Accessing VSAM Files on OS/390 from VisualAge Generator
by Chuck Proffer, Kristine Heaton, & Mitch Johnson

I. Overview

VisualAge Generator provides the capability to access VSAM files that reside on an OS/390 system or any other remote system that supports the Distributed Data Management architecture.
VSAM files on OS/390 systems are typically stored as EBCDIC data, although you can store ASCII data in them as well. VSAM files on the workstation are stored as ASCII data. If you use the OS/390 system only for data storage, you do not need to convert the data to EBCDIC. However, if you want to access the data from VisualAge Generator programs on your workstation and from programs on the host system, you need to store the data in EBCDIC. This means that your VisualAge Generator programs running on the workstation must convert the data between ASCII and EBCDIC. VisualAge Generator provides an automatic data conversion enhancement for remote VSAM files in V3.1 FixPak 3 and V4.0. The data will be automatically converted to EBCDIC before any write operations and converted to ASCII after any read operations.

II. Software Prerequisites

Before accessing remote VSAM files, there are several products that must be installed and configured. VisualAge Generator interfaces with Distributed File Manager (DFM) on the workstation and on the OS/390 to provide the remote VSAM access capability. DFM uses APPC for communications between the workstation and the OS/390.

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IBM eNetwork Personal Communications Version 4.21 or later	Provides the APPC communications support on Windows NT and OS/2
IBM DFSMS/MVS Version 1.2 or later	Provides the DFM support on the OS/390

III. Setup of Distributed File/Manager/MVS (DFM/MVS) on OS/390

Remote access to MVS/ESA and OS/390 VSAM data sets is provided by Distributed FileManager/MVS (DFM/MVS), a component of DFSMS/MVS. DFM/MVS communicates with remote clients using MVS/APPC, which is a part of the base control program (BCP) of each release of MVS/ESA and OS/390. For detailed information on DFM/MVS, refer to the DFM/MVS Guide and Reference - SC26-4915.

Using DFM/MVS for remote VSAM access requires the following:

- MVS/APPC must be active - DFM/MVS uses the MVS/APPC's base LU specified in member APPCPMxx in SYS1.PARMLIB.

```
LUADD ACBNAME(NRAPCVS1)
          BASE
          TPDATA(SYS1.APPCTP)
          TPLEVEL(SYSTEM)
SIDEINFO   DATASET(SYS1.APPCSI)
```

SYS1.PARMLIB(APPCPMxx)

Start MVS/APPC with the MVS command:
START APPC,SUB=MSTR,APPC=xx

- An APPC/MVS transaction scheduler - The DFM/MVS transaction program (TP) is initiated

```
CLASSADD CLASSNAME(DEFAULT)
                MAX(20)
                MIN(1)
                MSGLIMIT(5000)
                RESPGOAL(1)

OPTIONS DEFAULT(DEFAULT)

TPDEFAULT REGION(2M)
                 TIMES(5)
                 MSGLEVEL(1,1)
```

SYS1.PARMLIB(ASCHPMxx)

when a remote request is received. The scheduling information is provided in member ASCHPMxx in SYS1.PARMLIB.

Start the MVS/APPC transaction scheduler with the following MVS command:
START ASCH,SUB=MSTR,ASCH=xx

```
//ATBSDFMU EXEC PGM=ATBSDFMU
//SYSPRINT DD SYSOUT=*
//SYSSDLIB DD DISP=SHR,DSN=SYS1.APPCTP
//SYSSDOUT DD SYSOUT=*
//SYSIN    DD DATA,DLM=XX
  TPADD      TPNAME(^X'07'001)      ACTIVE(YES)
       TPSCHED_DELIMITER(##)
         CLASS(DEFAULT)
         JCL_DELIMITER(ENDJCL)
//GDEDFM JOB MSGCLASS=T,MSGLEVEL=(1,1),CLASS=A
//GDEDFM EXEC PGM=GDEISASB
ENDJCL
##
XX
```

Adding a DFM/MVS TP Profile

- A transaction program (TP) profile - A DFM/MVS agent is started when MVS/APPC receives a request. The TP profile is added to SYS1.APPCTP dataset with the ATBSDDMU utility.

- Start the DFM task with the MVS command:
  START DFM,SUB=MSTR

- The following example shows the VTAM definition for the MVS/APPC LU name.

```
*********************************************************
* MVS/APPC Application
*********************************************************
NRAPCVS1 APPL  ACBNAME=NRAPCVS1,                          C
               APPC=YES,                                   C
               AUTOSES=0,                                  C
               DDRAINL=NALLOW,                             C
               DRESPL=NALLOW,                              C
               DSESLIM=32,                                 C
               EAS=32,                                     C
               MODETAB=ISTINCLM,                           C
               SECACPT=CONV,                               C
               SRBEXIT=YES,                                C
               VERIFY=NONE
```

