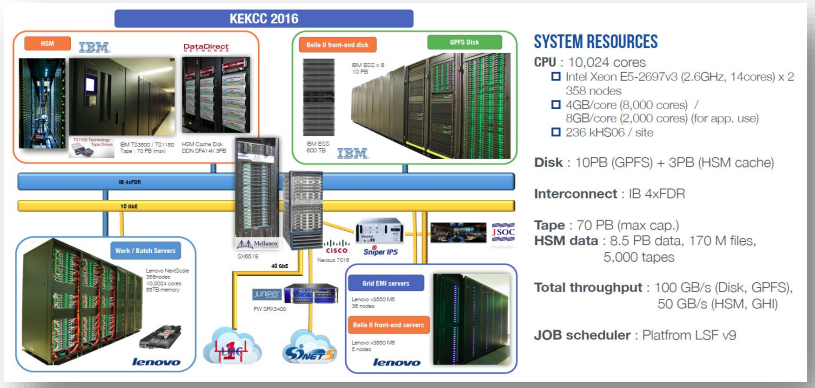
# TYL-FJPPL: Comp_04
# Evolution of the computing environment for high-energy and astroparticle experiments




**Members (*Leader)**

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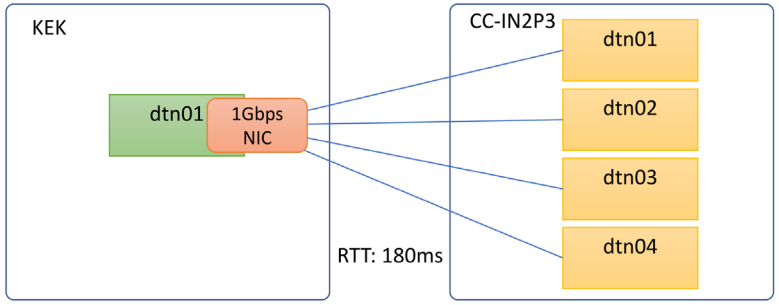
**Focus of COMP_04 project**

(a) Deployment of HTTP based data transfer system
(b) Study of hybrid computing system of on-premise resource and commercial cloud services
(c) Application and development of machine learning for computer system

