

§34. Development of User Friendly Interface for Simulation Code

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In order to analyze various aspects of plasma physics, several analysis codes have been developed. Most of them are usually written in FORTRAN and run on supercomputers, and most of these codes are command-line applications that the users invoke them through terminal emulators, while PC users typically use GUI-based applications with mouse operations. Furthermore, the necessary parameters are usually provided as text files and users must write them manually; this often causes errors. Therefore, in order to use the simulation code widely, graphical interface to the simulation code is required. EMOTO demonstrated Ruby on Rails (RoR) technologies is useful to develop a graphical interface for simulations¹⁾.

To use this technique in other fields, the authors have been studying the generalization. At the beginning, the authors have been adopting this technique to develop the user interface to the simulation code for the laser fusion developed by Sunahara.

Fig.1 shows the overview of this system. To generalize the RoR technique, the new technologies are introduced. They are 1) XML meta file to describe the necessary parameters. 2) SSH key authentication.

The author assumes the input parameters are given by FORTRAN's namelist format (Fig 2), and the system provides the GUI for the namelist. However, it becomes a routine and error prone task to modify a graphical interface of many input parameters when the required parameters are changed. To make this procedure easier, the system uses a meta file to describe the necessary parameter. When the parameters need to change, the user changes the parameter definition file, and the system reflects the changes automatically to GUI components and namelist files. The meta file is an XML text file. Fig 3 shows the sample XML parameter definition file corresponding to Fig2. Because XML is a self-descriptive text file, it is easy to understand its meaning. Furthermore, the format of XML file can be defined by the XML schema file. Using the schema file, the format errors of the parameter definition file, such as misspelling or lacks of the necessary parameters, can be easily detected by XML parsers without developing a special check programs.

To run the simulation code on the super computer, the system uses SSH. The server prepares the template of the shell script and modifies it to run the script remotely using SSH. The previous system uses a fixed account to run the simulation code; even if several users use the system, they used the same account of the super computer to run the simulation code. On the other hand, the new system uses the user's own account of the super computer. In order to connect to the super computer, the system uses SSH's public key authentication. The public and private key pair of the user is stored into the database, and the RoR server uses the private key to authenticate. For the security

reason, the private keys are encrypted by the pass phrase, and the user must enter the pass phase to use this system.

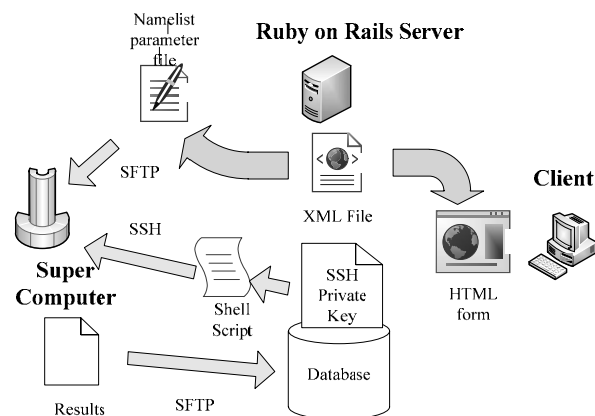


Fig.1. The overview of the system:

```
&sim_setup
sim_number=1
&end
#
&sim_param
nsteplim = 10000000
tstop_sec = 1.0d-11
dtout_sec = 1.0d-12

out_sec(1) = 0.5d-9
out_sec(2) = 1.0d-9
out_sec(3) = 1.5d-9
...
&end
```

Fig.2. A sample of namelist file.

```
<parameter>
<namelist name="sim_setup">
  <var name="sim_number" type="int"
  fixed="1" />
</namelist>
<namelist name="sim_param">
  <var name="nsteplim"
  type="int" default="10000000"
  comment="max step count" />
  <var name="tstop_sec"
  type="real8" default="1.0d-11"
  comment="upper limit of the
  calculation time" />
  <var name="dtout_sec"
  type="real8" default="1.0d-12"
  comment="Interval of Data Output" />
  <loop count="10">
    <var name="out_sec"
    type="real8"
    comment="the time to save output
    file" />
  </loop>
...
</parameter>
```

Fig. 3. A sample of parameter definition file.

- 1) Emoto, M., et.al : Fus. Eng. Des. **83** (2008) 453