IV. Setup on Windows NT

Install IBM Personal Communications

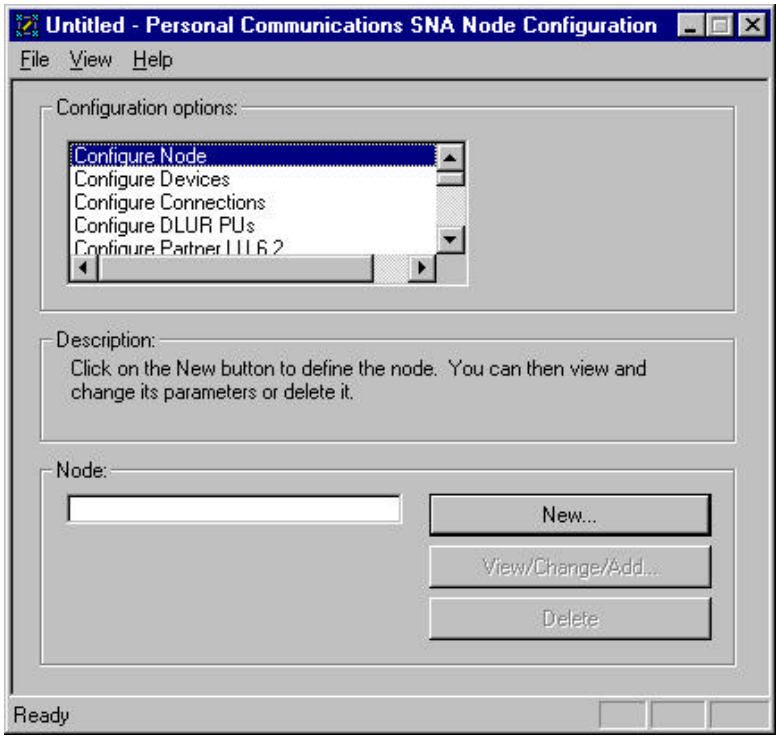
- Select the Communications APIs component
- Ensure that IBM LLC2 network protocol has been installed.

Configure an APPC session with the OS/390 host

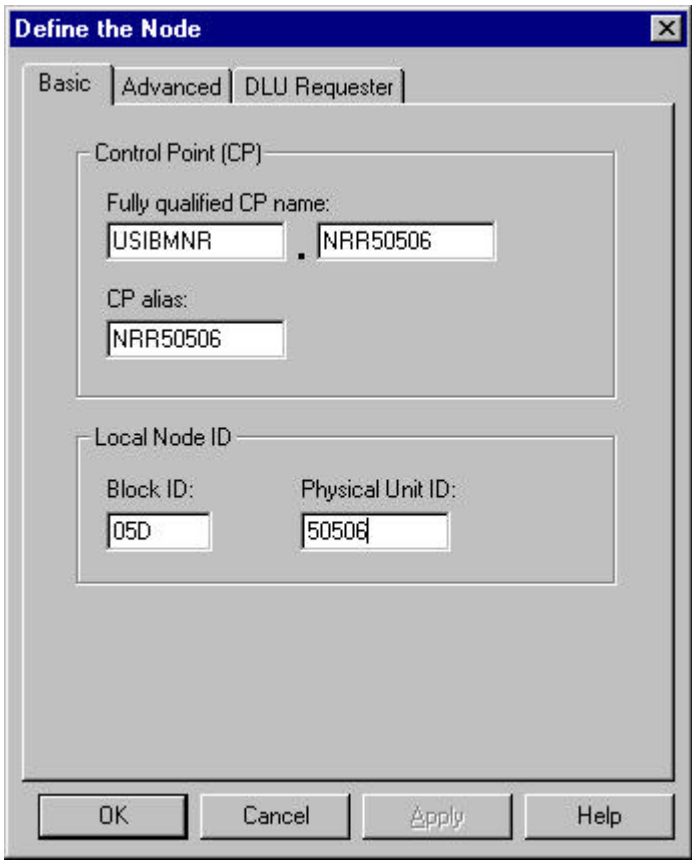
To configure Personal Communications to support APPC connectivity, do the following:

1. Select the 

button.
2. Select **Programs**.
3. Select **IBM Personal Communications**.
4. Select **SNA Node Configuration,** which opens the following window.



5. Select **Configure Node** in the **Configuration options** pane and then click **New...** to open the **Define the Node** window.

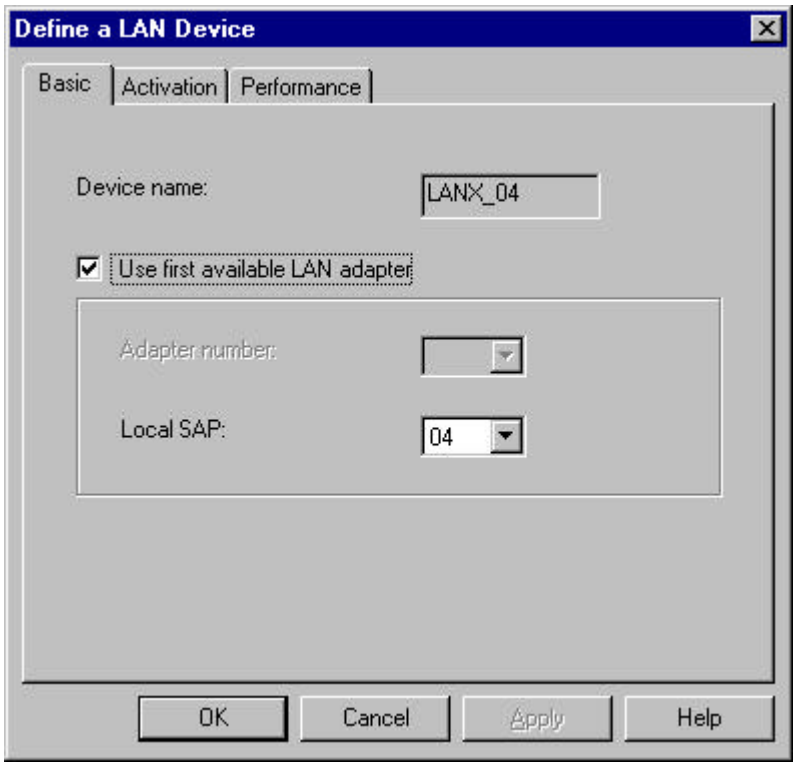


6. Define the host physical unit (PU) information for this workstation. In this example, the **Fully qualified CP name** should be USIBMNR.NRR50506. The **Block ID** is 05D and the **Physical Unit ID** is 50506 (Note: Physical Unit ID can be all zeros if IDNUM is not specified in the PU definition or if VTAM dynamic LU support is enabled). The **CP alias** is NRR50506 in this example but can be any value. This information was obtained from SYS1.VTAMLST(APPCPUS).

