A modern nuclear database structure beyond the ENDF format

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We’ve made excellent progress toward the development of a modern database structure

- Detailed requirements have been drafted and reviewed in 3 documents
  - Many thanks to David Brown, Bret Beck and Caleb Mattoon for documentation efforts
  - High-level vision and requirements
  - Basic numeric and text data
  - Particle information
  - Reaction information

- Initial specifications will be finished (I hope this week!)
  - Documentation
  - Basic data
  - Particle data
  - Reaction data

I propose to close SG38 in a few months with a summary report that references all documentation prepared by SG38
Two new subgroups will carry the effort to modernize our nuclear data infrastructure

Expert Group: Recommended definition for a General Nuclear Database Structure (EG-GNDS)

- A long-term sub-group to serve as a governance body
- Promote format, infrastructure into the future

New subgroup (SG-43): Code infrastructure to support a general nuclear database structure

- Code infrastructure will enable international adoption
- There is a lot of work to do -- a separate focused effort
- After completion, long-term subgroup can oversee efforts
Next steps

- Finish writing the specifications documentation
  - Since these will be maintained under version control, should we release with NEA document numbers?

- Release ENDF-B8 in both ENDF6 and GNDS

- Develop initial software infrastructure
  - Needs more involvement from evaluators and HF code projects

- Areas for further work by EG-GNDS
  - Address known and future issues as ENDF-B8 in GNDS is utilized
  - Add new capabilities as requested by community (e.g. covariance formats)
  - Promote structure and available tools, particularly in evaluation community
Current status of ENDF-VIII to GNDS translation

- Most sub-libraries are translated:
  - Incident n, p, d, t, He3, alpha, gamma and electron data
  - standards
  - photo-atomic
  - atomic relaxation (a few things to be fixed)
  - thermal_scattering

- Still to be translated:
  - Neutron-induced and spontaneous fission yields
    - nfy and sfy translation is simple, but finalizing how to store them in GNDS
  - Decay sub-library

Translations of JEFF-3.2 and JENDL-4 also being performed -- Interactions to work out issues taking place
Validation of backwards compatibility

- Original goal was to demonstrate ability to recover ENDF-B8 in ENDF6 format from GNDS
  - Works at the 98% level (by number of lines reproduced)
  - Remaining 2% seems largely due to data redundancy or errors (particularly in gamma outputs)

- Comparison of NJOY multi-group files maybe a better way to ensure that 100% of physics intent is captured
Concluding remarks

- It has been very rewarding to have the WPEC community be so supportive of taking these first steps toward modernization
  - Built community and goodwill
  - Hopefully will lead to new knowledge and clarity

- A new set of leaders step forward to continue these advances
  - SG43: Jeremy Conlin, Caleb Mattoon, Fausto Malvagi
  - EG-GNDS: David Brown, Emmeric Dupont

- The main technical benefit so far has been in improving data consistency/quality

- I’m really looking forward to seeing how the new structure gets used, unanticipated benefits
Translation status for JEFF-3.2 (incident neutrons only)

- 174 files (out of 472) fail to translate.
  - Additional 19 files require the ‘—continuumSpectraFix’ option

- Some common problems:
  - Mismatch between MF=2 and MF=32 resonance parameters
  - Using a ZA instead of MAT in the ‘MAT1’ field of MF=33.
    — If MAT1 == MAT, current manual says to set MAT1='0'
  - Incident energies out of order in MF=3
  - Excited-state products are sometimes listed in MF=8 with ‘LMF=6’…
    but the product is missing from MF=6
    — For example, MT=5 for Y90 and Y91
Translation status for JENDL-4 (incident neutrons only)

- 11 files (out of 406) fail to translate
  - B10 may be a translator bug
  - Te129m: for MT=51, QI should equal QM (inelastic from metastable back to ground state)
  - U233, U234, U235, U238, Np237, Pu238, Pu240, Pu242: resonance parameters in MF=32 don’t agree with MF=2
  - Am241: MF=8 and MF=9 disagree about excited level energy following (n,\gamma) to Am242_m1

- I previously reported patches for some of issues, so they may be fixed in latest development version