White Paper

The Logical Printer Concept

Axis Communications AB

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1. About This Paper

This White Paper describes and gives examples how to use the Logical Printer Concept(LPC). This concept allows system administrators to add functionality and data filters at the print server itself in a simplistic way.

2. Background

Handling printing issues in heterogeneous network environments can be a complicated task. Different Network Operating Systems (NOS) have their limited capabilities, as well as their respective printing methods and data streams. There are numerous dialects of printing methods, as well as print languages, that put high demands on a print server's ability to seamlessly handle its task. The traditional approach is to let printing functions be handled by the services provided by the NOS and the applications, letting the print server be transparent, transporting the data to the printer. Since printing capabilities and handling in some environments, such as NetWare, are fairly advanced, and in others more simplistic, a solution may very well be to centralize some functions on the print server.

3. Required Functions

The functionality short list demanded from a print system is:
- It shall work (!). Client's printouts shall come out on the printer
- Easy installation of new printers and configuration when changing the network
- Efficient use and sharing of printers
- Malfunction alert and recovery functions

Pretty obvious points, but many systems have hard living up to these. Take the first one for starters. Who can claim that PostScript and PCL jobs always have come out the way they should, and did not result in garbage printouts or a blinking error lamp on the printer? Network managers report much of their valuable time being spent on printer issues, such as distorted printouts and lost jobs.

4. Solutions

Solving printing issues in a mixed network environment can be time-consuming as they often are hard to reproduce, and may require changes of client platform software settings and server configurations across the whole network. Three main approaches can be found:
- Handle each NOS and server separately, and try to isolate dependencies. Use filters.
- Centralize printing to one NOS using software bridges.
- Use print server functionality.

This white paper discusses the role of the print server, and being a focal point for print jobs in a network, it is well suited to solve some common problems and enhance efficiency. Instead of changing applications on clients and servers, only the print server would need configuring, provided the print server has the required functionality.

5. The Logical Printer Concept

The Axis print servers have added functionality with the use of LPC, which gives the system administrator the possibility to configure the print server to handle and act upon the print data in several ways. The idea behind LPC is that certain printing problems and enhancements can be difficult and time-consuming to solve or introduce, respectively, at the system, spool or queue level, yet be simplistic at the print server level. LPC contains the following functions:

- The character set can be changed to suit the printer
- Strings can be added before and after the print data
- Strings within the print data can be substituted
- ASCII to PostScript conversion is available on a demand basis
- Redirection of print data to another printer if the printer is busy
- Hex dump mode to assist with printing problems

The network set-up of the Axis print server can be configured to either address a physical port (LPT1, LPT2 and COM1) directly, without any LPC functions activated, or instead address a Logical Printer Port (LPP). There are eight available LPPs per print server that independently can be set up to contain any combination of LPC functions (in addition to the specification of which physical port is used). The LPPs appear to the network just as any other network printers, and the system "believes" and "sees" that there are eight ports available on every Axis print server, although it may only have three, or one, physical port in reality.

