

DATA BASE MANAGEMENT SYSTEM dBASE-300

FOR CUBAN MINICOMPUTER CID 300/10

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## 1. INTRODUCTION

During the late seventies and early eighties of this century, a host of Data Base Management Systems (DBMS) have emerged, based on the Relational model presented by E. F. Codd in 1970. These microcomputer-implemented DBMS have spread this technology everywhere, although, nearly all of them fail to abide by the principles of Data Base theory. However, these systems provide simple means for the development of applications with a certain degree of data-program independence, means to reduce duplication of information, and also a language for data treatment with a high level and available to the average user.

As a result of this situation, as a complement to the software devised for CID 300/10 (similar to SM-3) a DBMS was developed to carry through the following purposes:

- easy use language,
- efficient management of data structures according to the hardware's memory restrictions,
- to ensure work with the rest of the software, and specially with Operating System for Commercial applications GES-300.

An early stage of the work was the assessment of the various DBMS available in order to determine whether it was necessary to design a new data management language and learn the general characteristics of present systems with a view to incorporate these into our system. From this study the conclusion was made that:

- a wide range of Relational DBMS exists in the market, each with a different man-machine interphase,
- one of the DBMS, the dBASE, is almost a standard for microcomputers due to its extended use in our country, its facilities and its simple design,
- the deficiencies set before the dBASE in respect of the rate of processing could be removed in the CID 300/10.

We accordingly set ourselves the aim of implementing a DBMS which from the user's point of view should be compatible with dBASE.

The dBASE-300 contemplates files used to be compatible with relative organization files of GES-300's COBOL, so that continuity of the work is ensured with applications previously developed for CID 300/10.

Now we shall expound the general characteristics of dBASE-300, pointing out the major techniques used in its development as well as the main differences regarding dBASE II of microcomputers.

## 2. General characteristics of the system

As DBMS standard the general features of dBASE II, version 2.4, were taken, developed for 8 bit microcomputers. Also



enclosed were some of the facilities of dBASE III which considerably increase the system's potentials. These are:

- the possibility to use more than 2 files simultaneously,
- precision of the arithmetic up to 18 digits,
- file classification by up to 6 keys simultaneously,
- command AVERAGE,
- some of the functions which are not in dBASE II.

Development of dBASE-300 has been carried out in FOBOS's macro-assembler language.

Implementation of the DBMS dBASE-300 is logically divided into one compiler and one command executer.

To implement the compiler a LALR/l/ grammar was designed that contemplates the required commands.

This grammar was processed by the table generator for syntactical analysis of LALR/l/ grammars of CID 201-B.

Due to capacity problems, this program could not process the whole grammar. Therefore, the syntactical analysis was carried out by using the two methods together: automated, which provided us with the table generator, and ad hoc in the portion that could not be processed by the generator. This was the more laborious part of the project on account of implementation of these two form of work, and also because the table generator of CID 201-B affords only very scanty facilities for its use.

Inside the executor, a module was designed that performs dynamic allocation of memory, so that any process needing memory asks for it. This module is based on a FIRST-FIT method and ensures compaction of free memory, if needed.

Also in the executor there is a module in charge of every input-output processes of files by solving both the sequential and the indexed organisation, for the latter purpose using the B+ tree structures for dense indexes.

The executor for command work has a decimal arithmetic with a capacity of up to 18 digits. This module also solves all arithmetical, chain and logical functions provided by dBASE-300.



A module has been included inside the executor for treatment of the terminal. This module responds to the heavy requirements of commands using this input-output medium.

At the time of execution, syntactical analysis of expressions supplied by the user is made using the recursive descent method. This occurs in commands such as INPUT, ACCEPT and REPORT.

The potential of command REPORT /report generator/ of dBASE-300 is increased with the possibility of defining up to 6 breakage fields.

To provide for programming of the classification command the SHELL method, which had already reported good results in the utility programs of CID 300/10, was selected, and a treatment of the auxiliary files with two balanced buffers was added. A considerable improvement of execution times was achieved.