7. Click **OK** when finished.

Next we need to define a LAN Device.

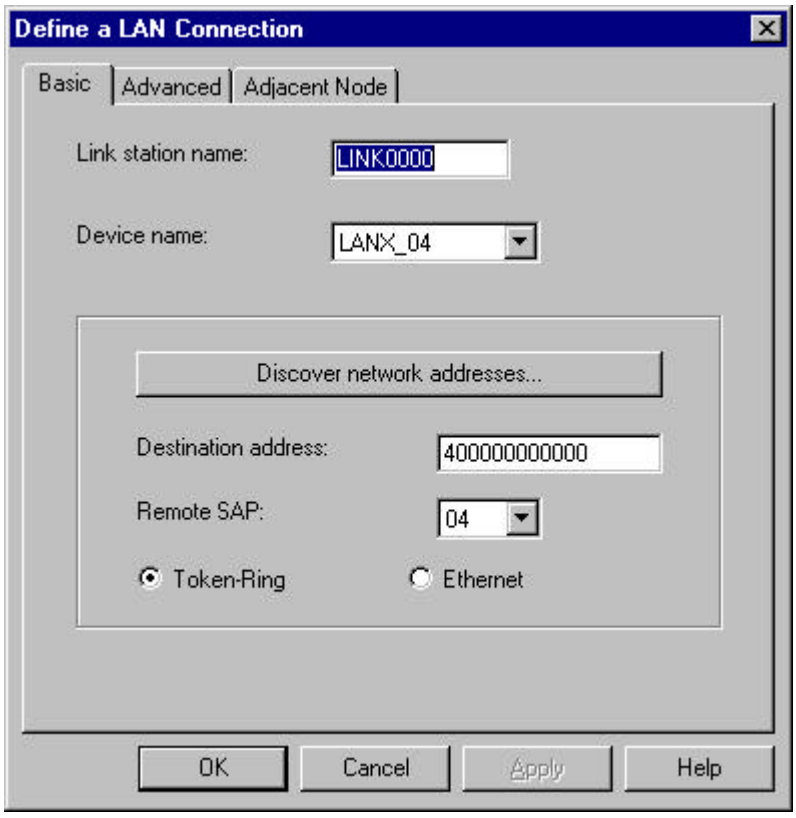
1. In the **Configuration Options** pane, select **Configure Devices** and then click **New...**. This opens the **Define a LAN Device** window.



2. Normally the default settings are okay. If the machine has multiple LAN cards then the **Adapter number** might have to be specified to correspond to the correct adapter.

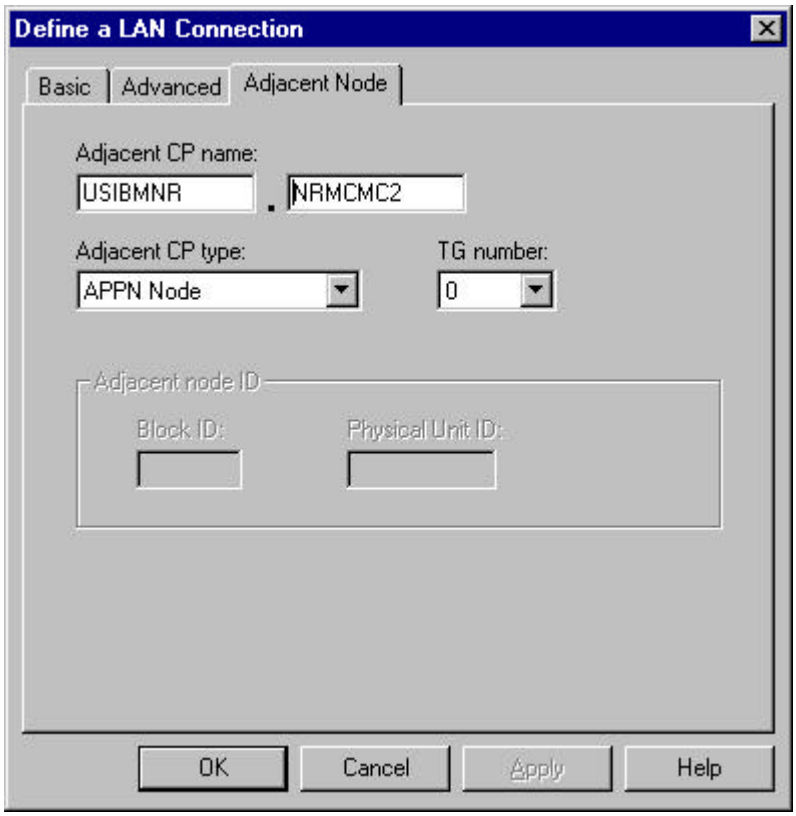
3. Click **OK** when finished.

4. Next we need to configure connections to the host. In the **Configuration options** pane, select **Configure Connections** and then click **New...**. This opens the **Define a LAN Connection** window.



5. On the **Basic** tab we need to specify the **Destination address**. This should be the LAN adapter address of the host (e.g. the TIC address of the communication controller). Also select the appropriate LAN type (Token-Ring or Ethernet).

