NJOY – Current Status and Future Plans

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Abstract

We provide an overview of the NJOY Nuclear Data Processing Code System, including recent history, current status and future upgrade plans.

Outline

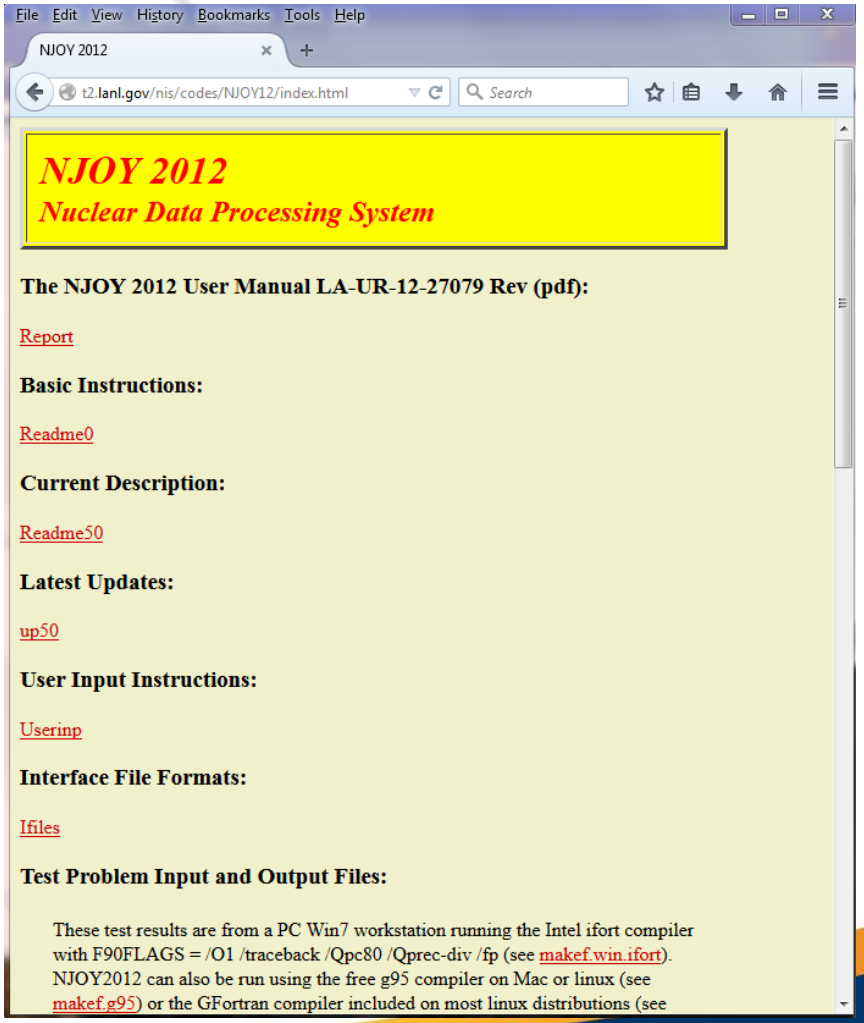
- Introduction & NJOY Review
- Current Status
- Future Upgrade Plans
- Concluding Remarks

Introduction & NJOY Review

- The NJOY Nuclear Data Processing System has been publically available for almost 40 years.
  - Primary developer was Bob MacFarlane.
  - Retired in 2006 but has remained active in NJOY development.
- The most widely distributed version of the code was NJOY99; the current public version is **NJOY2012**.
  - Updates are posted to a LANL website and the source code is updated by end-users.
    - Also allows end-users to include local patches.
- Unofficial updates and pre-release candidate updates are available from the NEA at http://www.nea.fr/html/dbprog/njoy-links.html.

Introduction & NJOY Review

- The most recent version of the code is NJOY2012.
  - Available directly from LANL (for a fee, ☹), per LANL Theoretical Division management decree.
    - See contact information at http://t2.lanl.gov/nis/transfer.html
- LANL's NJOY2012 web page …
  - http://t2.lanl.gov/nis/codes/NJOY12/index.html
  - Can find links to
    - The NJOY2012 manual.
    - Latest update file, currently up50.
    - Sample test job i/o files.



