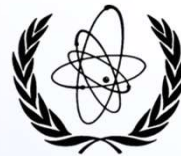


EXFOR Software

Viktor Zerkin



International Atomic Energy Agency,
Nuclear Data Section, 1999-2023

Part I.

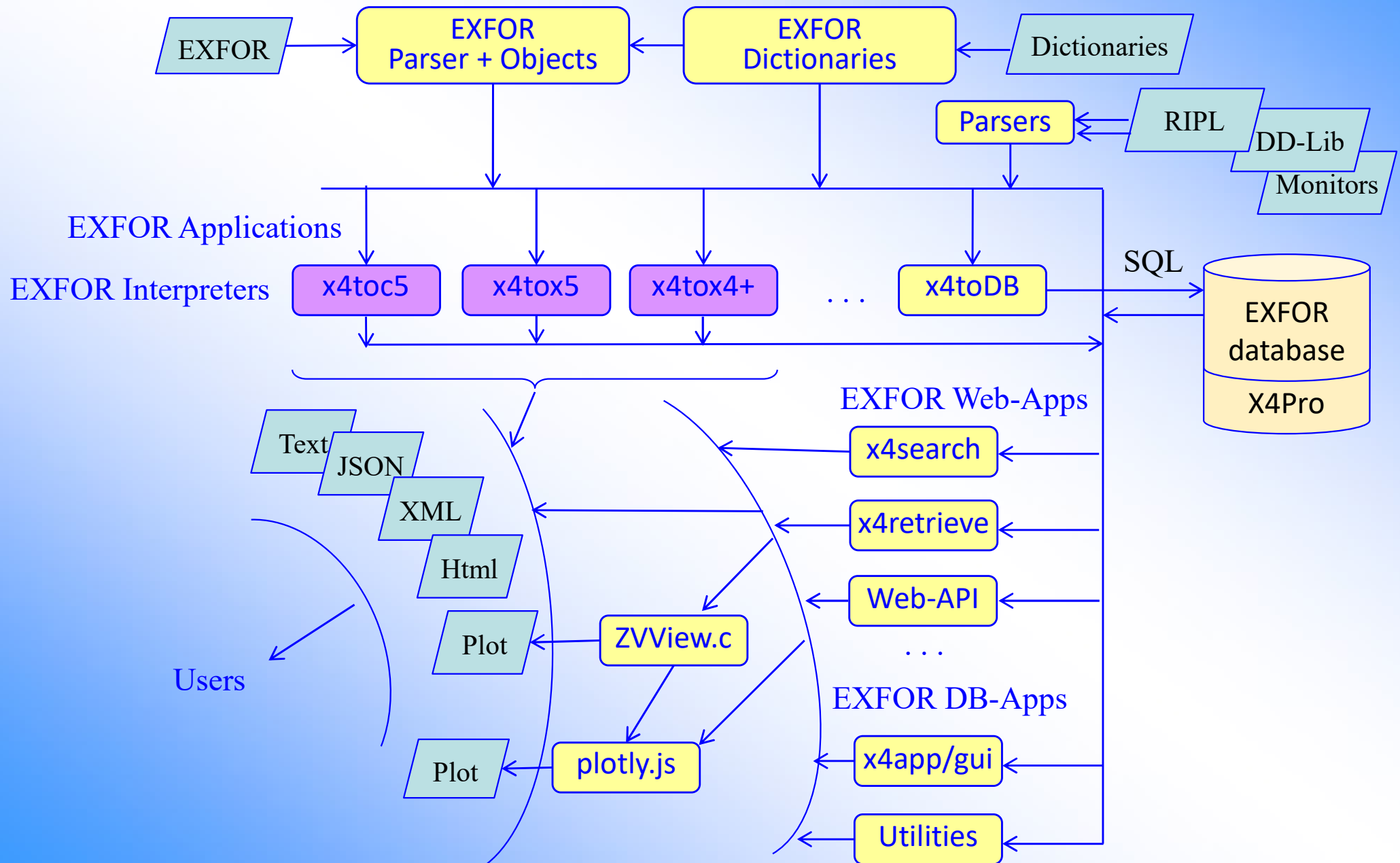
**EXFOR Checking Code,
EXFOR Java Package and Translators,
EXFOR Database Maintenance**

