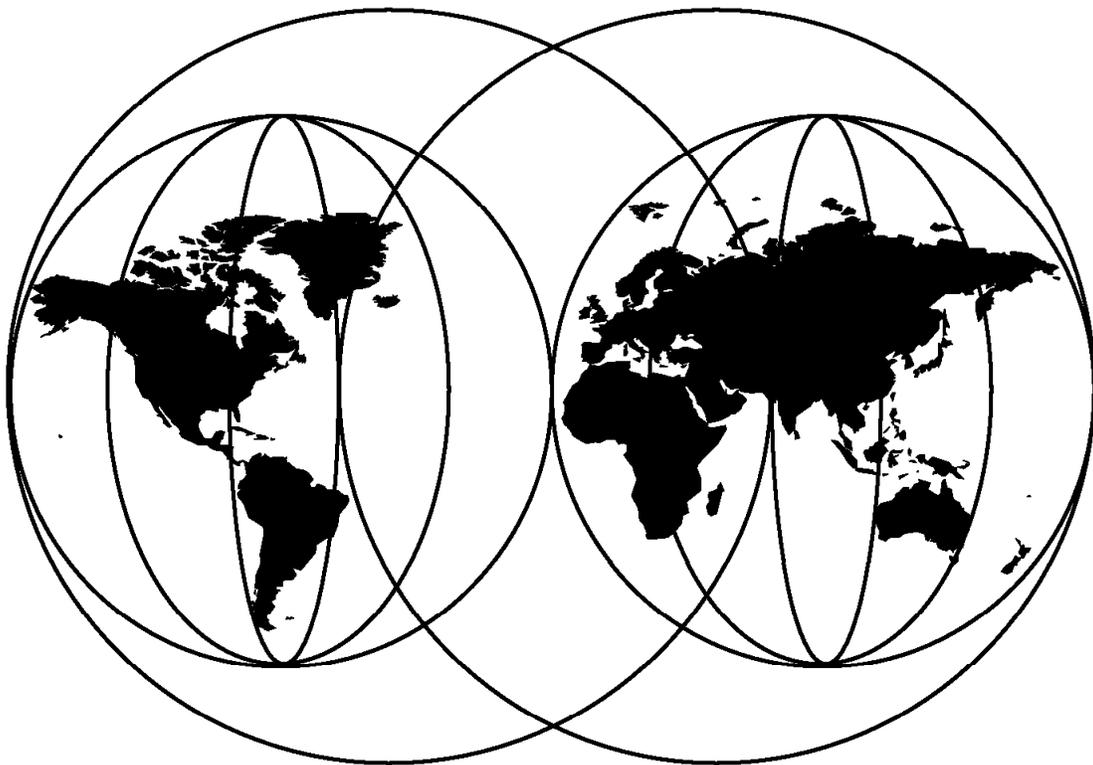


OS/390 V2R6 AD CD-ROM Guide

Bill Ogden



International Technical Support Organization

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International Technical Support Organization

SG24-5435-00

OS/390 V2R6 AD CD-ROM Guide

December 1998

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix A, "Special Notices" on page 59.

First Edition (December 1998)

This edition applies to V2R6 of OS/390.

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Preface

The OS/390 Application Development CD-ROM system is widely used by IBM's S/390 Partners-In-Development, Business Partners, and others. The AD CD-ROM is a complete, ready-to-use OS/390 system, and contains a substantial number of products in addition to base OS/390.

OS/390 (including products packages with it) changes with each release, and this is reflected in the AD CD-ROM. Initial customization, performed when the AD CD-ROM is being built, also changes somewhat with each release. These release-to-release changes can be confusing for many users. This document describes some of the setup and customization performed for the OS/390 AD CD-ROM V2R6 system, and is intended to reduce the time needed for users to become familiar with this release.

This document discusses TCP/IP setup at some length, with emphasis on P/390 systems.

The Author

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We thank the following people for their contributions to this project:

- Karen Miller - IBM Customized Solutions (Poughkeepsie)
- Reza Kaffashan - IBM Partners-In-Development (Poughkeepsie)
- Kathryn Arrell - International Technical Support Organization
- Jim Nichols - IBM Partners-In-Development (Poughkeepsie)
- Doris Conti - IBM S/390 Division (Poughkeepsie)
- Rich Conway - International Technical Support Organization
- Carmine Castaldo - R/390 Development (Poughkeepsie)
- Bob Haimowitz - International Technical Support Organization

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Chapter 1. AD CD-ROM V2R6 Overview

This chapter provides an overview of key elements of the OS/390 V2R6 Application Development (AD) CD-ROM system. This information is intended for planning and for orientation when moving from a previous release to this new release. This material was written before the final version of the AD CD-ROM system was produced and some of the minor details may vary in the released version.

1.1 EB1.Volume and Space Planning

Volumes provided for the V2R6 system are:

North America VOLSER	Other Areas VOLSER	Device	Cylinders	GB	Free Tracks
OS39R6	WT39R6	3390-3	3339	2.8 GB	13,800
OS3R6A	WT3R6A	3390	2200	1.9 GB	2,000
OS39H6	WT39H6	3380	1500	1.0 GB	2,500
SCPMV5	SCPMV5	3380	1770	1.2 GB	7,500
OS39D6	WT39D6	3390-3	3339	2.8 GB	little
OS39SV	WT39SV	3390	800	.7 GB	
HFSUS1	HFSUS1	3380	200	.15GB	700
P390DX	P390DX	3390-3	3339	2.8 GB	3,600

There are two versions of the AD CD-ROM: the North American version and the *World Trade* version. The difference is in the encryption products that are included. The North American version handles the higher levels of encryption (56-bit DES, TDES, longer public keys, etc), while the World Trade version uses CDMF (a compatible DES with 40 bits of security). For all practical purposes, the usage characteristics and interfaces of the two versions are the same. Different volsers are needed so that both versions can be built on the same driving system, at the same time.¹

Using the North American volsers, these volumes contain:

- **OS39R6** is the IPL volume and contains the majority of the static OS/390 data sets. It uses a full 3390-3 volume. There is considerable free space on this volume. If you elect to use this space for your data sets, you may create a migration problem for your next release. (Do you have enough server disk space to have this volume plus all the next release volumes online?)
- **OS3R6A** is an overflow volume for OS39R6, and contains more static OS/390 data sets. It has been trimmed to an "odd" size to conserve space on P/390 and similar systems. This is a required volume for any IPL.
- **OS39H6** contains all the system-provided HFS data sets. Note that these are now in the root file system, in contrast to earlier releases where system-provided HFS contents were spread over multiple file systems. This volume has been trimmed to 1500 cylinders of 3380 space to conserve total disk space. Note that this file system will not normally contain /u files. Although it is possible to run this release with OMVS functions, and no HFS,

¹ This requirement to build two versions of every AD CD-ROM is one of the (many) reasons for the delay between a new release of OS/390 and the corresponding AD CD-ROM.

it is not very practical; for practical purposes, this is a required volume for any IPL.

- **SCPMV5** contains most of the dynamic OS/390 data sets, such as spool, paging, catalogs, PARMLIBs, and so forth. This volume is normally mounted as a STORAGE volume and a reasonable amount of free space is needed for temporary data sets used during normal system operation. A double-density 3380 volume is used. *Please note that future releases may use a 3390 volume instead.* This volume is required for any IPL. In our early version, there were about 7500 tracks free on this volume. This is the only STORAGE volume in the distributed volume set, and tends to accumulate user data sets. You should monitor the available space on this volume or, better yet, allocate at least one local volume with the STORAGE attribute. (This attribute is set in a VATLST00 member in PARMLIB.)
- **OS39SV** contains (1) COBOL for S/390 compiler and libraries, and (2) all the service shipped with the ServerPac that was used to build this AD CD-ROM. This volume is *not* required for IPL, and we expect many users may elect not to restore this volume if they are short on disk space. You may temporarily need it if you are forced to apply some of the PTFs it contains.
- **HFSUS1** is a new volume that contains an empty HFS file system. This file system is mounted as /u, and would probably be used for much of your local OE files. The size is arbitrary, at 500 cylinders of 3380 space. This volume is not required for an IPL, although you may need to remove its MOUNT command from the BPXPRM00 PARMLIB member.
- **OS39D6** contains the system DLIBs. This volume is not required for IPL. You will need it if you apply PTFs. There is relatively little free space on this volume. This has the potential for problems if you install additional products or try to apply large volumes of fixes.
- **P390DX** contains CICS, DB2, and IMS modules. This volume is not required to IPL.

If you use only OS39R6, OS3R6A, SCPMV5, and OS39H6 you will need about 7 GB disk space for a P/390 or R/390 system -- assuming that there is no loss due to hard disk boundaries.²

Several of the IBM-provided volumes have considerable amounts of free space. Should you use this space? The considerations involved are:

1. Do you plan to apply maintenance (that is, PTFs) or install additional OS/390 products? If so, you will need some of the free space on the system volumes. Discussions with many AD CD-ROM users indicate that most do not routinely install PTFs or add additional OS/390 products. (This does not preclude the installation of a small number of PTFs that address a specific problem.) If you do not plan to install PTFs/products, we suggest that you keep a few cylinders, perhaps 10 - 20, free on these volumes³, and use the remaining free space if appropriate.

² If all your space appears as a single large disk (typical RAID 5 or LVM setup) this is the space required. If you are using discrete disks (not RAID 5 or LVM) then each volume must be completely contained on one disk.

³ This space is most likely to be used in obtaining additional extents for existing system data sets if the data sets are expanded by PTFs or by simple edit/save activity. If your space is very tight, you might compress any PDSs that you update. A PTF might allocate a new data set, for which you would need space, but few PTFs do this.

2. All volumes, except SCPMV5 and HFSUS1, will be replaced by newer releases of the AD CD-ROM system. Any data sets you place on OS39R6, OS3R6A, OS39D6, OS39H6, OS39SV, or P390DX might be lost when you install a new release. We say *might* because you can easily retain these volumes⁴ after installing a new release if you have sufficient disk space on your server. The typical P/390 system probably does not have sufficient disk space to hold an old release of OS/390, a new release, and local volumes.
3. If you use the migration process provided with the AD CD-ROM system⁵, your SCPMV5 volume will be retained when you install a new release. Thus, any data sets you place there will be retained. However, please note that SCPMV5 is the only *STORAGE* or *PUBLIC* volume⁶ provided with the AD CD-ROM system. (You can create new volumes and mount them as *STORAGE* or *PUBLIC* (via the VATLSTxx member in PARMLIB), but this is not done automatically.) You should ensure that there is *at least*, say, 100 cylinders free on SCPMV5 if there are no other *STORAGE/PUBLIC* volumes. If you do not use the migration process, or your own equivalent, then SCPMV5 will be replaced when you install a new release of OS/390 and any data left there will be lost.
4. We suggest that you do not place your MVS data sets on OS39H6 or HFSUS1. These are DFSMS-managed volumes, created to hold HFS data. You will need to learn to work with DFSMS controls and procedures if you use these volumes for non-HFS data sets. Unless you have a specific need to use DFSMS functions, we suggest that it is an additional complexity that you can avoid.
5. For HFS files, you can place your data on HFSUS1. Although this volume is provided on the AD CD-ROMs, it contains no files. It is intended for your files, provided your files are in the /u path. That is, the HFS on HFSUS1 is mounted at mount point /u in the root file system. You can change this by altering the BPXPRMxx member in PARMLIB. When the next release of the AD CD-ROM arrives, you would not install the HFSUS1 volume -- you would retain your current HFSUS1 volume.
6. We suggest you create your own emulated 3380 or 3390 volumes for your data, plus at least one volume for *STORAGE/PUBLIC* usage. Unless you are very constrained for server disk space, using the free space on the system volumes (instead of allocating your own additional volumes) is likely to lead to problems when you move to a new release. The author usually creates one or two 300-cylinder 3390 volumes for data sets, and retains these volumes across new releases of OS/390. (The local process is to completely replace the old release and then recatalog the data sets on the local volumes.)
7. If you understand these considerations and still want to use the free space on the system volumes, then use the space. There are no hidden OS/390 functions that will be disturbed.

⁴ You would need to assign new volume serials to OS39SV and P390DX if you install a new release that includes replacements for these volumes.

⁵ Informal surveys indicate that relatively few installations use this process.

⁶ These volumes are used for temporary data sets, such as compiler work areas, ISPF logs, and so forth.

1.1.1 DFSMS Definitions and Planning

The DFSMS control data sets are:

SCDS = SYS1.SCDS
ACDS = SYS1.ACDS
COMMDS = SYS1.COMMDS

System Name = P390

The following DFSMS classes and ACS routines have been added to the AD CD-ROM system:

TYPE	NAME
Management Class	DEFAULT
Data Class	--none--
Storage Class	DEFAULT
Storage Group	DEFAULT

The corresponding ACS routines are in SYS1.P390.CNTL with member names starting ACSxxx. Note that the name DEFAULT was chosen; it does not imply a default action. The ACS routines do nothing except assign the name DEFAULT to their appropriate DFSMS variable.

DFSMS function are appropriate for large installations, with hundreds or thousands of DASD volumes. P/390 and R/390 users do not need these functions and normally ignore DFSMS to the extent possible. One area that cannot be ignored is that volumes containing HFS files *must* reside on DFSMS-managed volumes. Two such volumes are provided with the current system: OS39H6 and HFSUS1.

If you want to create your own volumes for HFS files, you must make them DFSMS-managed. The most basic way to do this involves:

1. Indicating that they are managed when you initialize them with ICKDSF, and
2. Adding the new volsers to a DFSMS Storage Group list.

Unfortunately, changing a storage group list requires a number of steps to modify a source control file and then create a new active control file for SMS. One way to bypass these details is to use a volser that is already defined in the DEFAULT Storage Group. Fortunately, the definitions in the Storage Group have not been cleaned up, to remove old volsers from previous AD CD-ROM lists. Our system had volsers OS39H1, OS39H2, OS39H3, and so forth defined. You can simply create a new volume (3380 or 3390, remembering to use the "managed" option when you initialize the volume) using one of these volsers and you will not need to change anything in DFSMS.

You should verify what volsers are defined in the DEFAULT Storage Group for your system. To do this, use the following ISPF steps:

```

- ISPF primary menu
M Select the More option
  2 Select ISMF
    0 ISMF Profile
      0 User Mode Selection
        Set User Mode = 2 (Storage Administrator)
        PF3
      PF3
    6 Storage Group
      CDS Name = 'ACTIVE'
      Storage Group Name = 'DEFAULT' or '*'
      Enter
        In the Storage Group List, in the Line Operation field
        of the DEFAULT group, enter 'LISTVOL' (without the quotes).
        Press Enter.
        You should obtain a list of all volsers that are already
        members of this Storage Group.

```

1.2 Catalogs

The following catalogs exist on the indicated volumes:

VOLSER	CATALOG NAME
SCPMV5	OS390.MASTER.CATALOG
OS3R6A	USERCAT.S390PROD
OS39D6	USERCAT.S390DLIB
OS39SV	USERCAT.S390CUST
P390DX	USERCAT.P390DX

In addition to many data set entries, the master catalog contains a large number of aliases pointing to other catalogs. The aliases are:

```

Target = USERCAT.S390DLIB
Aliases = DLIB

```

```

Target = USERCAT.S390CUST
Aliases = CUSTOM

```

```

Target = USERCAT.P390DX
Aliases = CICS, DGO, DSN510, IMS, IMSRLM61, OS39D6AD, QMF

```

```

Target = USERCAT.S390PROD
Aliases = ABJ, ADSM, ANF, AOP, API, APX, ASMA, ASMT, ASU, BFS, CBC,
          CEE, CPAC, CSF, DCE, DFS, DIT, ECN, EDC, EDF, EHW, EJS,
          EDY, EPH, EQAW, WUV, EWX, EZM, FFST, FIREWALL, GDDM,
          GIM, GLD, HFS, ICA, ICQ, IEL, IGY, IMW, IOA, IOE, ISP,
          JAVA, LDAP, MQM, MVS NFS, NETVIEW, NPM, OS39R6AD, PLI,
          PSF, REXX, SCRIPT, SOMMVS, SYSMVIEW, TCP/IP, TME10GEM

```

Note that there are no aliases for the defined TSO userids. This means that any datasets cataloged under TSO will be cataloged in the master catalog. ISPF profile data sets do not exist for all the defined userids; they are created when the userid is first used. By default, they will be placed on SCPMV5, since it is

the only STORAGE volume in the distributed AD CD-ROM system. If you plan to use aliases to place TSO user data sets in a user catalog, you should do this before using any of the userids (otherwise you will need to uncatalog the ISPF profile data sets before you can create the alias).

1.3 IPL Parameters

This release provides six IPL parameters. (These are usually entered in the IPLPARAM field in the F4 display of a P/390 or R/390 system. The complete field is normally 0122xx, where xx is one of the following parameters and 0122 is the address of the PARMLIB volume.) The parameters are:

- **CS** performs a CLPA function (without DB2 or IMS modules) and cold starts JES2.
- **WS** uses the existing PLPA and warm starts JES2.
- **DI** performs a CLPA function (including DB2 and IMS modules) and cold starts JES2.
- **DB** uses the existing PLPA (which should have been created by using a DI IPL), and starts DB2. JES2 is warm started.
- **DC** uses the existing PLPA (which should have been created by using a DI IPL) and starts DB2. JES2 is cold started.
- **00** is not normally used. It does not concatenate the second PARMLIB; it uses the existing PLPA and warm starts JES2. DB2 functions are not started.

Several other IPLPARAM members exist (with suffix values 01, 03, 04, 05, 06, 10, NUCLIST00); you should ignore these. They are leftovers from the building and test process. Member SAMPLE contains useful comments.

Two parameter libraries are used: SYS1.ADCD06.PARMLIB and SYS1.PARMLIB. Except for the "00" IPLPARAM option, SYS1.ADCD06.PARMLIB is always searched before SYS1.PARMLIB. If the target member is found in SYS1.ADCD06.PARMLIB, then SYS1.PARMLIB is not searched for the member.