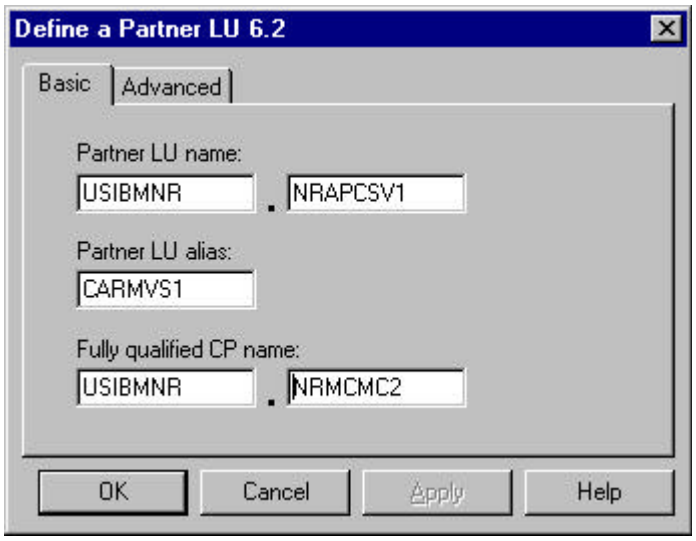
6. On the Adjacent Node tab, specify the **Adjacent CP Name**. This is obtained from SYS1.VTAMLST(ATCSTR00), which in this example is USIBMNR.NRMCMC2.



7. Click **OK** when finished.

Next we need to define the partner applications.

1. Return to the **Configuration options** pane, select **Configure Partner LU 6.2**, and click **New...**.

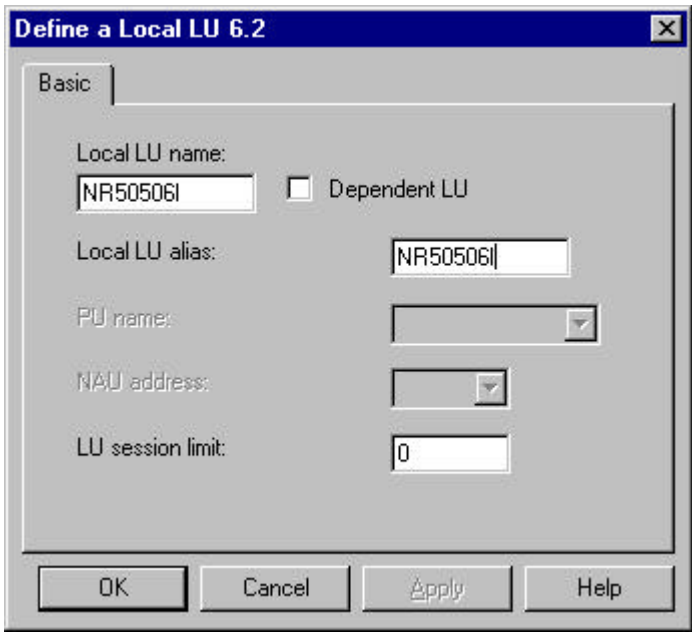


2. On the **Define a Partner LU 6.2** window, type the fully qualified control point name (CP name) of the MVS/APPC subsystem. The fully qualified CP name is network ID plus the LU name of the MVS/APPC subsystem. The network ID is obtained from SYS1.VTAMLST(ATCSTR00) and the LU name is obtained from SYS1.PARMLIB(APPCPMxx). The **Partner LU alias** will be used as the TARGET_SYSTEM in the dfm.rc configuration file and the **Fully qualified CP name** is obtained from SYS1.VTAMLST(ATCSTR00), which in this example is USIBMNR.NRMCMC2.

3. Click **OK** when finished.

Finally, the workstation needs to know the LU name to use when connecting to the host applications.

1. This LU name is specified by selecting **Configure Local LU 6.2**. The **Local LU name** is identified in SYS1.VTAMLST(APPCPUS) by the LU which has a LOCADDR equal to 0 (LOCADDR=0). This local LU name should also be specified via the environment variable APPCLLU. See the section entitled *Sample VTAM Definitions* for an example.



2. Click **OK** when finished and save the configuration.

If you installed Personal Communications in directory c:/PComm and saved the configuration as file config.acg, then the command **csstart -a /PComm/private/config.acg** can be used to load Personal Communications automatically when the system is started.

Configure DFM

The workstation support for DFM is provided by the SmartData Utilities component of IBM VisualAge for COBOL. If you have IBM VisualAge for COBOL installed, specifically the SmartData Utilities component, then you will have an *\ibmcobw\samples\hostdata* directory with sample configuration files. If you do not have IBM VisualAge for COBOL, you can download vsamnt.zip from *ftp://ps.software.ibm.com/ps/products/visualagegen/info/v4.0* and perform the following steps:

1. Create a directory called vgdfm
2. Copy the zip file to the vgdfm directory and unzip it using options -o and -d.

Modify the DFM configuration file (dfm.rc) from either the IBM COBOL directory or the vgdfm directory as follows:

1. There should be one DFM_TARGET statement for each server system that you plan to access.
2. Specify the LU alias of the server system in the TARGET_SYSTEM parameter as defined in the IBM Personal Communications configuration files, **Partner LU alias**.
3. Specify a MODE_NAME (LOG MODE) that is known on both the OS/390 and the workstation, such as **#INTER**.
4. Specify a MAX_SEND_LIMIT of 32767.

Modify the start DFM command (strtsdu.cmd) as follows:

1. Make sure that the configuration file name specified on the dfmcfg command is the same as the one previously modified (dfm.rc).
2. Replace the string machine-name on the dfmlogon command with the LU alias of the server system.
3. Replace the string userid on the dfmlogon command with the userid that will be used to access files on the server system.

