DCS-COMPASS project backup procedure
C.Q. 29/08/03

The DCS project consists of several parts: the PVSS panels, the PVSS database (containing the datapoint elements and their configuration) and the events and alerts history. In case of problems, it must be possible to recover the project with the shortest delay. The backup of all the project parts is essential for the reliability of the DCS system.

There are several kinds of databases in PVSS. All of them are kept in the db subdirectory of the project root directory. The **History Database** stores historical data in archived data files. In the DCS-COMPASS project there are 3 historical archives: **0** (ELMBs and PLC3), **6** (PLC1 and PLC2) and **7** (HV). The archived data files are stored in directories named after these archive numbers, like /localscratch/teste/db/pvss/VA_0000, VA_0006 and VA_0007. These files names are of the form AR_0000_2003.03.24.05.02.31, where the date and hour in the name stands for the moment when the file was first created. When a datapoint is created, one must decide if some of its features (like its **value**, for example) are to be archived. For each datapoint one can define how its archiving (if wanted) shall be done (per time intervals, if new value differs from old one, if this difference is larger than a certain deadband, combinations of time/value conditions, etc). At that moment one decides also in which archive (0, 6 or 7 in our case) it will be stored. Each archived data file has a mix of many datapoints, each being archived at a different rate, with values(events) that can be integer, boolean or float and with alerts.

1. The PVSS "Online Backup"

From the PVSS Tool bar, on the "System Management" icon, the procedure for the "online backup" of the Database can be started (fig. 1).
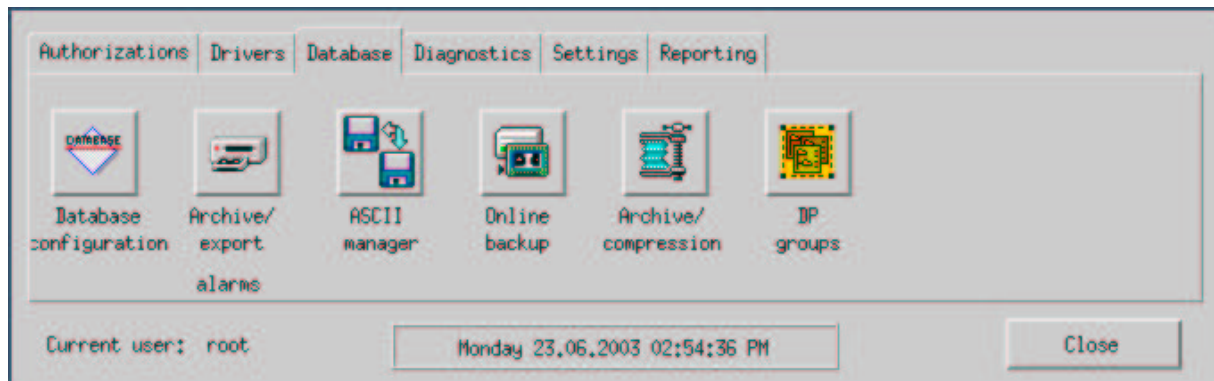

Figure 1: The Database tab from the System Management panel.