The current arrangement uses "00"-suffix PARMLIB members for almost all functions. Where 00-suffix PARMLIB members are not used, the suffix corresponds to one of the IPLPARAM values (usually DB) and the member is taken from SYS1.ADCD06.PARMLIB.⁷

For an IPL using the IPLPARAM selection CS, parmlib members were taken from the following sources, in the order they were used:

⁷ The only exceptions are CTIJESxx members that are taken from SYS1.PARMLIB.

```

+-----Taken from SYS1.ADCD06.PARMLIB
|
| +-----Taken from SYS1.PARMLIB
| |
| | +---Various members used, depending on
| | | the IPLPARM

```

MEMBER	A	S	V	Purpose.....
IEASYM00	A			Establish system symbols
IEASYS00	A			System parameters
IEASYS00	A		V	Override the IEASYS00 parameters
IEASVCO0	A			Define local SVCs
PROG00	A		V	Authorized libs and LNKLST
LPALST00	A		V	List data sets in link pack area
IEAPAK00		S		LPA pack list
IEAFIX00		S		Fixed LPA list
IEALPA00		S		Modified LPA list
DIAG00		S		Storage tracking
IEAOPT00		S		SRM controls
IEAICS00	A			More SRM controls
IEAIPS00		S		Yet more SRM controls
IEAABD00	A			SYSABEND dump controls
IEADMP00		S		SYSUDUMP dump controls
IEADMRO0		S		SYSMDUMP dump controls
CLOCK00	A			Clock offset from GMT and Sysplex clock
COUPLE00	A		V	Sysplex coupling controls
CTIXCF00		S		Component trace for XCF
CTIXES00		S		Component trace for XES
CTIGRS00		S		Component trace for GRS
IGDSMS00		S		SMS definitions
CTISMS00		S		Component trace for SMS
IFAPRD00	A			Licensed product control
CONSOL00		S		MVS console definitions
CTIOPS00		S		Component trace
IEACMD00	A			Commands for IPCS and SLIP
COMMNDCS	A		V	Automatic commands at IPL time
MSTJCL00	A			Source of master JCL
SCHED00	A			PPT (Program Properties Table)
IECIOS00		S		Missing interrupt handler controls
VATLST00	A			Volume usage attributes
BPXPRM00	A			OMVS parameters
IKJTS000	A			TCAS and TSO parameters
PFKTAB00		S		Master console PFK setup
SMFPRM00		S		SMF recording controls
IEFSSN00	A		V	Subsystem startup
IEASLP00	A			SLIP automatic commands
ADYSET00		S		Dump suppression (DAE) controls
MPFLST00	A			Message Suppression
CTIPBX00	A			Component trace for OMVS
CTILOG00	A			Component trace for Logger
CTIJES01		S		Component trace for JES2
CTIJES02		S		Component trace for JES2
CTIJES03		S		Component trace for JES2
JES2PARM	A			JES2 parameters
CTIJES04		S		Component trace for JES2
IVTPRM00	A			Communication storage mgr (VTAM)
COFVLF00	A			VLF Parameters

CTIEZB00 A Component trace for TCP/IP

The "V" flag indicates that different suffixes are used, depending on the IPLPARAM (which selects different IEASYSxx members, which have different suffix values for the indicated members). If you need to change PARMLIB values, we suggest you use the above table to determine which member to change, in which library.

The various IPLPARAM values affect these PARMLIB members:

IPLPARAM	Uses members (other than 00 members).....
CS	IEASYSCS COMMNDCS
DB	IEASYSDB COMMNDB COUPLEDB LPALSTDB PROGDB SCHEDDB IEFSSNDB IEASVCDB
DI	IEASYSDI COMMNDI LPALSTDB PROGDB SCHEDDB IEFSSNDB IEASVCDB
DC	IEASYSDC COMMNDC COUPLEDB LPALSTDB PROGDB SCHEDDB IEFSSNDB IEASVCDB
WS	IEASYS00

Member names not shown here are the suffix "00" members. That is, IPLPARAM xx (which results in the use of an SYS1.IPLPARAM(LOADxx) member, which specifies an IEASYSzz member) will use many PARMLIB members with suffix 00. Only the non-00 members are listed here.

An important result of selecting different IPLPARAM values is the use of different COMMNDxx members. It is the COMMNDxx contents that, to a large extent, produces the different results of the different IPLPARAM specifications. The COMMNDCS member has these commands:

```
S JES2,PARM=' COLD,NOREQ'
S VTAM,,,(LIST=00)
SET MPF=00
S IRRDPTAB
S VTAMAPPL
S EZAZSSI,P=P390
DUMPDS ADD,VOL=(SCPMV5)
DUMPDS (name specifications)
DUMPDS ALLOC=ACTIVE
```

And SYS1.ADCD06.PARMLIB(VTAMAPPL) contains (ignoring comments and time delay commands):

```
S VLF,SUB=MSTR
S LLA,SUB=MSTR
S TCAS
S TCP/IP
D T
```

Other COMMNDxx members are the same as COMMNDCS, with these changes:

COMMNDB and COMMND00 warm start JES2 (instead of a cold start)

COMMNDC is the same as COMMNDCS

COMMNDI adds or changes these lines:

```
'S VTAMIMS,,,(LIST=IM)'
'S IRLM'
'S JRLM'
```

1.4 RACF Parameters and Profiles

The following userids are defined:

USERID	PASSWORD	GROUP	UID	DAYS	Attributes.....
IBMUSER	IBMUSER	SYS1	0	30	SPECIAL OPERATIONS
P390	SYS1	SYS1	0	30	SPECIAL OPERATIONS AUDITOR
OPEN1	SYS1	SYS1	0	180	none
OPEN2	SYS1	SYS1	0	180	none
OPEN3	SYS1	SYS1	0	180	none
P390A	TEST	TEST	-	30	SPECIAL OPERATIONS GRPACC
P390B	TEST	TEST	-	30	none
...					
P390Z	TEST	TEST	-	30	none

Where GROUP is the default group, UID is the OMVS assigned UID (and - indicates no OMVS definition for the user), DAYS is the password interval, and Attributes lists the RACF special attributes for the user.

The early system we examined had 96 userids defined, including those listed above. Many of the additional userids are intended to be used for started tasks. (You can list all the defined userids by using the RACF panels, and performing a SEARCH with no arguments. You must have the SPECIAL attribute to do this.) The same system had 102 groups defined. We suggest you do not use any of these groups (except SYS1 and TEST) unless you have a specific need to do so.

There was no default UID/GID defined in our early system. That is, if a user (such as P390A) attempted to use OMVS, he would fail. A default UID/GID can be defined as follows:

```
ADDGROUP odefg OMVS(GID(1000))

ADDUSER odefu DFLTGRP(odefg) OMVS(UID(1000) HOME('/') -
PROGRAM('/bin/sh'))

RDEFINE FACILITY BPX.DEFAULT.USER APPLDATA('odefu/odefg')
```

This will permit any TSO user without a defined OMVS segment to use OMVS. If you want to permit such users to use secondary OE functions (such as TCP/IP sockets) but to not permit such users to access the OMVS shell, then use PROGRAM('/bin/echo') in the ADDUSER command.

Several RACF General Resource Classes are critical for many functions. In the following lists, access levels are indicated by N=NONE, R=READ, U=UPDATE, and A=ALTER. The FACILITY class profiles are:

```

PROFILE                                UACC Access List.....

BPX.DAEMON                            N  IBMUSER(A) OMVSKERN(R) WEBSRV(R) FTPD(R)
PBX.SERVER                             N  P390(A) WEBSRV(U)
PBX.SUPERUSER                          N  IBMUSER(A)
CBD.CPC.IOCDS                           N  P390(A)
CBD.CPC.IPLPRM                          N  P390(A)
DCEKERN.START.REQUEST                  N  IBMUSER(U) DCEKERN(U)
DFSKERN.START.REQUEST                  N  IBMUSER(U) DCEKERN(U)
IRRDPIO                                 R  P390(A)
DITTO.* (G)                             R  IBMUSER(A) SYS1(A)
STGADMIN.ADR.* (G)                     N  P390(A) SYS1(A)
STGADMIN.IDC.* (G)                     N  P390(A) SYS1(A)
STGADMIN.IGD.* (G)                     N  P390(A) SYS1(A)
STGADMIN.IGG.* (G)                     N  P390(A) SYS1(A)
STGADMIN.* (G)                         N  P390(A) SYS1(A)

```

The TSOAUTH class profiles are:

```

PROFILE                                UACC Access List.....

ACCT                                    N  IBMUSER(A)
JCL                                    N  all
MOUNT                                  N  IBMUSER(A)
OPER                                    N  IBMUSER(A) P390A(R)
RECOVER                                 N  all

```

The ACCTNUM class profiles are:

```

PROFILE                                UACC Access List.....

ACCT#                                  N  all

```

The TSOPROC class profiles are:

```

PROFILE                                UACC Access List.....

DBSPROC                                N  P390(A) DSN1SPAS(R) SYSADM(R) SYSOPR(R)
IKJACCNT                                N  IBMUSER(A)
ISPFPRCB                                N  IBMUSER(R) P390(R)
ISPFPROC                                N  all
OMVSPROC                                N  IBMUSER(A) OPEN1(R) OPEN2(R) OPEN3(R)

```

There are no STARTED class profiles defined. Please note that this situation -- no STARTED class profiles -- may not exist in future releases.

Currently, there is a userid defined⁸ for every started task provided with the AD CD-ROM system. These userids include:

```

DUMPSRV  OMVS      XCFAS      IXGLOGGER  SMF        WLM        CATALOG
VTAMAPPL  IRRDPTAB  VTAM       VTAMIMS    BLSUPRMI  EZAZSSI    JES2
RACF      IOSAS      JESXCF     ANTMAIN    DFSCM     SMS        ANTAS00
INIT      NFSC      VMCF       BPXOINIT   BPXAS     VLF        TCAS
LLA       TCPIP     IMWEBSRV  NFSS       FTPD      CICS
and others

```

Do not delete these userids, unless you convert to RACF's STARTED class controls. As provided, these userids depend on a RACF exit (ICHRIN03) to provide trusted system privileges when they are started. The same default

⁸ These userids are defined without a TSO segment, providing an additional measure of assurance that they will not be misused.

ICHRIN03 entry is used for all started tasks. The console message indicating that a STARTED class entry was not found and that the ICHRIN03 parameters are used has been suppressed (by placing the message number in the MPF list in PARMLIB). The messages appear in the full system log.

If you add your own started tasks, you can use the same process --that is, add a userid corresponding to your started task name.

1.5 ISPF Usage

The second panel of the primary ISPF menu, accessed through the "M" (More) option on the first panel, contains:

- 1 SMP/E
- 2 ISMF
- 3 RACF
- 4 HCD
- 5 SDSF
- 6 IPCS
- 7 DITTO
- 8 RMF
- 9 DFSORT
- 10 OMVS

Of these options, only SDSF is commonly accessed by end users. SMP/E, ISMF, RACF, HCD, IPCS, and RMF are the provinces of systems programmers. DITTO and the DFSORT panels might be accessed by normal system users, but this would probably be fairly rare. OMVS is usually started from ISPF Option 6. For these reasons, some installations prefer to move SDSF to the first panel.

The ISPFPROC logon procedure for TSO, as supplied with the AD system, contains a large number of allocations. Many of these are needed only for the systems programmer functions accessed through ISPF, such as RACF, RMF, ISMF, and so forth. Creating a new logon procedure, with many fewer allocations, substantially decreases TSO logon time.⁹ A sample shortened procedure was given in the *Cookbook*. It appears that the same example in the *Cookbook* should work for the V2R6 release. The ISPFPROC included in V2R6 has a few changes from previous releases -- mostly in the area of HLQs -- but these changes are to DD statements that are removed for the faster logon.

1.6 Supplied Jobs

A number of jobs are provided in SYS1.P390.CNTL. These should be used with care because many of the jobs correspond to older versions of the AD CD-ROM system and may not be exactly what you want for the current release. Nevertheless, this data set provides examples of many jobs you might need. Jobs (corresponding to member names in the data set) include:

- **ADDID**, **ADDIDS**, and **ADDWEDID** all add TSO userids. The last one also defines many of the group ids and system data set protection profiles. All of these jobs also add users to SYS1.UADS; you probably do not want to do

⁹ The tradeoff, of course, is that you cannot use the ISPF panels corresponding to the removed DD statements in your shorter logon procedure. If you sometimes need these functions, simply logon using the full ISPFPROC procedure.

this. The example of adding a userid that appears in the *Cookbook* may be more useful.

- **DMPFULL** provides a standard job to backup a full DASD volume to tape.
- **DSFINIT** provides a job to initialize an SMS-managed volume, such as you would use for HFS. (Remove the STORAGEGROUP operand to initialize a non-SMS managed volume.)
- **HFSALLOC** is a job to create a new HFS. It assumes the indicated volser has been initialized as SMS-managed.
- **HFSCONV** converts a non-SMS managed volume to an SMS managed volume without completely initializing the volume.
- **HFSDSF** has a misleading name. It initializes a volume WITHOUT the SMS-managed element that would be needed for an HFS volume.
- **HFSDUMP** dumps an HFS (which is a single data set, as far as MVS is concerned). This is a dump-by-dataset and not a dump-by-volume (or physical dump) job. **HFSREST** is the matching restore job.
- **HFSNEW** is a batch job that executes a TSO MOUNT command to dynamically mount a new HFS. (An authorized user could issue the same command from TSO.)
- **LISTCAT** lists the complete master catalog. You need to correct the name of the master catalog in the JCL. The current name is OS390.MASTER.CATALOG.
- **NFS** and **NFSRACF** are the jobs used to initialize NFS data sets for the V2R6 release. You will not need to run this job (again), but it provides an overview of the NFS setup.

1.7 SMP/E Data Sets

The key SMP/E data sets are:

VOLSER	NAME	Dataset.....	TYPE
SCPMV5	GLOBAL	MVS5.GLOBAL.CSI	GLOBAL
OS39D6	MVSD100	OS39D6AD.MVSD100.CSI	DLIB
OS39D6	MVSD101	OS39D6AD.MVSD100.CSI	DLIB
OS39R6	MVST100	OS39R6AD.MVST100.CSI	TARGET
OS39R6	MVST101	OS39R6AD.MVST100.CSI	TARGET

The LTS, MTS, SCDS, and other SMP/E secondary data sets are on volume OS3R6A. Note that the MVSD101 and MVST101 CSIs contain only JES3 materials. All of the base system is in the MVSD100 and MVST100 CSIs.

Separate Global CSIs are included for CICS, IMS, and DB2. The easiest way to locate these is to use ISPF option 3.4 and search for data sets with names ***.*.CSI**. While there is no rule against it, the only data sets in the AD CD-ROM system with the LLQ of CSI are the SMP/E data sets.

1.8 Device Addresses Defined

The following device addresses are defined:

ADDRESSES	DEVICE	
00C	2540	
00E	1403	
00F	3203	
010	3277	
063	3277	
120-15F	3380	(64 devices)
240-25F	3380	(32 devices)
260-27F	3390	(32 devices)
560-57F	3480	(no compaction)
580-5AF	3400	
700	3270	
701-73F	3277	(63 devices)
900-91F	3277	(32 devices)
A80-ABF	3390	(64 devices)
E20-E27	CTC	(8 devices)
E40-F47	CTC	(8 devices)

There are a large number of devices defined for OS/390. Remember that a P/390 or R/390 can have a maximum of 255 devices defined in its device map.

When possible, you should assign your devices (emulated disks, and so forth) to addresses in this list. If you cannot do this, you will need to use the HCD utility to alter the OS/390-defined devices. Note that none of the defined 3480 devices have the *compaction* feature. If you need this, you will need to use HCD to modify your IODF. The active IODF in the V2R6 AD CD-ROM is SYS1.IODF00.

Chapter 2. OS/390 TCP/IP

This chapter addresses TCP/IP setup and customization within the context of the OS/390 AD CD-ROM V2R5 and V2R6 systems, and a closely-related preloaded system available for IBM Application StarterPak systems. The AD CD-ROM is intended for use with P/390, R/390, and the IBM Integrated Server systems.

This chapter is only intended to assist with initial TCP/IP setup and customization in the context of the AD CD-ROMs and the named platforms. There is a much more complete discussion of OS/390 TCP/IP in the Redbooks:

- *OS/390 eNetwork Communications Server V2R5 TCP/IP Implementation Guide Volume 1 - Configuration and Routing* (IBM order number SG24-5227)
- *OS/390 eNetwork Communications Server V2R5 TCP/IP Volume 2 - OpenEdition Applications* (IBM order number SG24-5228)
- *OS/390 eNetwork Communications Server V2R5 TCP/IP Volume 3 - MVS Applications* (IBM order number SG24-5229)

The systems based on P/390 adapters have servers underlying the S/390 processors. A P/390 system is built by adding a P/390 adapter to a PC Server, for example. Adding OS/390 TCP/IP connections involves adding LAN adapters to the underlying server, adding and customizing whatever device drivers are needed by the server, defining OS/390 connections that use these server facilities, and then completing the necessary OS/390 TCP/IP customization. None of these steps is overly complex, but the total combination can be confusing.

The underlying servers also can have TCP/IP functions. A P/390, for example, can have OS/2 TCP/IP and OS/390 TCP/IP both operational. These are separate TCP/IP implementations that may be connected to the same LAN. We will discuss setup for both the server TCP/IP and OS/390 TCP/IP for each of the platforms described. We have found that describing only the portions relevant to OS/390 TCP/IP, while ignoring the server TCP/IP, leads to more confusion.

We separate TCP/IP setup into several parts:

1. Understanding and selecting IP addresses.
2. Installing hardware, software, and customization of the underlying server. The details are different for each of the hardware platforms involved.
3. Setup for TCP/IP on the server (OS/2 or AIX).
4. Basic OS/390 TCP/IP setup. This is common for all platforms, and is limited to making tn3270 and ftp¹⁰ operational.
5. A discussion of additional customization for OS/390 TCP/IP. This would be common for all platforms, and will be presented at an overview level.

¹⁰ Basic utility functions, such as *ping* and *netstat* are also included.

2.1 Understanding and Selecting IP Addresses

Explaining the general scheme of IP addressing is beyond the scope of this document. Fortunately, there are many TCP/IP publications (at almost any large bookstore) that describe IP addressing. Fundamental points include:

- You need to assign an IP address to every adapter/LAN interface that is used for TCP/IP. For example, the P/390 installation described below has two TCP/IP interfaces: one for OS/2 TCP/IP and one for OS/390 TCP/IP. It will require two IP addresses. An R/390 or Integrated Server installation will be similar. An Application StarterPak is different because there is no underlying OS/2 or AIX; it might have only one LAN interface for OS/390 TCP/IP.
- Where there is more than one interface (typical P/390, R/390, Integrated Server), we will assume both interfaces are connected to the same LAN -- with different IP addresses, of course.
- If your LAN is totally isolated -- not connected to other LANs or to the Internet -- you can select any IP addresses you wish. You still need to use consistent addresses. The "net" portion of the address (including the effects of a subnet mask) should be the same for each interface connected to the network, and the "host" portion of the address must be different for each interface.
- If your LAN is connected to other LANs (or already has a defined addressing scheme), you must coordinate with the person managing the LAN to obtain IP addresses. For our basic P/390 examples, you would ask for two addresses on the same network.

Do not use the IP addresses from examples in this document unless you have a totally isolated network. (The "9" address range used in the examples is assigned to IBM. Even within the IBM address range, the numbers used in our examples are "uncoordinated.")

2.2 Hardware and Server Setup

TCP/IP setup for a P/390, R/390, or Integrated Server is complicated by the fact that the server "side" of the system also uses TCP/IP. For a P/390, for example, OS/2 TCP/IP is used to provide emulated local 3270 paths to OS/390. This path is used by the MVS master console and can be used for local TSO, CICS, and so forth. The TCP/IP used by OS/2 (P/390 and Integrated Server) or AIX (R/390) is independent of the TCP/IP that is used by OS/390. Furthermore, the LAN adapter(s) used by the server TCP/IP (OS/2 or AIX) **cannot** be used for OS/390 TCP/IP.

Each of the platforms discussed here will normally have two (or more) LAN adapters; one for the server (OS/2 or AIX) and one for OS/390.¹¹ *You must clearly distinguish between LAN connections for the server TCP/IP and LAN connections for OS/390 TCP/IP.* Failure to understand this separation is a common cause of confusion when setting up OS/390 TCP/IP on these platforms.

¹¹ The Application StarterPak is a native S/390 system and does not have an underlying server. However, the OSA adapters it uses for LAN connections can be controlled from the OS/2-based Support Element.

