How to Print SAS/Graph Output from MVS on Printers Connected to a LAN Using TCP/IP

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ABSTRACT

The objective of this paper is to demonstrate how sites that have SAS/Graph only on a mainframe platform without a high resolution graphics printer can print SAS/Graph output by using TCP/IP to route the output to postscript printers connected to a LAN.

The paper will demonstrate how the CSU Chancellor's Office prints SAS/Graph output to various postscript printers on an Apple Talk network from an IBM 4381 MVS/ESA system via a VAX 6230 and via the LPR capability of TCP/IP. Coding of the appropriate SAS/Graph options to create postscript output, the use of the LPR command, and the setting up of the print capture files on the IBM and VAX systems will be discussed.

INTRODUCTION

The CSU Chancellor's Office SAS software products are available to users only on an IBM MVS/ESA platform. The MVS/ESA system is accessed via Apple Macintosh and PowerBook computers running TCP/IP software that emulates a 3270 terminal (tn3270 from Brown University and TCP Connect II). TCP/IP connectivity is established to the desktop via AppleTalk and/or Ethernet connections.

The terminal emulation software allows users to successfully generate high quality SAS/Graph output. However, there are no printers directly connected to the MVS/ESA system that are capable of printing the SAS/Graph output.

To solve this problem, TCP/IP has been used to direct SAS/Graph output generated on the MVS/ESA system to postscript printers connected to our LAN via a VAX 6230.

SETTING UP THE USER ENVIRONMENT

The user environment on the MVS/ESA platform is established via the creation of SAS AUTOEXEC files for each user and via a customized clist to invoke SAS.

AUTOEXEC File

The user's AUTOEXEC file is first created and can be used to perform various tasks such as to execute libname commands and to invoke SAS/Assist. The following is an example of an AUTOEXEC file :

userid.SAS.AUTOEXEC

```
libname mat 'wasd.mat.cc.sasdata';
dm 'assist' assist;
```

ISPF Profile

Next, the user's ISPF profile INIT member is modified to allocate the SAS AUTOEXEC file when the user logs on. The following is an example :

userid.ISPF.ISPPROF(INIT)

```
ALLOC FI(SASEXEC)
DA('USERID.SAS.AUTOEXEC') SHR
```

Modified CLIST

A modified clist is required to invoke SAS for the tn3270 environment and to establish the proper setting for the FSDEVICE and DEVICE options for the SAS session. The CLIST on our system is invoked from TSO as follows :

```
READY
        SAS3179
```

The following messages are then displayed in the SAS log :

```
NOTE: AUTOEXEC processing beginning; file is
AOSGMML.SAS.AUTOEXEC.

NOTE: SAS system options specified are:
      FSDEVICE=EM3179
      DEVICE=IBM3179

NOTE: The initialization phase used 1.22 CPU seconds and
2751K.

NOTE: Libref MAT was successfully assigned as follows:
      Engine:      V608
      PhysicalName: WASD.MAT.CC.SASDATA
```

SAS/GRAPH PARAMETERS

The terminal emulation programs being used are configured to emulate IBM 3179G graphics mode and the clist invokes SAS in this mode.

Displaying SAS/Graph Output

To display SAS/Graph output on the Mac as an IBM3179G Graphics Terminal the following parameters are used :

```
device=IBM3179
ctext=yellow          (default)
axis1 color=yellow    (default)
axis2 color=yellow    (default)
```

LASER II NT (non-color)

Use the following SAS/Graph parameters to print to a postscript printer, such as a Laser II NT :

```
filename aisout '.scsug.ais.sasgraph';
                (file to receive postscript output)
device=ps                   (postscript output)
gprotocol=sasgpasc          (ascii output)
gsfname=aisout        (points to filename for ps output)
gsfmode=replace
gsflen=80
ctext=black         (defaults to yellow)
ftext=swiss         (better choice then default)
rotate=landscape
axis1     color=black       (defaults to yellow)
axis2     color=black       (defaults to yellow)
```

From TSO route to the printer via TCP/IP LPR as follows :

```
lprset ais@filly
lpr scsug.ais.sasgraph (binary type filter l
```

Seiko Color Printer

Use the following SAS/Graph parameters to print to a Seiko Color Printer :

```
filename cpout '.scsug.cp.sasgraph';
                (file to receive postscript output)
device=ch5504       (Seiko driver)
target=ch5504       (allows viewing wysiwyg)
gprotocol=sasgpasc  (ascii output)
gsfname=cpout       (points to filename for ps output)
gsfmode=replace
gsflen=80
rotate=landscape
axis1  color=black    (defaults to yellow)
axis2    color=black  (defaults to yellow)
```

Invoke the window GRAPH1 to view the wysiwyg version of the graph created via the target option **BEFORE** routing to the printer.

From TSO route to the printer via TCP/IP LPR as follows :

```
lprset sara$cp@filly
lpr scsug.cp.sasgraph (binary type filter l
```

PRINTCAP FILES

TCP/IP printcap files must be set up on each computer to facilitate the routing of the LPR remote output files.

