Support Group Application Note
Number: 231
Issue: 1.00
Authors: MN-S and CAS

Acorn

Optimising AUN Network performance

This document is intended to assist network managers who have either recently installed, or upgraded to, the AUN/Level 4 Fileserver software. It will deal with aspects of the fileserver installation which directly effect the performance of the network.

It is, however, beyond the scope of this document to cover all aspects of Ethernet design and installation. Those readers who seek information on more complex network topologies should refer, in the first instance, to the documentation supplied with the AUN/Level 4 Fileserver.

Applicable Hardware :	All RISC OS based Level 4 Fileservers, version 1.10 or above.	Related Application Notes:	Purchase and Installation of a simple AUN Network.

Support Group
Acorn Computers Limited
Acorn House
Vision Park
Histon, Cambridge
CB4 4AE

1 Introduction

This note is intended to accompany the application note *Purchase and Installation of a simple AUN Network*. It is targeted at those who have a little experience in the day to day running of an AUN/Level 4 network and are now seeking to optimise its performance. Some of the advice given here is valid for all network types, but the emphasis is on Ethernet, AUN networks. Much of this information is available in the Level 4 Managers Guide and the AUN Mangers Guide, but is reproduced here.

2 Disc Management and directory structure

To make best use of the available space on the hard disc of the fileserver, it is often advisable to format the hard disc with a small "LFAU" or Large File Allocation Unit size. This is because each time a directory is created, there is a minimum size allocated to the directory and its contents. If this minimum size is rather large, and there are very large numbers of rather empty directories on the fileserver disc, then much space on the fileserver can be lost.

Consider the following situation:

A school has decided a policy of giving each student an area on the network for the duration of their time at the school. The school has a 5 year intake with approximately 200 students in each year. The network manager therefore creates a 1000 user accounts with the directory structure shown below:

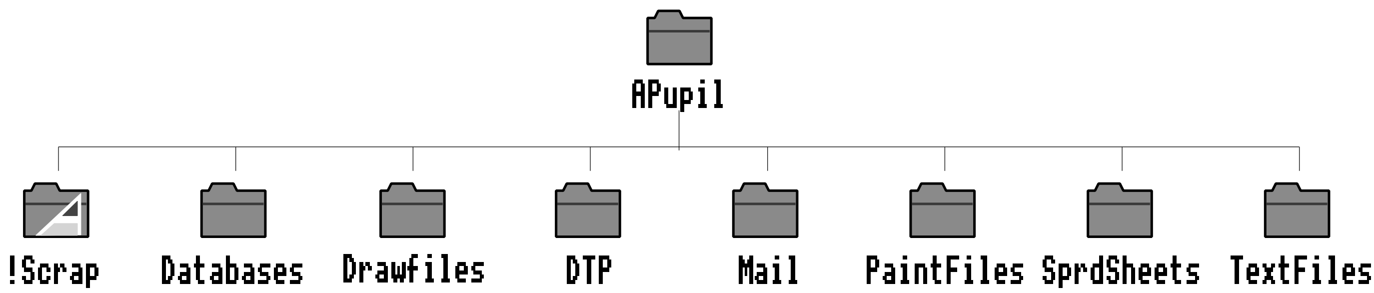


Figure 1: Typical directory structure for a student in a Secondary School.

Imagine the situation where the students in the 1st and 2nd years only use the network for saving DTP documents and so the other directories remain empty until the 3rd year or above.

On a large disc (200 MBytes and upwards) the default LFAU may result in the creation of directories as big as15Kb, which although fine for the hard disc of a standalone machine, may be far from ideal for the fileserver. The following table lists some common values and the minimum corresponding disc space used for each directory.

LAFU	Directory size (Kb)
256	4
512	8
1024	15

Table 1: Values for the Large Allocation File Unit and the resulting directory size.

The normal default LFAU for an A5000 is 512. So, using the default directory structure shown above, we can see that just the empty directories will allocate 67Kb of the disc space to each student. For 1000 students this will amount to over 65Mb of disc space. In contrast, a disc with a LFAU of 256 would only require 33Mb of disc space in order to store the same directory structure.

On the Level4 Fileserver disc there is a program *Read_LFAU* which enables you to interrogate the disc for information about the size of its LFAU. If this is large, and the difference between counting all files and the free space on the disc is significant, you may choose to reformat the disc at an appropriate time with a smaller (say 256) LFAU.

