THE CONTROL& ACCOUNTING SYSTEM FOR THE COMPUTER CENTER

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The Control & Accounting system for the Computer Center

(the REXX language and the management of host computers)

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In 1985 our Computer Center has received - at last - a normal computer - ES-1045 (a Soviet analog of IBM/370 Model 155: 8 MB RAM, 800 MB HD). After overcoming the long resistance of the people used to work under OS/360, it has been decided to perform all the future tasks only under the VM/370 environment. The majority of the problems being solved at our institution are purely computational, for most of which there has been some source code already, which simplifies considerably their migration to the new operating system. For the rest, by luck, substitutions were found to work under CMS. Almost immediately thereafter, we got VM/SP Release 3.x accompanied by REXX, which soon became (along with XEDIT) our main tool of system support.

One of the main problems we had to deal with, was the absence (at our disposal) of satisfactory systems for batch processing and systems of accounting (and limitation) of accessible computing resources. Soon enough it became clear that it was reasonable to restrict the usage of dialog resources of CMS to problems of editing and debugging of programs, concentrating the handling of resource-consuming tasks in several batch virtual machines.

The main principles on which the new system was based, were as follows:

1. All the accessible time was split into 3 approximately equal parts:

1.1. Dialog tasks (editing and the debugging of programs); they require personal work of the user at the terminal, mainly in the daytime.
1.2. Small tasks (up to approximately 20-30 minutes of CPU time).
1.3. All the rest.

According to this each user had monthly limits for paper usage, terminal and processor time (1.1). He had also the possibilities to send own tasks into a batch, for the processing in one of 2 queues: priority (we could guarantee the consuming time for each; this time was accounted weekly) and usual (the rest of tasks or tasks with unpredictable time for processing by system).

2. All the users were divided into 3 categories:

2.1. Ordinary users (usual limits on all resources);
2.2. Privileged users (twice the usual limits);
2.3. Super users (unlimited usage of resources).

The privileges were established by the administration, either on the constant basis or temporarily: an ordinary user could always get arbitrary resources but had to apply for them again in a month. The number of category 2.2 and 2.3 users was under strict control.

The batch processing was performed by several constantly functioning batch virtual machines automatically started (and stopped) by the described system according to “scenarios” depending on

- requested resources (estimated time, RAM, disk storage size);
- time for start and/or stop (weekdays and weekends differed).

The task became known to the system only after having been sent to iit by the user. The latter could send in, return back and delete (his) processed task, move it from one category to another, change the order of or establish links between his tasks. The order of sending the tasks to a queue did not determine the order of their processing - the system intended for processing the

task of the user possessing the minimal value of

already-used-time + estimated-time.

Usually during the daytime the tasks requiring not more than 20 minutes were served; longer tasks were postponed till the nighttime and the weekends. In the daytime shorter tasks were served first, in the nighttime - longer ones (everything was determined by an easily modifiable scenario). (Such a rule is excused certainly by non-sufficient reliability of the Soviet computing equipment).

All the batch virtual machines had (VM) priority higher than those dialogue VMs. Each user having already exhausted his limit obtained priority 99 upon entry. Such a system of controlling the priorities excluded monopolization of the computing resources by single persons.

Besides all above mentioned, the system automatically compiled daily, weekly, monthly and yearly reports on usage of machine resources, producing the bills for the payment.

The system is practically completely written using the mixture REXX + XEDIT and consists of several interacting (by exchanging the messages) virtual machines:

- PROGOPER (programmable operator). From VM/SP point of view, this is the main system operator. Here, filtration of messages is performed (to the usual operator only messages requiring human intervention are handed).

- BATCHx (batch virtual machines). These are usual VMs possessing in the system directory the CMSBATCH parameter. They receive subsequent tasks from the manager of batch processing, pass the results to the user and inform the system about termination of the task and the time used. To achieve the reliable work of these VMs, it was necessary to modify the DMSBTP module (by luck, VM/SP was supplied with source code).

- MANAGER (manager of batch processing). This VM receives tasks from the users, controls the business of the batch VMs, entry and exit of the users from the system, performs current accounting of the usage of computer's resources. This VM controls the order of work of the rest of service VMs (in case of hangs of certain VMs, it performs their reboot; if this reboot is unsuccessful, the ordinary operator is informed and the whole system is halted). This VM controls the activity status of DISKACNT.

- DISKACNT (accounting subsystem). This VM manages all the statistical information, automatically producing reports and answering the queries of the the rest of service VMs. Also makes cleaning of the out-of-date spool files and converts huge volume of accounting records into intermediate data, well-suitable for cumulative processing and report generating.

Besides the above, to the system are linked also VMs DIRMAINT and DATAMOVR. Their functions are standard, but the system controls their activity.

The above described system almost completely frees the operator from the routine tasks, is able to function without anyone's interference for months and utilizes about 20-30 minutes of processor time per day. After the appearance in VM/SP Release 5 of a feature of protected execution (CONCEAL) the consummation of the system functioning were reduced in three times.

As it seems to us (especially when reading complaints of the users on RAM deficit of 128 MB size and more) the absence of a feature for batch processing in the systems like OS/2 2.x and AIX is a mistake of the manufacturers, and the facilities of system control depend, of course, on it itself as well as on the level of its integration with a REXX-type language. VM/SP is a beautiful, well-balanced system, and we believe in the appearance of analogous features in our next favourite - OS/2 2.x.