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Using the Software Protection Scheme in a network environment

This application note will enable the reader to understand and hence correctly identify the behaviour pattern of the Software Protection Scheme (SPS) in the context of a network environment. It will achieve this by describing the operation of the SPS with particular reference to the installation of Advance on network filing systems. Guidance on overcoming filing system specific problems will also be offered. The mechanisms described here are deliberately generic and can be applied to other read only filing systems as they become available.

Applicable Hardware : All Archimedes
All Fileservers
Nexus
NetGain
AppFS Software

Related Application Notes: None

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Advance is the first application which utilises the Software Protection Scheme (SPS) which has been developed by Acorn. It is available for use by any software developer who wishes to discourage the use of unauthorised copies of a particular software title.

The underlying mechanisms used by the SPS are, by necessity, complex, but Acorn has made every effort to ensure that the installation procedure is as simple as possible.

In order to achieve this Acorn has striven to present the user with a simple, prompted, installation procedure. This has proved unobtrusive when coupled with a single user licence. Problems have occurred with multi-user site licence packs, particularly when linked to filing systems which can be configured, by whatever means, to be a read only media. Typically problems have manifested themselves as either continual requests for Program disc 1 or the appearance of an unauthorised use warning message on the client station(s).

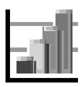
This application note will provide guidence on installing Advance on network based filing systems including installation on read only filing systems. It will also offer a simplified description of the operation of the SPS for the more inquisitive reader.

The Advance software; an overview

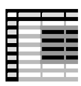
In order to provide a large degree of flexibility, both in terms of multi-user functionality and filing system support Advance was designed so that it could appear as a single application or as a series of discrete applications. This was deliberate so that individual user configuration and efficient use of the storage media could be achieved irrespective of the chosen filing system. It is hoped that other software packages which utilise the SPS will adopt similar practices. As a consequence Advance can be separated into 5 component parts or "sub-tasks":

!Advance The Advance "shell"

!AdvanceDB The Advance Database



!AdvanceGR The Advance Graph



!AdvanceSH The Advance Spreadsheet

!AdvanceWP The Advance Wordprocessor

Figure 1: The Advance application software.

The Advance shell contains the encoded information used by the SPS. This information cannot be written without the original Advance Program disc 1 being present in the floppy disc drive of the installing machine. Other applications within the Advance suite cannot be used without first seeing the shell. The shell holds vital information, without which the remaining applications will not function.

The Advance shell is used to store information about the single machine or network fileserver on which it has just been installed. (Note: Once installed the software always contains information about the first machine to install it.) This information may take the following form:

> In the case of a single machine fitted with an ID chip the unique code contained in the ID chip will be encoded into the shell and used to identify the machine each time the copy is run. Single machines without an ID chip will be allocated an alternative code by the SPS.
>
> In the case of a network installation the filing system name and the name of the specific device upon which it has been installed are encoded. The SPS only recognises filing systems whose path begins with Net or NFS.

The type of licence which has been issued will determine whether the shell will have "space" for information about the stand alone machine and/or the fileserver on which it has been installed for use. Each part of this information can only be written to the copy once, and then, only in the presence of the original disc. Once these "spaces" have been filled the shell must be deleted and re-installed from the original program disc. This would only be of any significance if the name of the fileserver, on which Advance has been installed, were to change for some reason. Thus, unlimited copies can be created on fileservers, hard discs, floppies etc from a single original site licence disc.

Installing Advance on a network.

The first thing that must be decided before installing !Advance onto a network is how you want to store it on the fileserver. There are two options;

a) Install !Advance in each users own private directory.

b) Install the !Advance shell in each users private directory and the Advance 'sub-tasks' i.e. Database, Word Processor, Spread Sheet and Advance GR in a public location which can be read by all users on the network.

Although the first of these options offers the most straight forward installation procedure, it is very inefficient in terms of space used on the hard disk.

The second option is always to be preferred. The idea of this system is, when a user logs on, their !ArmBoot file will inform the !Advance shell of the location of the 'sub-tasks' on the network. This will allow !Advance to function normally when run. The advantages of this system are that it is much more efficient on disk space and it will allow each user on the network to save their own configuration choices as opposed to using a common set which would apply to everybody on the network. This will allow !Advance to be configured for each individuals personal needs.

If you have decided to follow the first option then follow the steps below;

a1. Run !Advance from Program disc 1. This will enable you to register the disc for your site.

a2. Logon from a client station on the network as a System Privileged user and copy the !Advance application into a users directory on the fileserver.

a3. Whilst holding down the SHIFT key, double-click on the !Advance application. This should open the !Advance window and display the applications files. Copy !AdvanceWP from the second floppy disc into this window.

