

*Minutes of the Forum of*  
**Symbolic Computing for Accelerator Physics**  
*held on friday 26 february 1993*

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**Present:** E. Asseo, B. Autin (Chairman), R. Cappi, M. Chanel, P. Defert, G. Dôme, D. Dumollard, L. Durieu, W. Fischer, O. Gröbner, G. Guignard, S. Hancock, J.Y. Hemery, J. Jowett, M. Martini, D. Manglunki, B. Nicquevert, F. Pedersen, J.C. Schnuriger, G. Shering, S. Soini, R. Van Weelderen, E. Wildner.

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## 1 Introduction

B. Autin explains the purpose of the Forum (see the attached slide). It is intended to set up an inter-divisional support for symbolic computing based on *Mathematica* which provides a universal computing environment from desktop to control room.

## 2 ASIS, a repository for symbolic programs

Ph. Defert presents ASIS (Application Software Installation Server): A service including a UNIX repository for symbolic programs, and a tool to access the contents of the repository and to install the programs on workstations.

See attached slides

## 3 Organizational aspects

Communication by B. Autin

- Acronym of the Forum: **SAP** (Symbolics in Accelerator Physics).
- B. Autin is the Chairman of the Forum, S. Myers will be the Deputy and M. Martini the Secretary
- Courses will be organized in accordance with the needs: Independent sessions for introduction to *Mathematica* and functional programming.
- Meetings will be held on the last Friday of every month at 14.30 hr in the PS Auditorium, Bdg 6, Room 2-024

See the attached slide.

## 4 Work programme

B. Autin presents a possible work programme. The efforts will be oriented towards applications in the following fields:

- Accelerator Controls.
- Accelerator Physics (library of general purpose programs).
  1. Beam optics: B. Autin.
  2. Synchrotron radiation: O. Gröbner.
  3. Beam-beam interaction: J.Jowett.
  4. Beam cooling, longitudinal phase space dynamics: D. Manglunki.
  5. Collective effects: F. Pedersen.
  6. Magnetic horn: J.C. Schnuriger.

See attached slides.

The next meeting will be held on: Friday 26 March

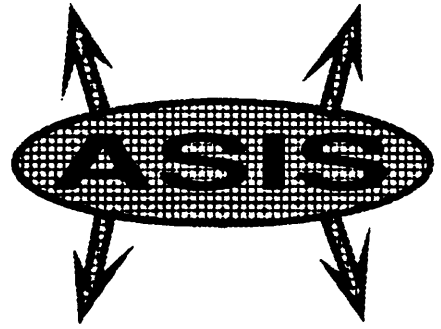
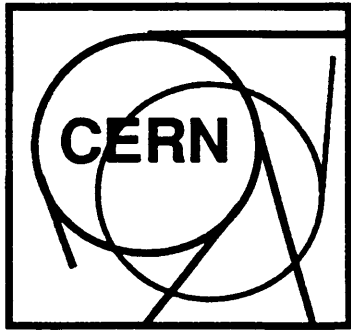
### Distribution list

AT, MT, PS and SL Division Leaders and Deputies.  
AT, MT, PS and SL Group Leaders and Associates.  
SAP list.

M.Martini

# Introduction

- Need for a corporate effort in symbolic computing (New Computing Techniques in Physics Research)
- Gain in productivity
- Insight into complex phenomena
- Interactivity (learning with notebooks, discussion forum, access to information, contact with other fields of science and technique)
- Why *Mathematica*?
  - Integration in a same package of
    - \* symbolics (arithmetics, algebra, calculus and geometry with *Descartes*),
    - \* numerics,
    - \* high level graphics,
    - \* programming language,
    - \* text processing.
  - Power and elegance of functional programming combined with list processing and pattern recognition.
  - Open system towards
    - \* Numerical libraries (*InterCall*),
    - \* Other programs (*MathLink*),
    - \* Other languages: C, Fortran, TEX,
    - \* System operation especially under UNIX
  - Quality of support
    - \* Books
    - \* Conferences
    - \* Courses
    - \* Electronic forum (*MathSource*)