The settings of a LPP is stored in the print server's own non-volatile memory, and is configured using NetPilot, Axis' configuration tool, or editing and loading the configuration file using FTP over TCP/IP. To simplify ease of installation, the configuration can be copied to other units, stored for backup on the system, and protected with user and password entries.
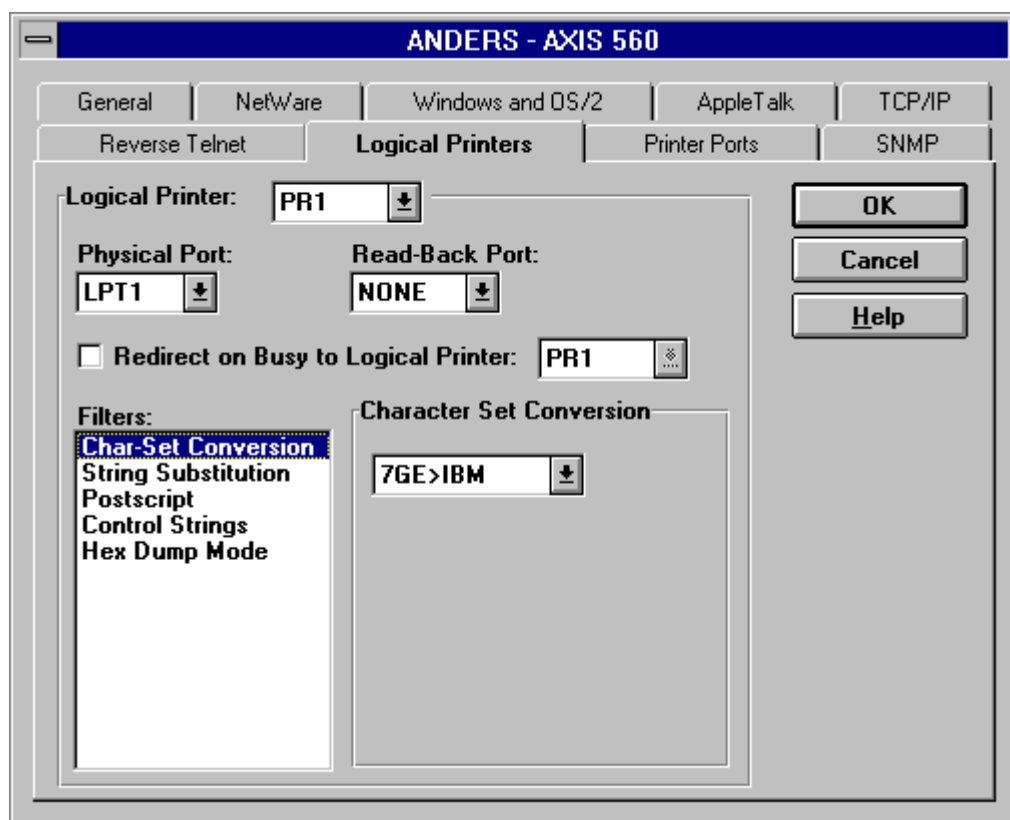
6. Examples

The following section will give some more in-depth description and practical examples of LPC use for each function

6.1 Character Set Conversion.

Printing international characters is a common nuisance. Many systems are based on 7-bit ASCII printer data streams, which when printed, may not reproduce special characters, such as the German ü and ä. This calls for either writing a filter in the spool system, or trying to change the printer's set-up, both not being the easiest or most glorious of tasks for an ambitious system administrator. When using an Axis print server, the solution is to assign a LPP, and for that port configure the LPC function to let the print server do the character set conversion. Individual characters can also be converted, which can solve specific problems with special characters to be printed. This is done using the String Substitution function, see further down the text.

6.1.1 Example

The following example shows PR1 assigned to convert 7-bit the German ASCII characters to be printed on an 8-bit (Code Page 437, 850) capable printer. From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets.

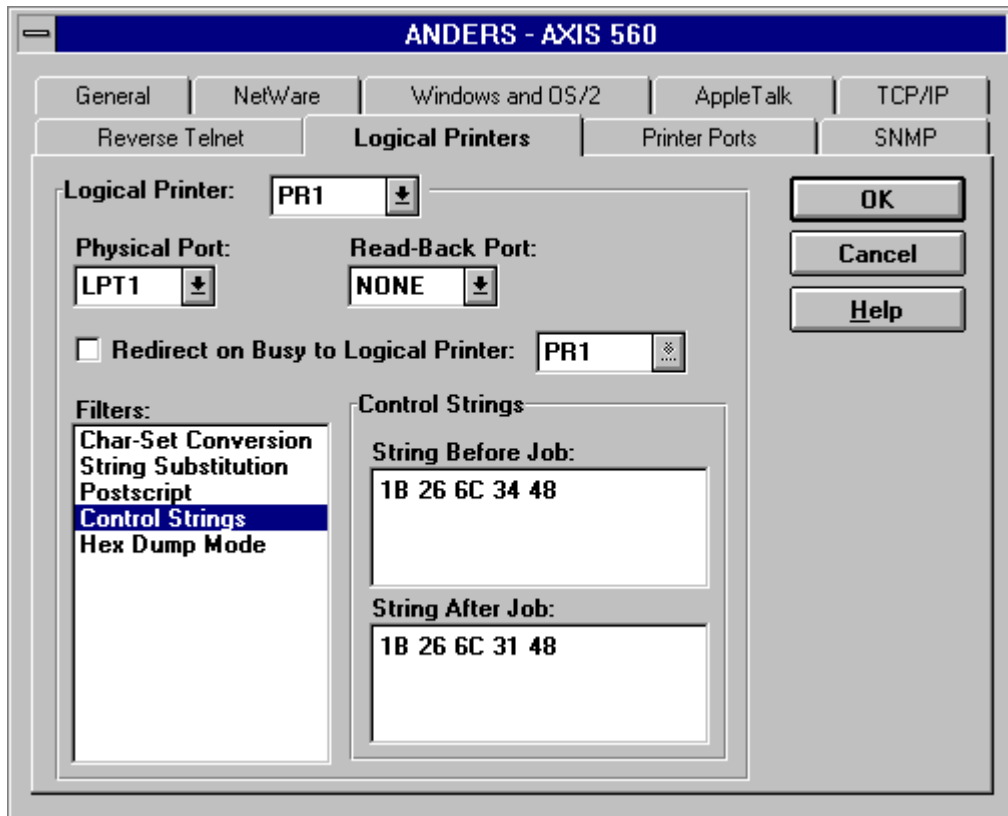In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:

```
PR1_OUT.      : LPT1
PR1_CSET.     : 7GE>IBM
```