If you do not have IBM VisualAge for COBOL installed, you will need to set the following environment variables:

```
CDRASRV=X:\VGDFM\CONVTABL
PATH=X:\VGDFM;%PATH%
```

Start DFM
To start DFM, issue the *strtsdu* command from a command window. You will be prompted to enter the password for the userid specified on the dfmlogon command. To verify that everything is set up correctly, run the *dfmtry* command. It is shipped in the VisualAge Generator Server samples directory. Enter: dfmtry *machine-name userid*

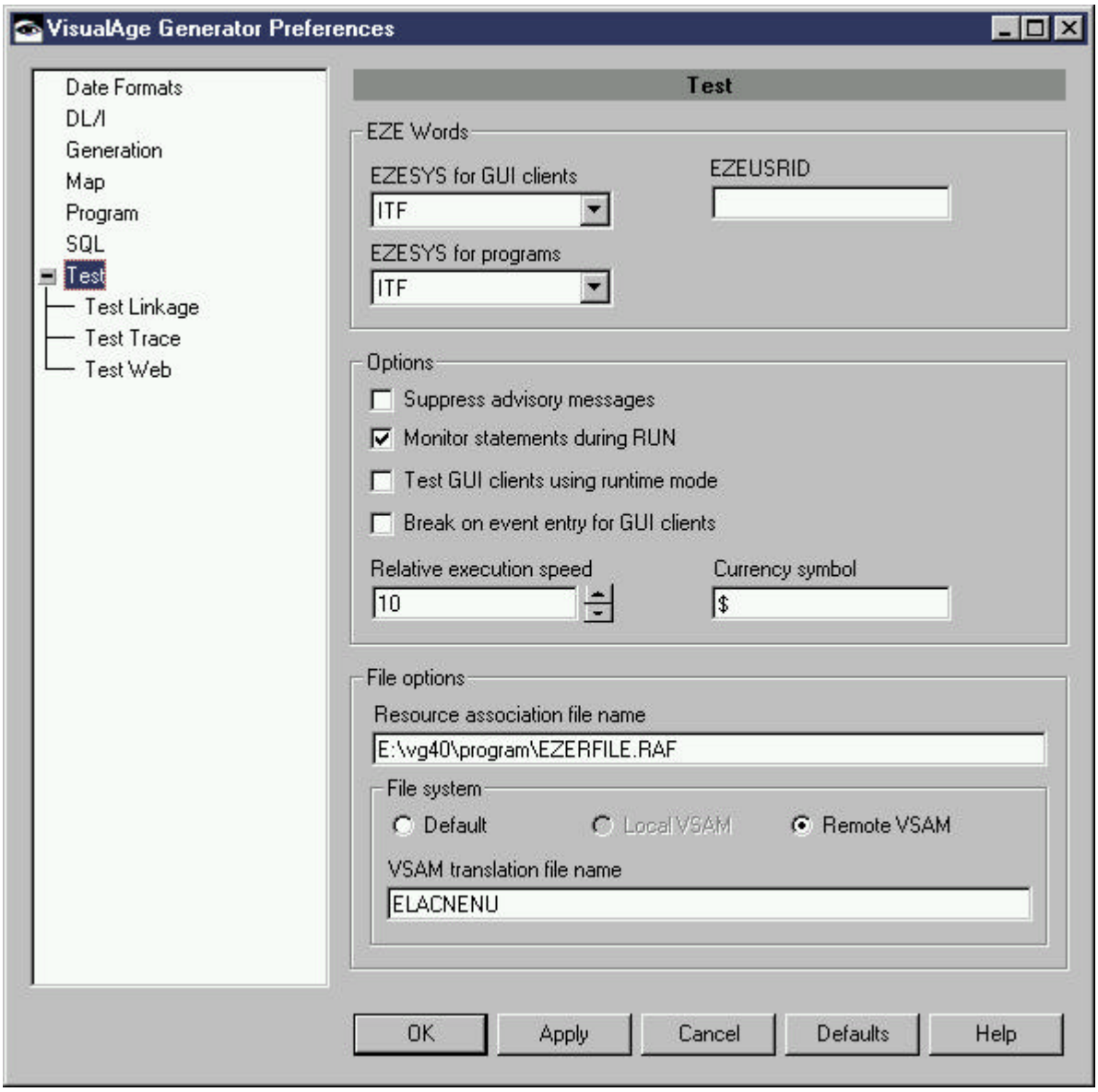
It will prompt you for a password to the userid and then issue messages indicating whether or not it was able to successfully connect to the server system.

Stopping DFM
To stop DFM, shutdown and restart your workstation. When you restart your workstation, do not start DFM.

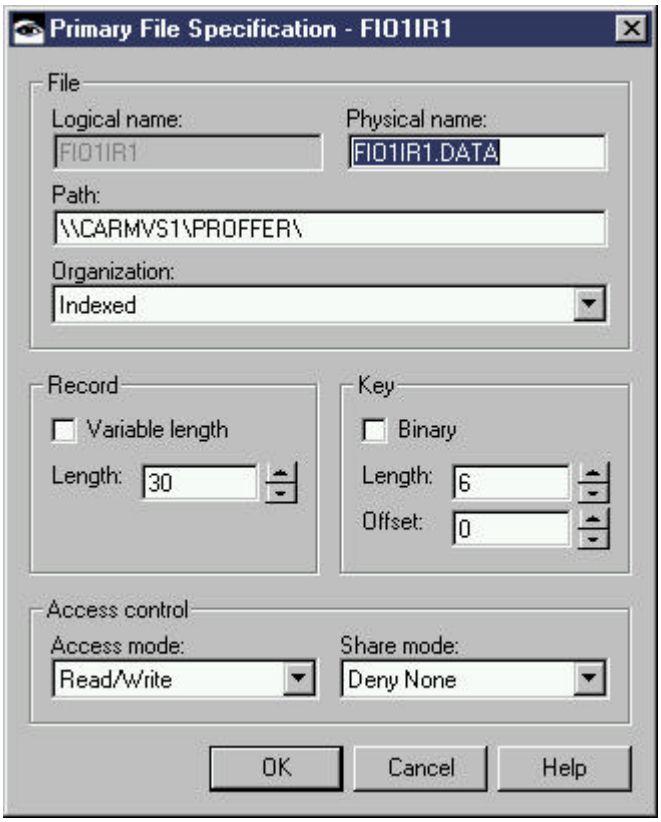
Additional information on configuring, starting, and stopping DFM can be found in *Distributed FileManager User's Guide*, SC26-7134. There is also information in the online documentation that ships with IBM VisualAge for COBOL.