It is possible to define a server TCP/IP network that does not use a LAN. That is, it uses only the internal loopback address.¹² This is sufficient for supporting an MVS master console and several TSO windows on the attached server display. In this situation, two TCP/IP “stacks” (OS/2 and OS/390) could be used with only one LAN adapter, with the LAN adapter belonging to OS/390 TCP/IP. We believe that most P/390, R/390, and Integrated Server owners will elect to install two (or more) LAN adapters, and the following descriptions assume two or more adapters.

Many types of TCP/IP links exist: standard and fast Ethernet (DIX or IEEE802.3), 4/16/100 Mbps token ring, FDDI, channel-to-channel, SLIP, PPP, and so forth. Our discussions will concentrate on 10 Mbps DIX Ethernet, as this appears to be the most common LAN protocol.

Some IBM-configured P/390 and R/390 systems have one Ethernet adapter (such as the integrated adapter in the Server 330) and one token ring adapter. This is not a useful mix in most situations. We suggest and assume that you have two LAN adapters of the same type --- either Ethernet or token ring.

2.2.1 P/390 Setup

Current P/390 systems are based on IBM Server 330-PB0 machines. These have PCI busses. Earlier P/390 systems were based on Server 500 machines with Micro Channel busses. This discussion assumes you are using Server 330 machines.¹³

The Server 330 has an integrated Ethernet adapter that can be used for either OS/2 TCP/IP or OS/390 TCP/IP. If you add another adapter, we strongly recommend the *IBM 100/10 EtherJet PCI Adapter*; this is available in several forms. We do not recommend the following:

- *IBM PCI Ethernet Adapter*. (This has connections for 10Base-T and AUI (15-pin connector)). We have had difficulties using this adapter with P/390 systems.
- Any ISA bus adapter. We have had difficulty configuring these if there is more than one ISA bus LAN adapter.

If you use token ring adapters, we recommend *IBM PCI Token-Ring Adapter*. We do not recommend *IBM Turbo 16/4 Token-Ring ISA Adapter*. Again, we have had problems configuring these if more than one ISA LAN adapter exists.

One of the P/390 systems used frequently for ITSO projects has one integrated Ethernet adapter, one PCI EtherJet adapter and two PCI Token-Ring Adapters. We have used these adapters in various combinations for OS/2 and OS/390 TCP/IP connections, without problems.

Setting up the P/390 Server for TCP/IP consists of:

1. Installing the adapters
2. Configuring the adapters with MPTS

¹² It might also use the serial ports for SLIP or PPP connections, but this is not addressed here.

¹³ The Server 500 did not have an integrated Ethernet adapter. You need Micro Channel adapters for each of the Ethernet or token ring adapters you wish to install. As far as we know, any IBM Micro Channel Ethernet or token ring adapter that is supported by OS/2 for a Server 500 can be used for a Server 500-based P/390 system.

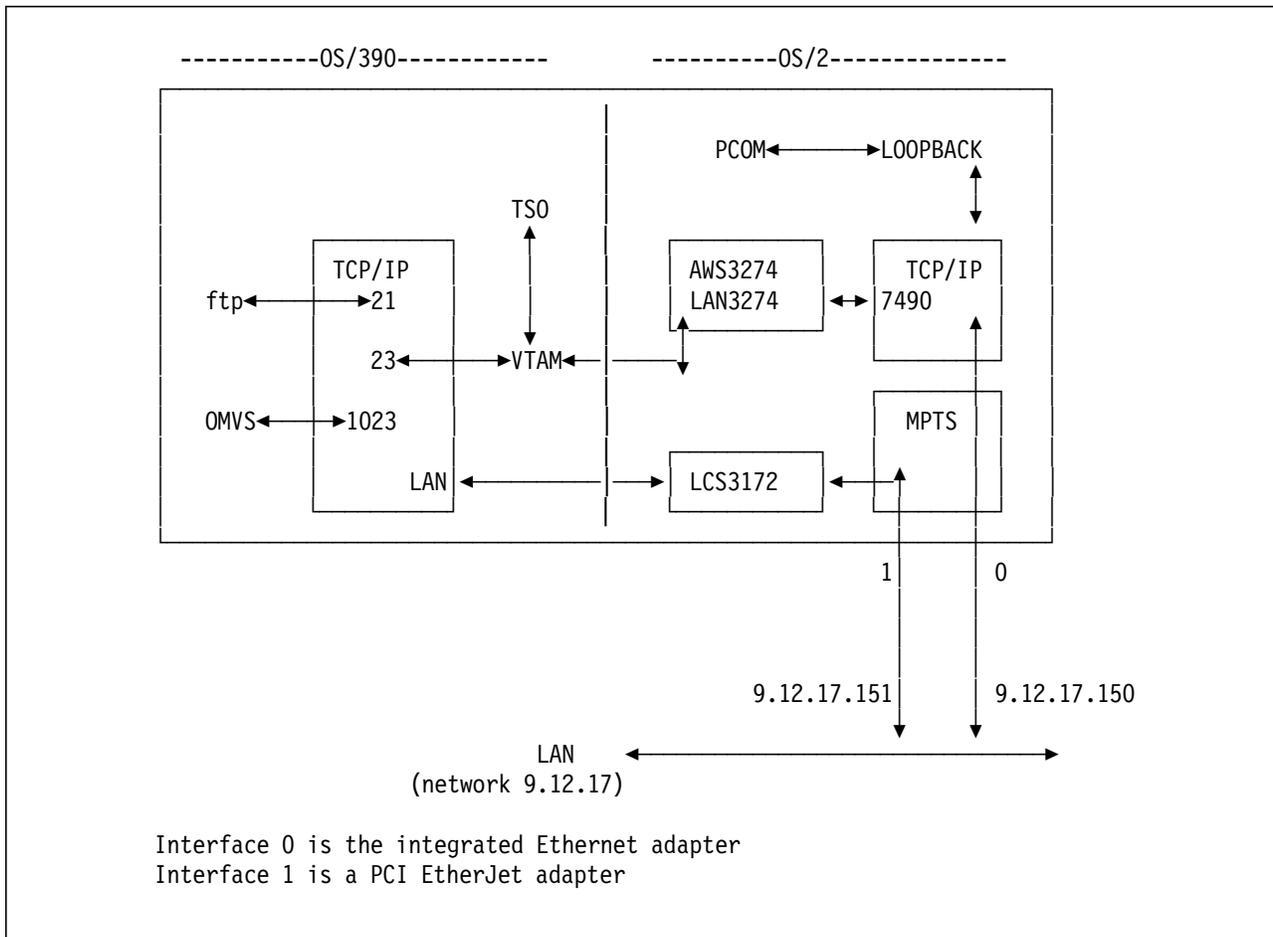


Figure 1. Goal for Basic P/390. This P/390 system has two LAN adapters. Adapter 0 is connected to OS/2 TCP/IP and the LAN3274 device manager. tn3270 sessions to port 7490 at 9.12.17.150 will appear to be local 3270 displays to OS/390. tn3270 sessions to port 23 at 9.12.17.151 will connect to OS/390 TCP/IP through the INTCLIEN server that connects them to VTAM. telnet sessions to port 1023 at address 9.12.17.151 will connect directly to OMVS. The PCOM sessions (on the OS/2 side) connect to OS/2 TCP/IP via the loopback address.

3. Configuring one or more adapters for OS/2 TCP/IP
4. A minor edit for CONFIG.SYS
5. Update the P/390 configuration (DEVMAP)
6. Rebooting OS/2 and verifying the adapters started correctly
7. Configure PCOM (or another 3270 emulator)

Figure 1 provides a graphic view of our goal for setting up TCP/IP for a P/390 system. It involves both OS/2 TCP/IP and OS/390 TCP/IP.

2.2.1.1 Installing the Adapters

The integrated Ethernet adapter is already installed in Server 330 systems. Other PCI adapters are installed simply by placing them in available PCI slots. Most adapters have their MAC address noted on a paper label somewhere on the adapter. We suggest you note which MAC address is located in which PC slot number. You may need this later to identify which adapter is for OS/2 and which is for OS/390.

2.2.1.2 Configuring Adapters With MPTS

This can be the most confusing step of this process. We suggest you step through it carefully and write down the final configuration, for future reference. Neither your server TCP/IP nor your OS/390 TCP/IP will work unless you have the correct definitions in MPTS.

Start with an OS/2 window and enter the command **MPTS**. (This stands for Multi-Protocol Transport Support; in earlier versions of OS/2 it was known as LAPS.) On the first panel select **Configure**; on the second panel select Configure LANs and then select **Configure**. This should produce a panel similar to Figure 2 on page 20. Note that there are three windows in this panel: Network Adapter, Protocols, and Current Configuration. The initial Current Configuration window will be empty. (Note that all three windows can scroll up and down, and may contain many more lines of data than shown here.)

The general operation of this panel is:

1. Select a Network Adapter that matches one of your adapters and ADD it to your Current Configuration.
2. Then select the protocol(s) that should be associated with this adapter and ADD each to the Current Configuration.
3. Then select another Network Adapter that matches another of your adapters and ADD it and its intended protocols to your configuration. And so forth.

However, there are some details to consider before you are start. Perhaps the most difficult detail is to find your adapter in the Network Adapter window. Many of the adapter names listed in the window are quite similar (especially among all the IBM adapters included). Furthermore, your adapter may not be included in the list. For example, the integrated Ethernet adapter included with Server 330 systems is not in this list.

You should have received a diskette of OS/2 drivers with your LAN adapter (and with the Server 330). You need this to add your LAN adapter to the list in the Network Adapter window. (Even if your adapter is already in the list, we suggest you follow the process of adding the adapter in order to copy the latest driver from your diskette.)¹⁴ If you have the diskette, select (double click with the mouse) the OTHER ADAPTER button and follow the instructions to insert your diskette in drive A. MPTS will search the diskette for appropriate drivers and setup information and add your LAN adapter to the list of adapters in the Network Adapter window.

Installing new adapters for MPTS is done only once. If you are reconfiguring your MPTS and the proper adapter drivers were previously installed, you do not need to install them again.

If your LAN adapter is already in the list somewhere in the Network Adapter window (remember to scroll through the whole list), then you do not need the diskette of drivers (unless you want to update the drivers). Read the Network Adapters list *carefully*. The names are confusing. If you select the wrong adapter your TCP/IP network will not work. (Fortunately, it is easy to reconfigure MPTS, so you can try again if you make a mistake.)

¹⁴ We assume your diskette will have a later version of the driver than the base OS/2 system is likely to have.

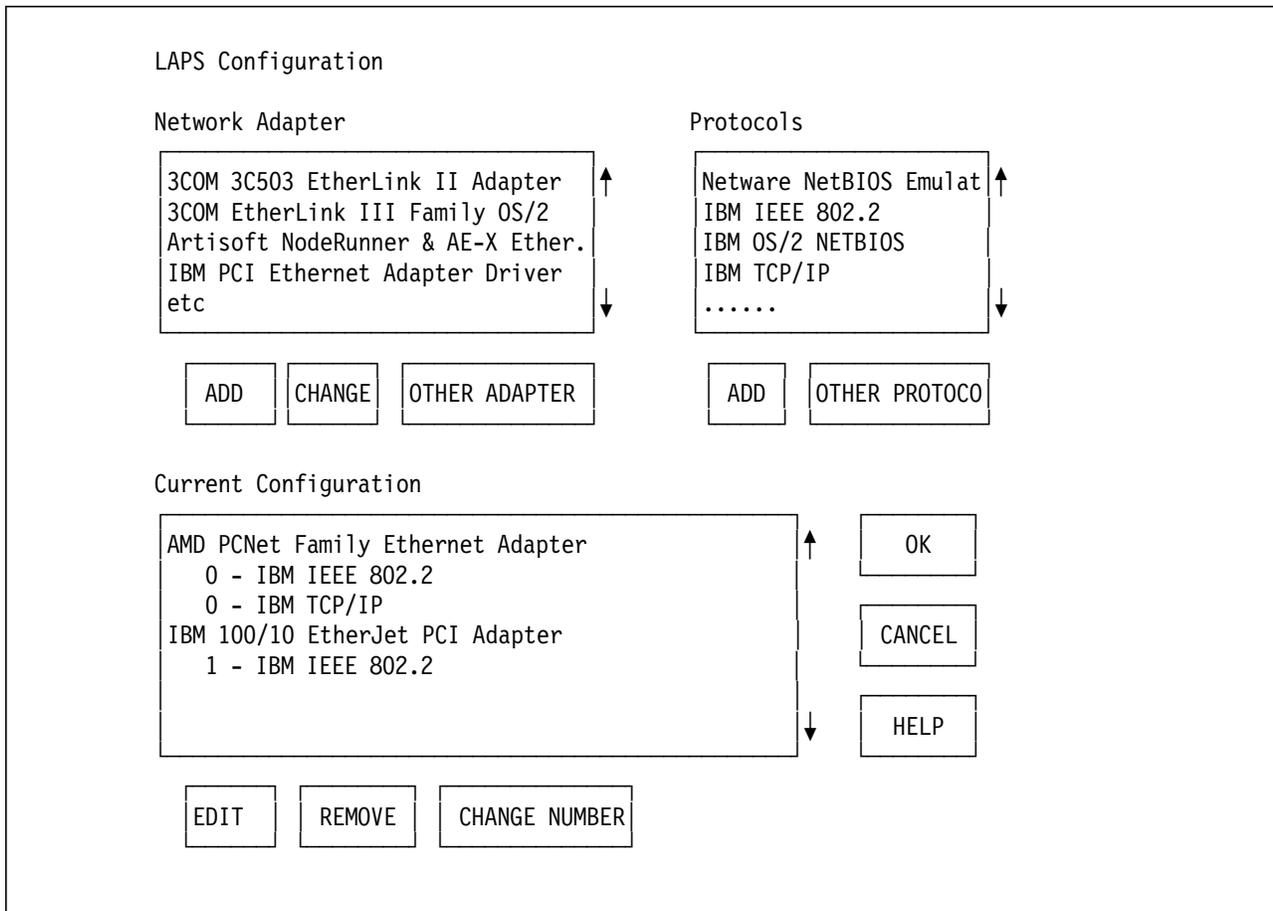


Figure 2. Primary MPTS Working Panel

If you have a Server 330 P/390, we suggest you make the integrated Ethernet adapter the first adapter for MPTS. You will need the Ethernet diskette that came with the system to do this. Follow the process just described to add this Ethernet adapter to the MPTS list. When you are finished there should be a new line in the Network Adapters window:

AMD PCNet Family Ethernet Adapter

This is the proper name of the integrated Ethernet adapter.

Now, select the first adapter you wish to configure (which should be the Integrated AMD Ethernet adapter if you have a Server 330); a single mouse click on the adapter name will select it. Then select the ADD button. This should result in a new line in the Current Configuration window, similar to the first line shown in the figure.

Next, with the proper adapter name highlighted in the Current Configuration window, move to the Protocol window. Select (single mouse click) the IBM IEEE 802.2 protocol, and then ADD it. This protocol must be included for every TCP/IP adapter, regardless of whether the adapter is intended for OS/2 TCP/IP or OS/390 TCP/IP.¹⁵

¹⁵ IEEE 802.2 is also selected for adapters intended for SNA.

If this adapter will be used for OS/2 TCP/IP then select IBM TCP/IP in the Protocol window and ADD it. **Do not ADD the TCP/IP protocol if the adapter will be used for OS/390 TCP/IP.** Be careful! The TCP/IP in the MPTS window refers only to OS/2 TCP/IP. If you select this protocol for an adapter, that adapter cannot be used with OS/390 TCP/IP.

After you have selected the protocols for your first LAN adapter, return to the Network Adapter window and select the line matching your second LAN adapter. ADD this line and then ADD the protocols for it.

Figure 2 on page 20 illustrates a system with two LAN adapters. The first is the integrated AMD Ethernet adapter and the second is an IBM PCI EtherJet adapter. The AMD adapter will be used for OS/2 TCP/IP and the EtherJet adapter will be used for OS/390 TCP/IP.¹⁶

In the Current Configuration window, note the number before the protocol name(s) for each adapter. You will need these numbers later for TCP/IP configurations in both OS/2 and OS/390. We suggest you print or write down the information in the Current Configuration window.

There are two slightly different ethernet protocols in use today. These are DIX Ethernet and IEEE 802.3 ethernet. Many IBM products default to the IEEE 802.3 form, while many other vendors (and customers) use the DIX form. MPTS defaults to IEEE 802.3 and OS/2 TCP/IP uses whatever form is selected by MPTS. If you have an existing (non-IBM) IP network and you are not certain which ethernet form you use, you are probably using the DIX form. We also suggest you change the adapter intended for OS/390 TCP/IP to DIX format unless you *know* that you will be using an IEEE 802.3 environment.

To change your MPTS OS/2 TCP/IP ethernet protocol to DIX:

1. In the Current Configuration window, double click (with the mouse) on the IEEE 802.2 protocol line associated with the appropriate adapter. For example:

```
AMD PCNet Family Ethernet Adapter
  0 - IBM IEEE 802.2          <---- double click this line
  0 - IBM TCP/IP
IBM 100/10 EtherJet PCI Adapter
  1 - IBM IEEE 802.2
```

2. This should produce a large display (scrollable) titled *Parameters for IEEE 802.2*. This display contains lines such as:

```
* ..... (more options)

*network adapter address      _____

*Type ethernet driver        I          <-- find this line

*System key value            _____

* ..... (more options)
```

Find the indicated line and change the value from **I** to **D**.

¹⁶ As an aside, note that either (or both) adapters can be used for SNA at the same time they are being used for TCP/IP. SNA connections can share adapters between OS/390 and OS/2 and can use adapters that are running TCP/IP at the same time.

3. Do not change any other parameters in this panel unless you understand what you are doing.
4. Click OK to exit.
5. Repeat this change for any other adapter that is used with OS/2 TCP/IP. (Remember: an adapter is used with OS/2 TCP/IP if it has the **IBM TCP/IP** protocol assigned to it in the Current Configuration window.) We also suggest making the same change for the adapter intended for OS/390 TCP/IP.

There may be one other change in the LAPS Configuration if you are using token ring adapters that have automatic speed sensing (4 or 16 Mbps) or have full duplex capability. If you have autosensing token ring adapters AND if you are connecting to a token ring with no other active systems, then the autosense function can cause problems. It switches speeds every few seconds (looking for packets from other systems on the LAN, in order to select a permanent speed), and this causes OS/2 to pause at intervals.¹⁷

There have been situations in which the use of full duplex token ring operation has been associated with problems. We do not have definitive information about this, but we usually disable full duplex operation in our small, lightly-loaded token rings used with our P/390 systems. (You may have different experience with full duplex in other situations, and want to ignore our suggestion to disable it.)

To remove autosensing and/or full duplex:

1. In the Current Configuration window, double click (with the mouse) on the title line (not a protocol line) for the token ring adapter.
2. This produces a panel with many token ring options. Find the line named *PCI adapter data rate* and change this from AUTO to M16 (or M4 if you want 4 Mbps).
3. If you wish, find the line named *Enable full-duplex* and change it from YES to NO.
4. Do not change any other lines on this panel unless you know what you are doing.

In general, the MPTS screens are easy to use once you understand the general operation. You can ADD and REMOVE adapters and protocols, in the Current Configuration window, until you are satisfied with the configuration. At this point select OK, and step through several screens to exit from MPTS. When you exit from the last screen, it will ask permission to update CONFIG.SYS. You should reply YES for this question.