6.2 Strings Before and After Print Jobs

Another useful function is to add command strings before and after print jobs. The typical example is to control printer language switching, with which two LPPs are addressing the same physical port, but with strings programmed to activate enter/exit PostScript/PCL. OK, many modern printers have auto-sensing capabilities, but this is almost fool-proof, as long as you have designated your PostScript network printer to one LPP and PCL to the other one (although, in practice, it is the same printer). Another common application of this function is to define selection of paper bins, different forms or tractor feeds.

6.2.1 Example

The following example shows settings for a HP LaserJet with dual input bins. The standard forms are taken from bin 1 and the preprinted forms from bin 2. LPP number 1 is used to add a string before the print job that includes commands to select bin 2 and the string after should contain commands to reset the printer to take paper from bin 1 again. From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets.

In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:
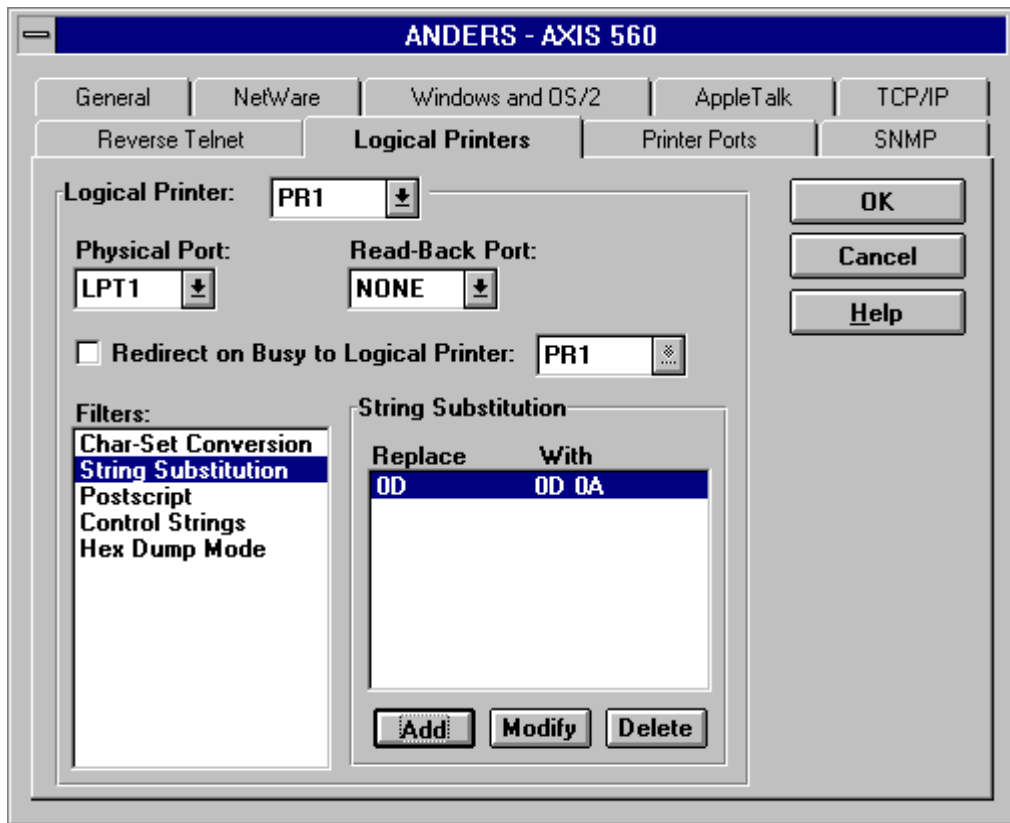
```
PR1_OUT.      : LPT1
PR1_BEF.      : 1B 26 6C 34 48
PR1_AFT.      : 1B 26 6C 31 48
```