All data is lost from the disc during formatting.
Ensure that you have backed up the contents of the disc *BEFORE*
reformatting any disc which contains valuable data.

It is important to remember that small files are stored in the sectors allocated to the directory structure so all the space is not "lost". However, it is important to remember that the size of the LFAU is a compromise between disc storage space and the file retrieval speed. You may wish to experiment with different LFAU values before transferring all the data onto the disc, although generally the following rules apply:

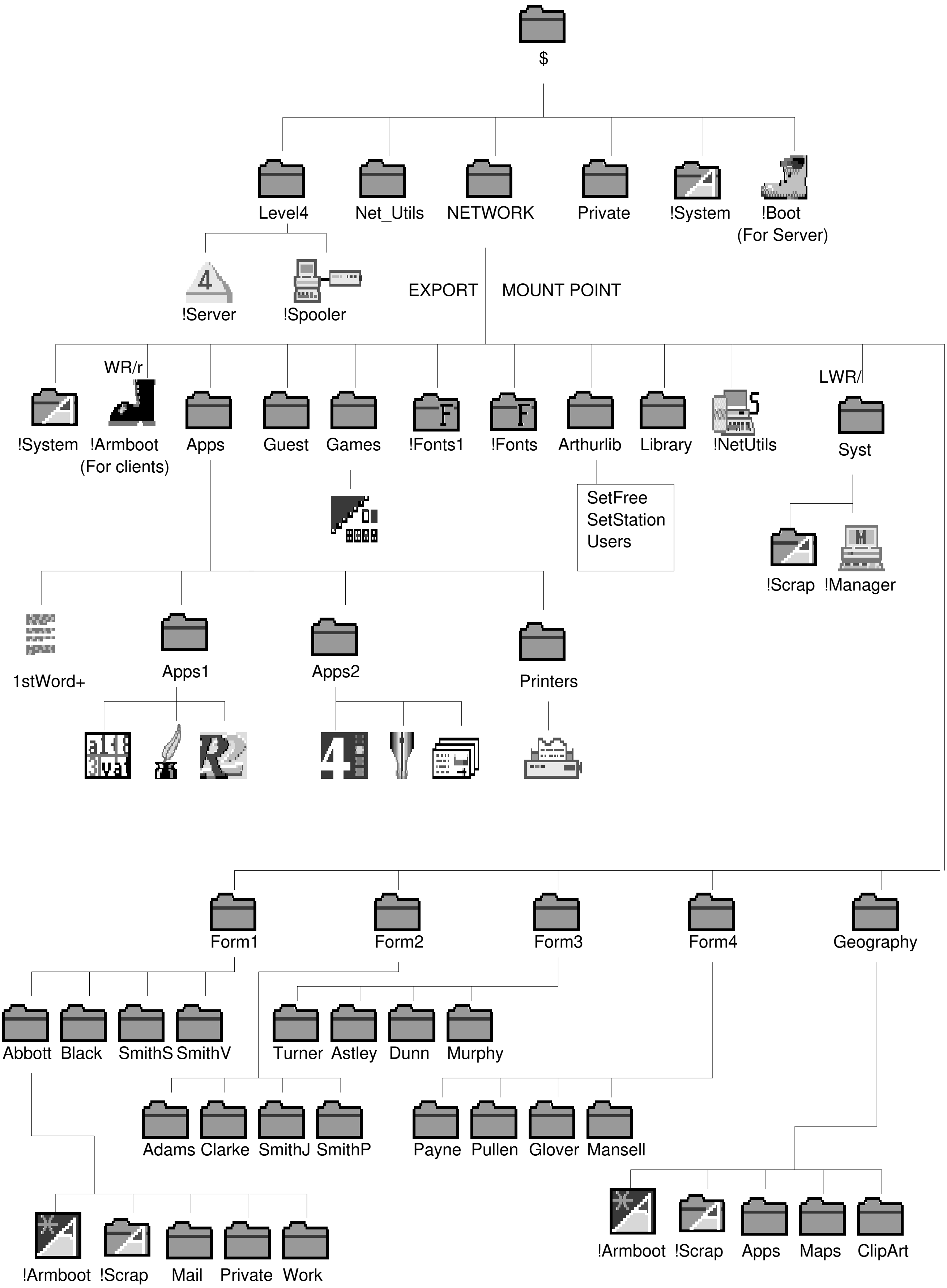
> If the LFAU is large then the data transfer rate will be faster, but slightly less data can be stored on the disc. Conversely, if the LAFU is small then the data transfer rate will be slower, but slightly more data can be stored on the disc.