Two different kinds of "online backup" are possible: the one of the "Database", and the one of the "Parameterizations". In this context "Database" refers to the historical data, including values and alerts, and configurations of the datapoint elements; "Parameterizations" here means the project itself, with its panels, scripts, etc (everything except for the databases and the log files). In the Online backup panel, the configuration of the backup procedure is done using the "Configuration" tab (fig. 2).
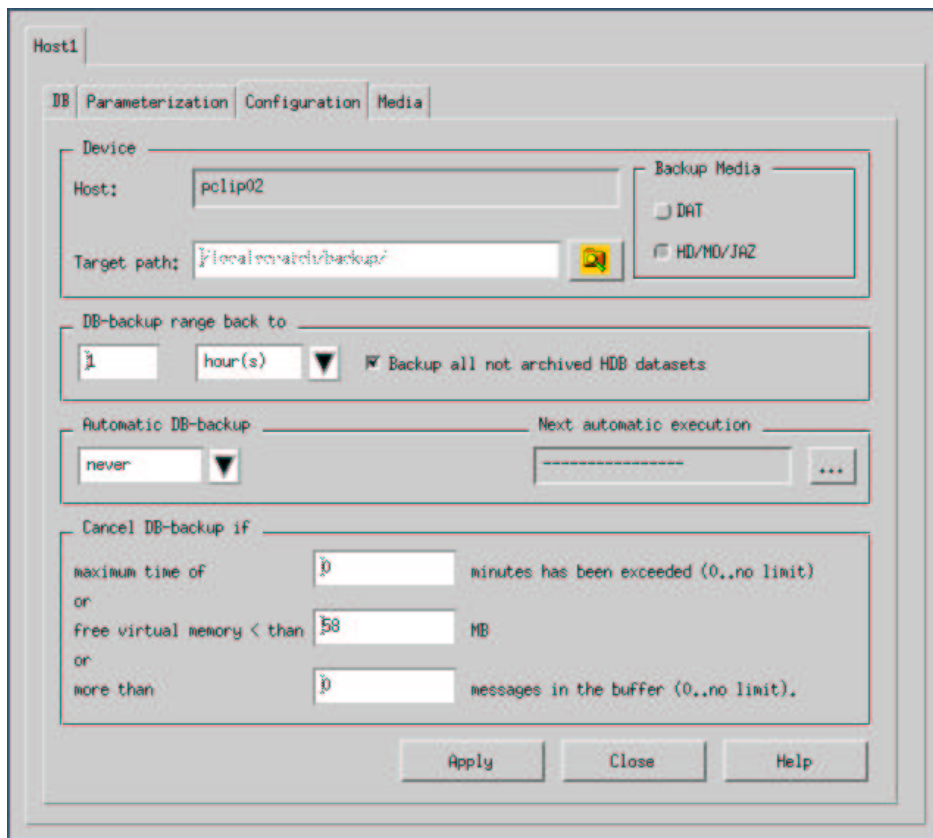
Figure 2: The Configuration panel from the System Management Online Backup.

In this panel, while the "Host" and "Target path" apply to both kinds of backups, the "DB-backup (time) range" (as well as the rest of the panel) applies only to the DB kind of backup. Setting it for the Parameterizations backup has no effect.

The "Target path" should point to a directory created for the effect, not under the project root directory (i.e. if the project root directory is /localscratch/teste, the backup directory can be for example /localscratch/backup) - this to avoid that the backup backs-up itself.

The option "HD/MO/JAZ" is to store in disk, while the option "DAT" is to store on tape.

When the DB-backup is done choosing a DB-backup time range and checking the "Backup all not archived HDB datasets" box, this means to backup all the content of the /localscratch/teste/db directory, including all the historical archives (here "not archived" means the historical archives not swapped out into another location, i.e. not yet exported somewhere else - and consequently deleted from the project). If the "Backup all not archived HDB datasets" is not checked, the time range chosen applies, and only the historical data files created since this time limit are included in the backup.

The name of the archived data file being filled at the moment of online backup refers to the opening of the file (so a file can have in its name a date from 1 month ago, but if it is still being filled, when we ask for DB backup since 1 week, this file will be backed-up).

The online **DB backup** (fig. 3) will **copy** part of the contents of the /localscratch/teste/db directory into /localscratch/backup/db. Inside, it will create an empty file whose name stands

for the kind, day and time of the online DB backup; for example:
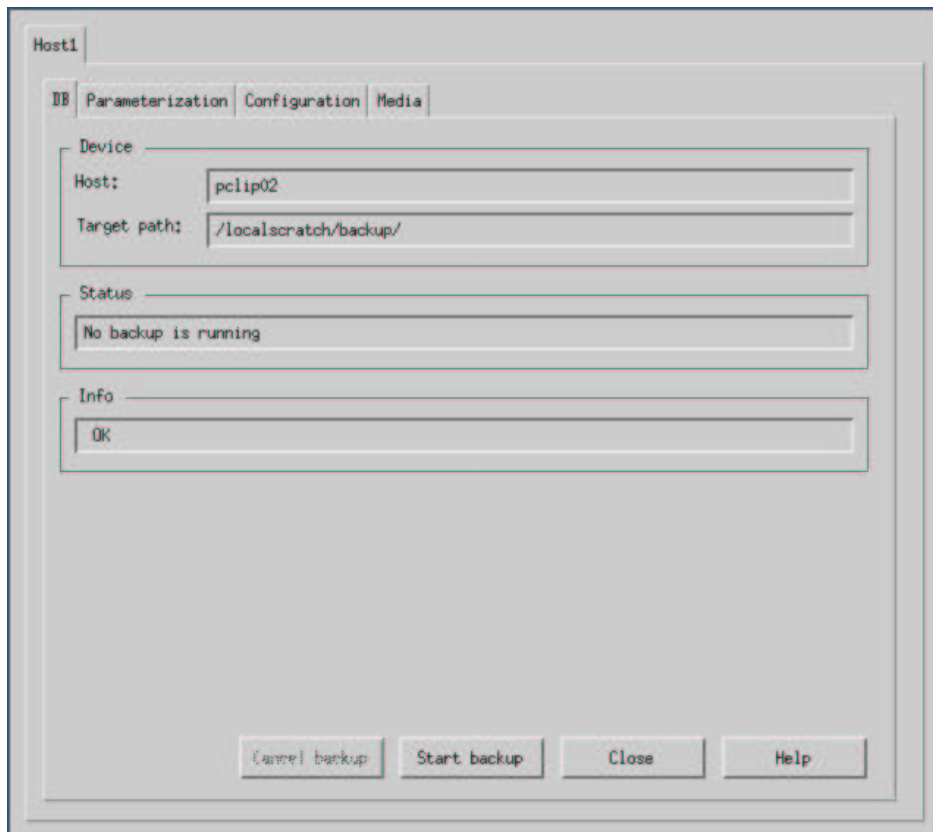/localscratch/backup/db/backup_db_teste_200306231116.txt.

