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ADABAS

Adabas, a contraction of "adaptable database system,"[1][2] is a database package that was developed by Software AG to run on IBM mainframes. It was launched in 1971 as a non-relational[3] database. As of 2019, Adabas is marketed[4] for use on a wider range of platforms, including Linux, Unix, and Windows.[5]

Adabas can store multiple data relationships in the same table.

Contents

History

Initially released by Software AG in 1971[6] on IBM mainframe systems using DOS/360, OS/MFT, or OS/MVT, Adabas is currently available on a range of enterprise systems, including BS2000, z/VSE, z/OS, Unix, Linux, and Microsoft Windows.[7] Adabas is frequently used in conjunction with Software AG's programming language Natural; many applications that use Adabas as a database on the back end are developed with Natural. In 2016, Software AG announced that Adabas and Natural would be supported through the year 2050 and beyond.[8]

Adabas is one of the three major inverted list DBMS packages, the other two being Computer Corporation of America's Model 204 and ADR's Datacom/DB.[9]

4GL support

Since the 1979 introduction of Natural[10][11] the popularity of Adabas databases has grown. By 1990, SAS[12] was supporting Adabas.

Non-relational

In a 2015 white paper, IBM said, "applications that are written in a pre-relational database, such as Adabas, are no longer mainstream and do not follow accepted IT industry standards."[13] However, an Adabas database can be designed in accordance with the relational model. While there are tools and services to facilitate converting Adabas to various relational databases,[14][15] such migrations are usually costly.[16][17]

Hardware zIIP boost

IBM's zIIP (System z Integrated Information Processor) special purpose processors permit "direct, real-time SQL access to Adabas" (even though the data may still stored in a non-relational form).[18]

Adabas Data Model

Adabas is an acronym for Adaptable Data Base System[19] (originally written in all caps; today only the initial cap is used for the product name.)

Adabas is an inverted list data base, with the following characteristics or terminology:

- Works with tables (referred to as files) and rows (referred to as records) as the major organizational units
- Columns (referred to as fields) are components of rows
- No embedded SQL engine. SQL access via the Adabas SQL Gateway was introduced through an acquired company, CONNX, in 2004.[20] It provides ODBC, JDBC, and OLE DB access to Adabas and enables SQL access to Adabas using COBOL programs.
- Search facilities may use indexed fields or non-indexed fields or both.
- Does not natively enforce referential integrity constraints, and parent-child relations must be maintained by application code.
- Supports two methods of denormalization: repeating groups in a record ("periodic groups") and multiple value fields in a record ("multi-value fields").

Adabas is typically used in applications that require high volumes of data processing or in high transaction online analytical processing environments.[21]

Adabas access is normally through Natural modules using one of several Natural statements including READ, FIND, and HISTOGRAM. These statements generate additional commands, under the covers, like open and close file. Adabas data can also be retrieved via direct calls.

Example of Natural program running against Adabas

```
FIND EMPLOYEE WITH NAME = 'JONES' OR = 'BAKER'
  AND CITY = 'BOSTON' THRU 'NEW YORK'
  AND CITY NE 'CHAPEL HILL'
  SORTED BY NAME
  WHERE SALARY  < 28000
    DISPLAY NAME FIRST-NAME CITY SALARY
```

```
   END-FIND
   END
```

Output of Program:

```
NAME   FIRST-NAME CITY      SALARY
----------------------------------
BAKER PAULINE     DERBY      4450
JONES MARTHA      KALAMAZOO 21000
JONES KEVIN       DERBY      7000
```

Natural (4GL)

Natural is a proprietary <u>fourth-generation programming language</u>. It was not part of the initial (1971) Adabas release.[22]

Natural programs can be "run" interpretively or "executed" as compiled objects.[23] Compiled programs can more directly use operating system services, and run faster.

Proponents say that Natural has evolved from a competitor of COBOL to "being in competition with Java as language of choice for writing services (<u>SOA</u>)."[24]

About Natural

Natural, which includes a built-in screen-oriented editor, has two main components: the system and the language.

The system is the central vehicle of communication between the user and all other components of the processing environment.

The language is structured and less procedural than conventional languages.