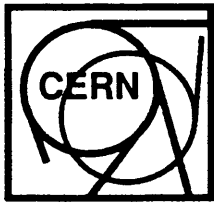
# Using ASIS as a library of symbolic programs

**Ph. Defert**

**CERN / CN**

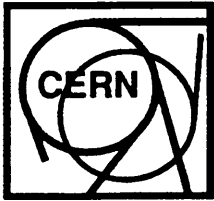
**<defert@dxcern.cern.ch>**

**Symbolic Computing Forum for  
Accelerator Physics. 93/02/26.**



## **ASIS : The plan.**

- 1. What is ASIS?**
- 2. How to get SW from ASIS ?**
- 3. How to install SW on ASIS?**



# 1. What is ASIS ?

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## - A software repository :

**CERN Program Library**

**CERN Software: phone, who, batch, www, ...**

**Public Domain Software**

**TeX: LaTeX, dvips, previewers, ...**

**GNU: emacs, gcc, ghostscript, ...**

**X11 releases and contributions**

**OSF, Athena, BSD, usenet, etc ...**

**CERNLIB: Complete....**

**P.D. packages already included in the data base:**

**215**

**P.D. packages available on the three "supported architectures":**

**56**

**Supported architectures:**

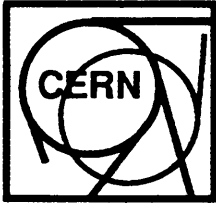
**- SUN 4**

**- DEC stations**

**- HP PA**

**Coming: IBM/RS6000 (Tim Bell)**

**SGL.**

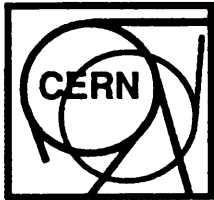


# 1. What is ASIS ?

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## - An Installation Server:

1. Easy installation from ASIS to any CERN workstation using an X-window based user interface.
2. Anonymous ftp from the CERN site and registered HEP sites
3. Application server for isolated nodes, using the NFS protocol.



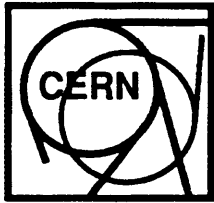
## 3. How to get SW from ASIS ?

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### - Anonymous ftp:

```
dxcern_/userf/defert_63>ftp asis01
Connected to asis01.cern.ch.
220 asis01 FTP server (Version 6.10 Mon Apr 13 15:59:17 MET DST 1992
Name (asis01:defert
331 Guest login ok, send e-mail address as password.
Password:
230-
230-      Application Software Installation Server
230-
230-
230- Welcome to the ASIS ftp server, developed by the CERN Computing and
230- Networking Division to serve the High Energy Physics research community.
230-
230- ftp clients may abort due to improper handling of such introductory
230- messages. A dash (-
230-
230- The CERNlib software, located in the "cernlib" directory, is covered by
230- CERN copyright. Before taking any material from this directory, please
230- read the copyright notice "cernlib/copyright".
230-
230- Please contact cernlib@cernvm.cern.ch for site registration. General
230- support questions should be addressed to asis-support@asis01.cern.ch.
230-
230 Guest login ok, access restrictions apply.
ftp> cd /pub/math
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for file list.
sap
226 Transfer complete.
5 bytes received in 0.059 seconds (0.083 Kbytes/s
ftp> cd sap
250-Please read the file README
250- It was last modified on Fri Feb 26 10:29:46 1993 - 0 days ago
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for file list.
README
226 Transfer complete.
8 bytes received in 0 seconds (0.0078 Kbytes/s
ftp> quit
221 Goodbye.
```