ZCHEX - EXFOR Checking Code

```
PROGRAM ZCHEX
!***Title   : Program ZCHEX
!***Purpose: Checking EXFOR file: format and content
!***OS      : VAX-VMS, Windows, Linux, MacOS
!***Authors:
!*   1998-2001. DEC-Fortran
!*           Originally written on VMS by:
!*           Ms. Victoria McLane
!*           National Nuclear Data Center
!*           Brookhaven National Laboratory
!*           Upton, NY 11973
!*           USA
!*   2002-2023. MS-Windows, Linux, MacOS
!*           Further development by:
!*           Dr. Viktor Zerkin, v.zerkin@iaea.org
!*           Nuclear Data Section
!*           International Atomic Energy Agency
!*           A-1400 Vienna
!*           Austria
!
!***Updates since 2002
!*   2023-12-27   V.Zerkin
!*               - process new STATUS with REFERENCE-code, e.g.:
!*               (TABLE,,D.M.Chittenden+,P,ORO-367,1,196101)
!*   2023-07-18   V.Zerkin
!*               - DANLO: adapted for using new Dict.227
!*****
!*   2002-05      V.Zerkin: Ported from VMS to Windows, Linux:
!*               - Dictionaries were re-organized to direct-access files;
!*               - New program DANLO written to create new Dictionaries
!*               from dictionaries-backup file (DAN_BACK_NEW.XXXX)
!*               - Subroutines to access new Dictionaries
!*   2002-03      V.McLane: Provided source code on VMS (DEC-Fortran)
!***
```