Figure 3: Online DB backup panel.

The time stamp of the backed-up directories is always the moment of the backup, while the time stamp of the files is the original time stamp, except for some cases that will be mentioned later.

The online DB backup will copy all the contents of the directory /localscratch/teste/db/pvss into the directory /localscratch/backup/db/pvss, except for the save and alsave subdirectories. The files dbase.status and dbase.touch are added to the **project** db/pvss directory. From the archives subdirectories (VA_0000, VA_0006 and VA_0007) inside the db/pvss directory some files are copied, but not all. From the copied ones, some show modified contents. For example, the files AR_0.redolog19 (clock) and AR_0.idp (file updated after the backup), in the case of the archive 0.

When doing an online DB backup, without asking for "backup all not archived HDB datasets", the following directories are **always recopied**: 0000000000, empty, aloverflow, alliving, al0000000000, lastval, ancient and the archived data directories. From all these, only the archived data directories have modified contents.

When the online DB backup is done asking for a short time range (for example 1 hour), the archived data files that were currently being filled (one per archive) will be copied into the backup directory. These files have names like:
/localscratch/backup/db/pvss/VA_0006/AR_0006_2003.04.01.16.45.50.

As an example, if the rate of archiving of one datapoint element (dpe) is modified (using the Para module), when doing the online DB backup, the files /localscratch/backup/db/pvss/archproc.db, archinfo.key and archinfo.db are updated.

As a second example, if the lower limit value for alert (alert_handler configuration of the dpe) of one datapoint element is modified (using the Para module), when doing the online DB backup the files /localscratch/backup/db/pvss/textvar.db, rngrec.db, floatvar.db, dynvar.db, dpidvar.db, alertval.key, alertval.db and alertrr.db are updated. Inside the directory /localscratch/backup/db/pvss/lastval, also the files ltimvar.db, lintvar.db, ltxtvar.db, ldynvar.db, lastptr.db, lastlong.db and lastflt.db are updated.
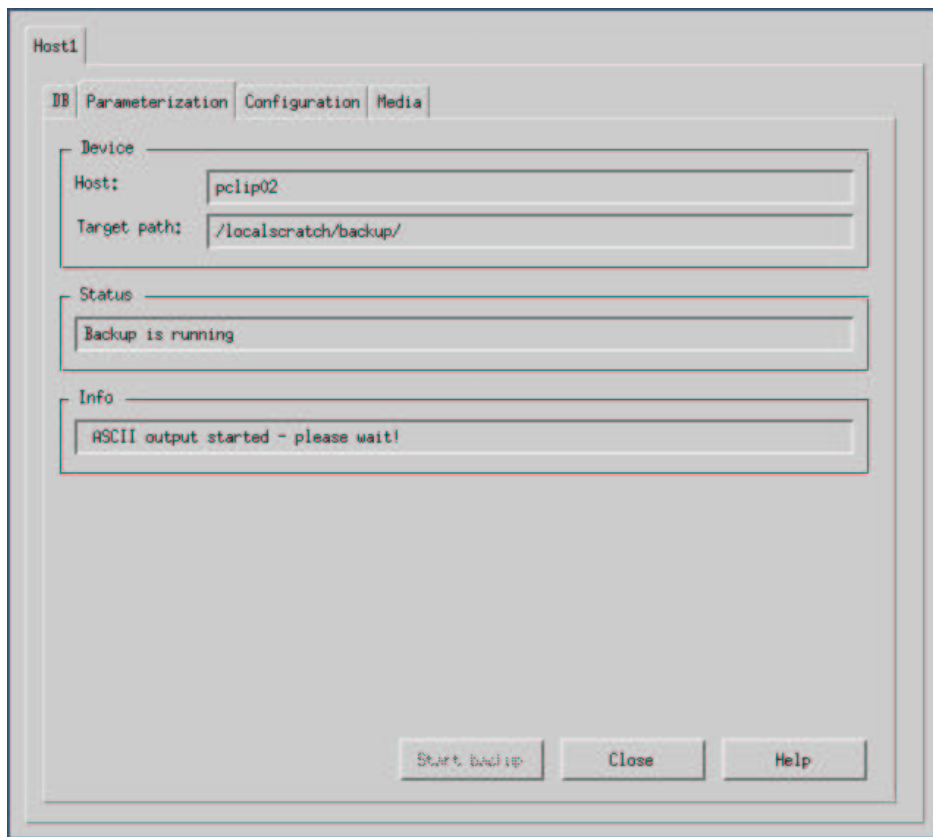

