

# NNDC Support of the NCSP Program: Assuring the Quality of the ENDF Library

*D.A. Brown*

*NNDC, Brookhaven National Laboratory*



# ENDF quality control in the days of yore

- CSEWG peer reviews all evaluations before accepting
- Phase I Testing:
  - ENDF/B-VI and earlier: pen & paper reviews
  - ENDF/B-VII.0: partially automated with EMPIRE tools
- Phase II Testing:
  - User/developer communication
  - Nuclear data week, CSEWG validation committee
- Version control by hand with ENDF/A & ENDF/B

## ENDF/B Evaluation Review

Material	<u>27 Al</u>	Library	<u>10</u>	MAT#	<u>1325</u>	Date rec'd	<u>7/13/00</u>
Evaluator	<u>P. Young</u>		Assigned to	<u>Tom Lane</u>			

Comments:

Phase I Reviewers: Dennis Mc Nab

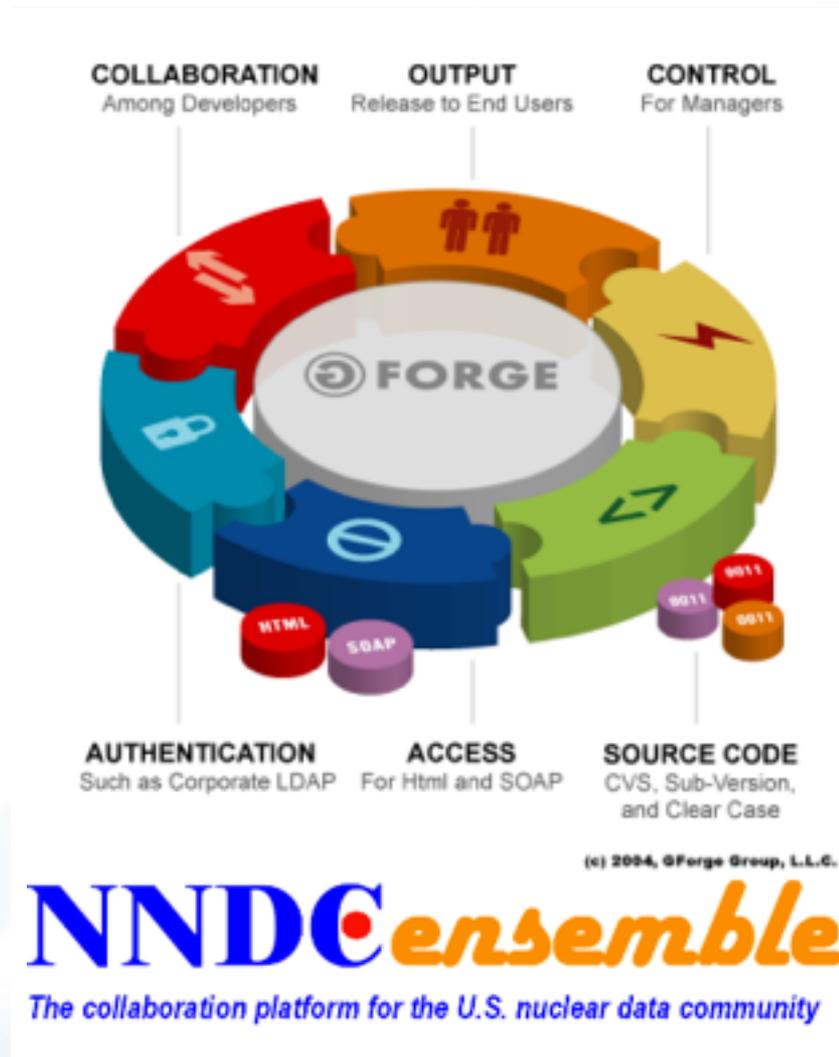
(Check off operations below as completed)	Initials	Date
<input checked="" type="checkbox"/> Copy onto disk: SA2:[ENDF.NEW] <u>AL27.LANL</u>	<u>25m</u>	<u>7/14</u>
<input checked="" type="checkbox"/> List: <input type="checkbox"/> entire file or <input checked="" type="checkbox"/> file 451 comments.	<u>PD</u>	<u>8/2/00</u>
<input checked="" type="checkbox"/> Run checking code: PRECHK P1 P2 P3 P1=working area, P2=file_name, P3=file ext. Check output listing ('P2'.CHK) before preceding.	<u>PD</u>	<u>8/2/00</u>