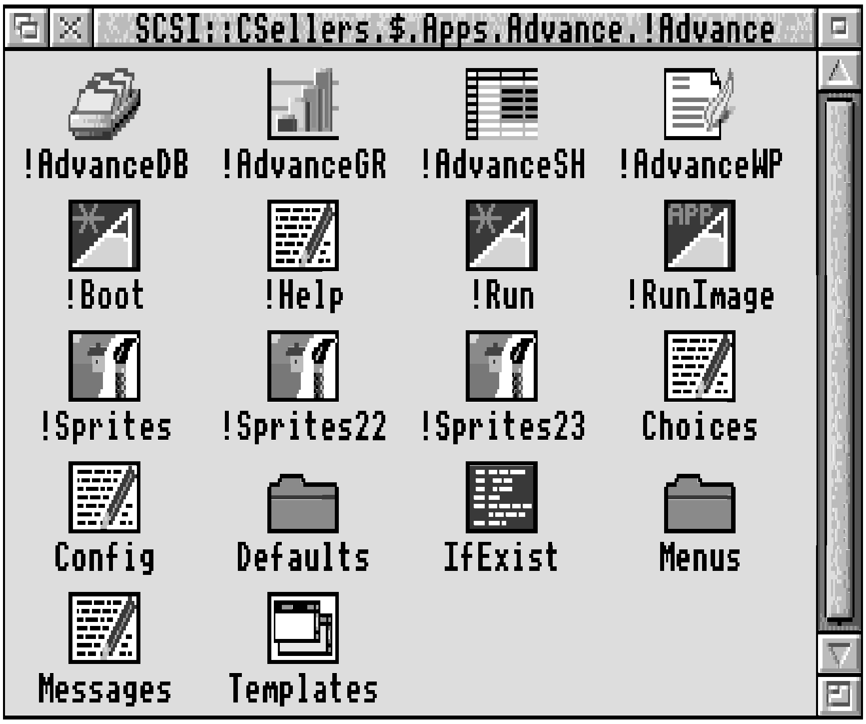


Figure 2: The complete !Advance application (including all sub-tasks).

a4. Run the copy of !Advance which you have just created.

a5. Follow the installation instructions which appear on the screen.

a6. Once the installation is complete, it will be possible to duplicate this fully installed version of !Advance from the directory in which it was installed into every users private directory.

If you have decided to impliment the second option then follow these steps;

b1. As (a1) above.

b2. As (a2) above.

b3. As (a3) above.

b4. Move the following files into a publicly accessible area on the fileserver.

!AdvanceDB
!AdvanceGR
!AdvanceSH
!AdvanceWP

The remainder of this section will assume that they have been placed in **`Net:$.Apps.Advance`**. The !Advance directory should now look like this;

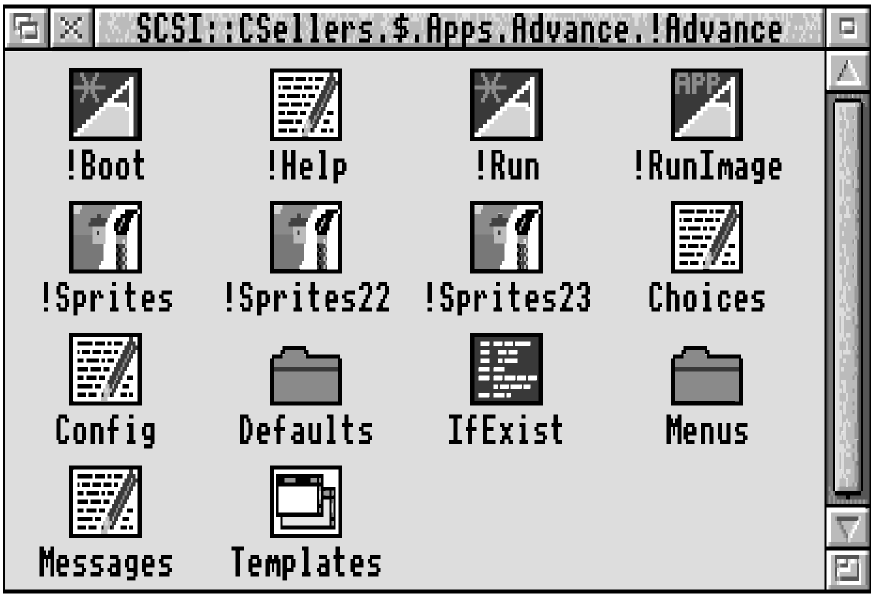


Figure 3: The !Advance shell.

b5. We need to inform the shell about the whereabouts of the main applications which it needs. There are two ways of doing this and you should select the one most appropriate to your working practices.

Method 1.

Shift-double click on the working copy of the !Advance application. Load the file called !Boot into !Edit. Amend the file to read as follows:

```
IconSprites <Obey$Dir>.!Sprites
Set File$Type_dfe CSV
Set Advance$Dir <Obey$Dir>
|
Set Advance$Apps Net:$.Apps.Advance
Filer_Boot <Advance$Apps>.!AdvanceDB
Filer_Boot <Advance$Apps>.!AdvanceGR
Filer_Boot <Advance$Apps>.!AdvanceSH
Filer_Boot <Advance$Apps>.!AdvanceWP
```

Method 2.