Figure 4: Online Parameterization backup panel.

The online **Parameterization backup** (fig. 4) will copy all the project into the backup directory, except for the db directory (database) and the log (log files containing error messages, etc), msg, source and printers directories (these last 2 are empty in our case). The time range defined in the configuration panel does not apply here. **Everytime** we do this Parameterization backup, the project directories are **recopied** — thus this is time consuming (in the case of the COMPASS project it takes ≈ 10 minutes).

When an online Parameterization backup is started, it creates under the directory /localscratch/backup an empty file whose name stands for the kind, day and hour of the online backup; for example: backup_full_teste_200306231814.txt. It also creates in the project subdirectory /localscratch/teste/dplist several **ascii outputs**: completeTypes.asc, completeDps.asc, completeAliases.asc, completeOrigs.asc and completeParams.asc. These files

are also copied into the backup directory.

Checking or not the "backup all not archived HDB datasets" box has no influence at all in the online Parameterization backup. This kind of backup does not produce any messages (like start or stop of the backup) in the PVSS log files.

It is also possible, from the configuration panel of the online backup, to ask for an online DB backup to start automatically, by choosing the periodicity (see fig. 2) with which it must be performed (for example: daily) and the starting time. When this option is deactivated and one wants to start back automatic DB-backup, after configuring it (and applying) one has to restart the manager PVSS01ctl (this restarts pvss_scripts.lst, that has inside the command to run the script archiv_client.ctl).

While the online backup is running, **trendings** or any actions that require queries to the Database are **not accessible** anymore. New values or alerts to be stored in the archives are buffered, and will be processed as soon as the online backup finishes. This means that regular archiving of data are not interrupted during the backup — data are stored after the online backup ends.

2. Backup of the History Database

The backup of the History Database can be done separately from the PVSS database and the panels backup, if wanted. It can be configured and started from the Database Configuration icon in the Database tab of the System Management panel (see fig. 1). Choose an archive from the table by left clicking on it, then press the parameterize button. The configuration of the backup is done from the **Backup H1** (see fig. 5).

The backup of the History Database can be also set to be done automatically, and configured per historical archive (this means that the frequency of backup can be different for each of the 3 historical archives).

A subset of the History Database is the **Alerts Database**. It can be exported separately from the History Database, so that events are not exported. This kind of export can be started from the **Archive/export Alarms** icon in the Database tab of the System Management panel (see fig. 1). Its configuration is done from a panel shown in fig. 6. In this figure, the upper red button means that the file changeover is deactivated (if activated, it would appear as green).

3. Possible solutions for a regular backup of the DCS project

In the case of the DCS-COMPASS system, the online backup would be the most convenient solution to have the hot-spare computer always up-to-date and ready to replace the main pccompass04 in case of need. In parallel with this backup procedure, the **ADSM** service (central CERN backup system) subscribed for the pccompass04 computer guarantees that daily work on this computer will not be lost. The ADSM is mirroring daily the contents of the /dcs partition on pccompass04, including the /dcs/home/db directory. In this way, all the project's closed files can recovered.

