

## Research of model based development for space systems at early development phase

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### ● Responsible Representative

Taro Shimizu, Research and Development Directorate, Research Unit III

### ● Contact Information

Hikaru Mizuno , Research Unit III, Research and Development Directorate. Japan Aerospace Exploration Agency(mizuno.hikaru@jaxa.jp)

### ● Members

Hikaru Mizuno

### ● Abstract

Recently, there are many research with regard to model-based development(MBD) approach and degialization of space systems. JAXA Reserch Unit III is developing system simulator necessary for space system design in early phase, and it can be used to improve efficiency of development time. In this project, we will develop a method to run various MATLAB-based simulation in the satellite concept study phase ,especially large simulations such as parameter studies and Monte Carlo simulations, on JSS3.

### ● Reasons and benefits of using JAXA Supercomputer System

All JAXA employee can use JSS quickly and easily without any complicated procedures.

The system can be connected within the JAXA intranet, so there is little risk of information leakage.

Quick access to extensive support on how to use the system.

Linux contaier technology can be applied.

### ● Achievements of the Year

Results 1

Using MATLAB Parallel Computing Toolbox, a parallel computing method on multicore CPUs with Windows10 Virtual Machine on JSS3 TOKI-RURI is developed. As a trial, a Monte Carlo simulation analysis model of a spacecraft was run in parallel, and it was confirmed that the Simulink model could be calculated about 22 times faster than the conventional method.

Results 2

Using MATLAB Compiler and Simulink Compiler, a method to implement the calculation of various MATLAB simulation models as a standalone application that runs in a Docker container is developed. In addition, the Docker container can be converted into a Singularity container running on JSS3, and confirmed that MATLAB model calculations could be realized in 50 parallel by batch jobs on JSS3 TOKI-RURI.

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	30 Minute(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources\*1(%): 0.03

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	0.00	0.00
TOKI-ST	198,575.97	0.24
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	5.00	0.00
/data and /data2	50.00	0.00
/ssd	50.00	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	0.00	0.00

\*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

\*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.

● **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2(%)
ISV Software Licenses (Total)	0.00	0.00

\*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.