Insert the following lines into the main client boot sequence if you have one, or alternatively into each users boot sequence:

```
Set Advance$Apps Net:$.Apps.Advance
Filer_Boot <Advance$Apps>.!AdvanceDB
Filer_Boot <Advance$Apps>.!AdvanceGR
Filer_Boot <Advance$Apps>.!AdvanceSH
Filer_Boot <Advance$Apps>.!AdvanceWP
```

Using either of these two methods will ensure that whenever !Advance is seen by the filer it will automatically know where to find its remaining resources.

b6. From the client machine ensure that you are still logged on as a System Privileged user and run the copy of !Advance you have created.

b7. Follow the installation instructions which appear on the screen.

b8. Once the installation is complete, it will be possible to duplicate the installed version of the !Advance shell from the directory in which it was installed into every users private directory as shown below.

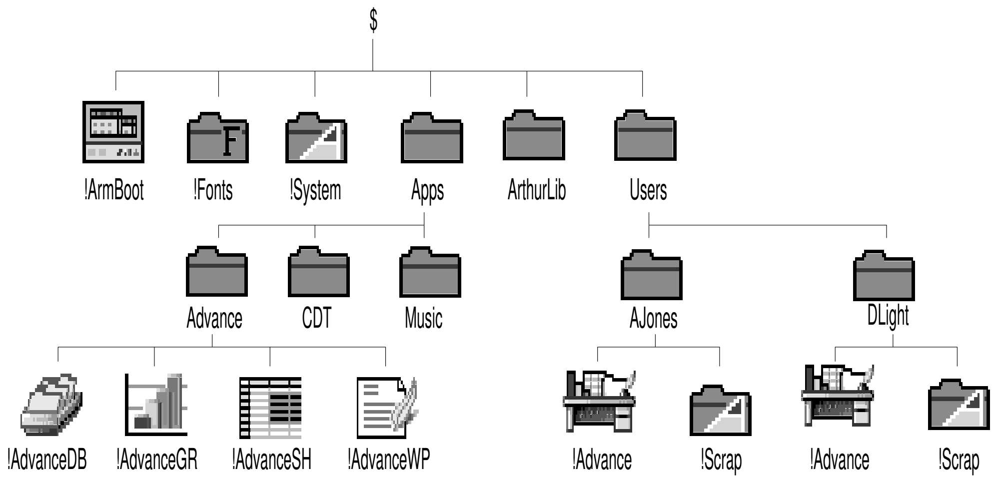


Figure 4: Overview of the directory structure after installation of !Advance.

Notes: In both these examples the path **`Net::$.Apps.Advance`** has been assumed. If you use a different directory structure or change the structure after installation then you will have to alter this reference accordingly.

Management of multiple copies of the Advance shell can be difficult. Utilities such as NetManage from Suitable Software can assist in this respect when the copies are stored on Acorn fileservers. Contact Suitable Software on (0638) 720171 for more information.

AppFS

When installing Advance on any application server the !Advance shell ***must*** be separated from the main sub-tasks. The following steps illustrate the procedure:

1. Run !Advance from Program disc 1. This will enable you to register the disc for your site.

2. Decide which filing system is to hold the !Advance shell. It may be placed on one of the following filing systems:

 on a fileserver whose path begins Net or NFS
 on a local dedicated writable media connected to the Archimedes
 eg. an ADFS hard disc
 an ADFS floppy disc
 etc, etc

If you decide to install the !Advance shell on a local media then each copy of !Advance will have to be individually installed for each machine. In the case of floppy disc based media, each disc will need to be uniquely identified to the machine on which it was installed. However, as most application servers utilise the network cable infra-structure it is likely that there will also be a fileserver present. In these circumstances it is recommended that the !Advance shell is placed on the fileserver. (See: Installing Advance on a network.)

3. As (b4) except that the files must be moved into an area of the AppFS filing system. The remainder of this section will assume that they have been placed in **`AppFS:$.Apps.Advance.`**

4. Make a copy of the !Advance shell on a floppy disc. Do not install this shell yet. The shell should contain the following files:

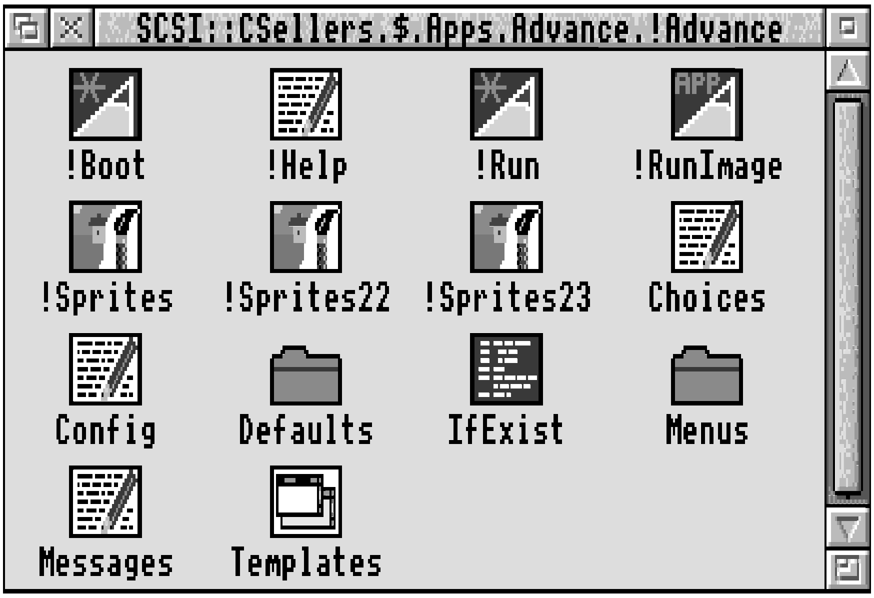


Figure 5: The Advance shell.

5. Taking the floppy disc copy, modify it as described in (b5) above. Ensure that all filing system references are to AppFS. eg:

```
Set Advance$Apps AppFS:$.Apps.Advance
```

Mark this disc as ***Modified Advance Shell Master Disc***.

6. Now copy the contents of the ***Modified Advance Shell Master Disc*** onto your chosen filing system as defined in 2 above.

If the !Advance shell is to be placed on a Network then follow steps (b5), (b6) and (b7) above.

If it is to be placed onto a media local to each machine then copy the contents of the ***Modified Advance Shell Master Disc*** onto the media and install each individual shell in turn, using the appropriate guidelines provided in the Advance User Guide and/or Release note.

The following diagram illustrates the completed directory structure for an AppFS/fileserver combination.

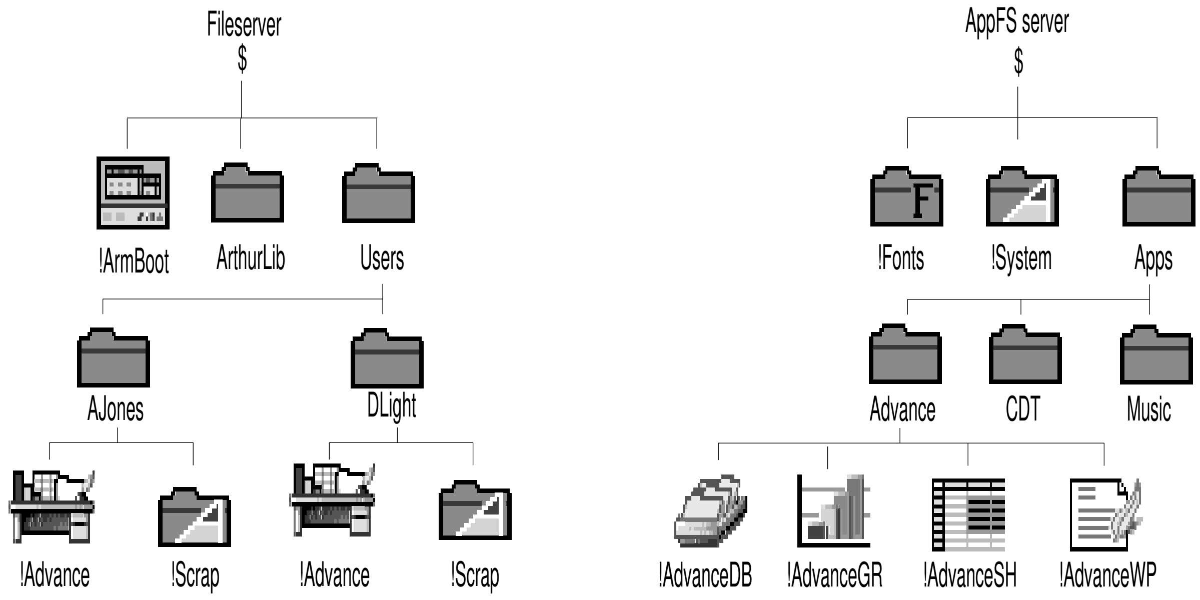


Figure 6: The AppFS and fileserver directory structures after installation.

NetGain

The method employed when using NetGain is identical to that used for AppFS installations. The differences are that the four shell dependant applications must be placed in the area reserved for use by the NetGain filing system and that the filing system name specified in the variable Advance$Apps is amended to specify NetGain.