6.3 String Substitution

This is a search and replace function. The match and replace strings are programmed into the print server, and it actively searches the matching print data, performing a substitution with the replace data when a match is found. As always, the LPC function is activated in one, or several of the LPPs. An example of use is to change the UNIX CR (Carriage Return) and replace it with a CR+LF (line feed).

6.3.1 Example

The following example shows the settings to replace 0D with 0D 0A. From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets.

In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:

```
PR1_STR.      : 01 0D 02 0D 0A
```
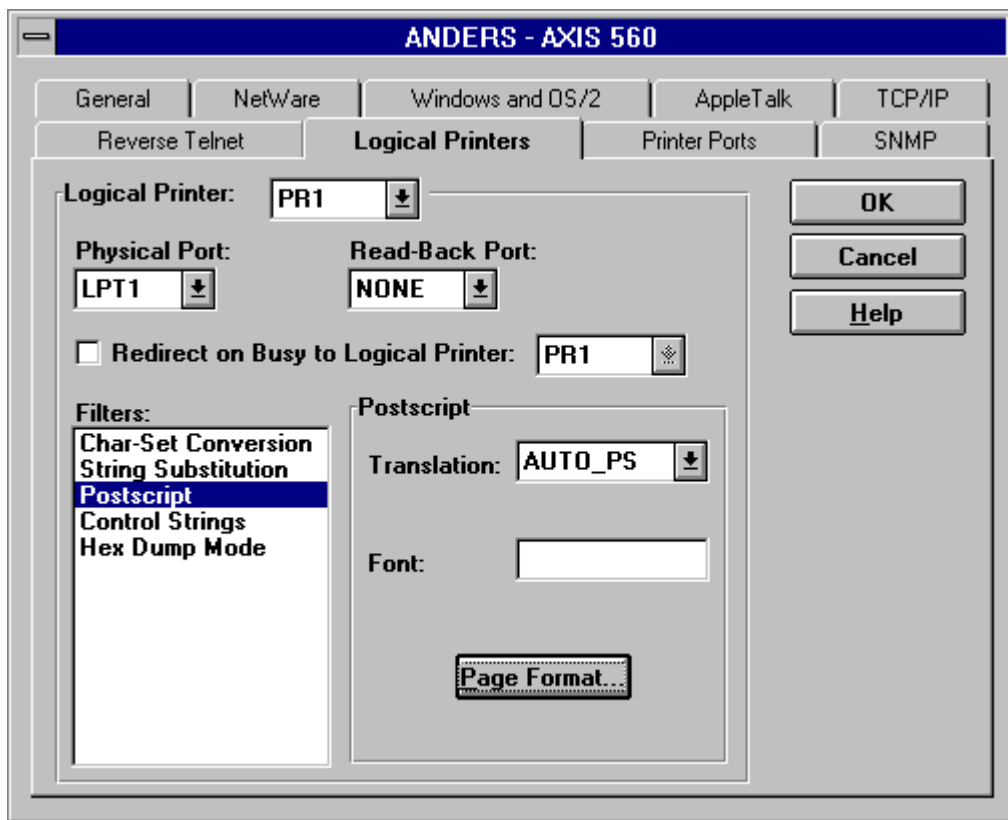
"01" is the length of the string to search for and "0D" is the hexadecimal value for the string to find. Similarly, "02" is the length of the replacement string and "0D 0A" is the replacement string.

6.4 ASCII to PostScript Conversion

This allows line printer data to be printed on a PostScript printer. In principle, PostScript data is added to every job to allow the PostScript printer to recognize and print the data. The application example is pretty obvious, program one LPP to have the filter activated and use that port for screen dumps or simple ASCII data. The LPC has "created" two printers out of one. The PostScript conversion can be set to be fixed, or auto-sensing, passing PostScript jobs through.