A sensible directory structure is essential to get the best performance out of the fileserver. A very flat, or an excessively deep structure is not recommended. Keep popular applications near the root of the fileserver with less popular ones further down and with little used reference material tucked further down still. Level 4 gives you the ability to export multiple discs, and also to export a disc from any point on its directory structure. This is very useful because it is then possible to keep information that is private to the fileserver out of reach of the normal network user.

Look at the example directory structure shown overleaf. Note that the number of objects in the exported Root ($) directory is kept reasonably small. Under no circumstances should you exceed 77 objects in this Root directory, and about half this is probably a good maximum.

Note the *!Armboot* application in the exported root (*Network*). This is the boot sequence used by the **Boot** user. If you have all RISC OS 3 machines, do not use the general purpose *!ArmBoot* application that is supplied with the Level 4 Fileserver as this is intended for a mixture of RISC OS 2 and RISC OS 3 machines and consequently contains a number of compromises. A different style boot sequence is required for RISC OS 3 to prevent stations running applications, such as *!System* and *!Fonts*, twice; once during during the boot sequence and a second time as soon as a directory window that contains them is opened. The example given in application note 228, *Purchase and Installation of a simple AUN Network*, is a good starting point, and it is advised that you observe what happens when a station is booted by looking at the server status window during this time in order to check that no redundant operations are taking place.

With a large *!Fonts* directory, much time is taken in the station establishing all the fonts available to it, so keep these to a reasonable minimum, (say 3 or 4) and put all the remainder in *!Fonts1* as supplied with Level 4. Worthwhile improvements can be obtained at boot time by sensible use of the **SaveFontCache** and **LoadFontCache** commands. These commands, as their names suggest, save and load the font cache. To use them simply allow a machine which is logged on as Syst to see the required *!Fonts.* Press **F12** and then issue the following commands at the * prompt:



Directory Structure

```
*SaveFontCache Net:$.Arthurlib.FontCache
*Access Net:$.Arthurlib.FontCache WR/r
```

This will save the machine's font cache into the *Arthurlib* directory and set its access rights for use by any machine on the network.

To use the saved cache simply include the following command immediately ***before*** any commands to **`Filer_Boot`** or **`Filer_Run`** the *!Fonts* application:

```
*LoadFontCache Net:$.Arthurlib.FontCache
```

thereby saving the machine the job of interrogating the font path when the machine is switched on.

When a station has been switched on and has booted itself from the network, it is then ready to be used by a user (client). In this state it is pointing into the exported root, with access to objects that have public read access (WR/R) only. Level 4 supports the concept of "Hidden objects". This is where objects can simply be hidden from other users by setting their access attributes to LWR/. If "Hidden objects" is switched on (see Section 8) then only objects with public read access (WR/R) will appear in the directory viewer.

A user coming up to the machine can then log onto the fileserver in one of two ways:

- as a group user such as "**Geography**" or "**Year5**"
- by his or her private account.

Once they have logged onto the fileserver they are free to load any application or file which has public read access or which is in their own URD.

Note: In the directory structure shown above you should not have a user "**Form1**" if there are personal accounts, such as **Abbott** and **Black**, below this point. The existence of such a user can seriously compromise the security of the network as this user will have access to all the individuals' data directly below that point!

3 Armboot & Scrap files

The safest approach to scrap files is to place a copy of *!Scrap* in each URD. Some applications, such as *!Printers*, insist on the presence of a *!Scrap* application before they will install themselves on the icon bar. *!Scrap* forms the repository for temporary data which is created while printing or when data is being transferred between applications.

For the technically minded here is a brief overview of what happens when *!Scrap* is run by a machine:

- a number of system variables are set which point to that particular *!Scrap* application.
- if the machine is not on a network it will create a directory called *ScrapDir* inside !Scrap.
- the machine, if it is on a network, will create a *Stnxxx!yyy* directory inside *!Scrap*.
  Where: *xxx* is the network number.
  yyy is the number of the creating station.