Nexus

Again the mechanism employed is similar to that used for AppFS, but the file transfer speed and flexibility offered by the Nexus disc sharer enable the system manager to maintain the individual copies of the !Advance shell far more easily. A recommended installation method for the Nexus disc sharer is illustrated below. Changes which are required to enable this to function for Nexus Networking are also included at the appropriate stages.

1. Run !Advance from Program disc 1. This will enable you to register the disc for your site.

2. Decide which filing system is to hold the !Advance shell. It is normal to place it on the Nexus drive 5 but it may be placed on one of the following filing systems:

   on a fileserver whose path begins Net or NFS
   on a local dedicated writable media connected to the Archimedes
   eg. an ADFS hard disc
   an ADFS floppy disc
   a SCSI hard disc
   etc, etc

If you decide to install the !Advance shell on Nexus drive 5 then each copy of !Advance will have to be individually installed for each machine. In the case of floppy disc based media then each disc will need to be uniquely identified to the machine on which it was installed. However, as most application servers utilise the network cable infra-structure it is likely that there will also be a fileserver present. If user specific configuration of numerous !Advance shells is required it is recommended that these are placed on the fileserver. (See: Installing Advance on a network.)

3. As (b4) except that the files must be moved into an area of the shared Nexus drive 4 filing system. The remainder of this section will assume that they have been placed in **`Nexus::4.$.Apps.Advance.`**

4. Make a copy of the Advance shell on a floppy disc. Do not install this shell yet. The shell should contain the following files:

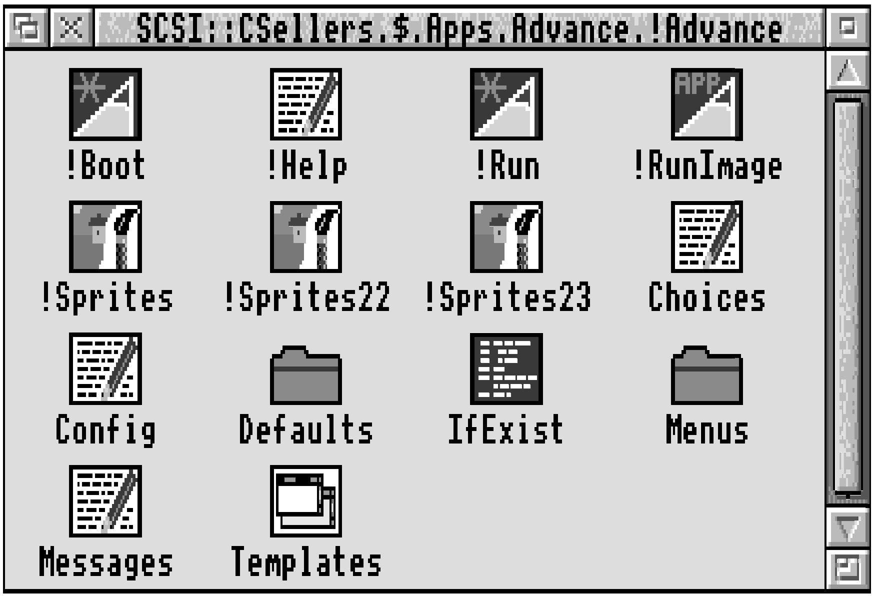


Figure 7: The !Advance shell.

5. Taking the floppy disc copy modify it as described in (b5) above. Ensure that all filing system references are to Nexus drive 4. eg:

```
Set Advance$Apps Nexus::4.$.Apps.Advance
```

Mark this disc as ***Modified Advance Shell Master Disc***.

6. Now copy the contents of the ***Modified Advance Shell Master Disc*** onto each Nexus drive 5 or your chosen filing system as defined in 2 above.

Install each individual shell in turn, using the appropriate guidelines provided in the Advance User Guide and/or Release note.

7. *Nexus disc sharer:*

Take an 800K formatted floppy disc and create on it a directory called Port_n where n is the number of the port to which the machine is connected. The port number can be obtained by pressing f12 and typing:

```
*Show Nexus$Portnumber
```

at the command line prompt. Copy into this directory the newly installed !Advance shell from the private partition. Repeat this for all the machines connected to the Nexus unit.

Nexus networking:

Take an 800K formatted floppy disc and create on it a directory called Stn<stationnumber> where <stationnumber> is the station number allocated to the machine. The machines station number can be obtained by pressing f12 and typing:

```
*help stataion
```

at the command line prompt. Copy into this directory the newly installed !Advance shell from the private partition. Repeat this for all the machines connected to the Nexus unit.

When you have finished you will have a floppy disc with a maximum of 12 appropriately named directories, each containing a unique, identifiable, installed copy of the !Advance shell for each machine connected to the Nexus unit.

8. If you are using the !Boot application supplied on the shared Nexus drive simply SHIFT double click on the !Boot application and copy the contents of the floppy disc which contains the directories into it.