### 3. How to get SW from ASIS ?

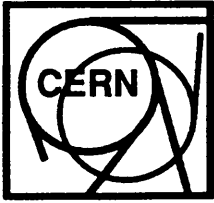
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#### - Mounting ASIS with NFS protocol:

```
mysunws_1> mkdir -p /asis/share
mysunws_1> mount asis01:/asis/share /asis/share
mysunws_1> cd /usr/local
mysunws_1> ln -s /asis/share/usr.local/math ./math
mysunws_1> ls -lR math/
total 1
drwxrwxr-x  2 c-sap  software   512 Feb 26 10:26 sap/

math/sap:
total 1
-rw-rw-rw-  1 c-sap  software   296 Feb 26 10:29 README
```

#### - Better use an automounter...



### 3. How to get SW from ASIS ?

- Use epip (the Easy Product Installation Procedure)

The screenshot shows the EPIP 2.0 window with the following menu items: **File**, **Select**, **Install/Update**, and **Help**.

Annotations with arrows pointing to the menus:

- File menu:** The file menu to read, edit, cancel and quit.
- Select menu:** The select menu to compose your installation i.e. to choose your products, and to define the supported platforms.
- Install/Update menu:** The install menu to really perform the installation and subsequent updates.
- Help menu:** Help menu provides you with basic information on how to use epip and help.

Text inside the window:

**EPIP 2.0**  
**The Easy Product Installation Procedure**

This is the main control window  
 at site "cern.ch"  
 for "cern,public" software

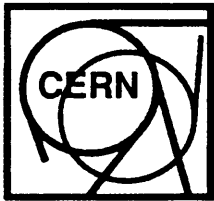
Tools Suite

Flowchart: get full information

1 EPIP: The Easy Product Installation Procedure for ASIS.  
 2 Copyright (C) 1991 CERN. All rights reserved.  
 3 Author: Ph. Defert, CERN/CN.  
 4 Version 2.0  
 5  
 6 \* This program should be free software under the CERN conditions \*  
 7  
 8  
 9  
 10  
 11 To install EPIP (The Easy Product Installation Procedure), here are the  
 12 steps to follow:  
 13  
 14 - cd /tmp # or anywhere you have got space  
 15  
 16 - use anonymous ftp to get the compressed tar file that corresponds  
 17 to your architecture:  
 18  
 19 ftp asis01.cern.ch  
 20 Name(...) anonymous  
 21 Password: youruserid@yourhostname  
 22 cd /pub/asis  
 23 binary  
 24 ls  
 25 Availability # of products for target machines  
 26 Index # of packages in the central repository  
 27 asis-bootstrap.REAHMF # this README  
 28 hp-pa-asis-2.0.tar.z # for HP 700's (Precision Architecture)  
 29 sun-4-asis-2.0.tar.z # for sun-4's  
 30 dec-station-asis-2.0.tar.z # for DECstations  
 31 get yourmachine.tar.z  
 32 quit  
 33  
 34 (Version may be newer than 0.9)  
 35  
 36 - Uncompress your tar file:  
 37 uncompress yourmachine.tar.z  
 38  
 39 - On your machine, login (or su) as root.  
 40  
 41 - Choose a file system where you have some free disk space.  
 42 The disk space you will need depends on the number and the size of the  
 43 products you want to install on your local machine. If you are going to  
 44 simply create links to your local server you will not need very much  
 45 space. Let us suppose /disk2 is the file system that you chose.  
 46 Then issue:  
 47  
 48 mkdir /disk2/asis  
 49 ln -s /disk2/asis /asis # /asis should not exist before hand.  
 50  
 51 - mkdir /asis/share  
 52 mkdir /asis/specific  
 53  
 54  
 55 - If you want to install the CERN Program Library or the public  
 56 domain software be sure that the directories /cern and /usr/local  
 57 exist. You need a bit of free space in the partition that  
 58 contains these directories in order to allow the installation of the  
 59 links to the real executable files that will be copied to /asis.  
 60  
 61 cd /  
 62  
 63 tar xvf /tmp/yourmachine.tar  
 64 This will create the directories /usr/local/etc and /usr/local/etc/asis  
 65 where the installation software will reside. It will add some files to  
 66 /usr/local/bin, /usr/local/bin/X11 and /usr/local/lib; if these  
 67 directories did not exist, tar will create them for you.  
 68  
 69 cd /usr/local/etc/asis  
 70  
 71

