

EXFOR as a multi-platform relational database: current status of development

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The Nuclear Reaction Database (NRDB) will combine CINDA, EXFOR, ENDF and Dictionaries as a united relational database. The EXFOR part on the NRDB project ("EXFOR-relational") is basically continuation of EXFOR/Access database distributed on CD-ROM since 2000. The project aims in developing platform independent software for using EXFOR as a relational database being used on PC, in local network and through the Web. EXFOR-relational suppose to work on most popular operating systems and several DBMS.

Because EXFOR-relational is becoming a part of united Nuclear Reaction Database, further development of EXFOR/Access contained following directions:

1. Study, investigations of a technical solution to be applied in EXFOR-relational, tests of performance on different platforms (see Tables 1, 2, Fig 2.);
2. Development of first version of platform independent software for loading data to database and retrieval Java-program (See Fig.1);
3. Migration to EXFOR/NRDB schema (See Fig.3);
4. Design and development Web version of EXFOR-relational;
5. Practical using of load software for creating EXFOR/Access CD-ROM revisions;
6. Extend functionality and simplify installation of EXFOR/Access;

Improvements of EXFOR/Access on CD-ROM:

1. Enhanced search of product (SF3, SF4, ELEM/MASS)
2. User's Manual in html pages, auto-run program, simpler ZVView installation
3. Accelerated search of data
4. Version without external X4 files (user does not need to read CD-ROM for X4 file reconstruction or install ~100,000 files on Hard Disk)
5. Plugged in Statistics system