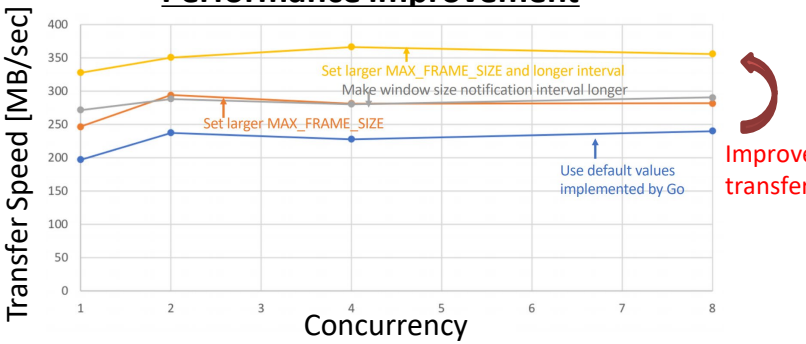
# Activities of item (a) in 2019

## Deployment of HTTP based data transfer system

### Prototype of data transfer nodes



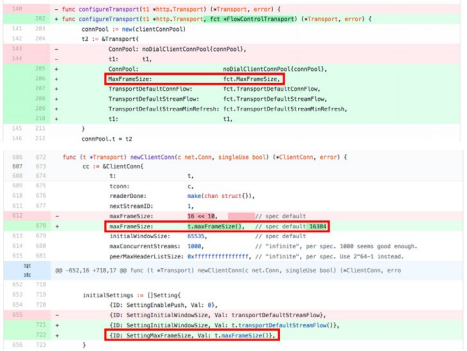

### Performance improvement

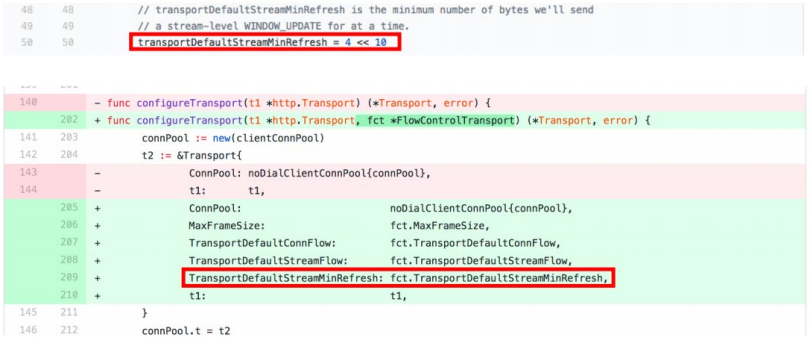



- We have investigated the feature and performance of data transfer protocol, for example, the difference of plane HTTP1.1 and HTTP2 with some algorithm of transport layer security by constructing a prototype of data transfer nodes in both sites.
- We found some problems in the implementation of HTTP2 inside the Go language which is used for an application tool of our data transfer test.
- We updated the module and our transfer tools, then confirmed certain improvements to the long-range transfer speed.

### Code modification of the transport module in Go language

Relax limit of maximum frame size





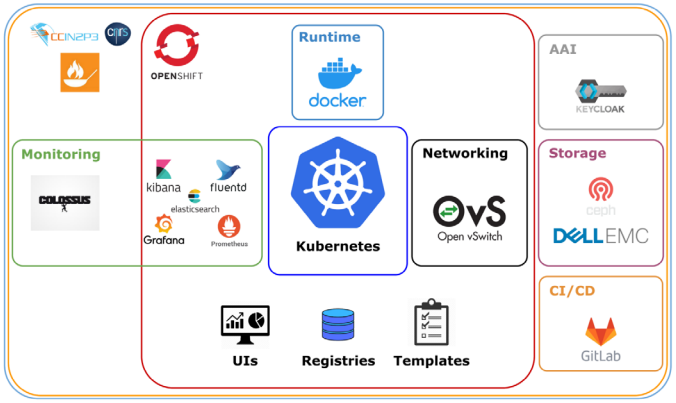
Decrease interval of window update notification

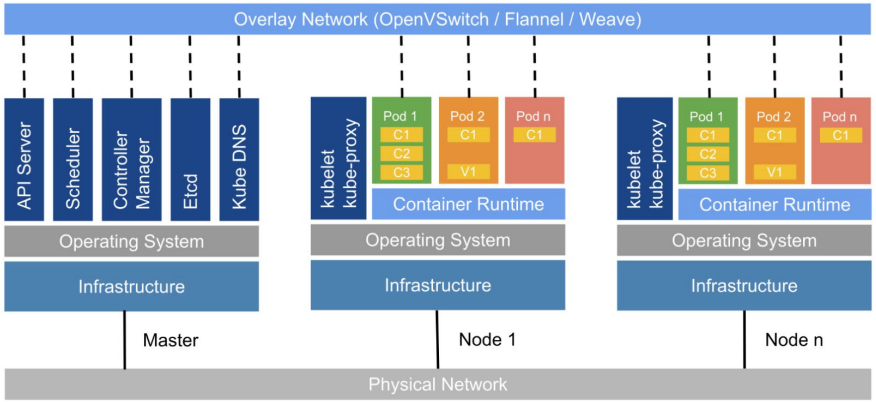
**Modified transfer tool (Chasqui)**: https://github.com/wtakase/chasqui/

# Activities of item (b) in 2019

Study of hybrid computing system of on-premise resource and commercial cloud services

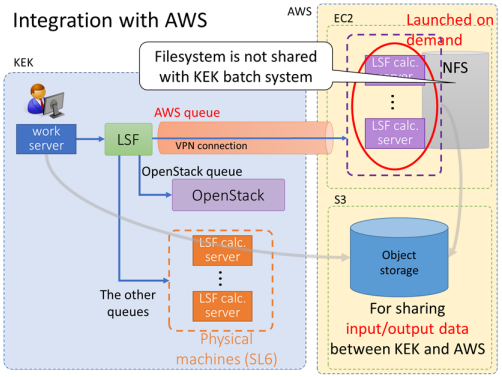
**Software modules and configurations for virtualization developing at CC-IN2P3**




- Toward studying the effectiveness of this hybrid-type system, we discussed a lot of things related to the virtualization technology and the method of its deployment often used in the cloud environment.
- We focused on the usability of Containers (docker, Singularity) and deployment method using Kubernetes at the workshop held at Lyon in last year for the future collaborative R&D.