72 - If you are going to link to or copy software from a local server  
 73 (not asis01 at CERN), edit the file asis.map and replace  
 74 asis01.cern.ch by the name of your local ASIS server.  
 75  
 76 cd ..  
 77  
 78 Be sure that you did not mount asis01:/asis/specific or  
 79 asis01:/asis/share using the NFS protocol before going on.  
 80 Check using the command:  
 81 if/etc/mount # may be /usr/etc/mount on some architectures  
 82 /etc/mount -h asis01 # may be /usr/etc/mount  
 83 Then, if necessary, edit the /etc/fstab to delete any lines relative  
 84 to asis01. On some systems use SAM or SMIT to do this.  
 85  
 86 sh amd.start  
 87 This will start the BSD 4.4 automounter (amd) and will define that the  
 88 location of the repository files is the directory /net/Server/asis which  
 89 is itself a remote link to your ASIS server.  
 90  
 91 Remark: You may avoid the use of amd by mounting the file systems  
 92 by hand, each time you want to install/update your ASIS  
 93 products and unmount them afterwards. Do not forget to  
 94 unmount!! Anyhow, the use of amd is recommended as it has  
 95 proven to be a nice and reliable tool. First if these /net  
 96 directories do not exist then create them:  
 97 mkdir /net  
 98 mkdir /net/Server  
 99 mkdir /net/Server/asis  
 100 mkdir /net/Server/asis/specific  
 101 mkdir /net/Server/asis/share  
 102 Then NFS mount the repository file systems:  
 103 /etc/mount -t nfs -o soft asis01.cern.ch:/asis/specific /  
 104 /etc/mount -t nfs -o soft asis01.cern.ch:/asis/share /  
 105 ... # updates using EPIP  
 106 /etc/umount /net/Server/asis/specific  
 107 /etc/umount /net/Server/asis/share  
 108 cd /net/Server/asis/specific  
 109  
 110 This will provoke an NFS mount on your ASIS server and some messages  
 111 will be displayed by the amd program. You should receive at the  
 112 syslog device (the console or your terminal depending on the set  
 113 up of your machine) a list of architectures as the result of ls.  
 114 If it is OK, then go to next step, else issue:  
 115 ps -ef | grep amd or ps -aux | grep amd  
 116 to get the pid of the amd process and  
 117 kill -2 amd\_pid  
 118 Then contact your ASIS manager!  
 119  
 120 The amd daemon should be started automatically after each reboot,  
 121 thus it is necessary to modify the corresponding rc file:  
 122 /etc/rc.local for sunos, ultrix  
 123 /etc/netnfsrc2 for hpux  
 124  
 125 Add the following lines at the end of the file:  
 126 if [ -f /usr/local/etc/amd.start ]; then  
 127 sh /usr/local/etc/amd.start; (echo -n ' amd') >/dev/console  
 128 fi  
 129  
 130 The script amd.start is in the standard distribution of the ASIS  
 131 software.  
 132  
 133 cd /usr/local/etc/asis  
 134 sh /asis-uid-merge.sh  
 135 This will merge your current passwd file with the current definitions  
 136 of the ASIS products. No login is allowed for these accounts they are  
 137 just used to give some ownership to the files of a given product.  
 138 Remark: If you want to remove asis product uid's in the password  
 139 file after installation, then issue:  
 140  
 141  
 142