### 3. Main differences from microcomputers' dBASE II

3.1 In the instruction formats, where reference is made to a file name, a specification of FOBOS files must be supplied instead of type CP/M or PC-DOS specifications. In creation /CREATE/, if a variable size data base is to be created a maximum quantity of blocks should be given, using option [n] of the FOBOS specification.

3.2 The number of open files depends on the free memory left by the System Generation /at present 5 files/. Several files being open at a given time, it is possible to indistinctly make reference to any of the files' fields and no additional procedure is required. To ensure this one has to bear in mind that field names should not be repeated in different files.

3.3 The records in the data files should have a length of 4 or more characters, up to a maximum of 512. The number of fields in a file is determined by character length of the field name, that is, the shorter the field name, the higher



the number of fields in a file. If, for instance, we have as an average 6 characters in the field names, 32 fields can be defined in a file.

3.4 Besides the dBASE II functions, dBASE-300 has the TIME(), MONTH(), CMONTH, CDATE, and DATE functions.

3.5 Command syntaxis in dBASE-300 is rigid, unlike that in dBASE II, where writing

```
DISPLAY ALL CAMPO FOR AUX=100
```

is allowed, which is equivalent to:

```
DISPLAY FOR AUX=100 ALL CAMPO.
```

This is not allowed in dBASE-300, where the order of commands expressed in dBASE II's manual must be adhered to. Nor is a reduction of command or option names to 4 letters allowed; that is, for instance, SELECT is not equivalent to SELE.

3.6 Keys CTL-S and CTL-Q having already been used by FOBOS Operation System, keys CTL-H and CTL-X are substituted, respectively.

3.7 It being possible to have more than 2 files open simultaneously in dBASE-300, SELECT instruction's format is now changed to SELECT <file> , where <file> is a file that was previously a parameter of a USE instruction.

3.8 The following are not implemented:

|                        |                      |
|------------------------|----------------------|
| SET STEP ON/OFF        | SET INTENSITY ON/OFF |
| SET ALTERNATIVE ON/OFF | SET DEBUG ON/OFF     |
| SET LINKAGE ON/OFF     | SET CARRY ON/OFF     |
| SET BELL ON/OFF        | SET RAW ON/OFF       |
| SET ESCAPE ON/OFF      | SET ALTERNATE TO     |
|                        | SET INDEX TO         |

3.9 In dBASE-300, character # is not allowed in the conditional commands. < > must be substituted.

In order to make automatic the transfer of microcomputer applications to CID 300/10, programs are being made up that change both the microcomputer programs and data bases of dBASE II to dBASE-300. Besides, utility programs, such as ZIP, are being implemented to facilitate operation with the system.

Documentation of dBASE-300 is the same as that of dBASE II.

An annex is added which details the above differences.

#### 4. CONCLUSIONS

With the acquisition of a Data Base Management System /DBMS/ for System CID 300/10, the user is provided with technology for data processing. Complemented with the other utilities of software, this system enables fast information retrieval from a data base created, maintained and controlled by different program packages already implemented. It enables the development of applications, with a high degree of data-program independence resulting in a saving on peaking and maintenance. It also enables exchanging application programs between microcomputers and CID 300/10, thanks to language compatibility.

The primary aims of this undertaking have been achieved with high quality level according to the results that were sought.

This work has been helpful in raising the technical level of those who use System CID 300/10 and at the same time has been instrumental in updating and improving the makers' technical level.



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dBASE-300: egy adatkezelési rendszer a CID 300/10 kubai  
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Összefoglaló

A dBASE-300 rendszert a következő célok elérésére tervezték: könnyű leíró-nyelv; a hardverhez alkalmazkodó adat-kezelés; kompatibilis a GES-300 operációs rendszerrel. A cikkben a dBASE-300 általános jellemzése szerepel, valamint megírásának fő technikája.

A cikk a dBASE-300 és a forgalomban levő más adatkezelő rendszerek fő különbségeire is kitér.

dBASE-300: система манипуляции базами данных для кубинского  
мини-компьютера CID 300/10

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Р е з ю м е

Система dBASE-300 была построена для следующих целей: простой язык; приспособленность к хардверу; компатибельность с операционной системой GES-300. В статье описаны базисные черты системы и техника ее построения. Статья также касается главных различий между dBASE-300 и остальными похожими системами.