**Cloud On-premise hybrid system at KEK (available at the next KEKCC in 2020)**



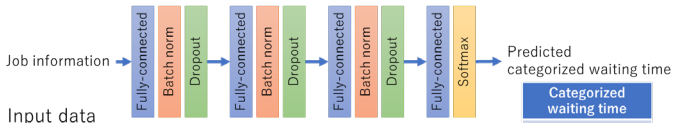

**Providing user friendly environment**
**by Singularity container and Kubernetes deployment tools**

# Activities of item (c) in 2019

## Application and development of machine learning for computer system

### Waiting time estimation based on Deep Learning at KEK-CRC

- Set up Fully-Connected Neural Network model




- Input data
  - Finished job logs last 7 months
  - Sampled 400,000 job histories

| Input job information | |
|---|---|
| The last observed user's waiting time | Run time currently spent |
| Submission time of the above | Day of submission |
| Number of cores currently in use | Submission time in 24 hours |
| Current CPU utilization efficiency | Queue |
| Number of current waiting jobs | |

| Categorized waiting time |
|---|
| 0 to 10 mins |
| 10 to 30 mins |
| 30 min to 1 hour |
| 1 to 3 hours |
| 3 to 6 hours |
| More than 6 horus |

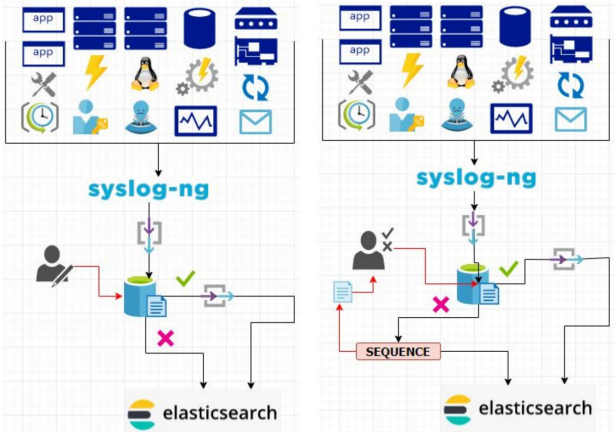
### Command line tool for end user

- The last observed user's waiting time
- Submission time of the above
- Run time currently spent
- Day of submission
- Number of cores currently in use
- Number of current waiting jobs
- Submission time in 24 hours

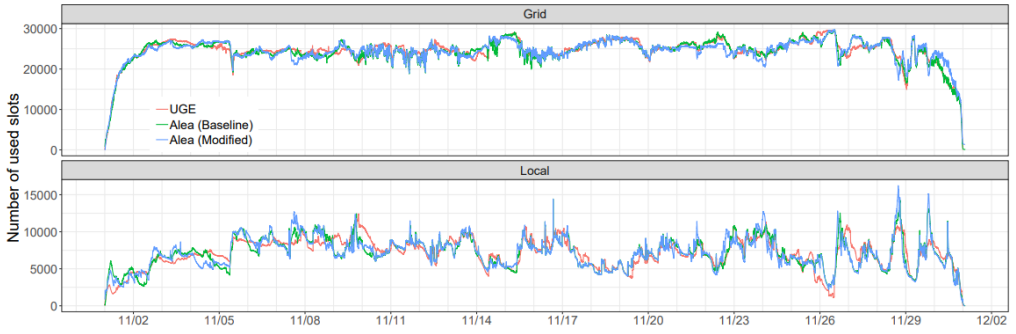
```
takase — 53×5
[takase@cw14 ~]$ bpredict -q l -u takase
Expected waiting time: 0~599 sec (prob. 92.1123 %)
[takase@cw14 ~]$
```

- The effectiveness of Deep Learning for the estimation of waiting time after the submission of user's jobs have been studied. A command line tool to provide the current estimation for users was also developed at KEK-CRC.
- We confirmed the applicability of the tools developed even for the batch job system utilized in CC-IN2P3.
- In addition to the batch job information, we discussed the possibility to extend this kind of log analysis method for the computing system, storage system, and network system by using the further brandnew tools utilized at CC-IN2P3.

