INTRODUCTION OF UNICOS INTO THE UK MET. OFFICE FORECAST SUITE

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1. INTRODUCTION

From 1981 the UK Met. Office had operated a CYBER-205 supercomputer to run its forecast models. This was due to be replaced by an ETA-10 in 1989 with existing climate and forecast models to be converted to run on the new hardware. Following the ETA-10 failing its acceptance trial, a CRAY YMP832 replacement was obtained in Jan 1990, requiring the operational forecast suite to be changed to work on the UNICOS operating system. Also, the deadline imposed by the CYBER nearing the end of its lifetime meant that there would be insufficient resources to recode both climate and forecast models. The decision was taken to combine tasks into a single unified model with the same structure for different model versions, and which share many common components.

2. COMPUTING SYSTEM

The UK Met. Office operates 2 CRAY-YMPs through a front-end Hitachi EX1000 computer, a YMP832 to run the forecast model and a YMP864 for climate research, with UNICOS 5.1.10 the current operating system and SUPERLINK 3.0 providing the connection between front-end and CRAYs. An upgrade to UNICOS 6.0 and a fast direct interface between CRAYs (HIPPI) will be provided in the near future.

Work commenced in mid-1989 on providing a new model, a new operational suite on UNICOS and a user interface for generating model control files and skeleton scripts. An operational trial of the model run within a prototype operational script started in April 1990. This became operational in June 1991, replacing the CYBER system.

3. FORECAST SUITE

The current operational suite is initiated by the computer operator submitting a

top level script which calls a number of separate modules at a lower level. The first lower level script transfers observations from the front end for quality control before the main unified model section is activated. Following the main forecast model, wave, surge and mesoscale models are run, with verification, model statistical output and archiving all structured into different scripts. In parallel with this sequence of processing, a number of jobs are spawned to send model output data to the front-end. This is under the control of the generating script such that output can be sent as soon as it is created without waiting for the script processing to end. On the front-end computer, networks of output jobs are released in a similar method to the previous IBM system and unix plays no further direct part.

Each script is under the control of environment variables acting on the top level script, which imparts a flexible system of control. Under normal operation the system will run itself and require no further action from the operator. If problems occur the omission or repetition of components of the system is readily accomplished. This contrasts strongly with the pre-UNICOS system on the CYBER which required sequences of jobs to be sent from the front-end, the queue checked and started. In the event of failures the input queue had to be stopped and other jobs submitted, possibly with manual editing of a large number of control files. The present system is much safer, more flexible and automatic error handling can be built in to a much larger extent.

4. SCRIPT MANAGEMENT

The hierarchy of script management for the unified model component is that the user interface builds control files (and top level scripts for non-operational jobs) with the overall control handled by the setting of environment variables. The unified model is then called via lower level scripts. Hence the same model and scripts are used for all configurations of the model, from operational forecast to climate research. Since these scripts are in unix they are potentially portable to other users and computing environments. However work is currently in progress to remove a small number of CRAY specific references in the model code itself.

To ensure that a stable form of software is available to users it is necessary to impose a release system in which the model code libraries, the user interface

and the component scripts are fixed. This is particularly appropriate because of the wide use of the system. A new release then gathers error correction and other changes to be tested by many users before acceptance. The basic method is to use the same scripts as much as possible but tailored with environment variable switches to achieve flexibility. For emergency action it is then possible to revert to the previous release.

5. SUMMARY OF PROBLEMS AND ADVANTAGES

New problems may be more numerous with the introduction of UNICOS but are easily outweighed by the advantages gained.

Administration is difficult on a large computing complex with many categories of user, the system being basically designed for a small set of users who were in close contact. There are some deficiencies with ouput handling, an ETHERNET not being sufficient to deal with links so that an enhanced method such as SUPERLINK must be employed. Also tape handling is relatively difficult and there were some problems with lost output messages on failures. The lack of security requires elaborate password measures to be adopted. Resources are not all allocated and checked at the start of a job as in the IBM system so there is a greater likelihood of wasted runs. The system is not geared to supercomputer multiprocessing and batch processing needs the extra facilities provided by NQS to be usable.

However the flexibility and scope of control provided by UNICOS allows a fully integrated method of suite management to be attained. A relatively small subset of commands is needed to accomplish a given task (although the naming of commands can be obscure). To achieve the maximum gains of such a system it is necessary to adopt an ordered structure with inline labelling and documentation, just as for other software.