Future of ZCHEX could/should be advised by NRDC

EXFOR Java-Family Packages and Codes

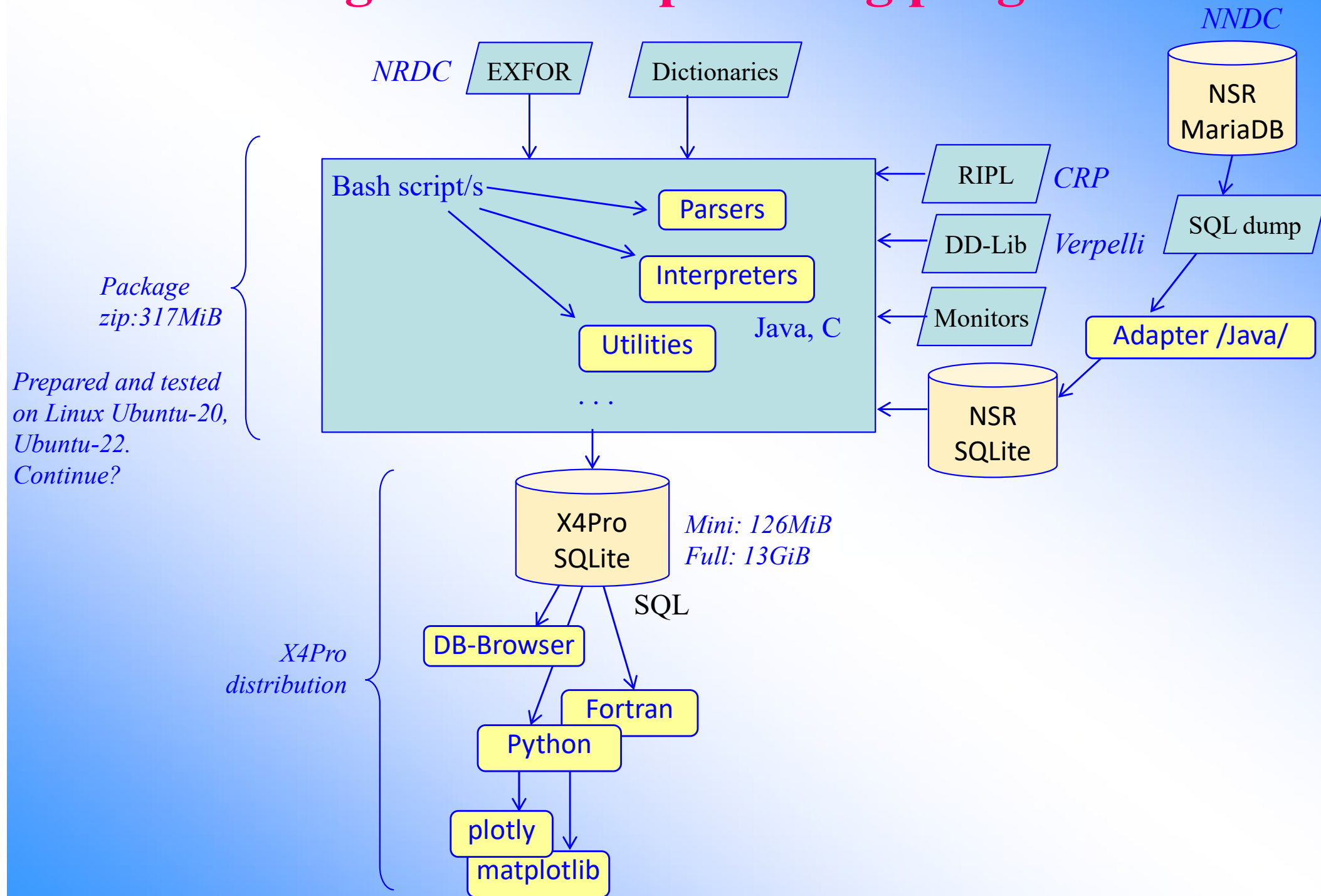


Part II.

Software package producing X4Pro

C29 NRDC supports proposal of Zerkin to distribute X4Pro database with X5 as a product of NRDC recommended for users' community. Implementing must include sharing NDS source code and documentation producing X4Pro within NRDC.

Package: bash script calling programs



Log: Producing X4Pro-mini

```
2024-05-13 13:14:59 0. Clean current directory
2024-05-13 13:14:59 1. EXFOR INSERT start
2024-05-13 13:14:59 1.c Delete data tables from EXFOR
2024-05-13 13:15:00 1.d Create data tables in EXFOR
2024-05-13 13:15:01 2.d Delete PRELIM from EXFOR-DB
2024-05-13 13:15:01 3. Create X4 file x4trans.txt from EXFOR TRANS files
2024-05-13 13:15:01 4. Create XML tables from X4 file x4trans.txt
2024-05-13 13:15:13 5. Loading x4trans.xml to database
2024-05-13 13:15:23 6. Loading BLOBs to database
2024-05-13 13:15:29 7. Make stdFileName for references
2024-05-13 13:15:30 8. Put external DOI for References
2024-05-13 13:15:32 8.a Put external NSR for References
2024-05-13 13:15:34 8.b Put external INIS-RN for References
2024-05-13 13:15:34 9. Automatic extension of Dictionary 236
2024-05-13 13:15:37 10. Finalizing tables...
2024-05-13 13:15:38 11. Finalizing AUTHORS table...
2024-05-13 13:15:39 12. Define C5.MF:MT...
2024-05-13 13:17:50 14. Finishing Trans...
2024-05-13 13:17:51 14.a Restore UpdateNo in ENTRY and SUBENT after file backup uploaded
2024-05-13 13:18:01 15. Checking XML vs OK...
2024-05-13 13:18:01 17. Define ENTRY.CenterID from the Dictionaries 55 and 56
2024-05-13 13:18:02 17.b Load X4PRELIM table from prelim/archive
2024-05-13 13:18:02 19. Setup Ei,An,E2,LVL from C4
2024-05-13 13:20:13 20. Create auto-correction file
2024-05-13 13:22:44 21. Create list of duplicative points (equal indep. variables)
2024-05-13 13:23:57 22. Making Error-report.html X4PRELIMDB=0 X4ADDPRL=
2024-05-13 13:24:18 77. Populate x4pro-db: update x4pro_tables...
2024-05-13 13:24:18 77.1a Populate x4pro-db. Part-1: prepare x4pro_x4data,x4pro_c5dat,...
2024-05-13 13:29:05 77.1b Populate x4pro-db. Part-2: upload x4pro_x4data,x4pro_c5dat,...
2024-05-13 13:29:25 77.2 Populate x4pro-db. Part-3: prepare and upload x4pro_x4z,x4pro_x5z,...
2024-05-13 13:38:23 24. Making html help files...
2024-05-13 13:38:24 25. Create an help-tables in database
2024-05-13 13:38:25 26. Set up a new date of database updated to current day
2024-05-13 13:38:25 27. Setup CompilerID
2024-05-13 13:38:26 28. Grant permissions to webusr
2024-05-13 13:38:26 29. Successful end of operations
2024-05-13 13:38:27 30. Clean current directory
```