### Pattern detection system of log messages (SEQUENCE) developing at CC-IN2P3




### Alea job scheduling simulator utilizes at CC-IN2P3



# Two-day workshop at CC-IN2P3 in Lyon

## Summarizing 2019's activities

- 16 registered participants
- 12 presentations
- 2 hands-on sessions

https://indico.in2p3.fr/event/19919/

FJPPL — Japan-France workshop on computing technologies

2 Dec 2019, 09:00 → 3 Dec 2019, 22:20 Europe/Paris

202 (CC-IN2P3)

Renaud Vernet (CCIN2P3)

Description The goal of this workshop is to explore relevant technologies, exchange experience and share ideas among experts of both Japan and France organisations in several scientific domains.

This is the 4th edition of this workshop, which is organized annually in the framework and with the sponsorship of the France-Japan Particle Physics Laboratory. The agendas of previous editions are available:

- 2018
- 2017
- 2016
- 2015

Guidelines for speakers

- to upload the slides of your presentations in PDF format. Additional formats are also accepted but please make sure at least a PDF version is provided
- to allow part of the time allocated in your slot for questions and comments from the audience

Information for participants

This meeting is organized so that participants can attend partially and should feel free to attend only their talks of interest. If you want to attend,

Benjamin Guillon | Benoit DELAUNAY | David Bouvet | Fabien Wernli | Frederic Suter | Ghita Rahal | Gino Marchetti | Renaud Vernet | Sébastien Gadrat | Tomoaki Nakamura | Vanessa Hamar | Wataru Takase

## Agenda

**Dec. 2nd, 2019**

- Welcome and introduction, Renaud Vernet (CC-IN2P3)
- Status report of KEK and KEK-CRC, Tomoaki Nakamura (KEK-CRC)
- CC-IN2P3 site report, Mattieu Puel (CC-IN2P3)
- ARM server: performance evaluation, Wataru Takase (KEK-CRC)
- Computing facility strategy, Vanessa Hamar (CC-IN2P3)
- Improving fairness in batch systems, Frederic Suter (CC-IN2P3)
- Machine learning on batch system, Wataru Takase (KEK-CRC)
- Data transfer test KEK-CCIN2P3, Wataru Takase (KEK-CRC)
- Storage analysis with SPARK, Antoine Dubois (CC-IN2P3)
- Log analysis: SEQUENCE, Fabien Wernli (CC-IN2P3)
- Kubernetes @ CC-IN2P3: what's cooking, Benjamin Guillon (CC-IN2P3)
- Containers for users, Sébastien Gadrat (CC-IN2P3)
- Conclusions and wrap-up, Renaud Vernet (CC-IN2P3)

**Dec. 3rd, 2019**

- Hands-on session, Fabien Wernli and Wataru Takase
- Preparation of FJPPL report and proposals, Renaud Vernet and Tomoaki Nakamura

# R&D Plans for 2020

**Plan (a) Deployment of HTTP based data transfer system**

- We will start the real file transfer by setting up the dedicated data transfer node with high-speed storage in the production network environment for the systematic evaluation.
- We will try to compare the result with the other data transfer methods like XrootD transfer and cache mechanism (Xcache).

**Plan (b) Study of hybrid computing system of on-premise resource and commercial cloud services**

- We continuously exchange the information on software for virtualization and experience to integrate which is well utilized in Europe and Japan in the existing Grid environment, for example, Singularity middleware.

**Plan (c) Application and development of machine learning for computer system**

- We investigate the performance improvements of the learning process for that application by deploying this application to the GPU clusters located in CC-IN2P3.
- We check the correctness of the obtained estimation by the future job accounting data stored in the batch job scheduler in conjunction with Alea job scheduling simulator.
- We try to apply SEQUENCE software module, which is an open-source module of the text pattern recognition, to the job accounting data and the status information of the computer system.

**Organizing a workshop on computing at Lyon in December 2020**