INTERNATIONAL STANDARDS FOR SOFTWARE STRUCTURES IN ASTRONOMY

M. Pucillo, P. Santin, G. Sedmak
Osservatorio Astronomico di Trieste
Via G.B. Tiepolo 11
34131 Trieste, Italia

ABSTRACT

The increasing request for astronomical data processing facilities forces the definition of standards for astronomical application software. Separating the application module from the interfaces to the data processing system allows to identify the standard user interaction interface, the standard data storage interface, the standard dedicated subsystems interface and the standard on-line documentation interface. We tested a tentative integrated solution that fulfills these requirements. This solution includes colour graphics and is available to the astronomical community.

INTRODUCTION

The definition of standards for the implementation, documentation, circulation and use of astronomical software is now a self-evident need due to the rapid growth of the number of Data Processing (DP) centers dedicated to astronomy, and of the end-users loading the available facilities and asking for access to further resources.

The experience made in existing DP centers has shown that software standards can be defined effectively only by separating the application module from the relevant components of the DP system, including the user, by the use of somehow defined interfaces. These interfaces are in any case system dependent, while the application module can be made in principle nearly system independant. A positive point comes from the substantial homogeneity of new astronomical DP hardware.

The basic architecture of the software environment is reported in Fig. 1

The organization of the software environment required to generate a standardized access to and/or development of DP resources must provide :

C. Jaschek and W. Heintz (eds.), Automated Data Retrieval in Astronomy, 111–113.

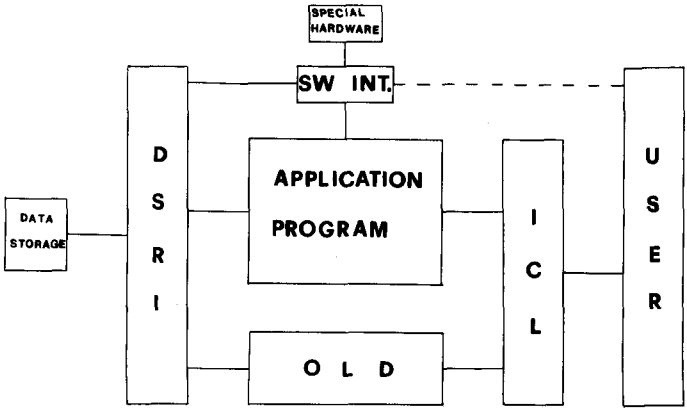

Fig. 1 - Interactive application oriented software environment

a) Flexible access to all facilities of the DP system. The interface between the user and the application module can be implemented advantageously through an Interactive Control Language (ICL)

b) Transparent access to local and remote data storage subsystems. The interface to local data storage requires an effective standard organization of the data structures and/or the definition of the organization of any remote data storage sub-system or support accessed. An automatic log of any operation through the data storage interface is necessary to trace and maintain the documentation of the DP task performed.

c) Transparent access to special purpose components. The interface to specific sub-systems (graphics, array processors, etc...) must allow component-independent access to available facilities through a proper design of the interface.

d) Effective integration of new application modules. The integration interface must provide on-line self documenting standards for entering any new modules.

Notice that all interfaces include necessarily a section which is operating-system dependent. Since this section can only be minimized it follows that full standardization of application software is possible exclusively within a common hardware environment. This limitation will not apply to application modules if a careful set of definitions is agreed on the sections of the interfaces to the application module facing the module itself.

3. A TENTATIVE INTEGRATED SOLUTION

We used the considerations reported above to implement an integrated solution dedicated to astronomical applications. This solution was implemented and run on a DEC PDP 11/45 computer under a RSX 11 M operating

https://doi.org/10.1017/S0252921100082774 Published online by Cambridge University Press

system. It operates according to the rules given above through

- straightforward interface to the user
- simple interfacing rules to the application modules
- simple maintenance and updating rules with on-line documentation for the ICL
- self-documentation and eventual batch operation of any successful session
- standard organization of data storage through standard structures of data files and standard user-transparent R/W routines. High efficiency was achieved by means of fixed and I/O optimized lenght random access file records, equivalence of physical and logical records, self-consistent file header, auxiliary user and system accesible storage space. The data organization includes an archive facility.
- self contained user-transparent access to a colour graphic subsystem AYDIN 5214A of 512x512x3 or 256x256x6 format.

The preliminary results show that also a very simple solution (if correctly designed and integrated into the available hardware), is able to give

1. basic homogeneity and compatibility of user programs, easy maintenance and access to data archives and full exchangeability of data between different users due to standardization of the data storage organization ;

2. easy access to all DP facilties for end-users and straightforward access to complex graphics with minimum overload and overhead to the application program.

3. CONCLUSION

We know that the tentative solution quoted here can be improved largely and that it is certainly very far from an optimum solution to the problem of standardization of astronomical software. We believe however that the experience acquired during this work may be useful to the astronomical community because it was made working in an astronomical environment on astronomical data taking into account the actual astronomical DP scenary.

We make ICL including AYLIB colour graphics available to the astronomical community and invite everyone interested in the standardization problem to push for and participate in the definition of international standards for astronomical applications.