

Nuclear data format suitable simultaneously for databases, experimentalists, and users

M. Aikawa,^{*1} M. Chiba,^{*2} S. Ebata,^{*3} T. Katayama,^{*4} K. Katō,^{*1} A. Makinaga,^{*1} H. Noto,^{*4} and K. Tsubakihara^{*5}

Nuclear reactions are useful in many fields related to nuclear physics, such as astrophysics, nuclear engineering, and radiation therapy. Many experimental studies have been performed worldwide to obtain nuclear reaction data, such as cross sections and product yields. The majority of such data is published in scientific journals, which may apply charges and are accessible only to researchers in the relevant academic fields. In addition, nuclear reaction experiments require enormous cost and huge researcher effort. Therefore, it is desirable to make such data freely available through the Internet.

One such database is the EXFOR database¹⁾ maintained by the International Network of Nuclear Reaction Data Centres (NRDC) under the auspices of the International Atomic Energy Agency (IAEA). Another is Nuclear Reaction Data File (NRDF)²⁾ developed by the Hokkaido University Nuclear Reaction Data Centre (JCPRG)³⁾. JCPRG and RIKEN Nishina Center established a collaborative research contract in 2010 to increase the availability of the nuclear reaction data produced at the RIBF. Under this collaboration, the nuclear reaction data obtained at the RIBF is compiled into the two databases above. However, including state-of-the-art experiments and physical quantities causes problems. For instance, the forthcoming electron scattering data from SCRIT is outside the compilation scope of NRDF and JCPRG on the EXFOR library at the moment. Therefore, we must extend the scope for the RIBF experiments.

In addition, the two databases have their own formats, which were defined more than forty years ago and designed for programming languages prevalent at that time, e.g., Fortran. Therefore, a new format suitable for the current situation and technology is desirable. The format must be applicable for the confirmation process of compiled data performed by experimentalists. It is also desirable for nuclear data users to read and manipulate data in the same format without detailed explanations. The format is now under development using XML technology, which is both human-readable and machine-readable. This feature is a requirement for the next-generation format to enable experimentalists to directly input data into the databases and to enable nuclear data users to retrieve them.

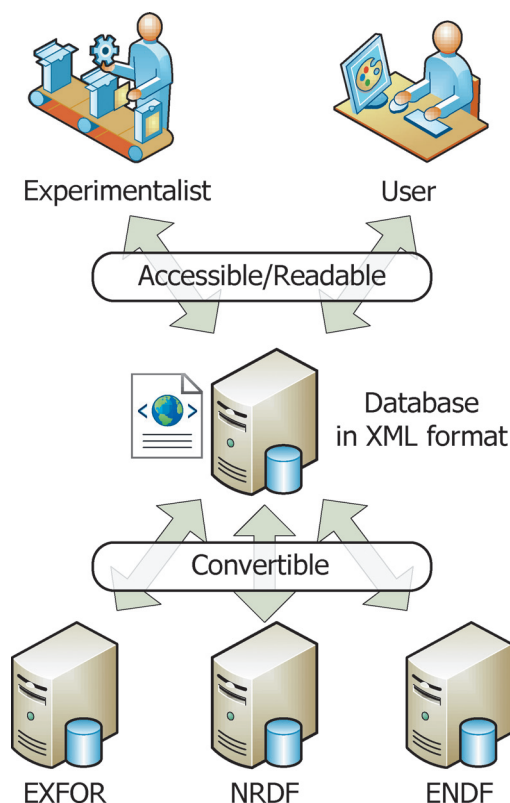


Fig. 1. Schematic of the process of accessing the database with the format under development using XML technology.

Here, we emphasize that this format does not affect other databases. The contents in the two databases above and evaluated libraries in the ENDF format, e.g. JENDL⁴⁾, can be converted one to one nearly equivalently into the new format. Figure 1 shows a schematic of the process of accessing the database with the format under development using XML technology. The format is described in simple terms and abbreviated less for users to understand and express contents correctly. Through this format, experimentalists and users can directly access the database in which contents are converted from the databases and libraries.

References

- 1) <http://www.jcprg.org/exfor/>
- 2) <http://www.jcprg.org/nrdf/>
- 3) <http://www.jcprg.org/>
- 4) K. Shibata et al.: J. Nucl. Sci. Technol. 48, 1 (2011).

^{*1} Faculty of Science, Hokkaido University

^{*2} Sapporo Gakuin University Professor Emeritus

^{*3} Meme Media Laboratory, Hokkaido University

^{*4} School of Economics, Hokusei Gakuen University

^{*5} Department of Engineering Science, Osaka Electro-Communication University