<input type="checkbox"/> Error(s) found. <input type="checkbox"/> File corrected. (See listing on back).	<u>ok</u>	<u>/</u>
<input checked="" type="checkbox"/> Run 2nd pass checking: KIT P1 P2 P3 P1=working area, P2=file_name, P3=REL8 Listings: 'P2'.CHK, + 2 copies each 'P2'.FIZ, .LST, .PSY	<u>25m</u>	<u>8/21</u>
<input type="checkbox"/> Error(s) found. <input type="checkbox"/> File corrected; kit rerun. (See listing on back).	<u>/</u>	<u>/</u>
<input checked="" type="checkbox"/> Process data for plotting: KDOP P1 P2 P3 P1=working area, P2=file_name, P3=REL8 Produces pointwise data file (TMP:'P2'.DPW) Produces listing of thermal and 14-Mev values ('P2'.INT_LST)	<u>25m</u>	<u>8/25</u>
<input checked="" type="checkbox"/> Plot vs. experimental data and other evaluations. (See Data Preparation Form). <input type="checkbox"/> ENDF/B <input checked="" type="checkbox"/> JEF <input type="checkbox"/> JENDL <input type="checkbox"/> BROND <input type="checkbox"/> CENDL (See Data Preparation Form).	<u>25m</u>	<u>8/25</u>
<input type="checkbox"/> Prepare review kit including plots, listings, and forms.		
Sent to Phase I reviewer(s).	<u>25m</u>	<u>8/29</u>
Phase I review kit returned from:		
_____ Date: _____		
_____ Date: _____		