Now amend the boot sequence with the following line:

Nexus disc sharer:

```
*Copy <Boot$Dir>.Port_<Nexus$PortNumber>.* <Work$Dir>.* FRV~Q~C
```

Most boot sequences supplied on the Nexus disc sharer automatically set the system variables **<Boot$Dir>**, **<Nexus$PortNumber>** and **<Work$Dir>**.

Nexus networking:

```
*Copy <Boot$Dir>.Stn<Nexus$Station>.* <Work$Dir>.* FRV~Q~C
```

Most boot sequences supplied with the Nexus networking automatically set the system variables **<Boot$Dir>**, **<Nexus$Station>** and **<Work$Dir>**.

Now whenever a machine is switched on or reset, the boot sequence will automatically identify the machine and copy the contents of the corresponding directory into the private partition. Thus, if students delete or damage the !Advance shell it is simply a matter of resetting the machine and letting the boot sequence copy a clean shell over. The appropriate areas of the directory structure is shown below.

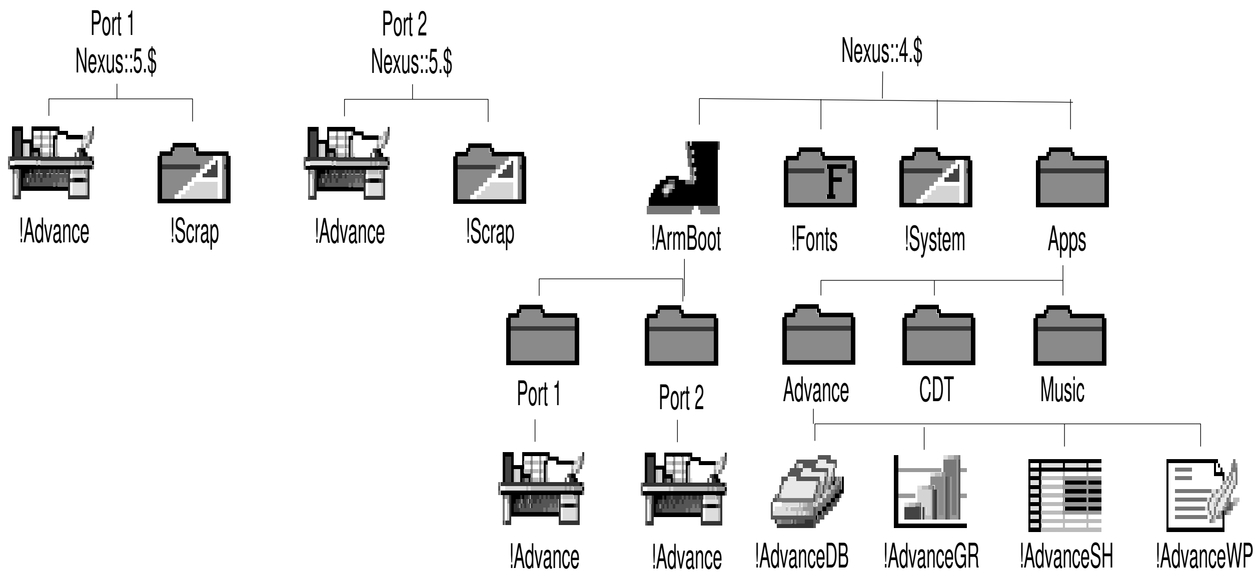


Figure 8: Nexus directory structure after installing Advance.

This method can only be recommended when using a Nexus style system because, whilst it can be made to function on other filing systems it will increase the boot up time significantly due to the slower data transfer rate.

Trouble shooting.

This section will deal with the remaining installation issues which have been reported to Acorn since the release of Advance.

The effects of attempting to install Advance on a fileserver without system privilege access.

In this instance Advance will generate the following error message:

Figure 9: An Advance I/O error box.

Whilst it appears that the original Program disc has developed a disc fault what has really happened is that an "Insufficient privilege" error has occurred and been reported as a disc fault.

Solution: Logon as a system privileged user and repeat the installation procedure again.

The effects of failing to set public read access on all the files in the Advance shell.

In the worst case this will have the effect of only allowing the system privileged user to run !Advance. In this situation if any attempt is made to run Advance as a normal user it will always prompt for the original Program disc. Attempting to install the software as a normal user will usually generate the previous error. Logging on as a system privileged user will always allow the software to be installed, but any attempt to run it will cause the SPS to prompt for the original Program disc.

Solution: Logon as a system privileged user and set the access rights for the whole application to WR/R.

Appendix A: The Software Protection Scheme; an overview

Conceptually we think of the SPS as having a series of "spaces" or "boxes" which are filled in at the time of installation. In the case of a site licence version there will be three such "boxes", other licence variants may have a different number. These boxes hold information about the machine on which the disc was originally registered, the stand alone machine on which it can be used and the fileserver from which it can be run. Prior to installation the Advance shell will have no registration information and hence these boxes will be empty, thus:

Orig Machine ID	Machine ID	Fileserver ID

Figure 10: Illustration of the information held by the SPS before installation.