The online DB backup allows to restore the whole project, including open files beeing filled at the moment of an eventual system crash. It can be done weekly. The online DB backup
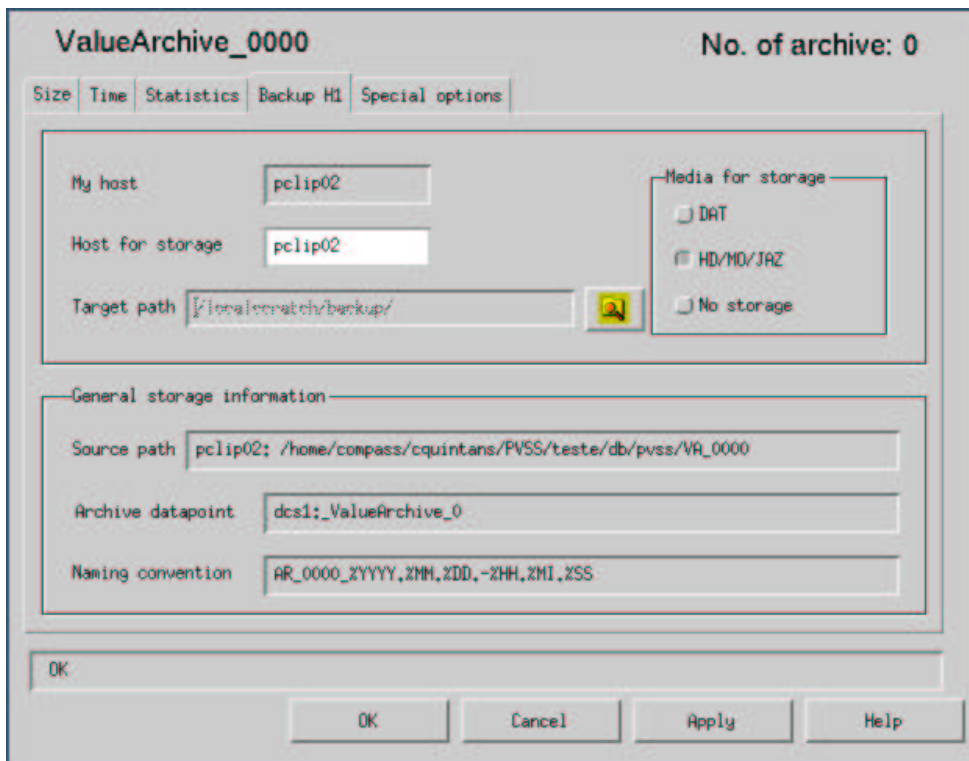
Figure 5: The backup History Database configuration panel.

should be done only by a DCS expert. The option of "backup all not archived HDB datasets" should **not** be checked (except for the first-ever backup. In subsequent backups, if this option is checked, PVSS will recopy every historical data file existent), and the time range should be chosen since the last backup. The target path would be a backup directory (outside of the project directory /dcs/projects/compass_dcs — for example it could be /dcs_backup/backup) in the 3rd disk (120 GB) of the hot-spare computer pccompass07, via a mounting point. Once per week, manually, one would restore the Database on pccompass07 using this backup information, by using the script /dcs/packages/pvss/bin/ restore_pvss2 (as root user), with **project path:** /dcs/home, with **source path:** /dcs_backup/backup, and with the **source type:** FILE. After the restore of the project is done, a message appears saying it was successful, and asking "please change owner and group of /dcs/home/log, .../source, .../db/pvss/save and .../db/pvss/alsave". Since in pccompass04 and pccopass07 name of the user is the same (compassdcs), it is not necessary to change anything.

Also once per week and using the mounting point of pccompass07 on pccompass04, one would do the online Parameterization backup, so that also the panels, etc of the project would be copied into pccompass07.

This update of the project on pccompass07 could be done weekly during the machine development. It would consist on: first to do the online Parameterization backup (directly into the /dcs/home directory on pccompass07); and second to restore the project using the restore_pvss2 script and using the backup directory as source.