ndcwinv/mclane/forms/ENDF FORM1

Sample PHASE I review packet cover page (June 2000)

# For ENDF/B-VII.0 (2006), we began modernizing

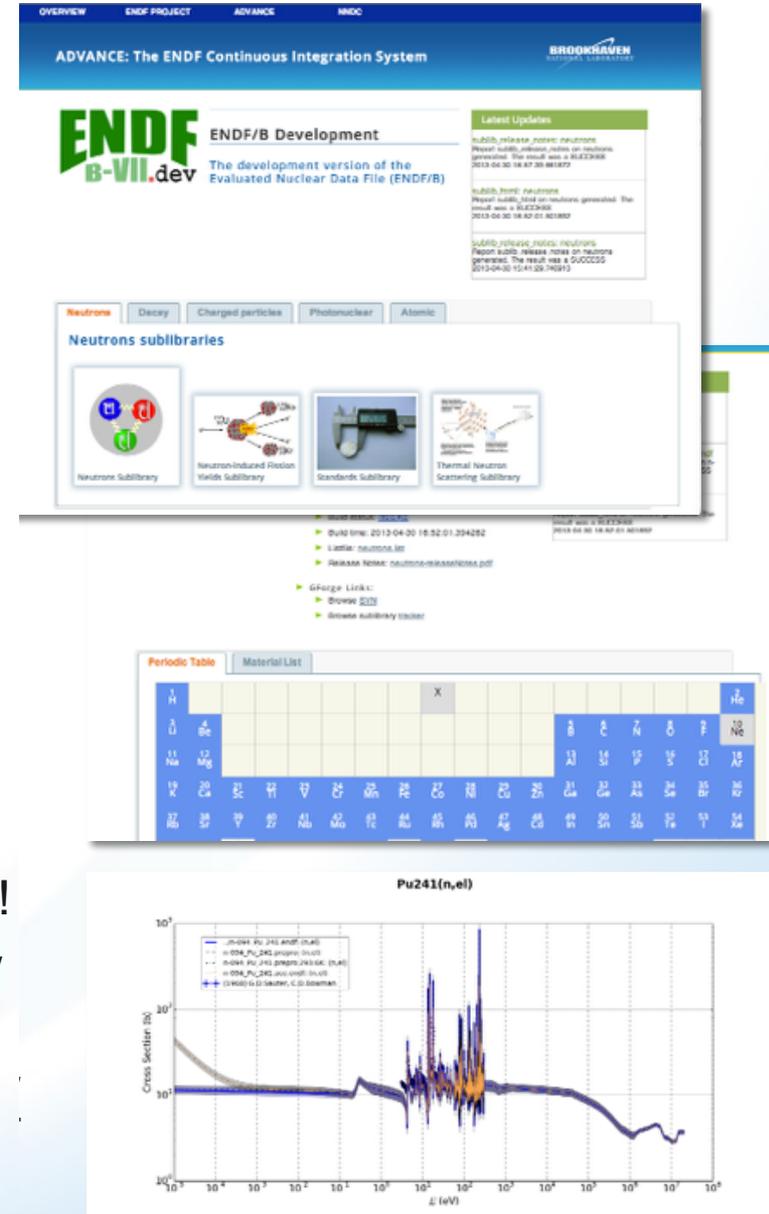
- Old ENDF/A & ENDF/B arrangement was ending
- Library version management now taken over by GForge
  - subversion does the main work
  - GForge adds bug tracking
  - (and a bunch of other stuff we don't use)
- Change spearheaded by Michal Herman, current head of the NNDC



**In the final stages of the preparation of ENDF/B-VII.1 (2011), we tried something else new**

# ADVANCE quality assurance system for ENDF

- On every commit of every evaluation in ENDF
  - Check out evaluation
  - Run through a battery of tests
  - Process with customer processing codes
  - Generate comparison plots
  - Generate HTML report of evaluation
- Automation is better!
  - Find data problems before the customers!
  - Far faster/better than old PHASE I review
- Available at <http://www.nndc.bnl.gov/endl/b7.dev/qa/index.html>



# For more information, see our contribution to ND2013 (Nucl. Data Sheets 118 (2014) 422-425)



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

**ScienceDirect**

Nuclear Data Sheets 118 (2014) 422–425

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**Nuclear Data  
Sheets**

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[www.elsevier.com/locate/nds](http://www.elsevier.com/locate/nds)

## Continuous Integration and Deployment Software to Automate Nuclear Data Verification and Validation

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We developed and implemented a highly-automated nuclear data quality assurance system ADVANCE (Automated Data Verification and Assurance for Nuclear Calculations Enhancement) which is based on the continuous integration and deployment concept that originated from the software industry. ADVANCE uses readily available open-source software components to deliver its powerful functionalities. This paper presents in detail the system's data verification functionalities which are being used to ensure the quality of every new evaluation submitted to the NNDC. Also discussed are the current development efforts to incorporate data validation capabilities into the system.

### I. INTRODUCTION

Data verification and validation are critical to ensuring the quality of a nuclear data library prior to its release. However, based on our experience in processing

cept which originated from the software industry. The system's CID capability is powered by ControlTier [7], an open-source software from DTO Solutions, Inc. ControlTier was selected from among today's popular CID software because it is: 1) proven to be robust and reli-

# In the beginning of FY14, two disasters struck

- **The ControlTier project died mid-2013**
  - ControlTier orchestrated the running of ADVANCE in versions before 0.7
  - Responsible for polling subversion and launching jobs
  - Responsible for automatic deployment
- **The old ADVANCE server died in Dec. 2014**