V. Accessing VSAM Files from ITF on Windows NT

Before you can access VSAM files from ITF, you must modify the VisualAge Generator Preferences. Select the **Options** menu on the **VisualAge Organizer** window. Select **Preferences** and the **VisualAge Preferences** notebook is displayed. Select the **VAGen - Test General** tab. At the bottom of the page, select the **Remote VSAM** radio button. This will cause ITF to use remote VSAM files for all file accesses (on Windows NT, there is only remote VSAM file support). In a later FixPak, this option will be moved to the Resource Association Editor so that the type of file accessed can be specified on a file basis. If you want the data converted to EBCDIC, a conversion table name must be specified in the **VSAM translation file name** field. The field should be preset with a default value based on your language setting. The list of valid conversion tables is documented in the *VisualAge Generator Client/Server Communications Guide, Appendix B*. When you have finished modifying the preferences, click the OK button. If you have changed your preferences to use **Remote VSAM** and you don't have APPC set up and working, you will receive error F207, which indicates a communications error.



In addition to changing your preferences, you also need to specify the physical name and path in the ITF Resource Association File editor. In the **Physical name** field, specify the file name as it is on your OS/390 system but without the high level qualifier. In the **Path** field, specify the machine name or a shortcut name using a technique similar to the Windows Universal Naming Convention used for network file access. In the example below, the dataset name on the OS/390 is PROFFER.FIO1IR1.DATA. In the **Physical name** field, FIO1IR1.DATA is specified and \\CARMVS1\PROFFER is specified. in the **Path** field. CARMVS1 is the machine name and PROFFER is the userid/high level qualifier.



If the file doesn't already exist on your OS/390 system, VisualAge Generator will create it for you the first time your program tries to add a record.

VI. Accessing VSAM Files from C++ Generated Programs on Windows NT

Access to VSAM files from a C++ generated program is determined by the resource association file (RSC). Specify /FILETYPE=VSAM in the ASSOCIATE entry for a VSAM file. Because there is no local VSAM support on Windows NT, all VSAM file access is remote. Specify the file name using a technique similar to the Windows Universal Naming Convention used for network file access. If you want the data converted to EBCDIC, specify the /CONTABLE option, otherwise the data will be written in ASCII. See the following example:

```
ASSOCIATE FILE=FIO1IR1 /SYSNAME=\\CARMVS1\PROFFER.FIO1IR1
      /FILETYPE=VSAM  /CONTABLE=ELACNENU
```

If you do not have APPC set up and working, you will receive error F207, which indicates a communications error. Refer to the *VisualAge Generator Server Guide for OS/2, Windows NT, HP-UX, and AIX* for more information on using VSAM and resource association files.

VII. Setup on OS/2 Warp

Install IBM Personal Communications - OS/2 Access Feature

Ensure that IBM IEEE 802.2 protocol has been added to the LAN adapter

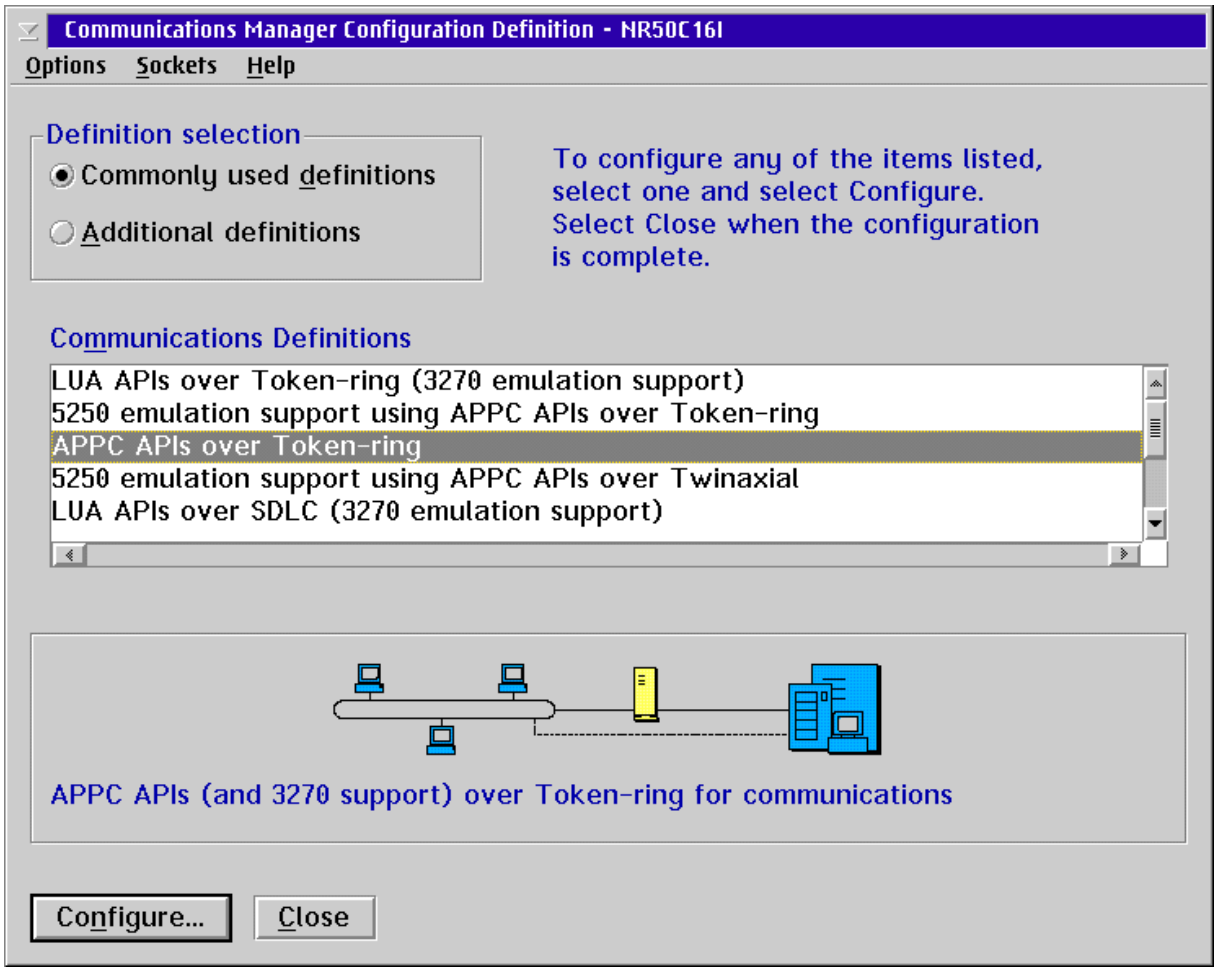
Configure an APPC session with the OS/390 host