NJOY2012 – Current Status

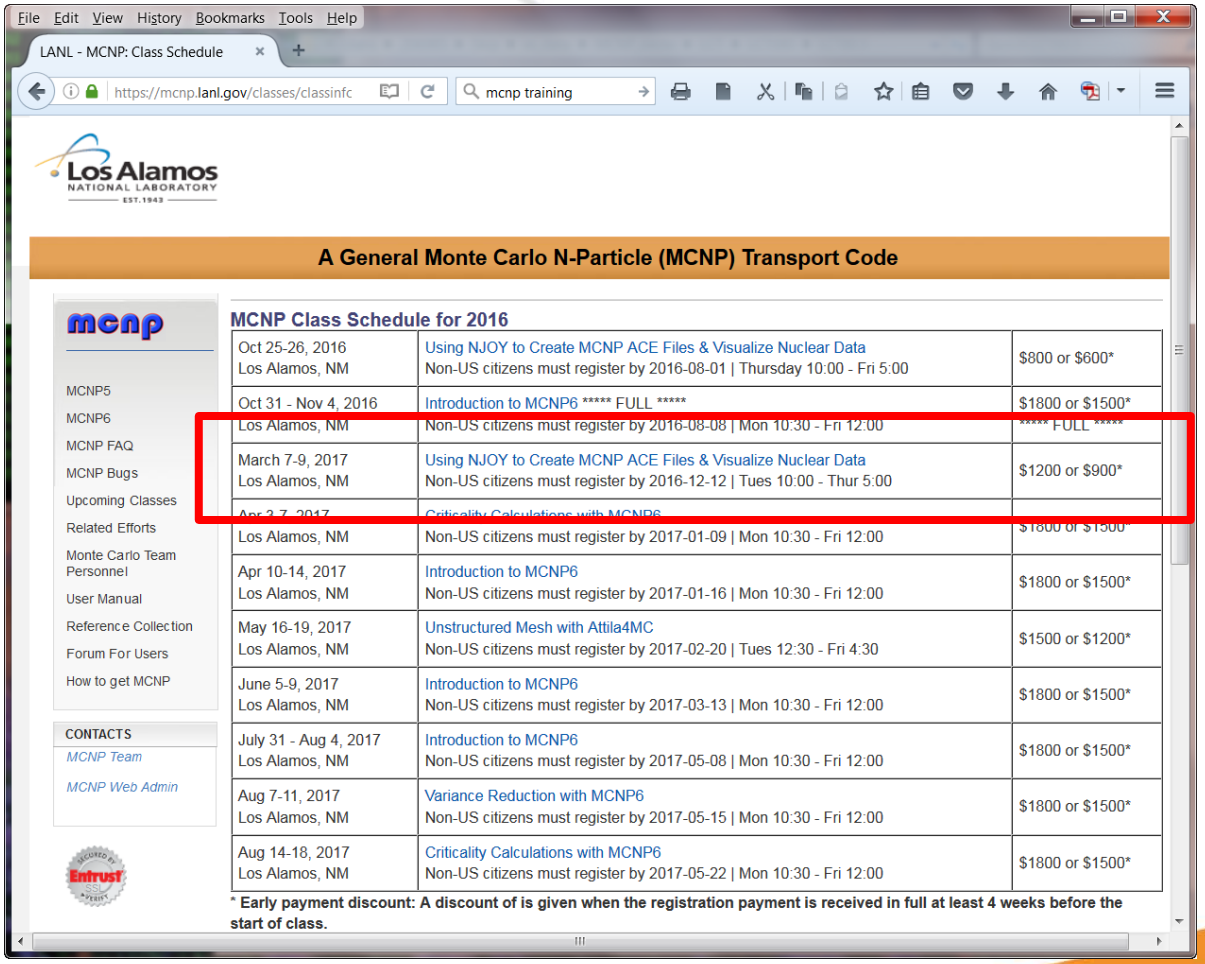
- NJOY2012 was released in December, 2012
- An initial set of update patches was released in the summer of 2013 (creating NJOY2012.8).
- The latest set of update patches was released in the Spring of 2015 (creating NJOY2012.50).
- New patches are nearing completion and will be released in coordination with a new clean code version, NJOY2016.
  - The latest patches have been shared with selected experienced users, and are available upon request.

NJOY2016

- An open source code release, ☺.
  - **DOE/NNSA approval has been received.**
- Re-package all public and local updates into a new, clean, source code release.
- Need to finish re-writing the current manual.
  - 800+ pages and not simply a global “2012” to “2016” change.
- Will use a new distribution model … to be discussed by Jeremy Conlin in the NJOY21 update.

NJOY Training

- Producing ACE files and Visualizing Nuclear Data …
- an NJOY training class offered in conjunction with MCNP training …
- Next class in March, 2017.
  - Also advertised through the monthly RSICC newsletter



NJOY2012, 2016, 21 – Future Plans

- Near Term
  - Incorporate patches developed to support ENDF/B “beta” and JEFF “test” library processing.
    - e.g., Oscar Cabellos (NEA) report from the Spring, 2016 JEFF meeting.
  - Complete work on a new clean code version … NJOY2016.

- (Not so) Long Term
  - For me … retirement, ☺!
  - For NJOY … “NJOY21” … Jeremy Conlin
    - NJOY21 = NJOY for the 21st Century
    - Current and past NJOY i/o is very much “cardimage” and ENDF “mf” and “mt” centric
      - NJOY21 will work with the new “GND” format.

NJOY21 – NJOY for the 21st Century

- *Major* updated to NJOY2016—ground-up rewrite of NJOY2016
- Ability to utilize modern nuclear data formats (ENDF and GND)
- Modern ways of interacting with NJOY
- Easier, faster, more flexible, and more maintainable
- Improved diagnostics (error messages)

- **Maintain capabilities of and backwards compatibility with NJOY2016**

NJOY21 Development Plan

- Wrap every Legacy NJOY module in C++
- **Legacy modules are replaced as functionality is developed in C++**

- Thoroughly tested (unit, system, integration)
- Continuously tested (https://travis-ci.org/njoy/)

NJOY21 – Current Status

- Foundation:
  - **utility** Operations used throughout all NJOY21 projects
  - **math** Mathematical objects and operations

- **nuclearData** Generic, in-memory, data objects
- **ENDFtk** Toolkit for reading/writing ENDF files
- **ACEtk** Toolkit for reading/writing ACEfiles

- Resonance reconstruction

NJOY21 Distribution Model

http://njoy.lanl.gov

http://github.com/njoy

- **Open Source — NJOY21 and NJOY2016**
  - No export control restrictions
  - Free
- Increase Availability
- Encourage wider use
- Encourage collaboration

DOE Approval has been received, ☺.

NJOY Open Source Collaboration

- NJOY has long history of non-LANL contributions

- Contributing
  - Fork repository on GitHub
  - Modify code
  - Write code tests
  - Initiate pull request

- NJOY2016 and NJOY21

Concluding Remarks

- NJOY has a long history as the premier ENDF processing code system … and LANL is committed to maintaining this capability as the ENDF format evolves.

- NJOY's past success is due to (i) Bob MacFarlane, and (ii) feedback by national and international users on code features of importance to them.

- We continue to welcome this interaction between LANL and the world-wide user community.
  - Send input to njoy@lanl.gov