30 procedures, 25 min

Tool to understand/discuss X5-json

JSON-Tree Editor: <https://vzerkin.github.io/>

by V.Zerkin, 2024

JSON-Tree Editor

Purpose/Features/Links:

- Currently, the main goal: development of JSON formats for nuclear data
- Presenting any JSON text as interactive tree in order to learn/understand/compare/discuss data formats: structures/contents/hierarchy
- Test samples: JSON files generated by nuclear data systems [EXFOR](#), [ENDF](#), [Web-API](#), [NSR](#), [ENSDF](#), etc.
- Viewer-part is extendable to display specific information along with the node name
- Editor implements operations:
 - File: new/save/open local JSON file
 - Edit: undo/redo
 - View: open 1 level of nesting, 2 levels, 3 levels, ..., open all nodes
 - History: view history of operations, select and roll back to previous editing steps
 - Tool: minify/expand/iTable current JSON text in pupup-window
 - Node in the graph-tree: JSON *<key-value>*
 - Edit: modify/clear/check/minify/expand/copy/paste JSON-text of "value" and modify "key"
 - Add: edit Node and save it as new Node, add item to Array
 - Move: move whole Node up and down
 - Remove: delete whole Node
- Edit-json-tree online:
 - vzerkin.github.io: [edit-json-tree](#), [x5](#), [x4std](#), [ensdf](#), [pace_ensdf](#); parallel view/edit: [exfor](#), [nsr](#)
 - zerkin.usite.pro: [edit-json-tree](#), [x5](#), [x4std](#), [ensdf](#), [pace_ensdf](#); parallel view/edit: [exfor](#), [nsr](#)
- Editor can also be used in local Web-Browser without Web-server.

JSON-Tree Editor

- X5Json {13}
 - ENTRY: 13597
 - updated: 20140415
 - TransID: 1401
 - TransDate: 20141111
 - CenterID: NNDC
 - Center: US National Nuclear Data Center, Brookhaven, USA
 - generated {3}
 - format: x5json.0.1.6
 - now: 2024-03-01T14:06:58.448Z
 - program: exfor2x5z, by V.Zerkin, IAEA-NDS,
 - y1: 1995
 - a1: S.K.Ghorai+
 - r1: J,ANE,22,11,1995
 - ref: Jour: Annals of Nuclear Energy, Vol.22, p.11
 - title: Partial neutron cross sections for 64Zn, 66Zn, 67Zn and 68Zn
 - x4subents {7}
 - x4subents[0] {7} Subent:13597001
 - SUBENT: 13597001
 - isub: 1
 - compiled: 20140415
 - TransID: 1401
 - TransDate: 20141111
 - BIB {15} Bibliographic and descriptive information
 - INSTITUTE {1} Institute
 - REFERENCE {2} Reference
 - AUTHOR {1} Author
 - TITLE {1} Title
 - FACILITY {1} Facility
 - INC-SOURCE {1} Incident particle source
 - SAMPLE {1} Sample
 - METHOD {1} Method (measurement technique)
 - DETECTOR {1} Detector
 - MONITOR {1} Standard
 - DECAY-MON {1} Standard decay data
 - CORRECTION {1} Corrections
 - ERR-ANALYS {1} Error analysis
 - STATUS {2} Status
 - HISTORY {2} History of Entry/Subentry
 - COMMON {5} Common data
 - ncols: 1
 - nrows: 1
 - x4headers {1}
 - datacols {3} Headers, Units, Pointers
 - data {1}
 - x4subents[1] {8} Subent:13597002
 - SUBENT: 13597002
 - isub: 2
 - compiled: 19950217
 - TransID: 0000
 - TransDate: 20050926
 - BIB {2} Bibliographic and descriptive information
 - REACTION {1} Quantity given
 - DECAY-DATA {1} Decay data
 - DATA {5} Data section