2.2.1.3 Configuring Selected Adapter(s) for OS/2 TCP/IP

Next you need to configure OS/2 TCP/IP. You should already have TCP/IP installed as part of your OS/2 installation. It should be represented as an icon on the primary OS/2 desktop. Select this icon (double click) and it should open to display icons for about 18 different TCP/IP options. One of these is TCP/IP

¹⁷ A token ring adapter can also cause OS/2 to pause if the adapter is not connected to a ring (such as an IBM 8228 MAU) or does not have a loop plug at the adapter connector.

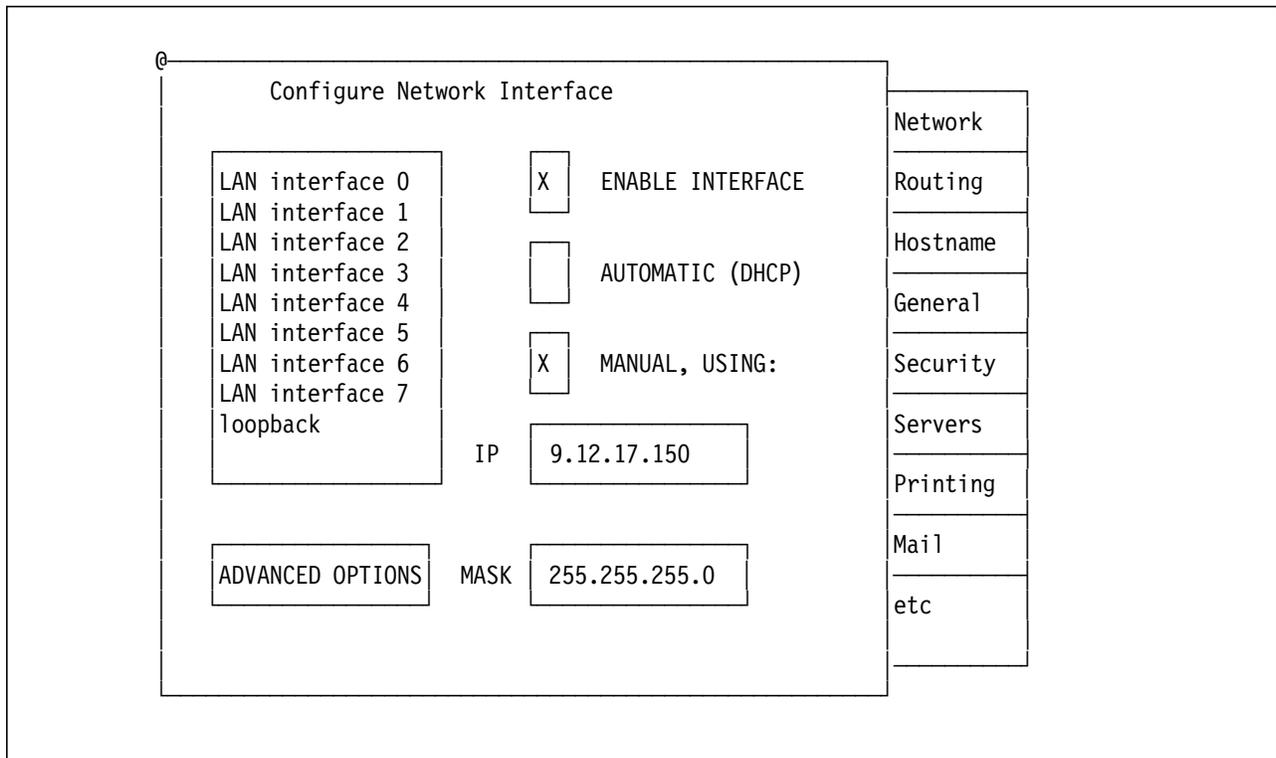


Figure 3. Primary Configuration Display for OS/2 TCP/IP

CONFIGURATION. Select this icon (double click) and it should produce a display similar to that in Figure 3 on page 23.

Assuming you will use the TCP/IP interface for AWS3274,¹⁸ you should first enable the loopback interface:

1. Select (single click) the LOOPBACK INTERFACE line on the Configure Network Interface display.
2. Select the ENABLE INTERFACE option.
3. Select the MANUAL address option and enter 127.0.0.1 as the IP address. No entry is needed in the MASK field.

When you later reboot (or restart OS/2 TCP/IP) this will enable the loopback interface at address 127.0.0.1.

You should enable one or more LAN interfaces for OS/2 TCP/IP. To do this you must relate the TCP/IP interface numbers (as illustrated in Figure 3) to the MPTS adapter numbers (as illustrated in Figure 2). This can be confusing and is best explained with an example:

¹⁸ That is, assuming you are no longer using CM/2 for 3270 emulation on the P/390 display. Earlier releases of the P/390 support programs (the AWS3274 device manager, in particular) used CM/2 to provide several 3270 sessions for the MVS master console, and several TSO sessions.

MPTS Adapter	OS/2 TCP/IP Interface

AMD PCNet Family Ethernet Adapter	
0 - IBM IEEE 802.2	
0 - IBM TCP/IP	Interface 0
IBM 100/10 EtherJet PCI Adapter	
1 - IBM IEEE 802.2	
IBM PCI Token-Ring Adapter	
2 - IBM IEEE 802.2	
2 - IBM TCP/IP	Interface 1
IBM PCI Token-Ring Adapter	
3 - IBM IEEE 802.2	

In this example, four LAN adapters are defined. The first two are Ethernet and the last two are token ring --- although the LAN types are irrelevant to the numbering scheme. The adapter numbers are 0 - 3.¹⁹ The OS/2 TCP/IP interface numbers are assigned, starting with interface 0, only to adapters having the (OS/2) TCP/IP protocol associated with them.

The typical P/390 we are considering has only two LAN adapters, as shown in Figure 2, and only the first is used for OS/2 TCP/IP. In this case the MPTS adapter number (zero) matches the TCP/IP interface number (zero). To enable this adapter for OS/2 TCP/IP:

1. Select (single click) the LAN INTERFACE 0 line on the Configure Network Interface display.
2. Select the ENABLE INTERFACE option.
3. Select the MANUAL address option and enter your selected IP address. Make an appropriate entry in the MASK field, if necessary. The example address in the figure is a class A address, and we subnet it to a class C network; this requires a mask of 255.255.255.0.
4. If this interface is Ethernet (IEEE or DIX), select the ADVANCED OPTIONS button. In the advanced options display, change the MTU size from 1500 to 1492.²⁰ Do not make entries in the Broadcast Address or Destination fields in the Advanced Options display. Select OK to return to the Configure Network Interface display.

Repeat these steps if you have a second OS/2 TCP/IP adapter (which is unlikely unless you are connecting to both Ethernet and token ring networks).

The Configure Network Interface display has a number of "tabs" on the right-hand side. The labels are *Network*, *Routing*, *Hostname*, and so forth. You need to select these tabs, one at a time, and make entries for several of the functions. The most important of these is the Autostart function.

1. Select the Autostart tab. This will display the Configure Automatic Starting of Services screen.
2. Select **inetd** in the left-hand window of the Autostart screen. Then select **Autostart service** and **Foreground** on the right-hand side of the screen.

¹⁹ These numbers are used later by OS/390 TCP/IP and VTAM.

²⁰ There has been considerable discussion about the best Maximum Transmission Unit size for Ethernet on a P/390, resulting in a range of opinions and recommendations. The author has had no problems with the 1492 size.

3. Select **telnetd** in the left-hand window and select **Autostart service** and **inetd super server daemon** on the right-hand side.
4. Select **portmap** in the left-hand window and select only **Autostart service** on the right-hand side.

Select and set the other tabs, as follows:

1. Routing. We normally make no entry here. However, you may want to configure IP Forwarding active on this screen.
2. Hostname. We normally make no entries here.
3. General. We normally make no entries here.
4. Security. You should enter a telnet password on this screen. We strongly recommend this.²¹
5. Servers. We normally make no entries here.
6. Printing. We normally make no entries here.
7. Mail. We normally make no entries here.
8. Sendmail. We normally make no entries here.
9. snmp. We normally make no entries here.

This completes your TCP/IP configuration. Double click on the top-left button of the window to exit. Read the exit prompts carefully. One prompt will offer to configure mail functions; we normally reply NO to this prompt. Another prompt requests permission to write in CONFIG.SYS; reply YES to this prompt.

2.2.1.4 Correcting CONFIG.SYS

Both MPTS Configuration and TCP/IP Configuration write additional lines at the end of the CONFIG.SYS file. You must edit CONFIG.SYS and move these lines to a location just before the beginning of the P/390 group of lines in CONFIG.SYS. We normally use the "e" editor and its cut-and-paste functions to do this. You will need to move 5 - 10 lines. *Do not use an editor that may truncate lines.*

If you reconfigure MPTS or TCP/IP, always check CONFIG.SYS to see if any lines were added at the end of the file. If so, move them to a point above the P/390 lines in CONFIG.SYS. The P/390 group of lines *must* be the last lines in CONFIG.SYS.

2.2.1.5 Update the P/390 Configuration

Three P/390 device managers are associated with TCP/IP connections.

AWS3274 device manager (uses OS/2 TCP/IP)
LAN3274 device manager (uses OS/2 TCP/IP)
LCS3174 device manager (uses OS/390 TCP/IP)

AWS3274 and **LAN3274** use OS/2 TCP/IP services, not OS/390 TCP/IP services.²² S/390 addresses associated with these device managers appear (to OS/390) to be locally-attached non-SNA 3270 terminals. If you are not using CM/2, these

²¹ Any user on your network can telnet to port 23 on OS/2 TCP/IP and obtain an OS/2 character-oriented window. He could then alter or destroy OS/2, since OS/2 has no security controls. The telnet password you set here is stored (in plain language) in CONFIG.SYS if you are using an older release of OS/2 TCP/IP that is packaged with an OS/2 CD-ROM. Never versions of OS/2 TCP/IP can have multiple passwords and they are stored in an encrypted format. However, most P/390 owner use the older OS/2 TCP/IP that was preloaded or installed from a basic OS/2 CD-ROM.

²² These device managers can use CM/2 instead. For this discussion, we assume you are not using CM/2.

two device managers perform the same function. You will use AWS3274 to define 3270 sessions on the display that is directly attached to your P/390 system, and LAN3274 to define tn3270 clients that are connected via the OS/2 TCP/IP LAN. OS/2 TCP/IP, in turn, will use the adapters and interfaces that you defined for OS/2 TCP/IP in MPTS and the OS/2 TCP/IP configuration.

The **LCS3172** device manager is associated with OS/390 TCP/IP connections. This will use adapters that were not defined for (OS/2) TCP/IP in MPTS.

The configuration process is started from the P/390 icons on the OS/2 desktop. Double click on the Configuration icon. This should produce the *Configuration Password* screen. Press enter (or enter a password if one has been set) to obtain the *Function* screen. Press F2 to obtain the *Update System Devices* screen similar to that shown in Figure 4 on page 27. You should be somewhat familiar with this *device map* function from your initial P/390 installation and use.

Your display may differ from the example in the figure. You will probably have more devices defined. (You can scroll through them with PageUp and PageDown keys.) More importantly, the list of device managers at the bottom of the display may have different letters assigned. In the figure, letter "A" is associated with device manager LCS3172, for example. You may have different letter if your display; use the letters in your display. You can create a new line in the devices table by entering the appropriate parameters in the line containing the ">" symbols and pressing enter.

You may first need to configure devices for AWS3274 and LAN3274. The device map delivered with the AD CD-ROM already has some of these devices at appropriate addresses. The OS/390 system on the CD-ROM expects to find a local 3270 at address 700 to use as the MVS master console. You should define at least three AWS3274 addresses at 700,701, and 702. (The two extra addresses are for VTAM sessions, such as TSO or CICS.)

You should define several LAN3274 addresses starting at 900, 901, 902, and so forth. Examples of these are shown in Figure 4. The number of LAN3274 addresses you define represents the maximum number of concurrent 3270 connections via OS/2 TCP/IP. Client systems (your potential TSO users, for example) connect to these addresses by establishing a tn3270 session with OS/2 TCP/IP at port address 7490.²³ The OS/390 on the AD CD-ROM has a large number of local 3270 devices defined starting at addresses 700 and 900.

To configure and use OS/390 TCP/IP, we need to assign S/390 addresses to the emulated 3172 channel addresses that will be used for OS/390 TCP/IP connections. The 3172 emulation function is provided by the LCS3172 device manager. OS/390 TCP/IP uses two addresses, an even/odd pair of contiguous addresses, to communicate with a 3172 control unit. As with almost all P/390 emulated devices, you could select any three-digit address pair you wish. In a practical sense, you should select an address pair that is already generated in the OS/390 AD CD-ROM system (or in any other OS/390 system you may be using).

²³ You can change this port address by changing default LAN3274 parameters, but you cannot use port 23 unless you stop OS/2 telnet or reassign its port address. Port 7490 was selected during P/390 development (for historical reasons) and most P/390 sites continue to use port 7490.

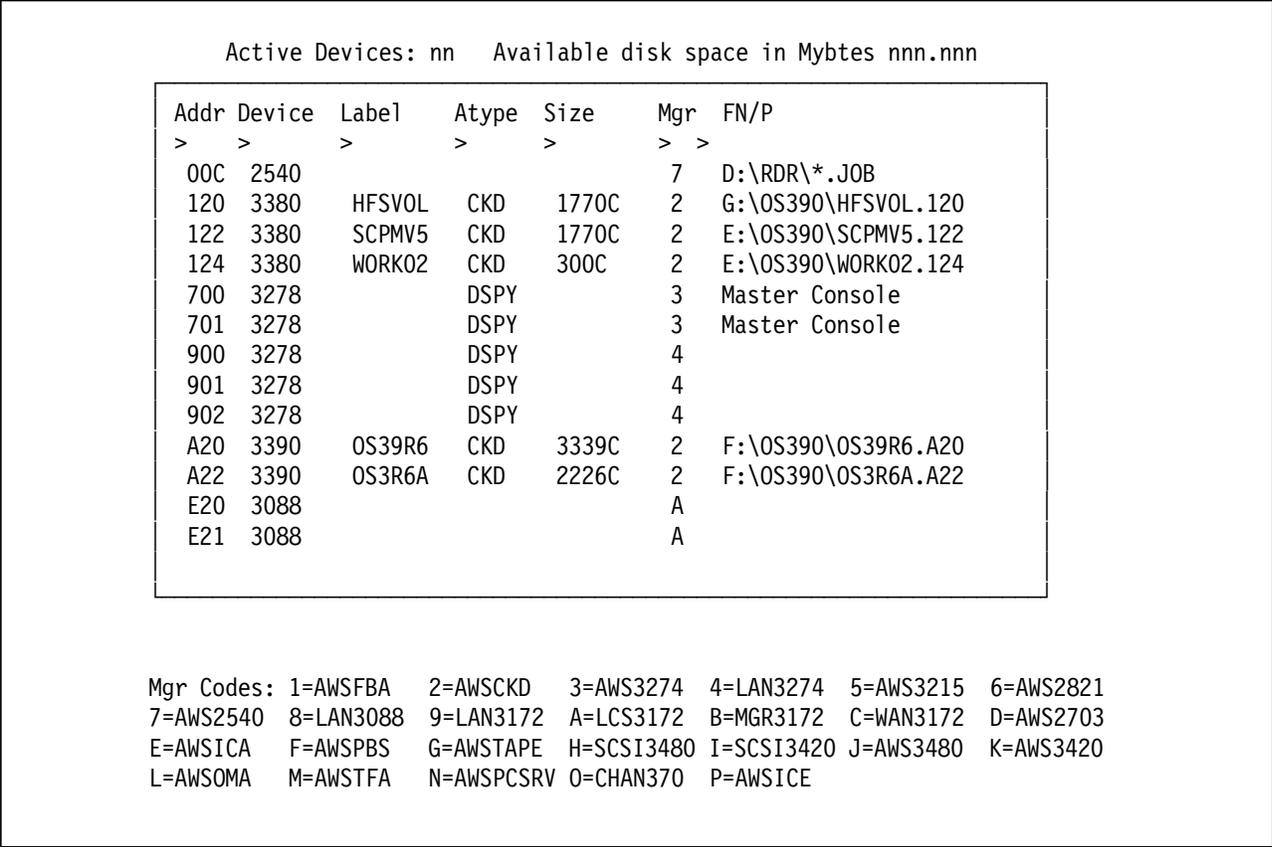


Figure 4. P/390 Device Configuration Display

OS/390 uses a device definition known as a Channel-To-Channel (CTC) adapter to communicate with a 3172 control unit. A CTC is also known as a 3088 control unit. The AD CD-ROM has addresses E20-E2F and E40-E47 generated as CTCs, and you can use any even/odd pair in this range. For our examples we will use E20 and E21 for our first (and only) OS/390 TCP/IP connection. This will correspond to MPTS adapter number one -- the EtherJet adapter in the examples earlier.

You want to add two lines in the device map to define addresses E20 and E21 as device type 3088 (another name for CTC devices) and assign these to the LCS3172 device manager. Two entries like this are shown in Figure 4.

When you are finished, press F10 (to exit from this function) and then F6 (to save your changes). You must restart the P/390 subsystem for changes to be effective.

If you have two OS/390 TCP/IP adapters, you would need four lines in the device map, and so forth. You can use different S/390 addresses, but the addresses you use must be generated as 3088 or CTC device types in OS/390.²⁴ There is no connection between the P/390 device map definitions and any specific LAN adapter. This connection is made later, in the OS/390 TCP/IP profile definitions.

²⁴ You can change or add OS/390 devices by using the HCD utility under TSO. We suggest you do not try this unless you are familiar with HCD or have a pressing requirement to use different addresses.

2.2.1.6 Rebooting OS/2 and Checking Results

At this point, we suggest you shutdown OS/2 and reboot. If all the changes were correct, there should be no errors during the rebooting. Booting may take longer; we assume this is due to startup times for the LAN adapters.

After OS/2 is restarted, open an OS/2 window and examine the file C:\IBMCOM\LANTRAN.LOG. This should contain lines such as:

```
IBM LANBB is accessing IBM DIX LAN Interface
Adapter 0 is using node address 006629050660
...
Port out: The IBMPCI Token Ring Adapter opened at 16 Mbps, half duplex
...
```

You can use this listing (and your notes about which MAC address is associated with which adapter) to determine which LAN adapter is adapter 0, which is adapter 1, and so forth. If significant errors are noted in this file, you must resolve these errors before proceeding with your TCP/IP configuration.

After your reboot, you should see a window for inetd and another for portmap. You can minimize these windows. You should be able to ping the OS/2 system from another machine on the same network. You should be able to telnet (not tn3270) to the OS/2 TCP/IP address (to port 23) and log onto OS/2. You will need the password you entered in the OS/2 TCP/IP configuration panel. (OS/2 can support several simultaneous telnet users. However, we strongly suggest you do not make this available to other users. Once logged onto OS/2, there are no security controls for OS/2. You should make the OS/2 TCP/IP telnet password as obscure as possible if your system will appear on a large network. You can change it in CONFIG.SYS (older OS/2 TCP/IP releases) or through the TCP/IP configurator (newer releases)). The OS/2 telnet function can be used to remotely IPL OS/390, among other useful tasks.

2.2.1.7 Configuring PCOM

You need an 3270 emulator if you want to access AWS3274, LAN3270, or the OS/390 tn3270 interface. You need a 3270 emulator on the P/390 system itself, for the MVS master console and for local TSO sessions.²⁵ There are many 3270 emulator products available from many vendors. One is IBM's *Personal Communications AS/400 and 3270*, with versions available for OS/2, Windows 95, and other systems. This product is often known as PCOM. This is the emulator most commonly used with P/390 systems and we will briefly describe the customization of a 3270 session here.