When the application software is installed it must be recreated each time and new, machine specific, information placed in the appropriate ID "box". **It is vitally important that the application software is copied from the original program disc each time it is installed.** The application will contain other information which states if the copy on the machine has already been installed. If it has then the SPS will not allow the copy to be updated. Each part of this information can only be written to the copy once, and then, only in the presence of the original disc. Once these "boxes" have been filled the application must be deleted and re-installed from the original program disc. Thus, unlimited copies can be created on fileservers, hard discs, floppies etc from a single original site licence disc.

Imagine we have three machines; two with hard discs and one with only a floppy disc. The following sequence illustrates how the data in the Machine ID changes with each installation. (For the sake of clarity the data in the ID chip is fictitiously shown to correlate to the hardware configuration, and order of installation.)

The user copies the software onto the first hard disc machine. When the copy is run the SPS will prompt for the original Program disc. The SPS will read and update the copied software and the program disc with the unique code stored in the ID chip. This information will be written into the appropriate ID box. This information will always be carried on the program disc and copied to any subsequent discs. Once it has been copied, additional information may only be written once to each ID box in the copy.

Irrespective of the number of copies made the original Program disc will now remain unchanged.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1		

Figure 11: Illustration of the information placed on the original Program disc, by the SPS, after the 1st installation.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1	HDmachine1	

Figure 12: Illustration of the information placed in the working copy of the software, by the SPS, after the 1st installation.

The software is then installed on the second hard disc machine using exactly the same procedure.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1	HDmachine2	

Figure 13: Illustration of the information placed in the next working copy, by the SPS, after the 2nd installation.

The data in the Machine ID box now contains the current machine ID chip value (HDmachine2). Finally the software is installed on a floppy disc based machine.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1	FDmachine3	

Figure 14: Illustration of the information placed in the next working copy, by the SPS, after the 3rd installation.

This process can be repeated continuously until the software has been installed on all the machines. If the copy of the software is deleted then it will need to be re-installed from the original program disc. The flow diagram, provided for reference purposes in Appendix B, illustrates the sequence of tests which the SPS makes when loading the application to determine if the copy is authorised or not.

Network installation.

Now imagine we wish to use the first hard disc machine as a Level 4 fileserver. To do this we must ensure that the software is aware of the fileserver upon which it has been installed. To achieve this we simply ensure that when running the software from the fileserver for the very first time we do so as a System Privileged user and follow the instructions given by the SPS. This will ensure that the box which holds the Fileserver ID will be updated using the network type and the storage media name. In the following example it is assumed that the network type is Ethernet (or Econet) and that the fileserver appears on the network under the name Level4.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1	HDmachine1	Net::Level4

Figure 15: Illustration of the additional information placed in the 1st working copy, by the SPS, after the 1st Fileserver installation.

This particular combination of information will allow the same copy of the software to be run on the local machine which identifies itself, through its ID chip, as HDmachine1 and on any client machine on the network providing it is loaded from a fileserver which identifies itself as Level4 on the filing system called Net.

If installation were required on a FileStore, which identifies itself on the network by the name FS, then the procedure would involve simply copying the software from the original Program disc on to the FileStore in the usual way. The installation is completed by running the software from a system privileged client machine remembering to follow the prompts given by the SPS. Using the above example, the information in the SPS boxes after installation on the FileStore would be:

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1		Net::FS

Figure 16: Illustration of the information held in the next working copy, by the SPS, after the 2nd Fileserver installation.

As you can see the scheme is quite simple, and with an understanding of this model it becomes possible to predict the outcome of any given set of circumstances.

Installation on multi-user media which can be write protected.

Consider the installation of the application on a media which during normal client use is always write protected. In these circumstances the installation methods described above will always invoke the SPS because you cannot install the copy from a client machine over the network. Consider also the circumstances where the network cabling is utilised to load the application, but the filing system name does not begin with Net or NFS. Both these circumstances are possible due to the diversity of filing systems which are currently available under RISC OS.

An application server such as AppFS does not support any remote write operations. In these circumstances it has to be installed locally on the machine which is physically connected to the storage media. This results in the update of the Machine ID but not the Fileserver ID.

Orig Machine ID	Machine ID	Fileserver ID
HDmachine1	AppFShost	

Figure 17: Illustration of the information placed in an application, by the SPS, after installation on an AppFS Server.

When an attempt is made to run the software from a client machine the SPS will recognise that:

the software has been registered.

that it has been installed.

that it has only been installed for single machine access.

that the client machine ID is not the same as that of the machine on which it was installed.

The SPS will then issue an appropriate message. eg:

Figure 18: SPS unauthorised use warning.