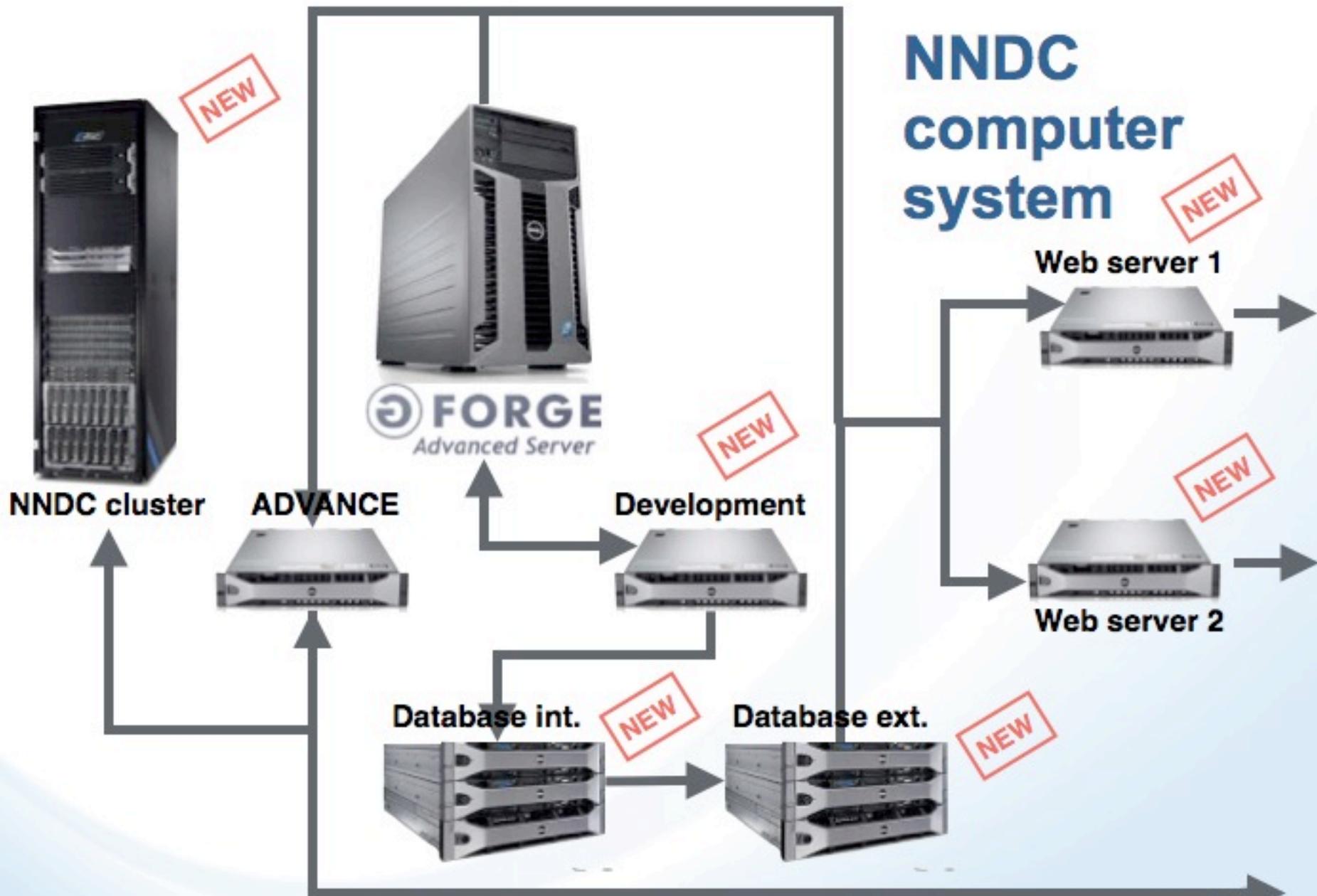
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## **Fortunately we were prepared:**

- a facility grant from the Office of Science enabled major computer purchases
- we were also planning an upgrade to ADVANCE software