PCOM can be installed from diskettes or a CD-ROM. Once installed, you need to execute a configuration function for each 3270 session you plan to use. The first GUI screen of the configuration process permits you to select a path for connecting your PC to a host system. You should select a **PC -> LAN -> TCP/IP -> S/390** path on this GUI screen, then select the CONFIGURE button.

In our examples, we are using IP address 9.12.17.150 for our OS/2 TCP/IP adapter and will use 9.12.17.151 for our OS/390 TCP/IP interface.²⁶ Using these IP addresses, we may need tn3270 connections for:

²⁵ Earlier P/390 systems used CM/2 for these functions.

²⁶ Setup for this is described later.

- 127.0.0.1, port 7490. tn3270 emulator windows on the P/390 itself would use this loopback address and port number for the MVS master console and local VTAM (TSO) sessions.
- 9.12.17.150, port 7490. tn3270 clients on the LAN can use this combination to access the LAN3274 device manager. This device manager makes the connections appear as local 3270s to OS/390.
- 9.12.17.151, port 23. tn3270 clients use this address and port to connect to OS/390 TCP/IP.

A given emulator session would use only one of these connections at a time, of course. Depending on its purpose, a given emulator session might have only one of these connections defined.

Within the CONFIGURE screens you should select:

1. Screen size 32x80 (this is optional, but very common)
2. Link Parameter - select CONFIGURE LINK
 - a. Host name - 127.0.0.1 (or any other appropriate address)
 - b. Select ADVANCED SETUP
 - 1) Change the port number to 7490 (or port 23 for direct OS/390 TCP/IP connections)
 - 2) Select AUTO-RECONNECT

When you exit from the PCOM configurator, it may offer to create a desktop icon for the session. We suggest you accept this. You can create several PCOM sessions. We usually create three sessions for PCOM installed on the P/390 itself, and two sessions for PCOM installed on other personal computers.

Start one of the sessions. There is a pulldown menu named ASSIST; under this is an option CUSTOMIZE KEYBOARD. If appropriate, use the Customize Keyboard function to map the common C characters, such as square brackets, onto your keyboard. You can also remap the ENTER key; the default location for the 3270 ENTER function is the right-hand Ctrl key of the PC keyboard.²⁷

After starting one of the PCOM sessions, you can use the COMMUNICATIONS pulldown menu, with the CONFIGURE suboption, to change the IP address and port number for the tn3270 session. Using the addresses in our examples, you could change from 9.12.17.151 port 7420 to 9.12.17.151 port 23 to change from a local 3270 connection (via OS/2 TCP/IP and LAN3274) to a direct OS/390 TCP/IP connection.

A side note: PCOM 3270 sessions apparently expect you to have a printer configured for the session. You may see a timeout of about ten seconds (100% CPU usage on the OS/2 pulse display) before a popup window appears asking about a printer. At this point we select the CANCEL option in the popup window. This usually happens only once per PCOM 3270 session.

²⁷ Defining the square brackets as "apl ad" and "apl bd" (which results in the hex values ad and bd for the characters) worked well for us.

2.2.1.8 Summary and Next Step

If you have followed the steps in this section, your P/390 should:

1. Have LAN adapter cards installed
2. Have MPTS configured to cover both OS/2 TCP/IP and OS/390 TCP/IP (using separate adapter cards, of course)
3. Have OS/2 TCP/IP configured and operational
4. Have the P/390 device map updated to provide two addresses for the LCS3172 device manager. This will provide the path from the adapters/MPTS to OS/390 TCP/IP.
5. Have OS/2 PCOM installed and configured.

You should be able to IPL OS/390 and use the PCOM sessions defined on the P/390 for the MVS master console and local TSO sessions. You will need a local TSO session to complete the OS/390 TCP/IP customization necessary before it can be used. The next steps for customizing OS/390 TCP/IP start in 2.3, "OS/390 TCP/IP Customization" on page 37.

2.2.2 IBM Integrated Server Setup

Setup for the IBM Integrated Server, machine type 3006, is the generally the same as for a P/390, with the following changes:

- The installation CD-ROM provided with the Integrated Server already has much of the setup completed.
- The integrated Ethernet adapter is a different adapter than the one used with the PC Server 330-based P/390 systems.

We did not have an Integrated Server available at the time this was written and cannot comment on additional differences between setup for it and setup for the older P/390.

2.2.3 R/390 Setup

There have been several base RS/6000 machines used for R/390 systems. The current base is the RS/6000 model F50, and we will assume this base for the following discussion. The setup goal is the same as for the P/390 system illustrated in Figure 1 on page 18, except that AIX is used instead of OS/2. Just as for a P/390, you will probably require two LAN adapters -- one for AIX TCP/IP and one for OS/390TCP/IP. Just as for a P/390, you could configure your server (AIX) TCP/IP to work without a LAN adapter (using only the loopback address). And, just as for a P/390, we strongly suggest you use two LAN adapters because it provides more flexibility in using your system.²⁸

R/390 owners are often experienced UNIX users. If this is the case, we will assume that you can install and customize your LAN adapters for use under AIX. We suggest you activate all your LAN adapters under AIX TCP/IP and verify that they are working. This can be done with the *smit* menus.

Basic setup considerations include:

²⁸ For example, if your OS/390 TCP/IP configuration is not correct, you will need a local 3270 connection (provided through AIX TCP/IP) in order to log onto TSO and correct the problem. (The loopback address can be used for this, and does not require an adapter.)

Active Devices: nn		Available disk space in Mybtes nnn.nnn			
Addr	Device	Label	Atype	Size	Mgr FN/P
>	>	>	>	>	> >
00C	2540				7 /os390/*.job
120	3380	HFSVOL	CKD	1770C	2 /os390/HFSVOL.120
122	3380	SCPMV5	CKD	1770C	2 /os390/SCPMV5.122
124	3380	WORK02	CKD	300C	2 /os390/WORK02.124
700	3278		DSPY		3 Master Console
701	3278		DSPY		3 Master Console
900	3278		DSPY		4
901	3278		DSPY		4
902	3278		DSPY		4
A20	3390	OS39R6	CKD	3339C	2 /os390/OS39R6.A20
A22	3390	OS3R6A	CKD	2226C	2 /os390/OS3R6A.A22
E20	3088				A /dev/ent1
E21	3088				A /dev/ent1

Mgr Codes: 1=AWSFBA 2=AWSCKD 3=AWS3274 4=LAN3274 5=AWS3215 6=AWS2821
7=AWS2540 8=LAN3088 9=LAN3172 A=LCS3172 B=MGR3172 C=WAN3172 D=AWS2703
E=AWSICA F=AWSPBS G=AWSTAPE H=SCSI3480 I=SCSI3420 J=AWS3480 K=AWS3420
L=AWSOMA M=AWSTFA N=AWSPCSRVR O=CHAN370 P=AWSICE

Figure 5. R/390 Configurator. The contents are very similar to that of a P/390. Note the extra operand in the line for address E20 and for address E21.

1. Do you have the AIX device drivers installed for your LAN adapters? The normal AIX installation process installs only the device drivers for the devices actually present. If you add another type of adapter, you will need to install the device drivers for it. (Adding another instance of an existing adapter type does not require additional drivers.) smit menus exist to assist you in installing additional drivers from the AIX distribution CD.
2. Configure and test your LAN adapters with AIX TCP/IP.
3. Use the current version of the R/390 support programs. At the time this was written, this was version 4.2.1.5. There have been substantial changes in this release. For example, it is no longer necessary to edit the IPL script to enable or disable various device managers or to detach LAN interfaces from AIX TCP/IP.
4. Use the most current fixes for LCS3172. These are available from the ftp site *p390.ibm.com*. There have been substantial improvements in performance in the latest versions.
5. Remember to make the DLPI modifications that are described in the LCS3172 DOC file. OS/390 TCP/IP will not work correctly without this step.
6. Ethernet connections default to the DIX format. See the device map sample below for an indication of how to change to IEEE802.3 format.
7. When using the R/390 configurator panel, press F12 to view the device manager parameters. You must set the parameter for LCS3172 to NOPARMS.

8. We assume you will normally use two LAN adapters: one for AIX and one for OS/390. However, it is possible to have a viable system with only one adapter that is assigned to OS/390. You would use the loopback function (under AIX) to connect 3270 emulator sessions (on the RS/6000 display) that provide the MVS master console and at least one TSO session.
9. There is no AIX equivalent for the MPTS and CONFIG.SYS functions of OS/2. AIX TCP/IP setup is through smit and is a completely different process than OS/2 TCP/IP setup. Otherwise, some of the secondary comments under 2.2.1, "P/390 Setup" on page 17 may be useful.

Figure 5 on page 31 contains an example of a device map for an R/390 system. Note the lines for addresses E20 and E21. The FN/P field must contain the AIX name of the LAN adapter to be used for this connection. *Starting with R/390 release 4.2.1.5* the S/390 startup process (when you click IPL) will automatically detach this LAN adapter from AIX TCP/IP, making it available for OS/390 TCP/IP.

As shown, the LAN connection (assuming it is Ethernet) will be in DIX format. If you modify the FN/P operand to be "/dev/ent1,802.3," it would be used in IEEE802.3 format.

Use the LAN number (ent0, ent1, ent2, tok0, tok1, and so forth) as the third operand (a single digit) in the LINK statement in the OS/390 TCP/IP PROFILE data set. This is described in 2.3.3.1, "Basic Adapter Customization" on page 41.

2.2.4 Application StarterPak Setup

TCP/IP setup for an Application StarterPak should be much simpler than for a P/390 or R/390. We will assume you have the OSA-2 adapter that has two LAN ports; this is commonly known as the ENTR (EtherNet - TokenRing) adapter. Each port can be used as either Ethernet (10 Mbps) or token ring.

If the LAN ports are used only for OS/390 TCP/IP, very little setup is needed. If the ports are also used for SNA connections, then you will probably need to use the OSA/SF utility, and this is outside the scope of the current discussion. By default, the ENTR adapter will support TCP/IP, without any additional customization with the OSA/SF utility.

The primary setup challenge is to assign the desired protocol (Ethernet or token ring) to each of the two ports. This is done from the Support Element (SE) console, and will probably involve a Power-On-Reset (POR) cycle. To begin, you need to examine the connectors on the ENTR adapter.

2.2.4.1 Connections To the ENTR OSA-2 Adapter

Figure 6 on page 33 roughly illustrates the external connections of an ENTR adapter. There are two ports, 0 and 1. Each port has three connectors, two for Ethernet and one for token ring. Only one of the connectors may be used for each port. For Ethernet, you select which connector to use based on the type of wiring you have; use the UTP connector for 10BaseT or use the AUI connector for an external Ethernet transceiver. Only one connector on each port should have a connection. (A wrap plug is considered a connection.)

The Application StarterPak will sense which connection, for each port, is used when you *first* power up the system. It will remember this choice thereafter. This is often not acceptable, because you probably did not have your LANs

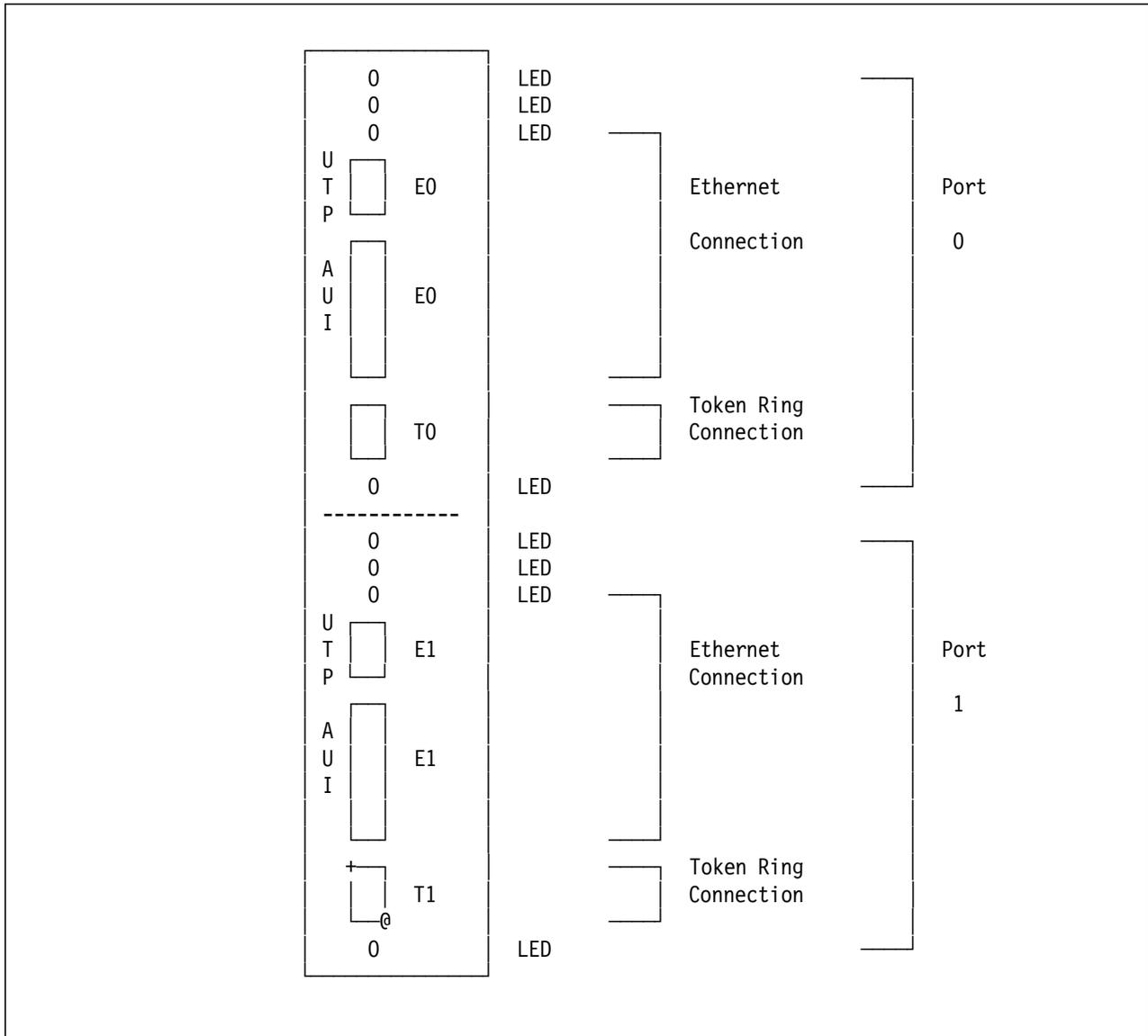


Figure 6. OSA-2 Ethernet / Token Ring Adapter Connections. Each ENTR adapter, as seen from one end of an Application StarterPak (with the end cover open) has six connectors and a number of LEDs.

connected when you first brought up the system; you probably left the IBM-provided wrap plugs in place.

2.2.4.2 Resetting the Ethernet vs Token Ring Selection

To set (or reset) the ENTR adapter to your desired configuration (that is, your choice of either token ring or Ethernet for each of the two ports) you need to:

1. Remove any connections from each of the six connectors on the ENTR adapter.
2. Attach one connector to each port, going to an appropriate LAN. (For token ring, the LAN might be an IBM 8228 MAU with no other connections. For 10BaseT Ethernet, it might be a connection to a hub.) If no connection exists for a port, the default setting is to Ethernet.
3. Use the SE tools to enable a reset function for the OSA adapter. This is described below.

4. Perform a POR (Power On Reset) function, during which the machine will sense the LAN connections and remember the settings.

There are four LEDs (indicator lights) on each half of the ENTR adapter face. These are (from top to bottom):

1. A2 - Not Operational. This will be on when the card is first reset; it should not be on during normal operation.
2. B2 - Operational. This light should flash during normal operation of the adapter.
3. C2 - Ethernet port not operational on LAN.
4. D2 - Token ring port not operational on LAN.

There are a great many SE "panels" provided with the Application StarterPak, used from the personal computer that is usually placed on top of the StarterPak. Use of the panels involves much mouse clicking to navigate from display to display. There are often several ways to navigate to a particular display. The following instructions should guide you through one path to reach the panel where you can enable the *Enable autosense on next reset* function to change the protocols for ENTR ports. These instructions are meant to be used while you are performing the indicated functions at the SE display:

1. Select the **Groups** option on the left-hand side of the display.
2. Double click on the **CPC** icon.
3. This should produce a small icon that, in a sense, appears as a box within a box. Use the **right mouse button** to select the right-hand (green) portion of the outer box.
4. This should produce a small window offering a choice of CPs or CHPIDs. Click on the **CHPIDs** option.
5. This will produce a window with an icon for each chpid on your system. OSA adapters have a section of pipe as the icon. The first OSA adapter is normally chpid 5C.
6. On the right-hand side of the SE display, find the **CHPID Operations** display.
7. Use the **right mouse button** to drag the 5C chpid icon (or whichever OSA chpid you need) to the **Advanced Facilities** icon in the CHPID Operations display.
8. You should receive a window with a single choice: **OSA Specific Advanced Facilities**. Select this option and click OK.
9. You should then receive a menu with options such as:

```
Enable or disable ports
Query port status
Run port diagnostics
View port parameters
Display or alter MAC address
Set ethernet mode
Enable autosense on next reset    <--- this one
Cancel command
```

10. You can try the various options to learn more about your OSA port.
11. Before exiting, select **Enable autosense on next reset**, and click **apply**.
12. Exit from the OSA and CHPID panels on the left-hand side of the screen.
13. Be certain you have your desired LAN connections for the ENTR ports.
14. Perform a POR, using this option in one of the right-hand displays on the SE console.

2.2.4.3 Finding Unit Addresses of OSA

The Application StarterPak uses IOCDS files to associate channels, control units, and devices with the unit addresses seen by OS/390. There is a very rough equivalent to the P/390 Configurator function, but an IOCDS can be considerably more complex. The best way to find the unit addresses for the OSA-2 ports you want to use for TCP/IP is to ask the systems programmer who defined the IOCDS for your system.

If this is not practical, and if your StarterPak has OS/390 working (implying that a valid IOCDS is being used), you can use the SE console as follows:

1. On the right-hand side select the **CPC Configuration** display. On the left-hand side, select **Groups**.
2. Using the right mouse button (RMB), drag the **CPC** icon over the **Input/Output (I/O) Configuration** icon on the right-hand side of the screen.
3. This should display the I/O Configuration window. Examine the top few lines to determine which IOCDS data set is active; it will be A0, A1, A2, or A3. Use the mouse to select the data set line corresponding to this name.
4. Select the **View** option from the action line of the I/O Configuration window; then select **Channel Path Configuration** from the drop-down menu.
5. This should produce a window listing all the chpids on your system. The first OSA-2 adapter is normally chpid 5C and the second is 5A. We will assume your ENTR OSA-2 adapter is the first one.²⁹ Use the mouse to select the line corresponding to your OSA chpid. Then select **View** in the action line and select **Device Information** from the drop-down menu.
6. This should produce a window containing something like this:

UNITADD=	ADDRESS	UNIT	MODEL	STADET=	TIMEOUT=
00	0900	OSA		Y	Y
01	0901	OSA		Y	Y
...					
FE	099A	OSA		Y	Y

This says that the first OS/390 address for the OSA adapter is 900, and so forth. By default the first two addresses (900, 901) are for TCP/IP connections to the first port of the adapter (port 0) and the next two addresses (902, 903) are for TCP/IP connections to the second port of the adapter (port 1). That is, by default, the first four addresses of an ENTR adapter are reserved for TCP/IP access. Additional addresses, after the first four, might be used for SNA access. A single ENTR adapter can be shared with multiple LPARs and can be used for both TCP/IP and SNA concurrently.