To mount the /dcs_backup directory of pccompass07 in pccompass04 one must first check if this partition is declared "exportable". With superuser priviledges, one must verify that the NFS service is active on pccompass07. Do this by doing:
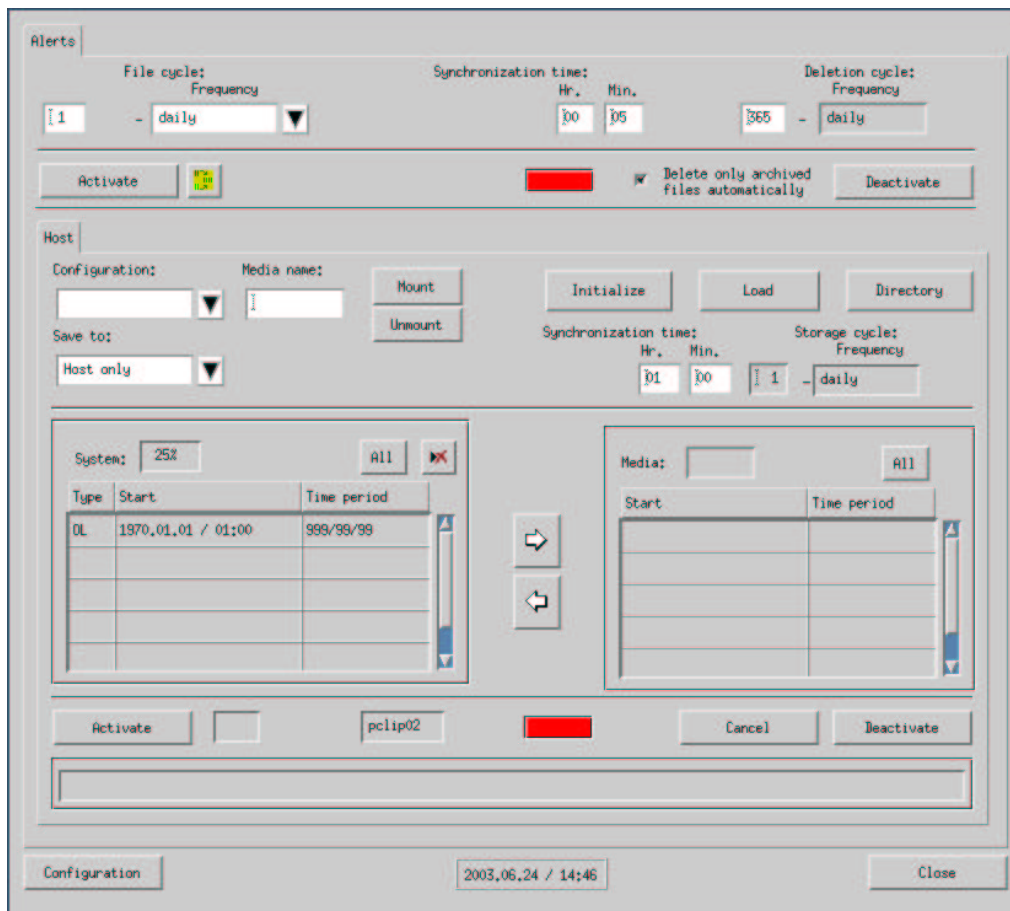
Figure 6: The Alerts backup configuration panel.

/etc/init.d/nfs status
If the answer is that nfs is not running, then one must start it with:
/etc/init.d/nfs start
Ask to export the several partitions of pccompass07 declared in the /etc/exports file by giving the following command, also as root:
/usr/sbin/exportfs -a
Then, go to pccompass04 and create the mounting point by going to the /home/compassdcs/pccompass07 directory and doing, as superuser:
mount pccompass07:/dcs_backup dcs_backup
From this moment the mounting point is created and one can do the backup of the pvss project to go into the /dcs_backup disk on pccompass07.

If pccompass07 is disconnected, or the nfs service on it is stopped, the PVSS data manager running on pccompass04 will notice that it is not able to contact the mounted directory of pccompass07, and give an error message (even if it is not doing an online backup at the moment).

4. Archiving of historical data

All the historical data files of the DCS-COMPASS project are stored in the pccompass04 computer, including the ones from 2001 and 2002. These could be safely exported into a

/dcs_backup/Archives directory on pccompass07, by using a mounting point and the tool of PVSS to export archives. This is accessible from the "Database Configuration" button (see fig. 1). One must select a given historical data archive (0, 6 or 7); set the destination directory where the data will be put by choosing "Parameterization", then "Backup H1", and introducing the correct target directory there; and, going back to the "Database Configuration" click the **Activity** button. Fig. 7 shows the panel that appears and allows to do this export. The archives to be exported should be selected and then sent to the desired location using the arrow on he panel. On the bottom of the panel, the following messages will be displayed:
"Waiting for DB acceptance"
"Starting"
"Backup: writing files"
"Backup: set data records"
"OK".