To configure OS/2 Access Feature for APPC connectivity, do the following:

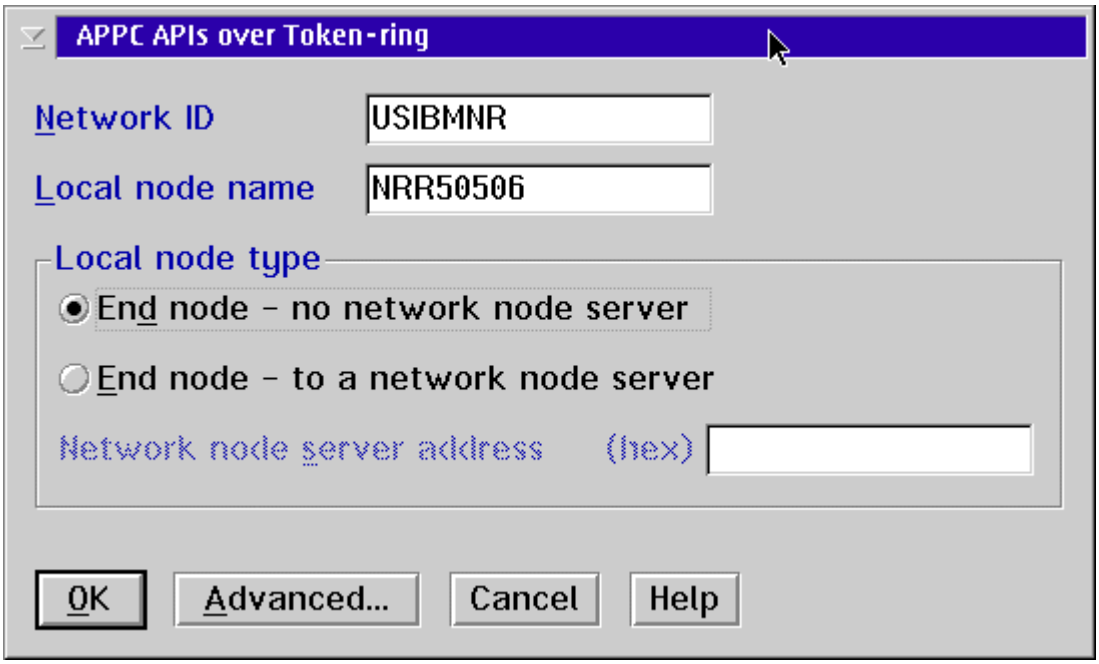
1. Open the **Personal Communications** folder.

2. Select the **Access Feature Configuration** tool.

3. On the **Communications Manager Setup** window, select **Setup** and then open the configuration to added or updated, which opens the following window.