- BIB {15} Bibliographic and descriptive information
 - INSTITUTE {1} Institute
 - REFERENCE {2} Reference
 - AUTHOR {1} Author
 - TITLE {1} Title
 - FACILITY {1} Facility
 - FACILITY[0] {2}
 - x4pointer:
 - x4codes {2}
 - x4codes[0] {4}
 - code: DYNAM
 - dict: FACILITY
 - idict: 18
 - hlp: Dynamitron
 - x4codes[1] {4}
 - code: 1USAAUB
 - dict: INSTITUTE
 - idict: 3
 - hlp: Auburn University, Auburn, AL, United States of America

- New
- Open
- Test samples
 - Example-0
 - exfor:X5
 - exfor:X4std (2019)
 - exfor:JSON-FY
 - exfor:Dictionaries
 - exfor:MF8.MT457
 - exfor:MF33
 - ibandl:R33
 - prog: NNDC::ensdf-json
 - prog: NNDC::nsr_result
 - exfor_json
 - pace_ensdf
 - PubChem:Elements
- Save
- Exit

✕ ↑ ↓ Remove

Edit node: X5Json → x4subents → x4subents[0] → BIB → FACILITY → FACILITY[0] → x4codes → x4codes[0]

Key: Object type:[object Object] Elements:4

```

JSON: {
  "code": "DYNAM",
  "dict": "FACILITY",
  "idict": 18,
  "hlp": "Dynamitron"
}

```

[Save][Save New][Reset][Clear][Check][Minify][Expand][Copy]

Part III.

Standalone version of EXFOR-CINDA-ENDF-IBANDL Web retrieval system having MyExfor without Internet

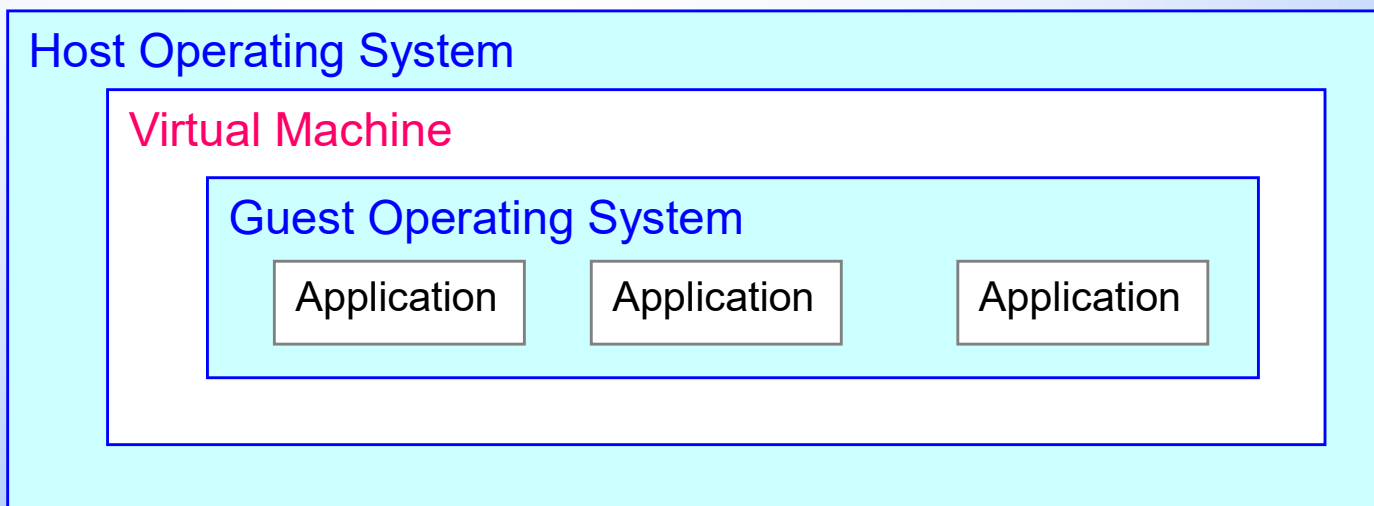
C30 NRDC recommends continuing the functioning of Web EXFOR-CINDA-ENDF-IBANDL Retrieval system including MyExfor on NDS and Mirror sites. Standalone version of this system would be also useful.

