Japan Geoscience Union Meeting 2015
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MGI37-P01 Room:Convention Hall Time:May 27 18:15-19:30

STARS touch: A web-application for time-dependent observation data

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This paper is to present a cloud system for science, which has been developed at NICT. The NICT science cloud is an open cloud system for scientists who are going to carry out their informatics studies for their own science. The NICT science cloud is not for simple uses. Many functions are expected to the science cloud; such as data standardization, data collection and crawling, large and distributed data storage system, security and reliability, database and meta-database, data stewardship, long-term data preservation, data rescue and preservation, data mining, parallel processing, data publication and provision, semantic web, 3D and 4D visualization, out-reach and in-reach, and capacity buildings. In the present study, we discuss a Web application for time-dependent science data, which is named STARS touch. This Web application is based on a technique of asynchronous data transfer of graphic files for several types of data plots. The cloud system create a huge number of data plots with various time scale (e.g., from few minutes to few years) for each data-set. Parallel processing techniques to create such huge number of graphic data files are also discussed. We also make a live demonstration of the STARS touch to show several types of applications not only for research works but also for social data previews.

Keywords: Web application, WDS, time-dependent data, Collective intelligence, spacecraft observation, Meteorological observation

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Security approaches of a distributed storage system in the NICT Science Cloud

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Open data and global data citation of a scientific data have been discussed in international projects of scientific research field in recent years. Nowadays, internet services of them are gradually being provided. In these circumstances that a scientific researcher can manipulate large amounts of scientific data, the Informatics for Earth and Space Sciences fields is expecting the data-intensive science which provides new scientific knowledge or realizes multidisciplinary research by cloud computing technology.

On the other hand, there are not much success cases of the data-intensive science because there are not many free cloud services which provides a storage with large capacity, high available and high security in addition to high performance computers at the disposal of users. Also, many scientific researchers are much concerned about security of cloud services according to the results of the questionnaire survey by a promotion project of the Ministry of Education, Culture, Sports, Science and Technology.

National Institute of Information and Communications Technology (NICT) established about 500 CPU and 3 petabyte-scale cloud systems (NICT Science Cloud) for the data-intensive science. The NICT Science Cloud has data centers in 5 regions (Tokyo, Nagoya, Kyoto, Osaka and Okinawa) of Japan and provides a distributed computing environment with the Gfarm file system on a 10Gbps Layer 2 network (JGN-X). Scientific researchers can use it anytime without charge.

We introduce security approaches of a distributed storage system with the Gfarm in the NICT Science Cloud. In particular, we explain an application and a system to verify integrity, authenticity and traceability of stored data. Also, we discuss about a contribution of the approaches to the data-intensive science.

Keywords: data-intensive science, cloud service, distributed storage system, security, open data

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Migration to BUFR/CREX of meteorological observation reports

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The World Meteorological Organization (WMO) is tring to finalize its decades-long migration plan of the format of conventional observation reports, from telgram-based traditional alphanumeric codes (TAC) to the table-driven code forms (TDCF). For major types of observatios, the deadline of migration was November 2014, and several countries terminated dissemination of reports in TAC.

There are two forms of TDCF: the preferred form is binary called BUFR, while an alternative one called CREX can be used for single-case character-based telecommunication channel. In both forms, the message contains a list of 16-bit numbers called element descriptors defines the structure of following data. Each element descriptor represents either a number (with units), an ASCII character string, an enumeration or a flag field (referring to external table). The descriptor list may include (maybe nested) repetition, and that allows XML-like semi-structured data such as list of a structure associated with other type of data.

With respect to self-descriptivity, the benefit of a TDCF message is that a new data structure can be analyzed without documentation, while the self-description is completed only after referring to external tables. Some features are considered old-fashoned (in comparison to XML), such as being binary, number-based, referring to external tables. Sometimes it is explained that the telecommunication bandwidth was much more expensive at the early stage of TDCF development in 1990s, and the short size had to be pursued at the sacrifice of readability. But the features have benefit of reducing freedom of representation, which is important for stability of operational system.

The migration to TDCF is almost perfect for satellite data, while it takes many yeares for surface-based observation, since all WMO members have to change their own systems. Use of upper-air sounding in TCDF requires great effort and care; firstly the TDCF was planned to have more elements and precision, while many countries circulate reformatted TAC with compromised content.

Keywords: WMO, World Weather Watch Programme, Upper-air obsservation, Table-driven code form, BUFR, TEMP

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Development and publishing of the Seamless Geological Map of Japan (Chiriinchizu edition, tentative name)

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We developed a next viewer of the Seamless Geological Map of Japan 1:200,000 with rewriting a cord completely.
This viewer adopts the Chiriinchizu as a base map.
This viewer, and also, the most high technique everywhere, for example 'Portable map', it's applied.
We are going to publish this viewer in May of this year.

Keywords: Seamless Geological Map, Leaflet.js, Chriin tile, portable map, Web site

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Parallel Distributed Processing of Plasma Waveform Using Science Cloud

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Measuring waveform of plasma waves by scientific satellites is one of very important methods for understanding the physical processes in space plasma. It is quite difficult to extract and study characteristic wave phenomena using waveform data manually, because the data amount of waveform is too large. We have tackled for many years on automatic detection algorithm to extract varieties of characteristic waveforms in a systematic way. In order to analyze the waveform data properly, however, many computation time is necessary for the signal processing for noise reduction and filtering and many turnarounds are indispensable to brush up the algorithm.

In the present study, we evaluate a parallel distributed processing technology implemented in the NICT Science Cloud using our original program for the automatic detection of bipolar pulses measured by the waveform capture (WFC) onboard the KAGUYA spacecraft. We introduce a task scheduler named Pwrake (Parallel workflow extension for Rake) for the parallel processing. We demonstrate that Pwrake is a suitable task scheduler for hetero-type tasks.

In the presentation, we report the current results and also new science outputs expected from our trial.

Keywords: Parallel Distributed Processing, Science Cloud, Plasma Wave, Signal processing, Waveform analysis