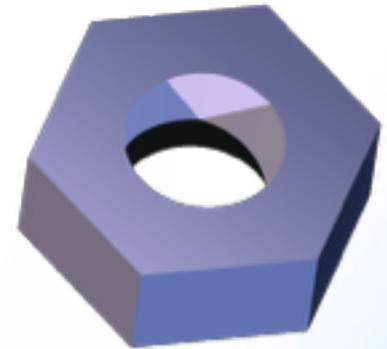


# NNDC computer system



# We also took the opportunity to rework the software behind **ADVANCE**

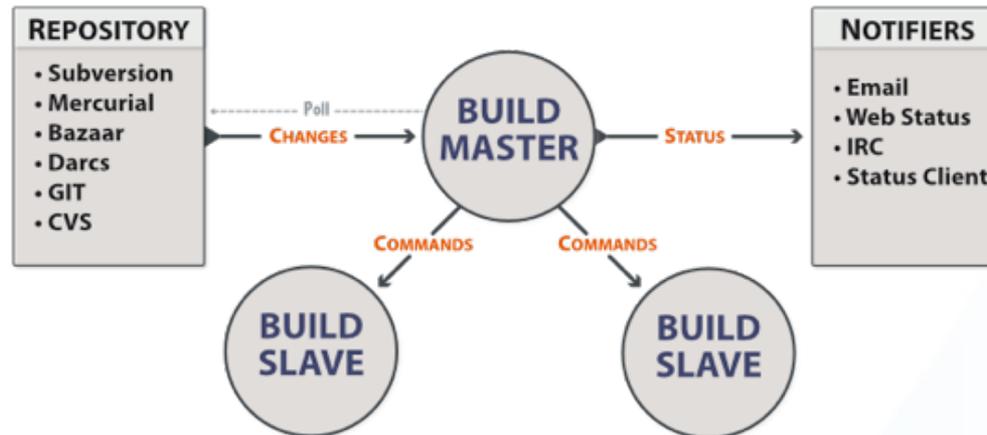
- Replace ControlTier with open source BuildBot system
- Improved reports, including BNL's new styles (js & css)
- Lots of bug fixes
- Upgrade processing codes:
  - Newer Fudge-4.0
  - NJOY2012, including CP and photonuclear processing
- Full library builds
- Latest release, v0.8.1 (Sep. 2014)



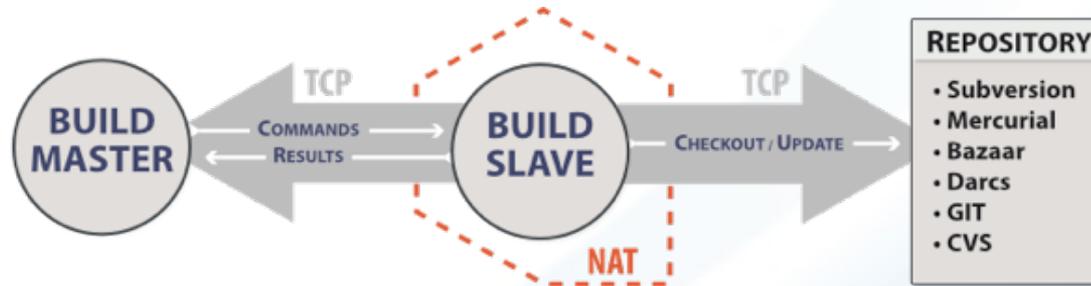
# ADVANCE is now parallelized & distributed



- Builds coordinated by ADVANCE server



- Slave nodes do work (ADVANCE server is master & slave)