143 sh ./asis-uld-delete.sh  
144 This implies that you execute  
145 sh ./asis-uld-merge.sh  
146 before the next installation. The result of an ls -l command  
147 in the directories touched by the installation procedures  
148 will also give numbers instead of product names for the  
149 ownership of the files. It is just a functionality that is  
150 offered but, in any case, not recommended.  
151  
152 - If you want to install the CERN Program Library using epip, then  
153 touch /cern/.epip  
154 to create a dummy file that gives a sign to epip that you allow  
155 the modification of the /cern directory. Do not do that if you  
156 develop a new version of the CERN program library there.  
157 For the public domain software,  
158 touch /usr/local/.epip  
159 etc... epip will report an error at installation time if this is  
160 not done correctly and give you instructions at that point.  
161  
162 - Now you are ready to install the ASIS products, issue:  
163 ./epip &  
164 This will start the Easy Product Installation Procedure.  
165  
166 - epip is self documented. This means that placing the cursor on the  
167 part of the window that you do not understand and then pressing  
168 the F1 or Help key pops up an help message on what is and how to  
169 use the object pointed to by the cursor.  
170  
171 - Choose the architecture(s) (''select'' menu) that is yours and the  
172 additional ones you want to support on your machine. If you are  
173 not an ASIS server, you should only support the architecture of  
174 your own machine.  
175  
176 - Choose the products you want to have access to. They are sorted by  
177 family. A small description of each product is obtained by a double click  
178 on its name. For each product you want to select  
179  
180 - push on the ''Install/Update'' menu button and choose ''Save selected  
181 installation for later use'' if you want to verify the script before  
182 executing it; it is in the a-lymmd-hmm.sh file in /usr/local/etc/asis.  
183 Choose ''Install selected products immediately'' to effectively install your  
184 selection. Do not hesitate to try as a confirmation is requested!  
185  
186



### 3. How to put SW from ASIS ?

---

#### - A typical session to install SW:

```
gnuisance_~_166>rlogin asis01 -l autin
passwd:

Last login: Fri Feb 26 11:14:06 from gnuisance
SunOS Release 4.1.1 (ODS10DSK) #1: Wed Feb 17 21:52:10 MET 1993
/asis/share/usr.local/math/sap
asis01% id
uid=8182(c-sap) gid=65(software) groups=65(software)
asis01% pwd
/asis/share/usr.local/math/sap
asis01% ls
README
asis01% ftp gnuisance
Connected to gnuisance.
220 gnuisance FTP server (SunOS 4.1) ready.
/dev/null/.netrc: Not a directory
Name (gnuisance:autin
331 Password required for defert.
Password:
230 User defert logged in.
ftp> get my_math_prog
200 PORT command successful.
550 my_math_prog: No such file or directory.
ftp> quit
221 Goodbye.
asis01% exit
asis01% Connection closed.
gnuisance_~_167>
```

## Organizational aspects

- **Acronym**

What about **SAP** for Symbolics in Accelerator Physics?

- **Deputy**

- **Secretary**

- **Information**

— News and Minutes on e-mail

- **Documentation**

— *asis*, by Ph. Defert

— PC network, by A. Pace

- **Courses**

— Introduction to *Mathematica* (number of days, number of participants)

— Programming (id.)

— *MathLink* (id.)

— Consulting for specific problems (id.)

- **Work environment**

— PC & Macintosh

— UNIX workstations

## Work Programme

### What? Who? When?

#### 1. Accelerator Controls

- The control sequence:
  - reading data
  - interpreting data
  - sending orders
- Signal processing
  - SEM grids
  - Flying wire
  - ...
- Coherent oscillations
- Closed orbit
- Dynamic aperture measurement
- *Mathematica* environment for machine experiments
  - A test case: PS for LHC. First experiments in Fall 93. The basic problem is emittance conservation. Tracking the degradation:
    - \* Orbit dispersion matching between PSB and PS
    - \* Ejection error from PSB,
    - \* Injection error into PS,
    - \* Acceleration from 1.4 to 3 GeV: control of dB/dt,
    - \* Transition,
    - \* Ejection from PS.
  - SPS
  - LEP
- etc...

## 2. General programs and notebooks

- FODO cells, doublets, triplets, ...
- Orbit manipulations
- Dispersion suppressors
- Insertions
- Transformers and telescopes
- Non-linear dynamics: second and higher order perturbations, normal forms, ....
- Collective effects
- Spin dynamics
- Synchrotron radiation
- Longitudinal phase space
- 3D beams
- Parameter lists
- RF structures
- Electrical Engineering (*Nodal*)
- Magnets
- Mechanical engineering
- Vacuum