7. Exit from the SE display screens.

If you have access to the IOCDS used for your system³⁰ you can determine your OSA addresses from it. A typical IOCDS listing might be:

²⁹ This implies it is located in the right-most slot of the available slots for OSA adapters.

³⁰ Access is typically from the HCD utility, under TSO.

```

CHPID PATH=(40),TYPE=CVC
CHPID PATH=(41),TYPE=CNC
CHPID PATH=(42),TYPE=CTC
CHPID PATH=(43),TYPE=CTC
CHPID PATH=(58),TYPE=OSA
CHPID PATH=(5A),TYPE=ISD
CHPID PATH=(5B),TYPE=ISD
CHPID PATH=(5C),TYPE=OSA          <-----
CHPID PATH=(5D),TYPE=ISD
CHPID PATH=(5E),TYPE=ISD
CHPID PATH=(5F),TYPE=ISD
CNTLUNIT CUNUMBR=0300,PATH=(5A,5E),UNITADD=((00,064)),      *
      UNIT=3990
CNTLUNIT CUNUMBR=0500,PATH=(5D),UNITADD=((00,001)),UNIT=3490
CNTLUNIT CUNUMBR=0600,PATH=(5B,5F),UNITADD=((00,064)),      *
      UNIT=3990
CNTLUNIT CUNUMBR=0890,PATH=(58),UNIT=OSA
CNTLUNIT CUNUMBR=0900,PATH=(40),UNITADD=((00,032)),SHARED=N,  *
      PROTOCL=D,UNIT=3174
CNTLUNIT CUNUMBR=0990,PATH=(5C),UNIT=OSA <-----
CNTLUNIT CUNUMBR=0F00,PATH=(41),UNITADD=((00,032)),UNIT=3174
IODEVICE ADDRESS=(300,064),CUNUMBR=(0300),UNIT=3390
IODEVICE ADDRESS=(500,001),CUNUMBR=(0500),UNIT=3490
IODEVICE ADDRESS=(600,064),CUNUMBR=(0600),UNIT=3390
IODEVICE ADDRESS=(890,010),UNITADD=00,CUNUMBR=(0890),STADET=N,*
      UNIT=OSA
IODEVICE ADDRESS=89A,UNITADD=FE,CUNUMBR=(0890),STADET=Y,    *
      UNIT=OSAD
IODEVICE ADDRESS=(900,032),MODEL=X,CUNUMBR=(0900),TIMEOUT=Y, *
      STADET=N,UNIT=3270
IODEVICE ADDRESS=(990,010),UNITADD=00,CUNUMBR=(0990),STADET=Y,*
      UNIT=OSA <-----
IODEVICE ADDRESS=99A,UNITADD=FE,CUNUMBR=(0990),STADET=Y,    *
      UNIT=OSAD
IODEVICE ADDRESS=(F00,032),MODEL=X,CUNUMBR=(0F00),STADET=Y, *
      UNIT=3270

```

Information in this listing should match the information from the SE displays.

If OSA/SF has been used to customize your OSA adapter(s), you may have a completely different usage of OSA ports. Using OSA/SF is normally associated with SNA setup for the OSA ports. If your StarterPak was preloaded by IBM, there was probably no OSA/SF customization and you can assume the first four addresses (for an ENTR adapter) can be used for TCP/IP. For more information about OSA/SF see the redbook *Open Systems Adapter 2 Implementation Guide*, IBM order number SG24-4770.

The following sections of this document assume that you will use S/390 addresses E20 and E21 for your TCP/IP connections. These addresses correspond to most P/390 and R/390 systems. If you have a StarterPak, substitute your addresses for E20 and E21. (In the example above, the StarterPak addresses are 900 and 901.)

2.3 OS/390 TCP/IP Customization

Server setup and customization, as discussed earlier, is the same regardless of the specific services you want from OS/390 TCP/IP. OS/390 TCP/IP customization depends on your requirements. For the following descriptions, we will assume our goal is:

- Configure a single interface, with static routing.
- tn3270 connections to traditional MVS are needed.
- telnet (ASCII mode) connections to Open Edition (Unix System Services) are needed.
- ftp connections for both traditional MVS and Open Edition files are needed.
- The IBM Domino Go Web Server will be used later.
- nfs is not used; neither client nor server.
- A Domain Name Server is not used. (That is, examples, tests, and initial usage will use absolute IP addresses.)

This is a fairly restricted goal, with static routes, no DNS, and no nfs services. It is, however, a useful goal for initial OS/390 TCP/IP customization. Functions beyond these tend to be highly customized for individual situations. If you can produce a stable system, running the functions listed here, then you have a solid base for your own implementation of additional functions.

After completing your server setup (or setting the desired OSA-2 protocols, in the case of the Application StarterPak), you should IPL OS/390. Your first step should be to verify the state of the Missing Interrupt Handler for the emulated 3172 addresses and verify that the interfaces are online.

2.3.1.1 Missing Interrupt Handler

You need to disable the OS/390 Missing Interrupt Handler (MIH) for the addresses associated with the emulated 3172 used by TCP/IP. This is done by adding member IECIOSxx to SYS1.PARMLIB.³¹ If the addresses are E20 and E21, then the PARMLIB member might contain one line:

```
MIH TIME=00:00,DEV=(E20-E21)
```

You should verify that this member is active in your PARMLIB. This member (and the associated IEASYSxx pointer) are usually already installed on AD CD-ROM systems, but you should verify that it exists and is correct. If you need to add the member, you will also need to add the operand:

```
IOS=xx,          USE MIH MEMBER (REMEMBER THE COMMA!)
```

to your IEASYSxx member(s).³² If you need to add or change the IECIOSxx member, it will not be effective until the next IPL. If you added or changed the member you can avoid an immediate IPL by issuing (from the MVS master console) the command:

```
SETIOS MIH,TIME=00:00,DEV=(E20-E21)
```

The SETIOS command is effective until the next IPL, at which time your PARMLIB member will be used.

You can verify that the MIH is set correctly by using the operator command:

³¹ The member name used is normally IECIOS00, but can have any suffix; the name follows normal PARMLIB rules.

³² This can be a nontrivial task. You must find all the IEASYSxx members that might be invoked by all the IPLPARM members you might use. These IEASYSxx members might be in SYS1.PARMLIB or in concatenated PARMLIBs. These details tend to change with every release of the AD CD-ROM.

```
D IOS,MIH,DEV=(E20-E21)
```

This should display output such as:

```
OE20=00:00  OE21=00:00
```

We strongly suggest you use this command to verify that your MIH is set up correctly. Adding or changing IECIOS members can be confusing when multiple PARMLIBs and IPLPARMs are involved. The D IOS,MIH command will verify that you have updated the correct IEASYSxx member in the correct PARMLIB (after you reIPL).

You should next display the unit status of the addresses for your emulated 3172 connections. Issue the command:

```
D U,,,E20,2          (Use your correct address, of course)
```

This should display:

```
IEE457I 11:04:42 UNIT STATUS 700
UNIT TYPE STATUS  VOLSER  VOLSTATE
OE20 CTC  0
OE21 CTC  0
```

This is a critical test. If the status is not "O" (meaning Online) there is a problem with the server setup or the P/390 configurator settings. Further efforts at OS/390 TCP/IP customization are pointless until the underlying server problem is corrected.³³

2.3.1.2 RACF and TCP/IP

The AD CD-ROM should already have the necessary RACF³⁴ customization defined.

2.3.2 Procedures and Data Sets

OS/390 TCP/IP references many data sets and files to obtain its customization parameters. These data sets and files do not have standard names, and the methods OS/390 TCP/IP uses to find them can be confusing. The methods are described, at length, in *OS/390 eNetwork Communications Server: IP Configuration* (IBM order SC31-8513, or later document). For our purposes, we will assume you are using the AD CD-ROM system and the data sets/files it provides.

The starting point for TCP/IP customization is the JCL for its started procedure. In the OS/390 V2R6 AD CD-ROM, this is in SYS1.PROCLIB(TCPIP):

³³ If the status is:

```
IEE457I 11:04:42 UNIT STATUS 700
UNIT TYPE STATUS  VOLSER  VOLSTATE
OE20 CTC  A-BSY
OE21 CTC  A
```

then OS/390 TCP/IP is probably already active and using these addresses. (We say probably because it is possible to have some other job/task using these addresses; this is unlikely if you are working with a new AD CD-ROM installation.) If this is your case, you might want to stop OS/390 TCP/IP until you complete your customization. You can do this with the OS/390 command P TCPIP, assuming the started task name is "TCPIP."

³⁴ A security product other than RACF may be used. In such cases, you must adapt TCP/IP security requirements to your security product.

```

//TCPIP PROC PARMS='CTRACE(CTIEZB00)'
//TCPIP EXEC PGM=EZBTCPIP, PARM='&PARMS', REGION=7500K, TIME=1440
//SYSPRINT DD SYSOUT=*, DCB=(RECFM=FB, LRECL=137, BLKSIZE=137)
//ALGPRINT DD SYSOUT=*, DCB=(RECFM=FB, LRECL=137, BLKSIZE=137)
//SYSOUT DD SYSOUT=*, DCB=(RECFM=FB, LRECL=137, BLKSIZE=137)
//CEEDUMP DD SYSOUT=*, DCB=(RECFM=FB, LRECL=137, BLKSIZE=137)
//SYSMDUMP DD DUMMY
//PROFILE DD DISP=SHR, DSN=TCPIP.PROFILE.TCPIP
//SYSTCPD DD DISP=SHR, DSN=TCPIP.TCPIP.DATA

```

and is started by issuing S TCPIP from the MVS master console. (It can also be started automatically from SYS1.PARMLIB(COMMNDxx) or equivalent.) Note that the started task name is **TCPIP**. You cannot readily change this name; it is coded in the BPXPRMxx member of PARMLIB.

The key element of this procedure is that it contains DD statements for PROFILE and SYSTCPD.³⁵ The data set names associated with these DD statements have changed from release to release. The names shown above were used for the OS/390 V2R5 AD CD-ROM system. In the remainder of this discussion, we will refer to these as the PROFILE and DATA data sets. To find the actual data set names, you should check the JCL for your TCPIP started task.³⁶

Assuming the TCPIP started task described here, your initial OS/390 TCP/IP customization involves a few lines in the PROFILE data set.

2.3.3 TCP/IP Profile

The complete PROFILE data set, as used in the author's V2R5 system is listed here. Comment lines have been removed for brevity:

```

ARPAGE 20
DATASETPREFIX TCPIP
TELNETPARMS
    PORT 23
    INACTIVE 600
    TIMEMARK 600
    SCANINTERVAL 120
    SMFINIT STD
    SMFTERM STD
    WLMCLUSTERNAME TN3270E ENDWLMCLUSTERNAME
ENDTELNETPARMS
TCPCONFIG          RESTRICTLOWPORTS
UDPCONFIG          RESTRICTLOWPORTS
AUTOLOG 5
    FTPD JOBNAME FTPD1 ; FTP Server
    PORTMAP           ; Portmap Server
ENDAUTOLOG
PORT
    7 UDP MISCSERV           ; Miscellaneous Server
    7 TCP MISCSERV
    9 UDP MISCSERV

```

³⁵ If these DD statements are not present, TCP/IP will follow a number of paths attempting to find data sets containing PROFILE and DATA parameters.

³⁶ This statement assumes that the started task name is TCPIP. This should remain standard, starting with V2R5, for AD CD-ROM systems. Other OS/390 systems may have different started task names. Furthermore, the started task procedure might not be in SYS1.PROCLIB. If the JCL does not contain PROFILE and SYSTCPD DD statements, you will need to examine the whole process by which OS/390 TCP/IP finds its parameters. This is beyond the scope of this discussion.

```

9 TCP MISC SERV
19 UDP MISC SERV
19 TCP MISC SERV
20 TCP OMVS NOAUTOLOG ; FTP Server
21 TCP OMVS ; FTP Server
23 TCP INTCLIEN ; Telnet Server
25 TCP SMTP ; SMTP Server
53 TCP NAMESRV ; Domain Name Server
53 UDP NAMESRV ; Domain Name Server
69 UDP OMVS ; OE TFTP SERVER
80 TCP OMVS ; OE WEB SERVER
111 TCP PORTMAP ; Portmap Server
111 UDP PORTMAP ; Portmap Server
135 UDP LLBD ; NCS Location Broker
161 UDP OSNMPD ; SNMP Agent
162 UDP SNMPQE ; SNMP Query Engine
433 TCP OMVS ; OE WEB Server
443 TCP OMVS ; Secure Server
512 TCP RXSERVE ; Remote Execution Server
513 UDP OMVS ; OE RLOGIN SERVER
514 UDP OMVS ; OE syslog server
514 TCP RXSERVE ; Remote Execution Server
515 TCP LPSERVE ; LPD Server
520 UDP OROUTED ; Routed Server
580 UDP NCPROUT ; NCPROUTE Server
750 TCP MVS KERB ; Kerberos
750 UDP MVS KERB ; Kerberos
751 TCP ADM@SRV ; Kerberos Admin Server
751 UDP ADM@SRV ; Kerberos Admin Server
; 1021 TCP OMVS ; OE FTP SERVER
1023 TCP OMVS ; OE TELNET SERVER
1023 UDP OMVS ; OE TELNET SERVER
1024 TCP OMVS ; OE SERVICES
3000 TCP CICSTCP ; CICS Socket
DEVICE LCS1 LCS E20
LINK ETH1 ETHERNET 1 LCS1
HOME
9.12.17.151 ETH1
GATEWAY
9 = ETH1 1492 0.255.255.0 0.12.17.0
; BSDROUTINGPARMS false
; ETH1 1500 0 255.255.255.0 0
; ENDBSDROUTINGPARMS
TRANSLATE
ITRACE OFF
ASSORTEDPARMS
FWD
RESTRICTLOWPORTS
ENDASSORTEDPARMS
BEGINVTAM
TELNETDEVICE 3278-3-E NSX32703 ; 32 line screen
TELNETDEVICE 3279-3-E NSX32703 ; 32 line screen
TELNETDEVICE 3278-4-E NSX32704 ; 48 line screen
TELNETDEVICE 3279-4-E NSX32704 ; 48 line screen
TELNETDEVICE 3278-5-E NSX32705 ; 132 column screen
TELNETDEVICE 3279-5-E NSX32705 ; 132 column screen
DEFAULTLUS
SCOTCP01 SCOTCP02 SCOTCP03 SCOTCP04 SCOTCP05
SCOTCP06 SCOTCP07 SCOTCP08 SCOTCP09 SCOTCP10

```

```

SCOTCP11 SCOTCP12 SCOTCP13 SCOTCP14 SCOTCP15
SCOTCP16 SCOTCP17 SCOTCP18 SCOTCP19 SCOTCP20
SCOTCP21 SCOTCP22 SCOTCP23 SCOTCP24 SCOTCP25
SCOTCP26 SCOTCP27 SCOTCP28 SCOTCP29 SCOTCP30
ENDEFAULTLUS
LUSESSIONPEND
DEFAULTAPPL TSO
LINEMODEAPPL TSO
ALLOWAPPL TSO* DISCONNECTABLE
ALLOWAPPL *
ENDVTAM
START LCS1

```

2.3.3.1 Basic Adapter Customization

Your CD CD-ROM system should have a PROFILE data set similar to this. We noticed, starting with the V2R5 AD CD-ROM system, that an executing TCP/IP has exclusive control on the PROFILE data set. We needed to stop TCP/IP before we could edit the PROFILE data set. Your initial customization, to get basic TCP/IP functions working with your IP network involves the following few lines:

```

DEVICE LCS1 LCS E20
LINK ETH1 ETHERNET 1 LCS1
HOME
9.12.17.151 ETH1
GATEWAY
9 = ETH1 1492 0.255.255.0 0.12.17.0
...
START LCS1

```

The illustrated parameters conform to our example in which we have a P/390 (or R/390 or Application StarterPak) with a single Ethernet adapter that will use S/390 addresses E20 and E21. The adapter is connected via the LCS3172 device manager (P/390, R/390) or is an OSA-2 port (Application StarterPac).

The DEVICE statement should appear approximately as shown. DEVICE and LCS are keywords and must not be changed. LCS1 (as shown) is an arbitrary *device name*; any name can be used provided it is also used in the LINK and START statements. E20 (as shown) is the S/390 address; it is the first (even) address of an even/odd pair. As shown here, it specifies the addresses E20 and E21.

The LINK statement has four parameters. The first parameter is an arbitrary *link name*; any name can be used provided it is later used in HOME, GATEWAY, and other statements. The second parameter is the type of protocol involved; common keyword values are ETHERNET, ETHERNETor802.3, or IBMTR.³⁷ The third parameter is the LAN adapter number; this is the number from the Current Configuration window in MPTS.³⁸ The fourth parameter is a device name -- the same name you used in a DEVICE statement earlier.

If you have multiple interfaces (adapters) for OS/390 TCP/IP, there will be one DEVICE statement and one LINK statement for each interface.

³⁷ If you are uncertain whether your ethernet network is DIX Ethernet or IEEE802.3 ethernet, you can use the ETHERNETor802.3 option. (You can use all upper-case letters to specify it.)

³⁸ For an R/390, use the number corresponding to the AIX adapter name; ent3 would be 3, for example. For a StarterPak, use 0 or 1, corresponding to the port on the ENTR adapter.

The HOME statement is followed by your IP address and the associated link name. If you have multiple interfaces, you would have one IP-address/link-name line for each interface. This is the single location where you set your IP address. (If you have multiple interfaces, you will have multiple IP addresses, of course.³⁹).

2.3.3.2 Static Routing Customization

The GATEWAY statement(s) provide static routing. You might later remove these statements if you want dynamic routing. For your initial customization, we suggest you use static routing. The format of the gateway statement is unusual and is best explained with examples. We have added a comment line that helps understand the operands:

```
GATEWAY
;Network FirstHop Link PSize SubnetMask SubnetValue
  9      =      ETH1 1492  0.255.255.0 0.12.17.0
```

The first parameter is the network number; ours is "9." The network number should correspond to the class of network address. A class A network has an address between 1 and 126.⁴⁰ A class B network has an address xxx.xxx, where the first xxx is between 128 and 191. A class C network has an address xxx.xxx.xxx, where the first xxx is 192 to 223. Do not include any subnet portion of the address in the Network column.

In the FirstHop column, the symbol "=" means to use the directly-attached LINK that is named in the third column. The PSize column specifies the maximum packet size for this link.⁴¹

The SubnetMask column specifies the *additional* mask to be added to the network class in order to produce your subnet. To subnet a class A address to a class C subnet, the mask would be 0.255.255.0.⁴² To subnet a class B address to a class C subnet, the mask would be 0.0.255.0.

The SubnetValue column specifies the address of your subnet. Do not duplicate the network address; specify only the subnet portion of your address.