Natural objects (programs, maps, data areas, etc.) are stored in libraries, similar in structure to a DOS directory, and can be named with identifiers up to 8 characters.

Objects, even if they are of different types, cannot have the same name.

Natural provides both online and batch execution and programming testing utilities.

Versions exist for z/OS, z/VSE, BS2000/OS, Linux, Unix and Windows.[25]

Language features

Natural works not only with Adabas files, but also supports <u>Oracle</u>, <u>DB2</u>, and others.

Sample code:

```
DEFINE DATA LOCAL
01 EMPLOYEES VIEW OF EMPLOYEES
   02 SALARY (1)
END-DEFINE
READ EMPLOYEES BY NAME
   AT END OF DATA
     DISPLAY
```

```
      MIN (EMPLOYEES.SALARY(1)) (EM=ZZZ,ZZZ,ZZ9)
      AVER(EMPLOYEES.SALARY(1)) (EM=ZZZ,ZZZ,ZZ9)
      MAX (EMPLOYEES.SALARY(1)) (EM=ZZZ,ZZZ,ZZ9)
   END-ENDDATA
END-READ
END
```

Output:

```
Page      1                                            18-08-22  16:42:22

   ANNUAL        ANNUAL        ANNUAL
   SALARY        SALARY        SALARY
----------- ----------- -----------

        0     240,976   6,380,000
```

The language is <u>strongly-typed</u>, using explicit typing of variables, which may be one of:

- Alphanumeric
- Numeric <u>Zoned decimal</u> up to 27 total digits, of which a total of 7 may be to the right of decimal point
- Packed Decimal,[26] same limits as "Numeric")
- Integer (1, 2 or 4 bytes, ranging from -128 to 127 / -32,768 to 32,767 and -2,147,483,648 to 2,147,483,647)
- Date
- Logical (True or False)
- Binary (a single byte, according to the translator)
- Control variable paralleling CICS map attribute
- Floating Point (4 or 8 bytes)

The system file

The system file is an Adabas file reserved for use by Natural, which contains, but is not limited to, the following:

- All Natural programs, both in source format (programs) and in object format (compiled), grouped in libraries;
- File Definition Modules, or Data Definition Modules (DDM), with the definition for the Natural or Adabas files and their userviews;
- Natural error messages;
- The texts of the Help function.

The system file is not limited to Adabas. Natural can also store programs in VSAM on mainframe operating systems. Natural uses the file system on Windows and various Unix implementations.

Programs

Natural objects are identified by names up to 8 characters, the first of which must be alphabetical.

The Natural program editor allows source in rows of up to 72 positions. Lines are numbered by 4 digits. This numbering is generated by Natural during program creation. Line numbers used by the compiler and editors, and can have important logical functions in the programs.

Within the lines, instructions (statements or program commands) have no positional parameters.

Comments can be included in two ways:

- Full-line comments are identified by a "*" or "**" prefix.
- Annotated code lines have a "/*" - everything to its right is a comment.

Examples:

```
0010 * These two lines (0010 and 0020)
0020 ** are comments.
0030 FORMAT LS = 80 /* As well as this part of the line (0030)
0040 * NOTE: The "/*" form has no space between the SLASH and ASTERISK.
.
.
0200 END
```

"END" or "." indicates the end of a program.

A Hello World code example:

```
* Hello World in NATURAL
WRITE 'Hello World!'
END
```

See also

- Adabas D

References

1. S.M. Deen (1977). *Fundamentals of Data Base Systems* (https://books.google.com/books?isbn=1349158437). p. 174. ISBN 1349158437.
2. "Adaptable Data Base System, or ADABAS, was developed by Software AG of Darmstadt, West Germany. Its first version appeared in 1971, and by now it has over 80 installations in Europe and the United States."
3. "Historically, the solution was to use nonrelational structures, such as the inverted structure used by Adabas ..." John Watson (2007). *Pro Oracle Collaboration Suite 10g* (https://books.google.com/books?isbn=1430202351). p. 324. ISBN 978-1430202356.
4. formerly named with ALL-caps, today as Adabas
5. "Adabas for Linux, UNIX & Windows" (https://software.ag/corporate/products/adabas_natural/adabas/products/luw/overview/default.asp).
6. "Adabas continues to play a vital role for installed base" (http://www.computerweekly.com/news/2240065879/Adabas-continues-to-play-a-vital-role-for-installed-base). Retrieved 12 February 2017.
7. "Adabas & Natural Database Management System - Software AG" (http://www.softwareag.com/UK/products/transactions/adabas/overview/default.asp). Retrieved 12 February 2017.

