers by using large-scale clusters or cloud computing. This will enable flexible allocation of computational resources and facilitate the execution of analysis programs even by researchers who do not directly participate in LHD experiments.

Specifically, it is intended to be used in commercial cloud services and academic cloud infrastructures such as mdx. To verify the effectiveness of this system, we established a network between the supercomputer system Raijin and the raw data management system at NIFS, and developed an environment to run analysis programs using experimental data on the supercomputer. In addition, last year, we concluded an open data sponsorship with Amazon, Inc. to facilitate the use of data from the cloud [3], and we plan to copy the data obtained from the LHD experiments, including raw data, to cloud storage and make them available via the Internet.

In this presentation, we will give an overview of these plans and introduce the current status of the project.

[1] LHD experiment data repository, https://exp.lhd.nifs.ac.jp/opendata/LHD/

[2] Aurora Observation Project, https://projects.nifs.ac.jp/aurora/en/

[3] Open Data on AWS, "NIFS LHD Experiment", https://registry.opendata.aws/nifs-lhd/ .

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Session Classification: Poster Session

Track Classification: Data Storage and Retrieval, Distribution and Visulaization