More examples might help:

```
Your desired subnet = 151.123.1.0
      Network = 151.123      (a class B address)
      SubnetMask = 0.0.255.0
      (Effective netmask = 255.255.255.0)
      SubnetValue = 0.0.1.0      (your subnet)
```

```
Your desired subnet = 192.168.25.0
      Network = 192.168.25   (a class C address)
      SubnetMask = 0
      (Effective netmask = 255.255.255.0)
      SubnetValue = 0
```

```
Your desired subnet = 10.0.0.0
      Network = 10           (a class A address)
```

³⁹ You can have multiple IP addresses with a single interface, but this is beyond the scope of this document

⁴⁰ 127.0.0.1 is automatically used as the loopback address; do not define it here.

⁴¹ See an earlier discussion about appropriate packet sizes for Ethernet.

⁴² Subnet masks of 255 are commonly used. You might use other values provided you produce a valid net/host address definition.

```

SubnetMask = 0.255.255.0
(Effective netmask = 255.255.255.0)
SubnetValue = 0

```

All three examples assume you want a single byte for your host addresses. A slightly more complex GATEWAY set might be:

```

GATEWAY
;Network FirstHop Link PSize SubnetMask SubnetValue
9          =      ETH1 1492  0.255.255.0 0.12.17.0
193.1.2   9.12.17.1 ETH1 1492  0

```

This set defines the system as being attached to network 9.12.17. (Network 9 with subnet 12.17.) Furthermore, packets to network 193.1.2 should be sent to address 9.12.17.1, whose network (9.12.17) has already been defined in a statement in the GATEWAY section. In this case, 193.1.2 is a class C address and no subnet information is needed. You must specify the "0" for the SubnetMask.

You generally describe all your directly connected networks first; these have the FirstHop value "=". You can then define any number of static routes. The FirstHop value in any line must be capable of being resolved to a directly-attached link, using previously defined routes.

One more example may be useful:

```

GATEWAY
;Network FirstHop Link PSize SubnetMask SubnetValue
9          =      ETH1 1492  0.255.255.0 0.12.17.0
193.1.2   9.12.17.1 ETH1 1492  0
DEFAULTNET 9.12.17.50 ETH1 DEFAULTSIZE 0

```

The DEFAULTNET statement indicates that all addresses not routed by earlier GATEWAY statements⁴³ are to be sent to the system at 9.12.17.50. The routing for this network is known from the first statement in the GATEWAY section. The DEFAULTSIZE operand (for the maximum packet size) is equivalent to a maximum packet size of 576.⁴⁴ You normally specify a SubnetMask value of 0 for a DEFAULTNET statement. You may have only one DEFAULTNET statement, and it is normally the last statement in the GATEWAY section.

At the end of your PROFILE, you need a START statement for the device name specified in your DEVICE statement. If you have multiple DEVICE statements, you would normally have a START statement for each device.

2.3.3.3 Other PROFILE Customization

Your PROFILE data set (assuming you are using an AD CD-ROM system) should be similar to the one in the earlier listing -- although it will contain many comment lines not shown here. We suggest you do not change any statements unless you are reasonably certain you know what you are doing. A brief discussion of some of the statements in this PROFILE data set may be helpful:

- ARP information will be retained 20 minutes before it is discarded.
- The standard MVS telnet server (primarily designed for tn3270 connections that interface with VTAM) is present on port 23. See the TELNETPARMS

⁴³ In this example, routes for networks 9.12.17 and 193.1.2 are specified in previous statements.

⁴⁴ This is the default Internet packet size. Discussions about packet sizes can be found in many Internet and TCP/IP texts. 576 is a "safe" size for packet groups that may go through many intermediate nodes.

statements and the port 23 line in the PORT statements. INTCLIEN is the name of the standard MVS telnet server.

- Unauthorized applications cannot obtain port addresses lower than 1023; this is the effect of the RESTRICTLOWPORTS operands.
- A started procedure named FTPD will be automatically started, and restarted if it fails. The AUTOLOG statement causes this. The jobname will be FTPD1. A started task named PORTMAP is also automatically started and restarted, if necessary.
- The PORT section simply reserves port numbers for specific application names. It does not start the associated applications. The application name “OMVS” means that the application claiming the indicated port must be started from OMVS.⁴⁵
- Note that port 1023 (both UDP and TCP) is reserved for an OMVS application. Later customization will use this port for otelnet (the application that accepts ASCII telnet connections for the Open Edition shell).
- The ASSORTEDPARMS parameter NOFWD or FWD determines whether OS/390 TCP/IP will perform IP forwarding. This may be a security issue for your installation. For a small development system, such as a P/390 using an AD CD-ROM OS/390 base, you probably want the FWD parameter.
- Do not even think about changing the TELNETDEVICE lines unless you understand VTAM mode tables or unless you are following carefully documented advice.
- You should ensure there are enough DEFAULTLUS defined to handle all the concurrent tn3270 connections to INTCLIEN (normally your port 23). If necessary, simply define more using the pattern shown. The base part of the LU name (SC0TCPnn in the examples) must correspond with VTAM definitions, so do not change this unless you make corresponding VTAM changes.
- The distributed PROFILE may have some VTAM IMS definitions not shown here. These are examples of ways to limit the number of VTAM connections and can be used or deleted.

There are many PROFILE options and alternatives not discussed here. These are documented in *OS/390 eNetwork Communications Server: IO Configuration* (IBM order number SC31-8513). We strongly suggest you obtain a copy of this manual.

2.3.4 Other Basic Customization

The data sets, files, and customization described in this section should be already complete in your AD CD-ROM system, except for your host names in /etc/host and the corresponding MVS files. The details are very briefly described here to assist you in locating the relevant data sets and files and to provide a starting point for making changes (*after* your basic OS/390 TCP/IP is operational).

⁴⁵ OMVS, OE, OpenEdition, and UNIX System Services are all synonyms, as used here.

2.3.4.1 The DATA Data Set and /etc/resolv.conf

Our TCP/IP started task JCL, shown in 2.3.2, "Procedures and Data Sets" on page 38, contains a DD statement with DDname SYSTCPD. In the JCL listing, this points to TCPIP.TCPIP.DATA. (This is not a standard name and may change in future releases of the AD CD-ROM. You can find the name by examining the TCP/IP started task procedure.) We will refer to this as TCP/IP's DATA data set.

The DATA data set contains several global controls for OS/390 TCP/IP. Our working version, with many comment lines removed, is:

```
keep 10.
TCPIPJOBNAME TCPIP
HOSTNAME MVSEA
DOMAINORIGIN ITSO.IBM.COM
; NSINTERADDR specifies the internet address of the name server.
; LOOPBACK (14.0.0.0) is the default value (your local name server).
; If a name server will not be used, then do not code an NSINTERADDR
; statement (Comment out the NSINTERADDR line below). This will cause
; all names to be resolved via site table lookup.
; NSINTERADDR 9.14.1.30
; NSPORTADDR specifies the foreign port of the Name Server.
; 53 is the default value.
; NSPORTADDR 53
; RESOLVEVIA UDP
; RESOLVERTIMEOUT 30
; RESOLVERUDPRETRIES 1
;
; These datasets may be allocated dynamically:
; datasetprefix.STANDARD.TCPXLBIN (translation tables)
; datasetprefix.ETC.PROTO
; datasetprefix.ETC.SERVICES
; datasetprefix.HOSTS.xxxxxxxx
;
DATASETPREFIX TCPIP
ALWAYSWTO YES
```

The DATA data set provides key parameters for *some* TCP/IP applications and functions. Other applications and functions obtain similar information from /etc/resolv.conf.⁴⁶ Our /etc/resolv.conf looked like this:

```
TCPIPJobname TCPIP ;
Datasetprefix TCPIP ;
Messagecase mixed ;
HostName mvsea ;
DomainOrigin itso.ibm.com;
; NSinterAddr 9.14.1.30 ;
; NSportAddr 53 ;
ResolveVia UDP ;
ResolveTimeout 10 ;
ResolveUdpRetries 1 ;
```

This is approximately the same information that appears in the DATA data set. (Since the NSinterAddr address is commented out in the /etc/resolv.conf file,

⁴⁶ If it exists. If the /etc/resolv or /etc/services or /etc/hosts files do not exist, TCP/IP (when using the OE sockets) should go to the equivalent MVS files. However, you may need some of the HFS versions of the files --- /etc/services in particular --- any most users appear to define both the MVS files and the HFS files. We assume this is the case in the following discussions.

there is no need to comment out the other Resolve values.) *You should keep your DATA data set and your /etc/resolv.conf file synchronized.*⁴⁷

In both cases, the TCPIP job name is the name of the started task. The data set prefix is the qualifier used to dynamically locate required data sets (described later). The HOSTNAME and DOMAIN ORIGIN are used as implied by their names. (Many TCP/IP utilities and library functions append the domain name to any host name they receive that does not contain at least one period in the supplied name.

NSINTERADDR is the address of a name server. If none is specified (which is the case in our files), the appropriate library routines will use the HOSTS.LOCAL and /etc/hosts files described below. If you provide an address for NSINTERADDR there are several additional NS controls you can specify; their purpose is apparent from their parameter names.

2.3.4.2 FTP Customization

Earlier versions of OS/390 TCP/IP had two ftp servers; one for MVS and one for OpenEdition. Current OS/390 (V2R5 and later) has a single ftp server. It can handle both traditional MVS data sets and HFS files. The ftp server is usually started by the AUTOLOG function in the PROFILE data set.

The AUTOLOG function starts a started task, usually named FTPD. The procedure can be found in SYS1.PROCLIB(FTPD):

```
//FTPD  PROC  MODULE='FTPD',PARMS=''
//FTPD  EXEC  PGM=&MODULE,REGION=4096K,TIME=NOLIMIT,
//          PARM='POSIX(ON) ALL31(ON)/&PARMS'
//CEEDUMP DD SYSOUT=*
//*SYSFTPD DD DISP=SHR,DSN=TCPIP.FTP.DATA
//SYSTCPD DD DISP=SHR,DSN=TCPIP.TCPIP.DATA
```

Note that the SYSFTPD DD statement is commented out. This causes a search for several default names.⁴⁸ One default name, assuming that DatasetPrefix (in the DATA data set) is "TCPIP") is TCPIP.FTP.DATA and this data set exists in the AD CD-ROM system. It appears as follows (with many comments removed):

```
;ANONYMOUS                ; anonymous login accepted
;ASATRANS      FALSE      ; do NOT translate control characters
AUTOMOUNT      TRUE       ; automatic mount of unmounted volume
AUTORECALL     TRUE       ; automatic recall of migrated data sets
;AUTOTAPEMOUNT FALSE     ; do NOT automatically mount tape volumes
BLOCKSIZE      6233       ; new data set allocation blocksize
CONDDISP       CATLG      ; data sets catalogued if transfer fails
;CTRLCONN      IBM-850    ; ascii code set for control connection
;DATACLASS     SMSDATA    ; sms data class name
;DB2           D31        ; db2 subsystem name
;DB2PLAN       PLANNAME   ; db2 plan name for OE-FTP
;DCBDSN        MODEL.DCB  ; new data set allocation model dcb name
;DEST          USER14@MVSL ; files destination for store
DIRECTORY      27         ; new data set allocation directory blocks
DIRECTORVMODE  FALSE     ; directorymode vs. data set mode
FILETYPE       SEQ        ; file transfer mode
```

⁴⁷ This dual structure is a result of earlier implementations of several different TCP/IP "stacks" and several sockets programming interfaces.

⁴⁸ We cannot think of any particular reason why the developers chose to do this instead of coding the DSNAME.

```

INACTIVE      300          ; inactive time out (seconds)
JESLRECL     80           ; lrecl of jes jobs
JESPUTGETTO  600          ; timeout for remote job submission put/ge
JESRECFM     F           ; recfm of jes jobs
LRECL        256          ; new data set allocation lrecl
;MGMTCLASS   SMSMGMT     ; sms mgmtclass name
;MIGRATEVOL  MIGRAT      ; migration volume volser
PRIMARY      1           ; new data set allocation primary space
;QUOTESOVERRIDE FALSE    ; single quote(s) are treated as part of
                          ; hfs filename, i.e. single quotes do
                          ; NOT indicate working directory override
RECFM        VB          ; new data set allocation record format
;RETPD       30          ; new data set retention period: 30 days
;SBDATACONN  (IBM-1047,IBM-850) ; ebcdic/ascii code sets for data conn.
SECONDARY    1           ; new data set allocation secondary space
;SMF         STD        ; SMF records use standard subtypes
;SMFEXIT     ;           ; load SMF user exit FTPSMFEX
;SMFJES     ;           ; SMF recording when filetype=jes
;SMFSQL     ;           ; SMF recording when filetype=sql
SPACETYPE    TRACK      ; new data set allocation space type
SPREAD       FALSE     ; sql output format
SQLCOL       NAMES     ; sql output uses column names as headings
;STARTDIR    MVS        ; use MVS directory at connect time
;STORCLASS   SMSSTOR   ; sms storclass name
;TRACE       ;         ; trace active
;TRAILINGBLANKS TRUE   ; include trailing blanks when fixed
                          ; format data sets are retrieved
;UMASK       027       ; octal UMASK to restrict setting
                          ; of permission bits when creating
                          ; new hfs files
;UNITNAME    3380      ; new data set allocation unit
;VOLUME      WRKLB2    ; new data set allocation volume serial
WRAPRECORD   FALSE     ; data is NOT wrapped to next record

```

Read this listing carefully since many lines are commented out. The meaning of most of the controls is apparent, although some of the specified values might not be appropriate for you. In particular, you might want to consider and change the AUTOMOUNT (change to FALSE), BLOCKSIZE (change to halftrack blocking), PRIMARY (change to something larger than one track) and INACTIVE (change to a larger timeout number, such as 1200) parameters. The possible parameters are explained in the *IP Configuration* manual (SC31-8513).

In addition to simple file transfers, the ftp server can submit jobs to JES2 and run DB2 SQL. Setup information is in the *IP Configuration* manual. The TCP/IP setup we are describing here does not have these features enabled.

Use of this ftp server is straightforward. From an ftp client, you request to GET or PUT a host file. If the host file name is a traditional data set name, a traditional MVS data set is used. If the host file name is an HFS name, then an HFS file is used. The current host directory can be an HFS directory, a catalog listing based on an HLQ, or a member listing of a PDS. Which is used depends on the format of your cd commands from the client.

2.3.4.3 inetd Customization

A started task or process is needed for INET. This is normally started from from the /etc/rc file, with the following line:

```
_BPX_JOBNAME='INETD' /usr/sbin/inetd /etc/inetd.conf &
```

It could also be started from a procedure (placed in SYS1.PROCLIB(INETD) if there is a problem starting it from the rc file.⁴⁹

```
//INETD PROC
//INETD EXEC PGM=INETD,REGION=4096K,TIME=NOLIMIT,
//          PARM=' POSIX(ON) ALL31(ON) /etc/inetd.conf'
/* Note the required lower case name above
//SYSPRINT DD SYSOUT=*
//SYSERR DD SYSOUT=*
//CEEDUMP DD SYSOUT=*
//SYSOUT DD SYSOUT=*
//SYSIN DD DUMMY
```

However inetd is started, it references /etc/inetd.conf for parameters. The basic content of this file, for the AD CD-ROM system, should be:

```
otelnet stream tcp nowait OMVSKERN /usr/sbin/otelnetd otelnetd -lm
logon stream tcp nowait OMVSKERN /usr/sbin/rlogind rlogind -m
```

(The presence of the rlogin daemon in /etc/inetd.conf does not mean that rlogin is completely installed.) For the basic TCP/IP startup we are describing, the otelnet entry in /etc/inetd.conf is important. Remember that:

- A tn3270 connection to port 23 will produce a 3270 logon connection via VTAM. This uses the INTCLIEN function defined in the PROFILE data set.
- A telnet connection to port 23 will produce a line mode TSO connection, via VTAM, and is fairly useless.
- A telnet connection to the port associated with otelnet will produce an ASCII-type connection to the OMVS shell. You can run the vi editor, for example, with this connection. If you use the customization outlined in this paper, otelnet will appear at port 1023.

2.3.4.4 Local Host Name Customization

If you do not use a network name server (the DATA and /etc/resolv.conf files listed above specify no name server), TCP/IP will attempt to resolve names using local files. There are two of these files, one for traditional MVS service interfaces and one for OE interfaces. The OE file is /etc/hosts and is in the same format used on many other platforms. Our /etc/hosts file contained:

```
9.12.17.150 os2a
9.12.17.151 mvsea.itso.ibm.com
9.12.17.151 testit
```

The equivalent MVS data set is more complex; there are several data sets involved. They are TCPIP.HOSTS.LOCAL, TCPIP.HOSTS.ADDRINFO, and TCPIP.HOSTS.SITEINFO. (The HLQ "TCPIP" is controlled by the DATASETPREFIX value in the DATA data set. We will assume this value is set to TCPIP.) You create and edit the TCPIP.HOSTS.LOCAL file and then execute the MAKESITE program to create the other two data sets.

⁴⁹ Early shipments of the V2R5 AD CD-ROM had a minor customization error that prevented starting inetd from the rc file.

Our TCPIP.HOSTS.LOCAL data sets was like this:

```
HOST : 9.12.17.150 : os2a ::::
HOST : 9.12.17.151 : mvsea.itso.ibm.com ::::
```

(We intentionally left out the "testit" name.) All the colons are needed, exactly as shown. After creating this data set, issue this command from a TSO command line:

```
MAKESITE HLQ=TCPIP,VOL=SER=vvvvvv,UNIT=uuuu
```

For the AD CD-ROM system, we used VOL=SER=SCPMV5 and UNIT=3380. You need to stop and restart TCP/IP in order to use the new data.

You will normally want to keep your /etc/hosts and your HOSTS data the same. Remember to run the MAKESITE command every time you change the HOSTS file. The *IP Configuration* manual contains information about /etc/hosts and the HOSTS data set in the chapter *Configuring the Site Table*.

2.3.4.5 TCP/IP Services Definitions

The /etc/services file is used to associate port numbers with various OE-based TCP/IP services. A similar data set, TCPIP.ETC.SERVICES, is used to associate port numbers with various MVS-based TCP/IP services. The file and data set are similar, but not identical. In particular, the port for otelnet is assigned in the /etc/services file. You should not need to change the file and data set provided with your AD CD-ROM system.