In a network environment the inclusion of the network and station number ensure that the directory is unique, because these always combine to form unique numbers. This ensures that the integrity of the users scrap files is always maintained. If you look inside a *!Scrap* application that has been accessed over the network you will see the scrap directories created there by each station.

Opening directory viewers when a user logs on is a useful and powerful thing to do. It saves the user wasting network bandwidth by searching through the directory structure for his or her applications. To do this, use *!Edit* to create an **Obey** file. A line such as:

```
Filer_OpenDir Net::MYSERVER.$.Apps
```

will open a viewer into Apps. Note that no reference is made to the export mount point as this is quite invisible to the network user.

4 Loading applications & AppFS

Application loading is probably the most testing activity of a network, especially if a whole class attempts to load an application at once. The **Broadcast Loader** is not effective with Ethernet, as it chops up packets into small ones to enable more clients to participate in the broadcast activity. This dramatically reduces throughput on an Ethernet network and is the reason for the recommendation that you `*Unplug` the **Broadcast Loader** in the *!ArmBoot* file which is accessed by the **Boot** user.

There are third party solutions to the problems of loading applications, one very effective method is used by **AppFS** that is marketed by *AngelSoft*. This read-only filing system uses the buffering and cacheing provided by the filecore filing system to access the disc remotely over the network. A hard disc is required for the exclusive use of **AppFS,** which can then attached to the fileserver, or indeed any other machine on the network. As **AppFS** is read-only, it can rely on the fact that no data will change on the disc, and therefore many of the problems associated with cacheing information over the network are dispensed with. **AppFS** provides the following benefits:

- reduces the network traffic considerably, by only asking for file information once.
- reads data in large chunks which allows Ethernet to operate as efficiently as possible.
- it speeds up application loading time over the network by a factor of five or more.
- frees the fileserver to do what it does best: handling secure user data.

5 Gateways, bridges and repeaters

Application note 228, *Purchase and Installation of a simple AUN Network*, mentioned the numbers of stations and permissible segment lengths of Ethernet. To enable more stations to be used or longer lengths to be spanned then a means of joining bits of Ethernet together is required.

The AUN guide recommends that the network is arranged in clusters, with departmental servers supplying data to stations in its domain. The stations in each departments domain will also require access to data on other fileservers on the network.

The use of the *!Gateway* application running on a machine (usually the server machine) provides a cost effective means of achieving this. Using such a **Gateway**, will:

- allow a maximum of two different networks to be linked together.
- provide a very cost effective solution.
- require no additional hardware apart from a second network interface.
- ensure that network traffic is kept off the "Backbone".

Gateways do pose an overhead, and you should not consider a network where the data ever has to cross more than two Gateways to reach its destination.

A **Bridge** is the next type of network interconnector. These commercially available devices:

- are usually quite expensive (circa £1500).
- have built in intelligence that "learns" where destination stations live.
- only pass information over the Bridge where necessary.
- only bridge between two networks.

A **Repeater**, often in the form of a "**Multiport Repeater**" will:

- join together a number of Ethernet segments
- only act as a signal amplifier
- ensure that signals emanating from one network get repeated on ***all*** connected networks.
- acts as a way of extending the network,
- not confine traffic to a particular part of the network.

Repeaters are not a low cost solution, a good multiport repeater costs around £1000.

Note: There are very specific rules governing the use of Repeaters, Bridges and Gateways which are beyond the scope of this document. You are strongly advised to seek professional help if any of these components are required in an installation.

6 User management

A large institution may have well in excess of 1000 users, each with their own account. It is not recommended to try to give each user a simple user name because it becomes increasingly difficult to separate out popular names such as Smith when many may exist. It is much easier to give users a name which identifies their position in the establishment, for example Year8.SmithPJ or Staff.ATeacher.

A fileserver which is structured using this technique:

- makes finding users easier.
- is easy to understand.
- allows the fileserver to mirror the hierarchy of the establishment.

Such direct mapping is not the ideal solution in some circumstances. It may be that the user root directory needs to be further down the directory tree such as:

`$.Users.Year8.SmithPJ`

or possibly that the user root directory needs a completely different mapping so that user Year8.SmithPJ would have a URD of say:

`$.Users.Girls.Form3.SmithPJ`

It is possible, but perhaps a little tedious to manage such a mapping using !Manager. Recent third party products, such as *!NetManage* from **Suitable Software,** provide access to full global user profile management facilities, via the desktop. The facilities provided by *!NetManage* include:

- the selection of a group of user profiles which can then be updated, removed or deleted.
- batch creation of user profiles via text or CSV files.
- the ability to create user root directories matching predefined directory structures.
- user icons that be dragged between fileservers to provide true copy and move operations.