After the export is finished, the "DIR" button allows to refresh the list of files in the remote directory (right). On the left panel, the exported archive files still appear, but with label "AR" (instead of "OK") – this gives information that they were already swapped out of the system (but the file is still existent in the db directory, and data can be viewed from PVSS). If one wants to remove them permanently from the project, the file must be selected and first button on the bottom of the panel used to delete it. To re-import the file into the system, the opposite arrow must be used – after which this file will appear in the left panel with the label "IMP".
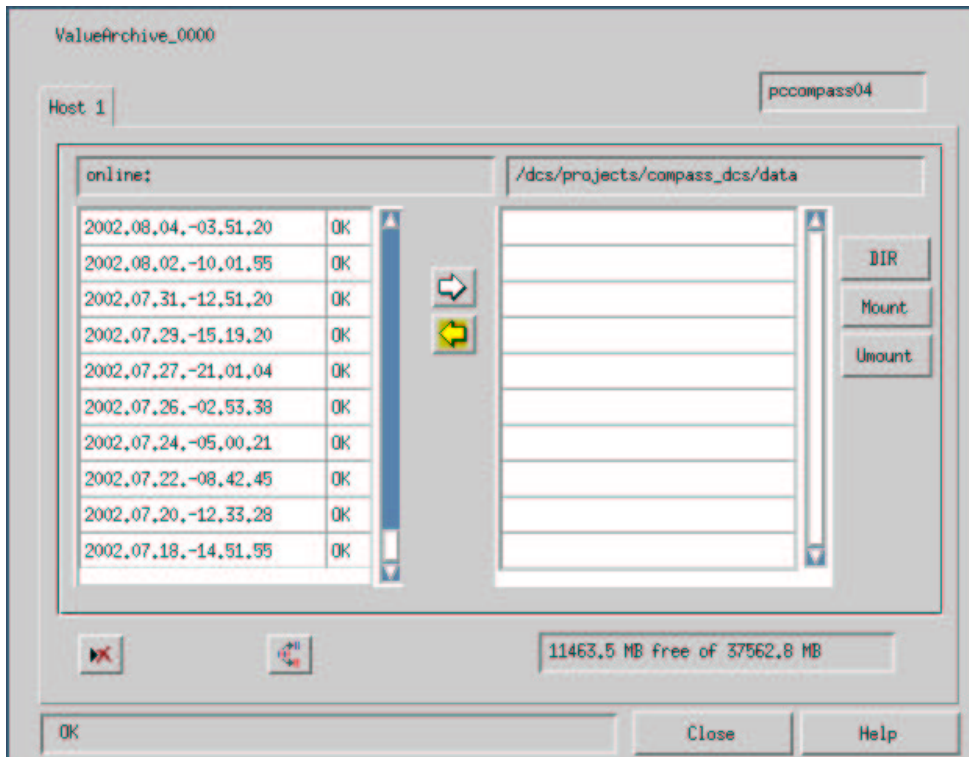

Figure 7: The History Database Activity panel.

At any time these past archive data files can be imported back to the project, for example to view and compare past trendings, using the opposite arrow. The archive file will re-appear on the left panel, with the information that it was imported.

In parallel with the export of the past archive data files into the backup disk on pccompass07, these data shall be copied to some "exterior to DCS" location, for example into the CASTOR facility. The advantage of swapping out the past archives from pccompass04 into the new location is that one recovers much disk space ($\approx$ 20 Gbytes). As soon as this is done, these swapped out files can be deleted from the project (using the Database Activity panel) – following, they will be erased also from its ADSM location (since this service is **mirroring** pccompass04).

In the /dcs_backup/archives directory these past archive files can be zipped (this reduces significantly their size – by 90% to 98%) and a .tar shall be done to group them per data years. These tar files can then be put into Castor, at the location
/castor/cern.ch/user/o/onl/dcs/pccompass04. To transfer the data into Castor, one should login as **onl** user in pccompass07, and on
/dcs_backup/archives directory do:
> rfcp archives-2002.tar /castor/castor/cern.ch/user/o/onl/dcs/pccompass04/archives-2002.tar
Then the listing can be done with:
> nsls -l /castor/castor/cern.ch/user/o/onl/dcs/pccompass04
to check the contents of the directory.