Our V2R5 AC CD-ROM had the following /etc/services file:

```
echo          7/tcp
echo          7/udp
discard      9/tcp          sink null
discard      9/udp          sink null
systat       11/tcp         users
daytime      13/tcp
daytime      13/udp
netstat      15/tcp
qotd         17/tcp         quote
chargen      19/tcp         ttytst source
chargen      19/udp         ttytst source
ftp          21/tcp
otelnet      1023/tcp
smtp         25/tcp          mail
time         37/tcp         timserver
time         37/udp         timserver
rlp          39/udp          resource      # resource location
nameserver   42/tcp         name          # IEN 116
whois        43/tcp         nicname
domain       53/tcp         nameserver    # name-domain server
domain       53/udp         nameserver
mtp          57/tcp
tftp         69/udp
rje          77/tcp         netrjs
finger       79/tcp
http         80/tcp         www
link         87/tcp         ttylink
supdup       95/tcp
hostnames    101/tcp         hostname     # usually from sri-nic
#csnet-cs    105/?
pop          109/tcp         postoffice
```

```

sunrpc      111/tcp
sunrpc      111/udp
auth        113/tcp      authentication
sftp        115/tcp
uucp-path   117/tcp
nntp        119/tcp      readnews untp # USENET News Transfer
snmp        161/udp      # snmp request port
snmp-trap   162/udp      # snmp monitor trap por
# UNIX specific services
exec        512/tcp
biff        512/udp      comsat
login       513/tcp
who         513/udp      whod
shell       514/tcp      cmd # no passwords used
syslog      514/udp
printer     515/tcp      spooler # line printer spooler
talk        517/udp
ntalk       518/udp
efs         520/tcp      # for LucasFilm
timed       525/udp      timeserver
tempo       526/tcp      newdate
courier     530/tcp      rpc
conference  531/tcp      chat
netnews     532/tcp      readnews
netwall     533/udp      # -for emergency broadcast
uucp        540/tcp      uucpd # uucp daemon
remotefs    556/tcp      rfs_server rfs # Brunhoff remote filesystem
telnet      623/tcp
ingreslock  1524/tcp
# Start of IBM added services ...
router      520/udp      routd
ncprout     580/udp      ncproute
# RVD service
rvd-control 531/udp      # rvd control port
# Andrew File System services
filesrv     2001/tcp
console     2018/udp
venus.itc   2106/tcp
# For file server backup and migration
client      2030/tcp

```

The same system had the following data set for TCPIP.ETC.SERVICES. The contents are in lower case, which is unusual for MVS-based parameter files:

```

echo        7/tcp
echo        7/udp
discard     9/tcp      sink null
discard     9/udp      sink null
systat      11/tcp      users
daytime     13/tcp
daytime     13/udp
netstat     15/tcp
qotd        17/tcp      quote
chargen     19/tcp      ttytst source
chargen     19/udp      ttytst source
ftp         21/tcp
telnet      23/tcp
smtp        25/tcp      mail
time        37/tcp      timserver
time        37/udp      timserver

```

```

rlp                39/udp        resource           # resource location
nameserver         42/tcp        name              # IEN 116
whois              43/tcp        nickname
domain            53/tcp        nameserver        # name-domain server
domain            53/udp        nameserver        # deprecated
mtp               57/tcp
tftp              69/udp
rje               77/tcp        netrjs
finger           79/tcp        ttylink
link             87/tcp
supdup           95/tcp
hostnames        101/tcp       hostname          # usually from sri-nic
#csnet-cs        105/?
pop              109/tcp       postoffice
sunrpc           111/tcp
sunrpc           111/udp
auth             113/tcp       authentication
sftp             115/tcp
uucp-path        117/tcp
nntp             119/tcp       readnews untp    # USENET News Transfer Protocol
snmp             161/udp       # snmp request port
snmp-trap        162/udp       # snmp monitor trap port
# UNIX specific services
exec             512/tcp
biff             512/udp       comsat
login           513/tcp
who              513/udp       whod
shell           514/tcp       cmd              # no passwords used
syslog          514/udp
printer         515/tcp       spooler          # line printer spooler
talk            517/udp
ntalk           518/udp
efs             520/tcp       # for LucasFilm
timed           525/udp       timeserver
tempo           526/tcp       newdate
courier         530/tcp       rpc
conference      531/tcp       chat
netnews         532/tcp       readnews
netwall         533/udp
uucp            540/tcp       uucpd            # -for emergency broadcasts
remotefs        556/tcp       rfs_server rfs  # uucp daemon
                 # Brunhoff remote filesystem

ingreslock       1524/tcp
# Start of IBM added services ...
route           520/udp       router routed
ncprout         580/udp       ncproute
# RVD service
rvd-control     531/udp       # rvd control port
# Andrew File System services
filesrv         2001/tcp
console         2018/udp
venus.itc       2106/tcp
# For file server backup and migration
client          2030/tcp
# Andrew File System Authenticated services
vexec           712/tcp       vice-exec
vlogin         713/tcp       vice-login
vshell          714/tcp       vice-shell
# For the Venus process.

```

```

venus.itc      2106/tcp
rauth2        2001/udp
rfilebulk     2002/udp
rfilesrv      2003/udp
ropcons       2115/udp
# The following are assigned in pairs and the bulk must be the srv +1
rupdsrv       2131/udp
rupdbulk      2132/udp
rupdsrv1      2133/udp
rupdbulk1     2134/udp
# Kerberos services
klogin        543/tcp      # Kerberos aythenticated rlogin
kerberos      750/udp      kdc # Kerberos aythentication--udp
kerberos      750/tcp      kdc # Kerberos aythentication--tcp
kerberos_master 751/udp      # Kerberos aythentication
kerberos_master 751/tcp      # Kerberos aythentication
passwd_server 752/udp      # Kerberos passwd server
userreg_server 753/tcp      # Kerberos userreg serrver
kpop          1109/tcp      # Pop with Kerberos
knetd         2053/tcp      # Kerberos de-multiplexor
kshell        544/tcp      cmd # and remote shell
eklogin       2105/tcp      # Kerberos encrypted rlogin
krb_prop      754/tcp      # Kerboros slpave propagation
erlogin       888/tcp      # Login and environment passing
# Kerberos sample server
sample        906/tcp      # Kerberos sample app server
sample        906/udp      #for kerberos simple test

```

Both versions contain port assignments for services you may not want or need. We suggest you use the file and data set as provided, unless you have specific reasons for changing them. You might want to change the port number used for otelnet. If you want to switch the ports for otelent (port 1023) and INTCLIEN (port 23), be certain to change TELNETPARMS in the PROFILE data set as well. You may notice that /etc/services has a telnet service defined at port 623; we did not experiment with this and do not know how it relates to the INTCLIEN version of telnet/tn3270.

2.3.4.6 Other Minor Setup and Customization

Several entries have been added to the SCHEDxx and IEFSSNxx members in PARMLIB. This has already been done for the AD CD-ROM, but you might want to verify it. Remember that there are multiple PARMLIBs, and finding the members actually used for a particular IPL may require some effort in tracing the effects of the IPLPARAM parameter used.

PARMLIB(SCHEDxx) should have these sections:

```

PPT PGMNAME(MVPTNF)
    KEY(0)          (storage protection key)
    PRIV           (special WLM handling)
    NOCANCEL       (operator cannot cancel)
    SYST           (no timing)
    NOSWAP         (never swap out completely)
PPT PGMNAME(MVPXVMCF)
    KEY(0)          (storage protection key)
    PRIV           (special WLM handling)
    NOCANCEL       (operator cannot cancel)
    SYST           (no timing)
    NOSWAP         (never swap out completely)
PPT PGMNAME(EZBTCPIP)

```

KEY(6)	(storage protection key)
PRIV	(special WLM handling)
NOCANCEL	(operator cannot cancel)
SYST	(no timing)
NOSWAP	(never swap out completely)
SPREF	(preferred storage)
LPREF	(preferred storage)

The active PARMLIB(IEFSSNxx) member should include these two lines:

```
SUBSYS SUBNAME(TNF)
SUBSYS SUBNAME(VMCF)
```

You may find IEFSSNxx data in an older format, without keywords such as SUBNAME. Either format can be used.

Member EZAZSSI should exist in SYS1.PROCLIB. It normally is like this:

```
//EZAZSSI PROC P=''
//STARTVT EXEC PGM=EZAZSSI,PARM=&P
```

This procedure (started task) must be started before TCP/IP can be started. This is normally done with a command such as S EZAZSSI,P=P390 in a COMMNDxx member of PARMLIB. The AD CD-ROM systems are set up this way. If you change COMMNDxx processing you must be certain that EZAZSSI is started before the start command for TCPIP. The program parameter (set to "P390") in the AD CD-ROM systems is the *NJE name* of your system, if one exists, or the SID from PARMLIB.

2.3.5 Advanced Customization

Obtaining tn3270 and ftp service can be considered part of basic TCP/IP customization. Additional services, such as dynamic routing, nfs, name servers, and so forth involves more advanced customization and is generally beyond the scope of this document. The following comments may be useful as a starting point for additional functions for your OS/390 TCP/IP.

2.3.5.1 Dynamic Routing

You can disable static routing by removing (or commenting out) *all* the GATEWAY statements in your PROFILE data set. You can then enable dynamic routing. In our examples, this might be:

```
; GATEWAY
; 9 = ETH1 1492 0.255.255.0 0.12.17.0
BSDROUTINGPARMS false
ETH1 1492 0 255.255.255.0 0
ENDBSDROUTINGPARMS
```

The *false* operand means that a maximum size of 576 will be used for packets. (A *true* means that your specified maximum packet size will be used.) The first "0" in the line beginning ETH1 is the hop metric. This value is normally zero. The subnet mask should be whatever is appropriate for your local network. The last "0" is required unless you have a point-to-point (non-LAN) link.

Note that, with the OS/390 releases discussed here, *you must also run the OE RouteD server on the same OS/390 system*. The setup for OE RouteD is described in Chapter 24 of the *IP Configuration* document. If you work with OE

RouteD, remember to configure VARSUBNETTING, IGNOREREDIRECT, and DATAGRAMFWD in your PROFILE controls.⁵⁰

2.3.5.2 Network File System

OS/390 TCP/IP includes both an nfs client and nfs server. The OS/390 AD CD-ROM V2R6 release provides initial customization for both elements. IBM distributes nfs functions as part of DFSMS services, and not as part of TCP/IP. The documentation for nfs is completely separate from the TCP/IP documentation, and different data sets are used for control parameters. The following manuals are important:

- *OS/390 Network File System Customization and Operation (SC26-7253).*
- *Network File System User's Guide (SC26-7254)*

In the AD system, the key control data set is MVS NFS.CNTL. This is a partitioned data set with two key members: NFSATTR and EXPORTS. The NFSATTR member contains all the controls for the nfs server. One of the controls (as set up in the AD system) selects the *exports* level of security. This means that any data set or file listed in the EXPORTS member can be accessed from external nfs clients without going through RACF controls.⁵¹ The list of files and data sets in MVS NFS.CNTL(EXPORTS) is intended only as an example. You will need to revise it (or move to a different security option) for any serious use of nfs.

The AD system provides two started tasks, NFSS and NFSC (nfs server and nfs client), that are started via VTAMAPPL. You may want to edit or remove these if you are not using nfs. For reasons we did not explore, the NFSC started task does not appear in D A,L displays on the MVS master console, while NFSS does appear. Both appear in D A,ALL displays. We used the nfs server with OS/2 and AIX clients, and had no problems. However, we understand that some nfs clients may not match the nfs protocol version used by the OS/390 nfs server.

You *must* read the nfs manuals listed above if you plan to use either client or server functions. If you do not plan to use these functions, we recommend removing both functions from SYS1.ADCD06.PARMLIB(VTAMAPPL).

2.4 Problems

A structured approach to problem solving is important when dealing with TCP/IP problems on these systems. The most common situation is that:

- OS/390 is installed and working.
- The MVS master console and local VTAM (TSO) sessions are working on the server, via the AWS3274 device manager.
- OS/390 TCP/IP is not working.

This set of symptoms means that the server TCP/IP is correctly configured -- at least for the loopback address.⁵²

⁵⁰ These are discussed on page 238 of the *Volume 1: Configuration and Routing (SG24-5227) Redbook*.

⁵¹ nfs access, in UNIX environments, is partly controlled by UID and GID values. The meaning of UIDs and GIDs across multiple systems can be a complex topic; issues involved often place bounds on what can be reasonably exposed to nfs accesses. OS/390 nfs adds options to use RACF controls to force use of OS/390-defined UIDs and GIDs. These options are well designed and potentially permit wider use of nfs while retaining reasonable security.

⁵² This statement assumes you are not using CM/2 for your local sessions on a P/390.

Do you have the most recent P/390 (or R/390) device managers?. A number of fixes and upgrades have appeared over the last few months. Updates and fixes are available at the p390.ibm.com ftp site.

If you have a LAN attached to your server TCP/IP (OS/2, AIX), does it work? Can you ping it? (This would be address 9.12.17.150 in our examples.) If not, you have problems at the server level. For a P/390, check C:\IBMCOM\LANTRAN.LOG to see if the LAN adapters are being started. If there are errors here, check your MPTS configuration. If there are no LANTRAN errors, and the adapters are starting, check OS/2 or AIX TCP/IP definitions. For an R/390, use smit to verify that the adapter is available.

If the problem appears to be only with OS/390 TCP/IP, use the MVS master console to display the unit status:⁵³

```
D U,,,E20,2          (Use your correct addresses, of course)
```

This should display:

```
IEE457I 11:04:42 UNIT STATUS 700
UNIT TYPE STATUS  VOLSER  VOLSTATE
OE20 CTC  0
OE21 CTC  0
```

If the status is O (online) or A (allocated) or A-BSY (allocated and busy), your problem is probably with OS/390 TCP/IP definitions, or with your network (such as routing problems).

If the status is OFFLINE, try to vary the units online:

```
V (E20-E21),ONLINE
```

If the result is NO PHYSICAL PATH or a similar message, your problems are probably with MPTS, server TCP/IP, or the P/390 Configurator. In this case:

1. Use MPTS to confirm that the adapter you want to use for OS/390 TCP/IP does not have TCP/IP associated with it in the Current Configuration window. It should have only IEEE802.2. Note the adapter number before the IEEE802.2 line.
2. Do you have the right adapter selected? The names in the Network Adapter window of MPTS can be quite similar and may not be easy to relate to the adapter you think you have. Can you verify which adapter you have? By finding the packing box, for example?
3. Review C:\IBMCOM\LANTRAN.LOG, looking for any obvious error messages associated with this line. There should be messages indicating the adapter started.
4. For an R/390, use smit to verify that AIX TCP/IP is not using the adapter. The TCP/IP adapter status should be *down*.

Start the P/390 Configurator. Be certain the appropriate addresses are defined, as shown in Figure 4 on page 27. The even/odd pair of S/390 addresses you want to use must be defined to the LCS3172 device manager.

⁵³ We will assume the unit addresses are E20 and E21 for the rest of this section.

Are these addresses defined as CTC units (or equivalent) in your OS/390 system? This can be verified by the `D U,,E20,2` command shown earlier.

If OS/390 indicates that the addresses are ONLINE, but not allocated, try stopping and starting OS/390 TCP/IP.

```
P TCPIP
   (wait for ENDED message)
S TCPIP
```

(This assumes your started procedure name is TCPIP.) After TCPIP starts, the `D U,,E20,2` message should change from O (online) to A-BSY (allocated) for E20 and A (allocated) for E21. If the addresses remain O (online), you probably have a problem with the DEVICE, LINK, or START lines in your PROFILE data set. Be certain the correct adapter number (from the IEEE802.3 line in the MPTS Current Configuration window) is specified as the third operand of the LINK statement in your PROFILE data set.

If you are using *ping* to test your OS/390 TCP/IP, you should confine your test (both sides of the ping) to the local LAN connected to your OS/390 TCP/IP system. If you try to ping *to* or ping *from* a more remote system, the ping may fail due to routing problems. There must be defined routes from your system (using GATEWAY statements, for example) and to your system (and these must be defined in the remote system and any intermediate routers).

There is no point in trying `tn3270`, `telnet`, or `ftp` until you have ping working. Again, we stress *perform ping tests with another system connected directly to your local LAN*.. If this works, but remote pings fail, there is a routing problem with intermediate or remote nodes.

If basic functions work, such as ping and `tn3270` logon, but there are erratic connection drops or errors, verify that you have the correct DIX or IEEE802.3 selection. The steps are documented earlier in this chapter. If you are in a complete IBM environment, you may be in an IEEE802.3 environment. Otherwise, you are probably in a DIX environment and your system should be configured for it. Note that OS/390 can have it both ways by using the `ETHERNETOR802.3` parameter in the PROFILE data set. Your server TCP/IP (OS/2, AIX) does not support this dual operation and should be set to the correct protocol.

Verify that your MTU size for Ethernet is not larger than 1492. A few users have reported that they needed to set the size to something in the 1450 range; we assume this was due to intermediate node limitations in their network. (If you think your problems are in this area, try setting the MTU to 576; all IP nodes should handle this size correctly.) MTU sizes are set in the GATEWAY statements of the OS/390 PROFILE data set, in the OS/2 TCP/IP configurator, and in `smit`.

Useful commands for TCP/IP debugging are:

1. **ping** from a TSO command line
2. **oping** from an OMVS command line
3. **oe ping** from an OMVS command line (more options)
4. **tracerte** from a TSO command line
5. **otracert** from an OMVS command line
6. **netstat** from a TSO command line

7. **onetstat** from an OMVS command line
8. **D TCPIP,,N,xxxx** where xxxx is a netstat-type option, from the MVS master console.

These commands offer help information; the new MVS operator commands are described in the *IP Configuration* document.

If you are unable to connect to otelnet (the direct Open Edition ASCII telnet connection, at port 1023 in the AD system), the problem may be understanding your telnet client. By default, telnet clients attempt to connect to port 23.⁵⁴ To connect to otelnet, you need to specify a port number when calling your telnet client. The method of doing this varies with different telnet client packages. If you are starting your client with a line command, it might be something like this (using port 1023 as the example):

```
telnet 9.12.17.151 -p 1023    or
telnet 9.12.17.151 1023     or
telnet 9.12.17.151:1023
```

or something similar.

2.5 Compiling TCP/IP Applications

We used the following JCL to compile simple TCP/IP client and server applications:

```
//OGDEN7 JOB 1,OGDEN,MSGCLASS=X
// EXEC  EDCL,PARM.COMPILE='SOURCE'
//COMPILE.STEPLIB DD DISP=SHR,DSN=SYS1.SCEERUN
//          DD DISP=SHR,DSN=SYS1.SCBCMP
//COMPILE.SYSLIB DD DISP=SHR,DSN=CEE.SCEEH.H
//          DD DISP=SHR,DSN=CEE.SCEEH.ARPA.H
//          DD DISP=SHR,DSN=CEE.SCEEH.NET.H
//          DD DISP=SHR,DSN=CEE.SCEEH.NETINET.H
//          DD DISP=SHR,DSN=CEE.SCEEH.SYS.H
//COMPILE.SYSIN DD *,DLM='<>'
           source code
<>
//LKED.SYSLIB   DD DISP=SHR,DSN=CEE.SCEELKEX
//          DD DISP=SHR,DSN=CEE.SCEELKED
//LKED.SYSLMOD DD DISP=OLD,DSN=OGDEN.LIB.LOAD(PSERVER)
```

Using this JCL, we did not have any private INCLUDE libraries. You would need to add such libraries to the SYSLIB concatenation. And the following JCL was later used to execute the programs in MVS batch:

```
//OGDEN8 JOB 1,OGDEN,MSGCLASS=X
// EXEC  PGM=PSERVER,PARM='POSIX(ON)'/
//STEPLIB DD DISP=SHR,DSN=OGDEN.LIB.LOAD(PSERVER)
//SYSOUT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//CEEDUMP DD SYSOUT=*
//STDOUT DD SYSOUT=*
//STDERR DD SYSOUT=*
//CEESNAP DD SYSOUT=*
```

⁵⁴ Connecting to port 23 in ASCII telnet mode will attempt to use TSO in line mode. It is very unlikely that you really want to do this.

All the SYSOUT statements may be overkill, but this is a good starting point for execution.

Under OMVS, we used the same programs (without the JCL, of course) and compiled with a simple "cc" command.

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Appendix B. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

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For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 65.

- *P/390 (and R/390) OS/390: New User's Cookbook*, SG24-4757
- *OS/390 eNetwork Communications Server V2R5: TCP/IP Implementation Guide Volume 1 - Configuration and Routing*, SG24-5227
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B.3 Other Publications

These publications are also relevant as further information sources:

- *OS/390 eNetwork Communications Server: IP Configuration Version 2 Release 5*, SC31-8513
- *OS/390 Network File System Customization and Operation*, SC26-7253
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