MVS Printcap File Entries

The MVS TCP/IP printcap file entries are located in the LPD configuration file as shown below :

```
;TCPIP.LPD.CONFIG - LPD Configuration

;LPR (Line Printer Remote) Entries

; These statements define a SERVICE
; called REMOTE, which
; provides access to the printing queues
;  on another system.
```

```
SERVICE AIS PRINTER
REMOTE
LASER2$AIS@FILLY.CALSTATE.EDU
FILTERS F P R

SERVICE CP PRINTER
REMOTE
SARA$CP@FILLY.CALSTATE.EDU
FILTERS F P R
```

VAX Printcap File Entries

The VAX TCP/IP printcap file entries are shown below :

```
printer ais$laser-
        /queue=LASER2$AIS-
        /name="AIS Apple LaserWriter II NT"-

/spooldir=twg$tcp:[netdist.lpd.spool.aislaser]
printer ais$laser /filetype=f-
        /1="TEXT"
printer ais$laser /filetype=1-
        /1="POSTSCRIPT"

printer sara$cp-
        /queue=SEIKO$SARA_P-
        /name="SARA Color Print (Paper)"-

/spooldir=twg$tcp:[netdist.lpd.spool.saracp]
printer sara$cp /filetype=f-
        /1="TEXT"
printer sara$cp /filetype=1-
        /1="POSTSCRIPT"
```

TCP/IP AND THE NETWORK

TCP/IP Version 2 runs on the MVS/ESA system. The lprset command designates the current queue to route the LPR output.

The MVS file containing the postscript output is then routed to the LPR queue on the VAX.

Woolongong TCP/IP running on the VAX then routes the output to a queue managed by DEC Pathworks.

DEC Pathworks finally routes the file to the appropriate printer on the AppleTalk network.

A diagram of the TCP/IP and network components can be found in Appendix A.

ACKNOWLEDGEMENTS

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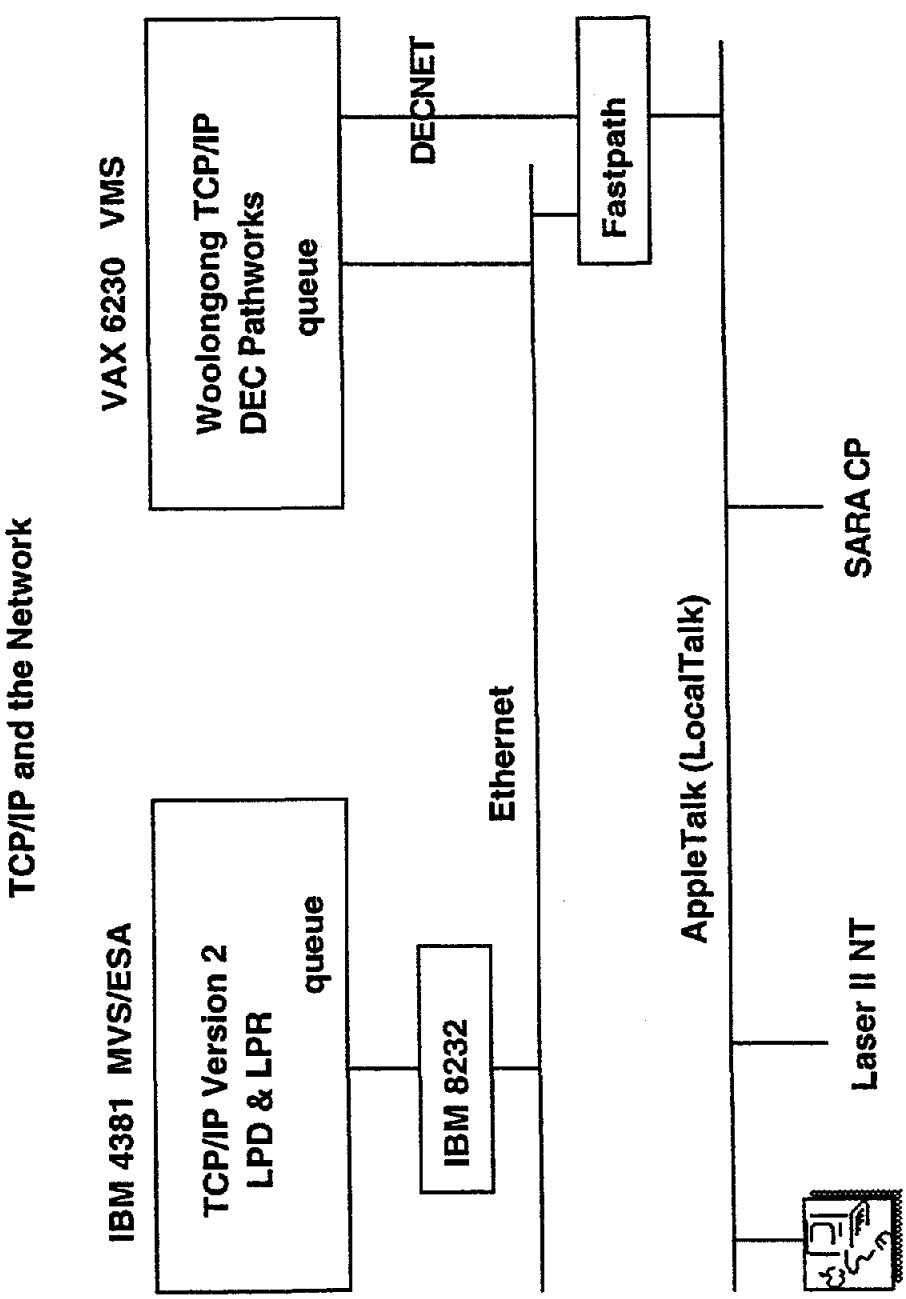
Appendix A


TCP/IP and the Network
IBM 4381 MVS/ESA
TCP/IP Version 2
LPD & LPR
queue
IBM 8232
Ethernet
VAX 6230 VMS
Woolongong TCP/IP
DEC Pathworks
queue
DECNET
Fastpath
AppleTalk (LocalTalk)
SARA CP
Laser II NT