6.4.1 Example

This example shows PR1 configured to be able to print ASCII data on a PostScript printer, formatted on Letter size paper, with 66 lines, no line break, 10.0 CPI, 6.0 lpi, top margin 30/100", and left margin 50/100". From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets.

The paper size and other settings are made in a similar way after pressing the Page Format... button.

In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:
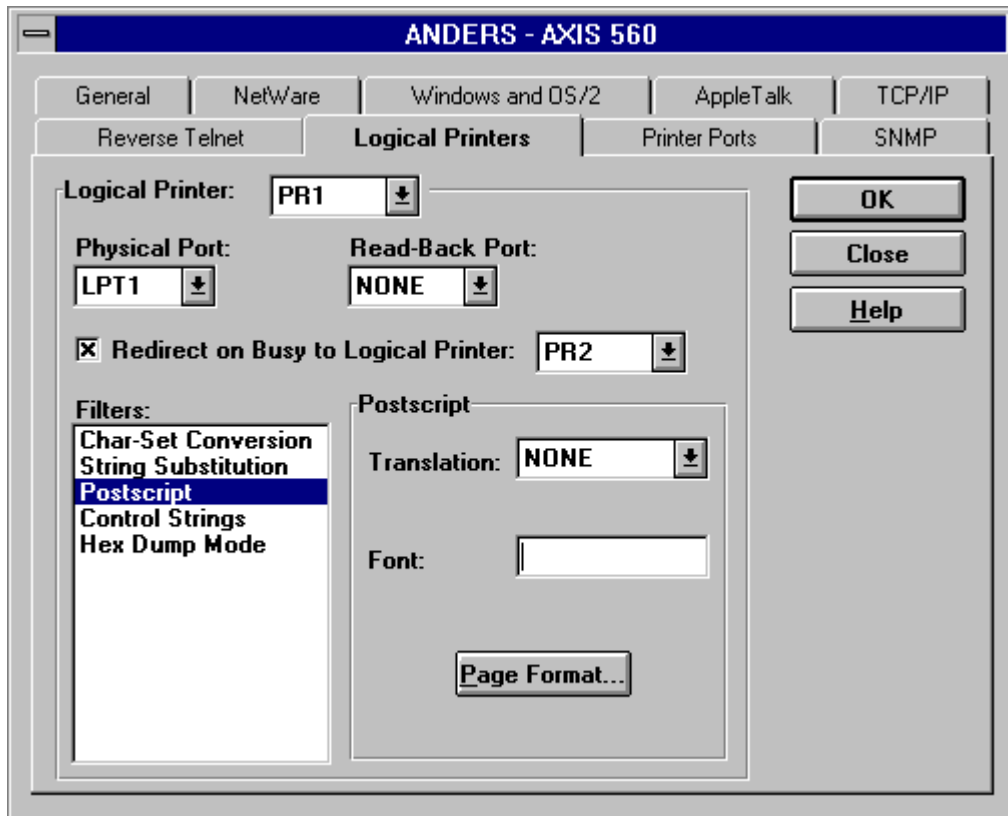
```
PR1_FILT.     : AUTO_PS
PR1_SIZE.     : LETTER
PR1_ORNT.     : PORTR
PR1_FORM.     : 66 0 100 60 30 50
```

6.5 Redirection of Print Data

When a job is initiated, and the designated printer port is occupied by another job or just busy, the LPC function can redirect the job to another port. The typical application is when there are time-critical print jobs that need to be printed, with two printers connected. The function can then balance the printing between the printers, achieving a higher throughput. One of the printers, can for instance be a lot faster than the other. Another good example is to redirect as a printer gets out of paper or jams. Some NOSes have this kind of redirection built-in.

6.5.1 Example

This example shows how to configure a LPP, in this case PR1, to send print jobs to another LPP, in this case PR2, if PR1 is busy. From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets. As shown in the snap-shot below, the PR1 uses the LPT1 printer port on the print server and if PR1 is busy the print job is automatically re-directed to PR2 which uses LPT2. (This is not visible in the snap-shot below. To check it, one has to choose PR2 in the "Logical Printer:" box and check the "Physical Port:" box..)