Different circumstances can generate the same end result. Consider a Nexus disc sharer which is at the heart of a Nexus network. In this instance the application can only be updated from the client machine connected to port 1 of the Nexus system. When this has been completed the shared application area is write protected using the mechanical keyswitch. This would seem to overcome the problems described earlier. However, during the installation procedure the SPS will have examined the path used to update the copy. It will derive from this that the pathname does not start with Net or NFS and so will update the shell as if it were a single machine copy. When the application is run from one of the other client machines the SPS will generate the unauthorised use warning as before.

This is exactly the same for other shared solutions which have filing system names other than Net or NFS. Some common examples are given below:

AppFS	AppFS::
NetGain	NetGain::
Nexus	Nexus::

The solution is, broadly speaking, the same for all these and other, perhaps yet to be developed, filing systems which exhibit the same or similar features. It involves breaking down the application into its component parts and storing the SPS component on a different supported filing system or, if the filing system supports this, on read/write areas of the same filing system.

Appendix B: SPS flow chart

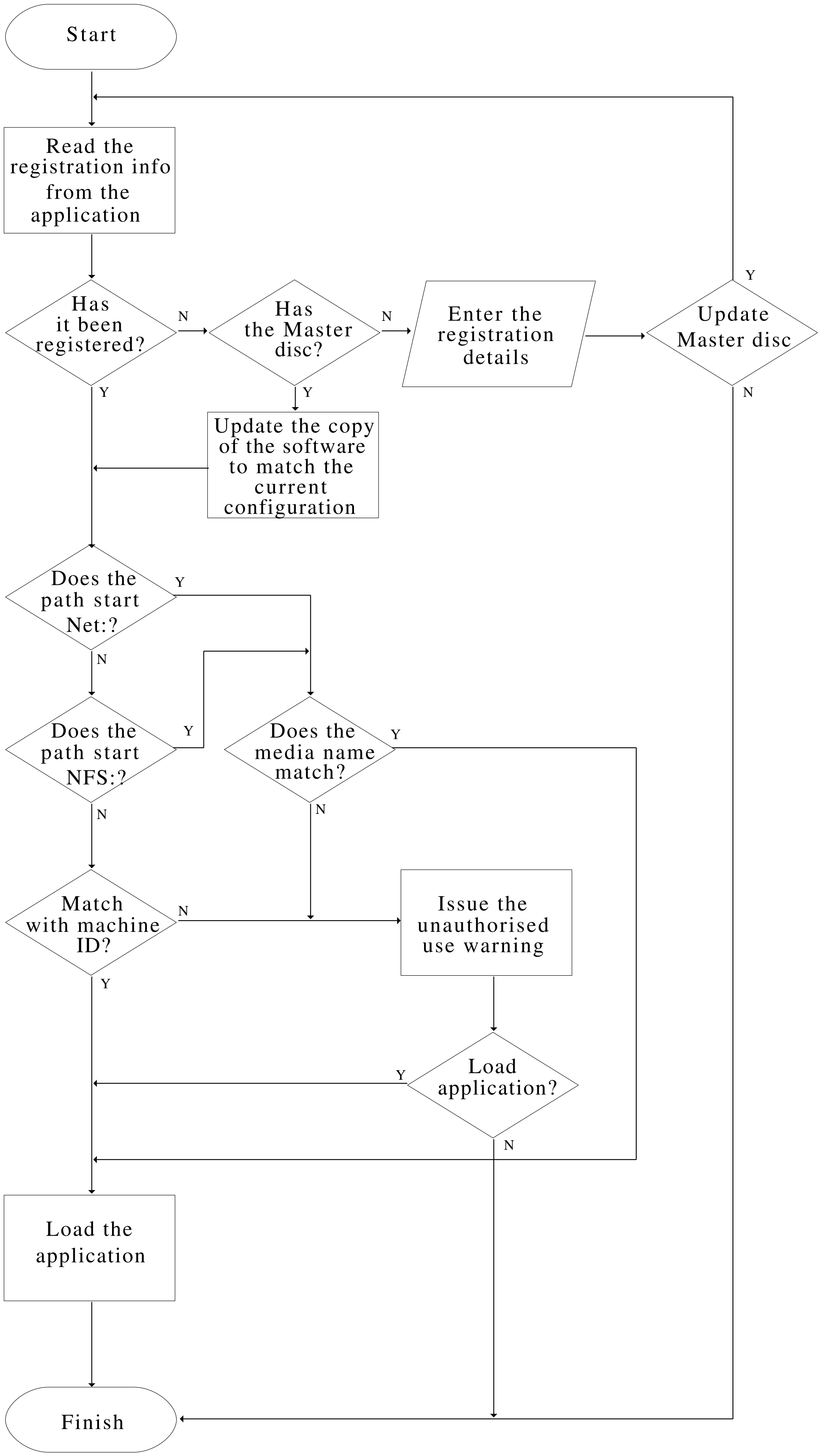


Figure 19: The flow chart for the SPS.