7 CD ROMs on the network

Level 4 has the ability to export any filing system that has been attached to the server machine, and this of course includes CD ROM. CD ROM differs from many filing systems in that although data can be read from the media quite quickly once the drives read head is in the correct position, it takes a long time to search for the start of the required data. This means that although performance may be satisfactory on a local disc when accessed by a single user, it becomes much slower when used simultaneously by a number of users over the network. This is because the read head of the drive is moving constantly between areas of the disc in an attempt to be "fair" to all users.

The issue of networking CD ROM is currently under investigation by Acorn, and it is hoped that Acorn will be in a position to announce improvements in this area in the future.

For some data, such as clip art and encyclopaedic information that is accessed relatively infrequently, CD ROM provides a viable service on the network. For application loading it usually fails to meet the requirements of a classroom situation. It is not yet possible to guarantee the integrity of single (let alone multiple!) moving video sessions from applications such as **Replay** over the network.

8 Hidden objects

This is a powerful feature of Level 4 that was designed as a security enhancement but can also be used to good effect when an increase in network performance is required. By enabling this feature from the Level 4 icon on the Icon bar, all files, directories and applications that the user has no right to use fail to appear in the directory window. This is achieved by removing public read access to applications that are not in regular use. As applications take some time to load into directory viewers, the use of this technique will ensure that the windows open faster, and that less traffic appears on the network.

9 Automatic log on

The Level 4 fileserver disc contains an example, in *Extras.AutoBoot*, of how to configure the system so that when a machine is switched on it logs onto the fileserver as a particular user. This is especially useful in institutions where a particular machine always has the same user(s) on it, such as many primary school classrooms. It has the benefit that no time is lost between the user arriving at the machine and being able to use it, as it will (assuming that it has been powered up) be waiting, with perhaps the application and work directories displayed, ready for the user.

This approach, coupled with staggering the time that machines are switched on, may prove to be useful in reducing the perceived natural delays that occur on any network.

10 Server Mode and type

Although this has been covered in application note 228, *Purchase and Installation of a simple AUN Network* it is worth mentioning again. For best performance run the Server machine in Standalone mode, ie by starting *Level4* rather than *!Server* on start up. As this prevents multitasking from taking place, this mode of operation cannot be used if other applications such as *!Spooler* or *!AppServer* is also required to be run on the same machine. In this case, ensure that a low resolution screen mode is used such as **Mode 0**, and that the status window is not open. Do not use the log file facilities unless you have a genuine reason for recording transactions.

If you are using an ADFS hard disc (which includes the IDE drive of A5000s) then you should ensure that the ADFS cache is enabled, by using the configure commands:

```
*Co. ADFSDirCache 64K
*Co. ADFSBuffers 128
```

With SCSI drives on a machine fitted with an Acorn SCSI card, a suitable command would be:

```
*Co. SCSIFS DirCache 128K
```

And with CD ROMS:

```
*Co. CDROMBuffers 128K
```

A fileserver machine with an ARM3 processor such as an A5000 will give much more throughput on the network than one with an ARM2. The amount of memory available to the server is not particularly relevant, more than 2Mb will not actually help. Clearly a fast SCSI device will pay dividends, and it is worth investing in a high performance drive when considering adding drives to the fileserver.

Appendix A: Useful Addresses

AppFS is available from**:**

Angelsoft Educational
35 Heol Nant
Swiss Valley
Llanelli
SA14 8EN

Tel 0554 776845

NetManage is available from**:**

Suitable Software
136 Carter Street
Fordham
Ely
Cambridgeshire
CB7 5JU

Tel 0638 720171

Other network related products are also available from**:**

XOB
Balkeerie
Eassie by Forfar
Angus
DD8 1SR

Tel 0307 84364

NetGain is available from**:**

Digital Services Limited
9 Wayte Street
Cosham
Portsmouth
Hants
PO6 3BS

Tel 0705 324934

Network Supervisor is available from**:**

AU Enterproses Ltd
126 Great North Road
Hatfield
Herts AL9 5JZ

Tel 0707 266714
Fax 0707 273684