A73 Prepare standalone version of Web EXFOR CINDA-ENDF-IBANDL retrieval system with MyExfor working without Internet (c.f. Conclusion 30)

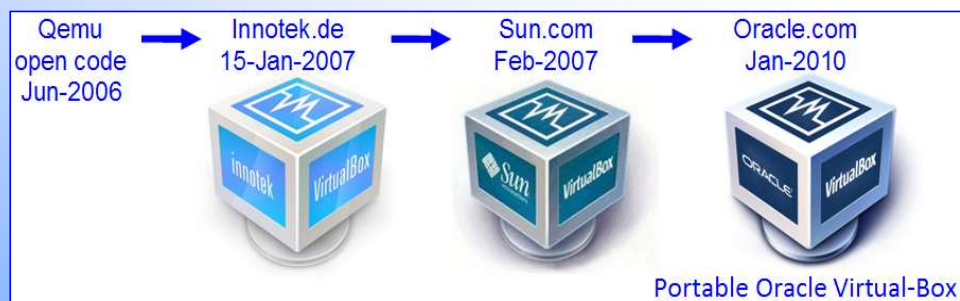
Virtual Machines (VM)

Paradigm.

Complete operating system (“Guest OS”, e.g. Ubuntu, MacOS, Windows, Android, etc.) can be installed and running within a Virtual Machine application running under another operating system (“Host OS”, e.g. Windows, Linux, MacOS, etc.)



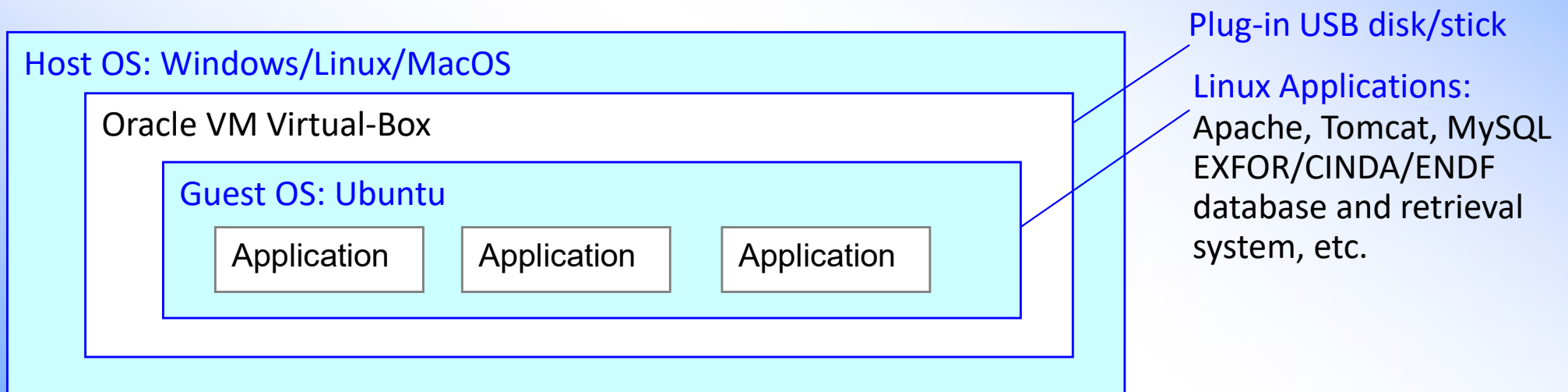
Oracle VM VirtualBox



I use Oracle VM VirtualBox: 2012-2024 for development (home, duty travels)

Linux/Ubuntu within Oracle VM Virtual Box

1. Developer's PC (x64) with installed "Oracle VM Virtual-Box":
prepare **Guest-OS Ubuntu** on Virtual Machine and install all components of nuclear database and Web services.
Result: single VDI file (16GiB-500Gib) in **Host-OS**.
2. User's PC (x64) having Windows/Linux/MacOS:
 1. install application "Oracle VM Virtual-Box"
 2. copy VDI file (VirtualBox Disk Image) to your PC
 3. "Create Virtual Machine" and "Use an Existing Virtual Hard Disk File"



*Note. In such way, **we can distribute** not only nuclear database retrieval system, but **any software:** programs, packages, large systems, Web and database applications, legacy codes, etc., which will always be ready to run without installation procedures.*

Web Nuclear Data Services without Internet

V.Zerkin, International Atomic Energy Agency, 2012-2016

Tasks:

- 1) Run Web nuclear database services locally on MS-Windows PC without Internet
- 2) Run Linux Desktop applications on MS-Windows PC (including X-Windows apps, e.g. Empire)
- 3) All components of the system should be running from USB disks without any installation

Operating system: MS-Windows (-7, -8, -XP, etc.) with

- Win-Application: Portable Oracle Virtual-Box running
 - Guest operating system: Ubuntu-11.10 Desktop with
 - System components: apache2, tomcat7, mysql
 - Tomcat Application: EXFOR-CINDA-ENDF Web database retrieval system
- Win-Application: any Web-Browser (FireFox, Opera, Google Chrome, etc.)