In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:

```
PR1_OUT.      : LPT1
PR1_SCND.     : PR2
PR1_WAIT.     : NO
PR2_OUT.      : LPT2
```
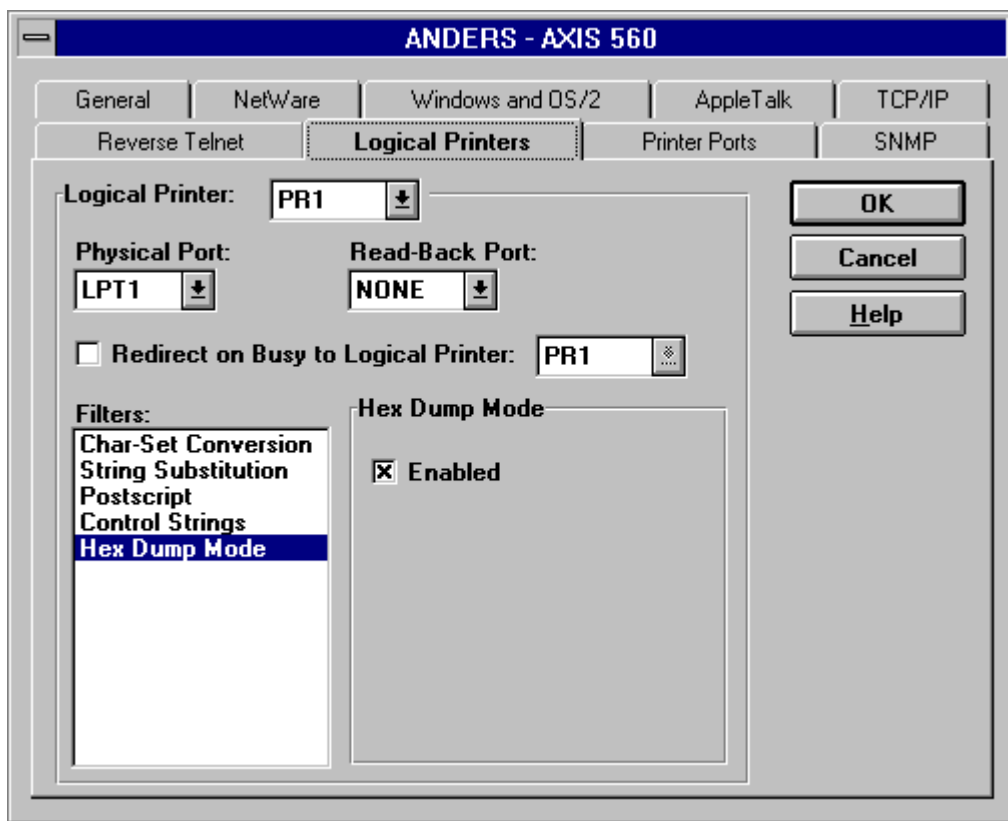
6.6 Hex Dump Mode

This is a diagnostic tool. Instead of printing the data as it is received, it is converted into hexadecimal representation of each byte which then is printed, revealing all data sent to the printer in a readable format. Application examples can be to find and trace the cause for unprintable data generated by the network print system, or tuning of printer commands. It is an alternative to using line tracing equipment, but with the difference that here you can more easily see what actually is sent to the printer (which could include other activated LPC functions).

6.6.1 Example

This example shows the setting for Hex Dump Mode for PR1 and the printed results. Assume the following text is printed to PR1: "Hello" <CR LF>
Using the PC (850) ASCII symbol set, it will be printed as: 48 64 6C 6C 6F 0D 0A. From a Windows platform it is easiest to do the configuration in the NetPilot's property sheets.

In a Unix system an alternative way is to upload the Configuration File with FTP and change following parameters:

```
PR1_OUT.      : LPT1
PR1_DUMP.     : YES
```

7. Summary

The LPC introduces a set of simple, yet powerful filters that can be used to solve printing issues that would involve network configurations on a much bigger scale. LPC has proved to be especially valuable for larger organizations with growing, mixed networks, typically incorporating Unix, NetWare and Windows NT, and use of several types of printers.

LPC is available in Axis' whole range of print servers, except for the AXIS 150 Workgroup Print Server. In addition, the LPC can not be used with the NetWare protocol in print servers supporting NetWare Directory Services (NDS).

8. Corporate Information

Axis Communications is a global network peripherals company with a print and CD-ROM server product line. Axis has its headquarters in Lund, Sweden, is represented in over 60 countries, was founded in 1984, has 120 employees, and a revenue of 34 MUSD and profits of 7 MUSD (1994/95).

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