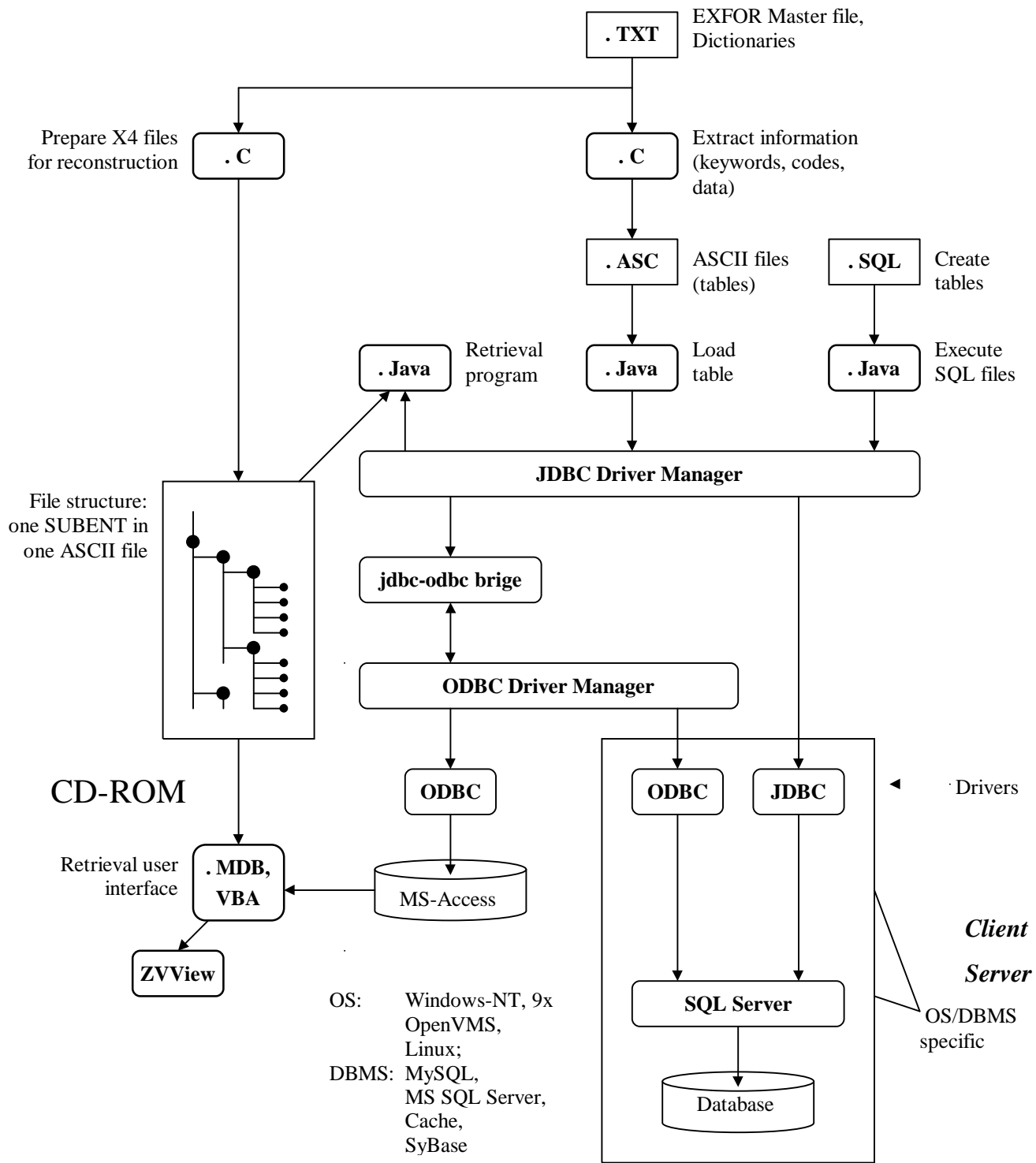


Fig.1. EXFOR Relational: programs and data flow

EXFOR relational on Java/JDBC: performance on different platforms.

Table 1. Access to database by standalone Java programs via JDBC drivers

DBMS on Server	Server OS	Client OS	Load tables (min:sec)			Retrieve data (sec)		BLOB checked	N
			ENTRY 12,357rec. 1.5 Mb	SUBENT 79,175rec. 11.5 Mb	REACT 94,703rec. 13.5 Mb	Execute SQL-1			
						First time after restart	Fastest time of execution		
Access-97	NT*	NT	1:00	6:42	12:20	4.5	0.06	√	1
MS-SQL-6.5	NT*	NT	1:19	8:32	10:36	4.5	0.03		2
Cache ³ 3.2.1.8	NT*	NT	0:24	2:40	5:16	8	3.6		3
	VMS*	VMS	5:18	32:58	78:12 ²	6.6	0.99		4
		NT	1:18	8:24	13:35	6.5	0.99	√	5
Cache ³ 3.2.1 (from Germany)	Linux*	VMS					0.45		8
		NT					0.05		9
		Linux	0:16	1:43	3:35	4.7	0.23		10
	NT	NT				4.7	0.15		11
	Linux				4.6	0.14		12	
MySQL v-3.23.27	NT*	NT	0:16	1:40	1:15	12	1.06		13
	Linux*	NT	0:28	4:27	4:56	5.7	0.1		14
		Linux	0:09	0:53	2:06	5.2	0.07		15
	NT	Linux	0:35	3:59	7:41	10.2	1.2		16
ASE-12.5b ⁴	Linux	NT	2:16	14:23	35:17		0.06	√	17
ASA-7.0 ⁴	NT*	NT	0:59	6:24	12:09		1.57	√	18

Table 1a. Web access to database by CGI-Java and Servlets via JDBC drivers

Alpha-VMS > USU-Server > CGI/Perl > JDK-1.1.7 > Cache-3.2.1.8	12-15	11.7		18
LinuxRedHat-6.2 > Apache / JServ / JDK-1.3.0 > MySQL-3.23.27-beta	5.2	0.1		19

* Server was located on the same machine as Client.

² Java itself is slow on VMS: e.g. load time of REACT without execution of SQL statements was 26:30

³ Cache buffers were set up to 16/8 Mb.

⁴ Done in NNDC (BNL,USA), March, 2001: NT-RAM=64Mb; LAN: slow

Table 2. Performance with different ways to store original EXFOR data *

<i>Store Subentries as</i>	<i>Read by</i>	<i>Extract by</i>	<i>MDB file (Mb)</i>	<i>Text files (Mb)</i>	<i>Time to create³ X4 (sec)</i>	<i>Add cost</i>
BLOB/Zip	VBA	DynaZIP-32	180	-	25	\$200
BLOB/Zip	VBA	Pkunzip/DOS	180	-	107	-
BLOB/Zip Text ⁴	VBA	Pkunzip/DOS	301	-	65	-
BLOB/Text	VBA	-	421	-	16	-
Text Files	VBA	-	105	270 ²	15	-
Text Files	Java	-	105	270 ²	100	-

