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# SOFTWARE DEVELOPED IN CUBA FOR DATA PROCESSING ON MINICOMPUTERS

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The introduction and evolution of the electronic computer into the Cuban economy dates from the end of the 1960's. During this period the first models of computer machines were imported. They came from England, France, and the Soviet Union. At the same time began the researches to obtain a minicomputer to be designed and constructed in Cuba.

At the beginning, the minicomputer was to be used in the railroad service of the sugar cane industry. Our first minicomputer was constructed in 1970. After this year we began to use our own computer techniques.

Our Cuban computer systems are used in process control, business application, scientific calculation; mainly in the different levels of our administrative structure. The more generalized application implemented on our computer systems is the commercial type.

There are many different data processing systems developed fundamentally over our CID 201 B (compatible PDP-8) and CID 300 (compatible PDP-11/20) systems.

- The field of Electronic Data Processing has become a highly specialized technical area. Data are basically defined as information. Any information, whether it relates to a person, a business operation, or something else, may be considered data; the job of processing information is data processing.

A data processing system is an integrated group of programs which are used to create and to manipulate one or more files in

order to achieve some specific data processing objective. Inventory and payroll systems are, among others, the more common data processing systems.

To facilitate the implementation of commercial data processing systems, using CID 201 B, a COBOL language processor and several utility programs were developed.

The COBOL language was chosen because it is the most widely used language. We have had experience in COBOL language programming, using the French computer IRIS 50.

The utility programs allow basic functions such as listing of COBOL data files, file copy and file sorting.

To provide CID 300 with facilities for data processing, we considered our experiences on the CID 201 and the requirements of this kind of application.

Then, we decided to implement an operating system which should automatize to a high degree the development of commercial applications. This operating system must run over FOBOS operating system (compatible RT-11 DEC operating system). Then, some business oriented systems, developed for minicomputers similar to our machine, were analyzed. To continue our work tradition, the application programs must be written in COBOL language. For this reason, the operating system includes a processor for COBOL ANS 74 specification X.3.23.1974. This processor includes, among other features, the indexed organization for COBOL files and the possibility to perform input/output operations with additional terminals using ACCEPT and DISPLAY statements.

Our operating system was called GES 300. GES 300 is composed by three monitors and several utility programs. The monitors provide three different environments of task execution. They are a singly job monitor (SJ), a foreground-back-groung monitor (FB) and a multitask monitor (MTJ). These monitors do not need to run more than 56 k bytes of memory.

The SJ monitor is for a single program execution. The FB monitor allows the execution of two tasks, one of them with

higher priority than the other. The MTJ monitor permits previously compiled COBOL programs to be independently loaded and they are executed in a multiprogramming environment. The programs can be loaded either from the same terminal or from different terminals. During the executions, each program seems to have at its disposal the full resources of the GES 300 system. Besides, under MTJ the COBOL programs can share data files.

The MTJ monitor dynamically manages the allocation of the available memory, used by COBOL programs. The number of COBOL tasks that may be executed simultaneously depends on the program's length and the number and kind of data files used by them. The maximum number of tasks that may run simultaneously can be defined at GES 300 generation time.

The utility programs have been conceived as a comfortable environment to program classic processes in the commercial data treatment.

We have used the "program generator technique" in the conception of some of the utility programs.

A program generator can be informally defined as follows:

> A program generator is a type of translator which, using an easy and comfortable source language (Le), performs a transformation function (Ft) of this language and creates a program (Pr) which is written in a new language (Ls) which is capable of performing an execution function (Fe). That is:

$$Ft\ (Le) = Pr; \qquad LPr = Ls$$

$$Fe\ (Ls) = result$$

In the case of GES 300, Ls is the COBOL language.

All program generators use the same general algorithm but changes in the input-output information produce treatment particularities.

The program generator technique is used in Management Information systems.

The GES 300 utility programs developed using that technique are:

- update program generator (GEPACT)
- report writer generator (REPGEN)
- program generator to create relative files using
- randomizing methods (GENALE)
- consolidation program generator (GPCON)
- program generator to obtain sample COBOL files (GEFENS)

Other utility programs are:

- interactive edit program for COBOL files (EDICOB)
- program to collect and validate data (PREDAM)
- programs to sort COBOL files (COSORD, COSORT)
- programs to merge COBOL files (MERGED, MERGET)

We have developed three utility programs, one for each monitor, which provide line printer spooling.

We provide, to develop application programs, the FOBOS components PIP, EDIT, SRCCOM and BATCH and the COBOL processor.

The utility program GENGES tailors the system environment to the user's needs. GES 300 can be generated according to the specific hardware and software of the installation.

STATUS is another utility program which only runs over MTJ monitor. Using STATUS, the user can know how tasks are running on the system and which are the system generation parameters.

The operating system GES 300 was internationally tested in 1982 in Sofia, Bulgaria, with successful results.

## CONCLUSION

At present, GES 300 is being used in many Cuban companies and institutes. There, the programming and debugging time to develop application systems has been considerable decreased. Besides, the introduction of new tools (the multiprogramming, the multiterminal access and the possibility to share COBOL files) has been allowed to develop more complete and integral application systems.

This new conception has been contributed to increase the experience of our application programmers.

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## Ö S S Z E F O G L A L A L Á S

### A MINI-SZÁMITOGÉPEK SZÁMÁRA KUBÁBAN KIFEJLESZTETT ADAT-FELDOLGOZÁSI SZOFTVER-ESZKÖZÖK

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A cikkben a szerzők áttekintik a CID 300 kubai mini-számitógépre tervezett szoftver-eszközöket. Részletesebben ismertetik a CID 300 számára kifejlesztett GES 300 operációs-rendszert.

### РАЗВИТИЕ МАТЕМАТИЧЕСКОГО ОБЕСПЕЧЕНИЯ РАЗРАБОТКИ ДАННЫХ НА МИНИ-КОМПЬЮТЕРАХ НА КУБЕ

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В статье описаны проблемы разработки данных на кубинском мини-компьютере CID 300. Авторы дают отчет о новой операционной системе GES 300 конструированной для CID 300.