8. "Software AG Announces New "Adabas & Natural 2050" Agenda" (http://www.businesswire.com/news/home/20160831005145/en/Software-AG-Announces-%E2%80%9CAdabas-Natural-2050%E2%80%9D-Agenda). 31 August 2016.

9. "Software AG memories" (http://www.softwarememories.com/category/companies/software-ag). March 25, 2011. "ADABAS was .. one of the three major inverted-list DBMS, the other two being Computer Corporation of America's Model 204 and ADR's Datacom/DB."

10. "Adabas new products" (https://books.google.com/books?id=Qrjca3MN6nIC). *Computerworld*. May 29, 1978. p. 27.

11. "Both the Adabas Data Dictionary System and the Adacom batch report writer are due out in July while Natural, a natural programming language, is expected to be ... Described as entirely reentrant, multithreaded and priority dispatched, the system is in Alpha testing and scheduled for general release in January 1979.

12. "SAS/ACCESS 9.2 Interface to ADABAS: Reference" (http://support.sas.com/documentation/cdl/en/acadbas/59521/PDF/default/acadbas.pdf) (PDF).

13. "Converting Adabas to IBM DB2 for z/OS" (http://www.redbooks.ibm.com/redpapers/pdfs/redp5154.pdf) (PDF).

14. "ADABAS Database Migration to IBM DB2, Oracle, Microsoft SQL Server" (http://www.tsg.co.uk/services/adabas-natural.htm).

15. "... including the conversion of any applications written in 4th Generation languages (4GL) to more contemporary languages, and the adaptation of any applications in standard programming languages to directly access the new relational database. Included in that coverage is Adabas and Natural from Software AG ..."

16. "Adabas to DB2 conversion" (http://www.idug.org/p/fo/et/thread=17428).

17. "COSTS: "So far its been 2 years and 30 million dollars to convert." _versus_ BENEFITS: (but) "a single SQL statement (with joins) to replace pages of code."

18. "5 Ways to Simplify Access to Adabas & Natural with Data Virtualization" (http://www.rocketsoftware.com/sites/default/files/resource_files/WP_Data_Adabas-Data-Virtualization.pdf) (PDF). 1990.

19. Pratt & Adamski 1987, p. 471

20. "CONNX for Adabas | CONNX Solutions" (http://www.connx.com/databases/adabas-db.php). *www.connx.com*. Retrieved 2017-09-01.

21. "WHAT IS ADABAS?" (https://archive.sap.com/discussions/thread/577971).

22. "Adabas / Natural – From pioneer to relegator - fast and proprietary for over 40 years" (http://www.pks.de/_old/en/adabas-natural).

23. "Natural Program Activity" (http://frontline.compuware.com/doc/sb/sb52/html/Strobe%20Options%20Guide/WebHelp/CWSTUO5B/Anfch3/Natural_Program_Activity.htm).

24. "Which is better, COBOL/DB2 or Natural/ADABAS" (http://tech.forums.softwareag.com/techjforum/posts/list/24345.page). July 6, 2011.

25. https://resources.softwareag.com/adabas-natural/2018-3-fs-natural-app-dev-en-natural-application-development-platform-fact-sheet

26. "Packed-Decimal Format" (https://www.ibm.com/support/knowledgecenter/en/ssw_ibm_i_73/rzasd/padecfo.htm). June 2012.

Bibliography

- Pratt, Philip J.; Adamski, Joseph J. (1987). *DATABASE SYSTEMS: Management and Design*. Boston: Boyd & Fraser Publishing Company. ISBN 0-87835-227-9.

External links

- ADABAS product home page (http://www.softwareag.com/corporate/products/adabas_natural/adabas/overview/default.asp)
- ADABAS Developer Community (https://tech.forums.softwareag.com/tag/Adabas-Natural)
- ADABAS Discussion Forum (https://tech.forums.softwareag.com/tags/c/forum/1/adabas-natural)