* Database: Access-97, VBA buffer size: 4096 bytes; ² Total number of files: 99,523; ⁴ size limit for zip: 4096 b

³ Request: "WHERE (SAN='1000*')"; Reactions: 99; Subentries: 91; X4: 11.7Mb (144,414 lines)

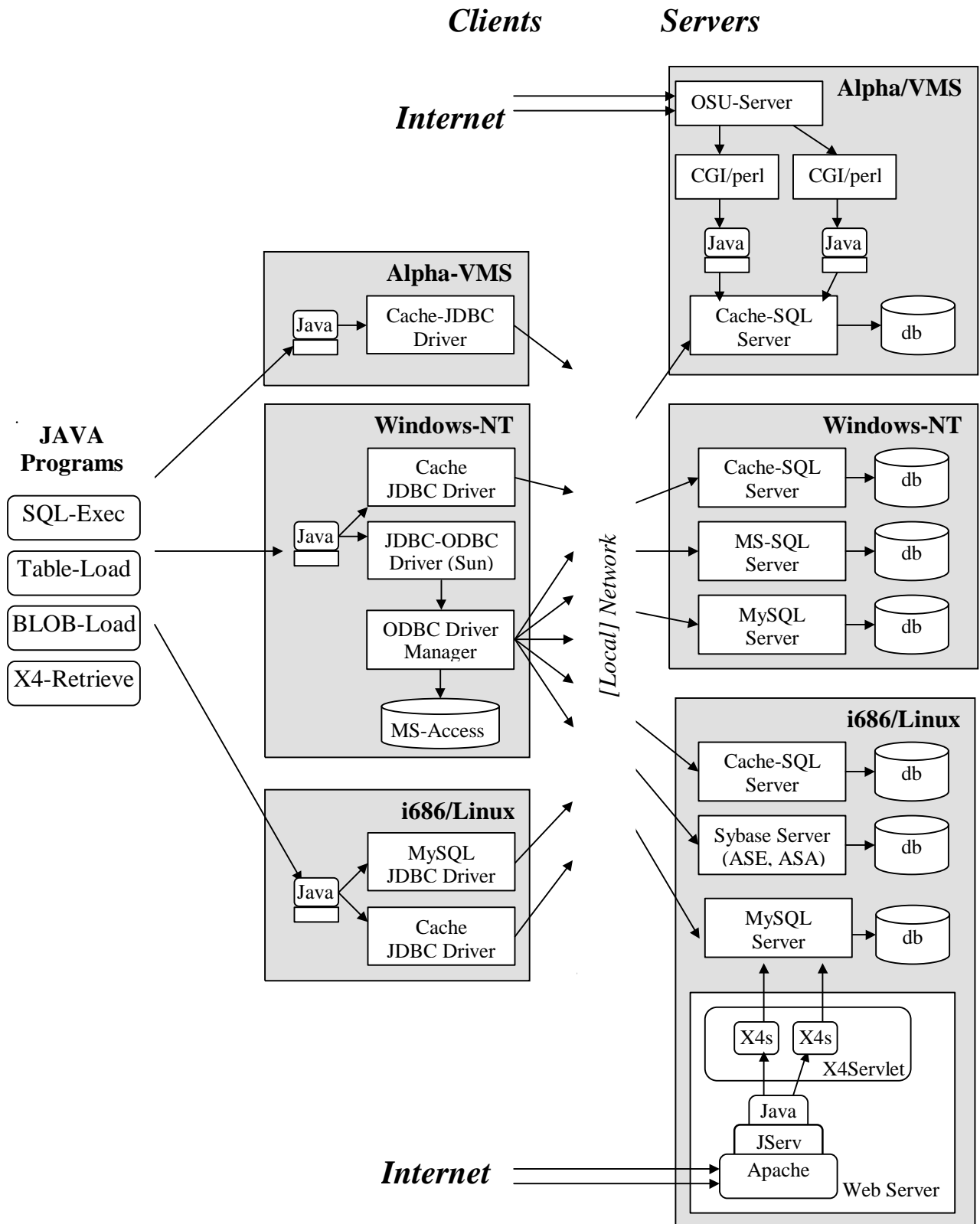


Fig.2. EXFOR multi-platform implementation: studied and tested architectures

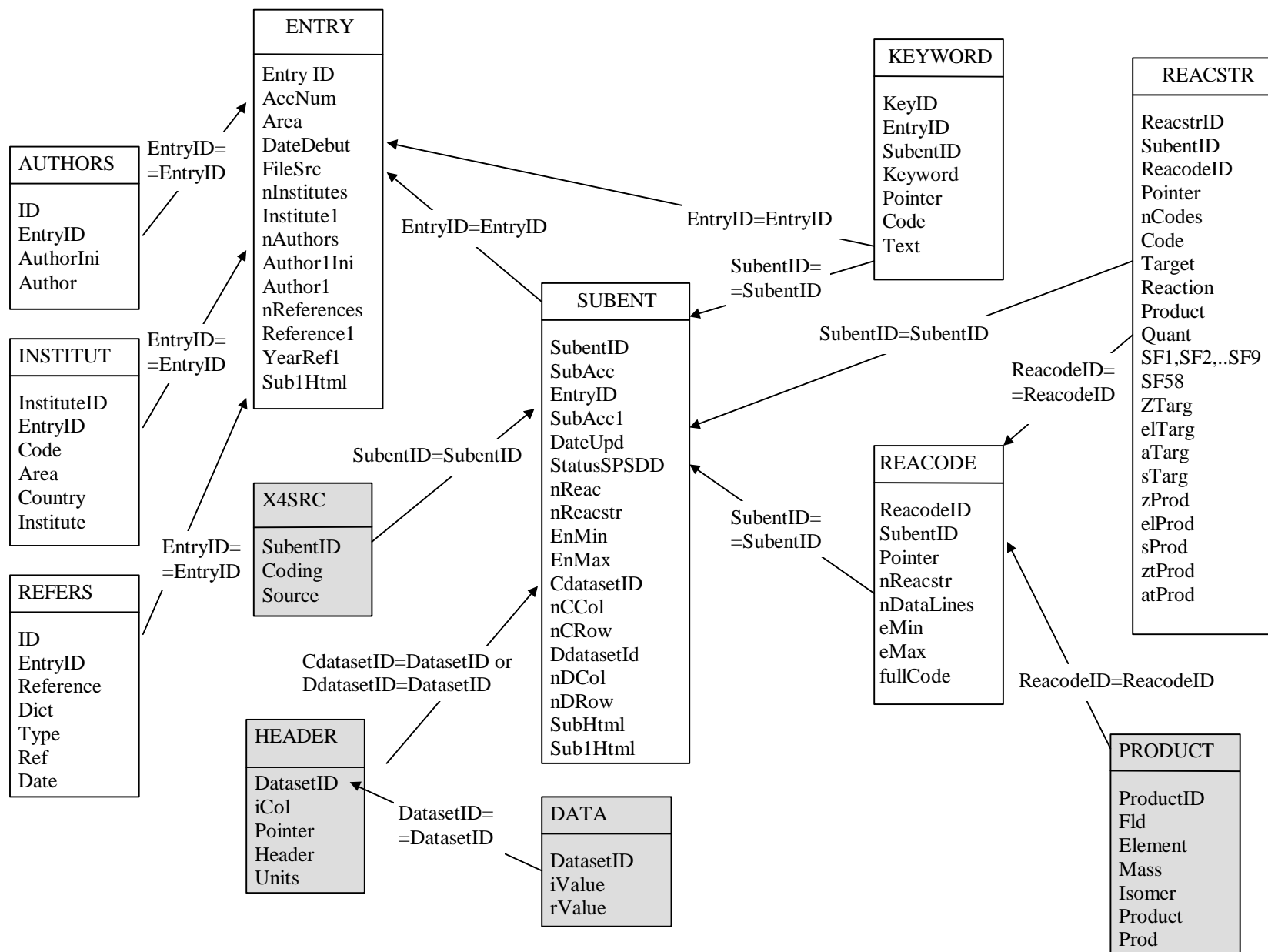


Fig.3. EXFOR Relational: Schema, May-2001