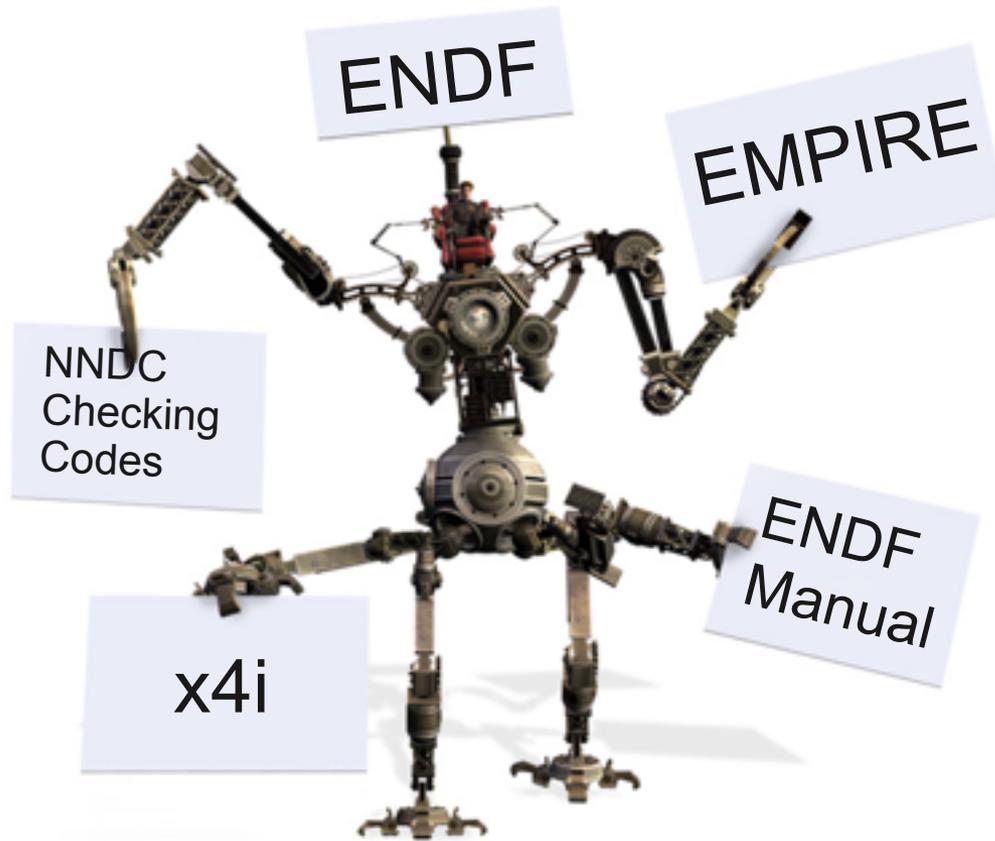
- NNDC cluster main node will be slave too...

# ADVANCE has been busy and it will get busier



- In FY14, we begun collecting, vetting and validating new evaluation for CIELO ( $^{16}\text{O}$ ,  $^{56}\text{Fe}$ ,  $^{245}\text{U}$ ,  $^{239}\text{Pu}$ ) and other NCSP evaluations ( $^{180-186}\text{W}$ )
- **FY15 should be even more exciting:**
  - more CIELO revisions (including last CIELO eval,  $^{238}\text{U}$ )
  - adding EGAF primary gammas to evaluations (2 so far)
  - TSL data from AECL, NCSU
  - new alpha sublibrary
  - EPICS: Red Cullen's new atomic\_relaxation, electron and photoatomic sublibraries
  - lots and lots of bug fixes

# The NNDC is now using ADVANCE for several projects



That is pretty cool.  
I like it very much.

Actually, it is amazing,  
congratulations !

— Roberto Capote

# Will have summer student to start adding automated benchmarking to ADVANCE

- **We will start with COG (Thanks Dave & Chuck)**
  - Have COG and COG library builders
  - Have ICSBEP test suite from COG
- **If there is time, will automate MCNP as well**
  - Have MCNP6
  - Have Russ Mosteller's test suite
- **Would like to add SCALE and AMPX, but AMPX requires GUI, so can't be automated yet**