Total size: 15Gb (including databases: EXFOR, CINDA, IBANDL, ENDF with two libraries)

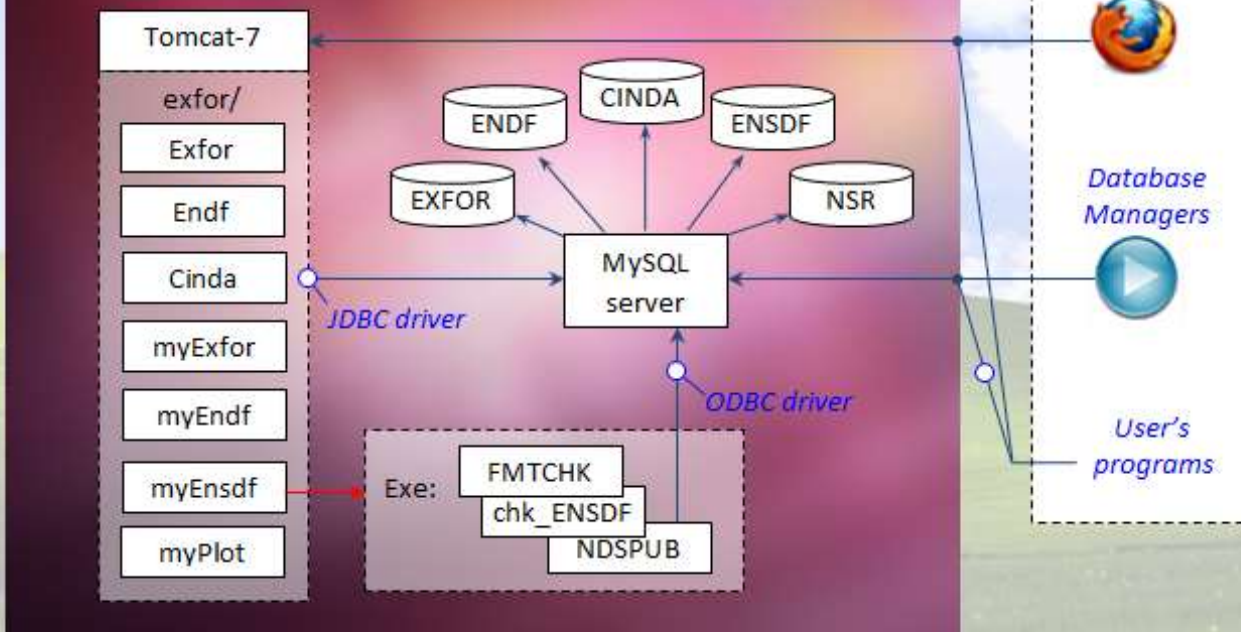
Start: IAEA-NDS page, EXFOR, ENDF, CINDA, IBANDL, myExfor, myEndf, myEnsdf, myPlot

Start: local Tomcat manager

Host Operating System: Windows

Oracle VM VirtualBox

Guest Operating System: Linux



Web without Internet using Oracle VM VirtualBox

Portable system in 2012-2016

✓ 2024: complete dev-system on Mini-PC: AMD Ryzen-5, SSD:256GB, HDD:2TB
OS: Windows-11
+VirtualBox-7.0

1) Ubuntu-22.04

- Apache Tomcat/8.5.96
- Java 1.8.0-openjdk-amd64
- MariaDB 10.6.16
- GNU Fortran 11.4.0
- Python 3.10.12
- git version 2.34.1
- etc.

Concluding remarks

1. EXFOR Software is running on NDS, Mirrors, NRDC, etc.
2. Maintenance, development, debugging is needed?
(for NDS, Mirrors, NRDC)
3. Standalone production of X4Pro is ready
4. X5json is proposed to be an NRDC output file
and be a starting point for user communities

Thank you.