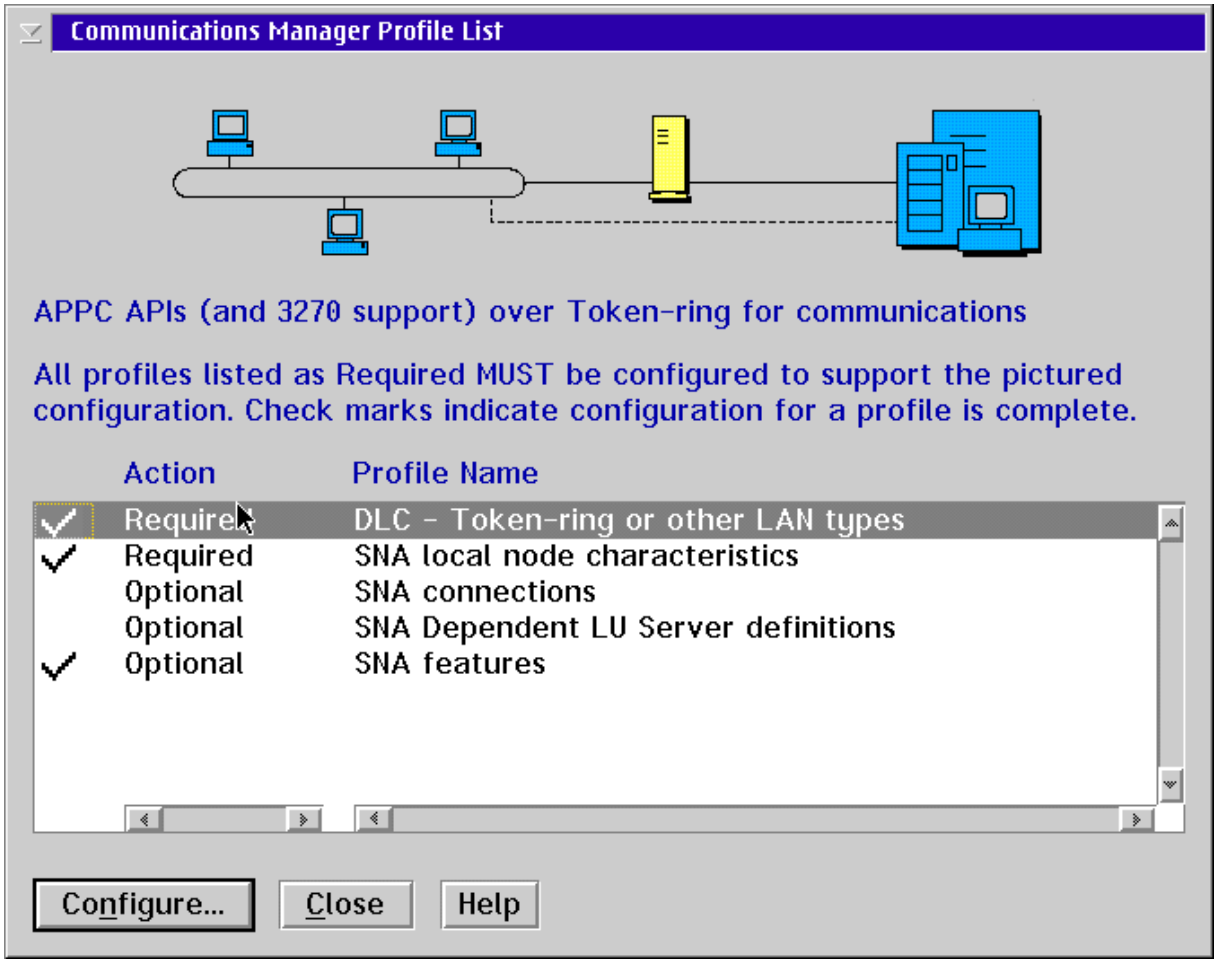


4. Select **APPC APIs over Token-ring** or **APPC APIs over Ethernet** and then click **Configure** to display the **APPC APIs over ...** window.



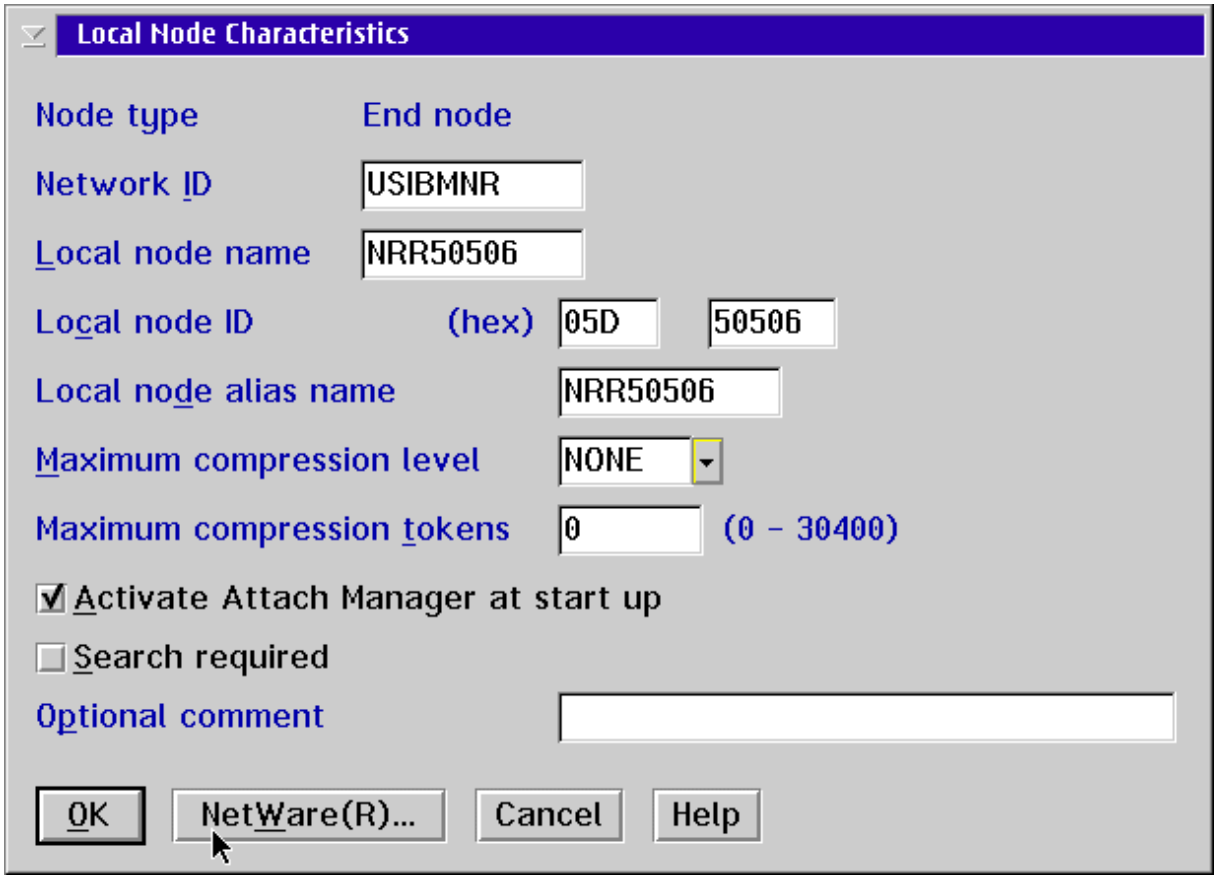
5. Define the the host physical unit (PU) information for this workstation. In this example, the **Network ID** is USIBMNR and the **Local node name** is NRR50C16. This information was obtained from SYS1.VTAMLST(APPCPUS) and SYS1.VTAMLST(ATCSTR00). Select **Advanced...** to display the **Communication Manager Profile List** window.

6. From the **Communications Manager Profile List** window, SNA APPC profiles are configured.

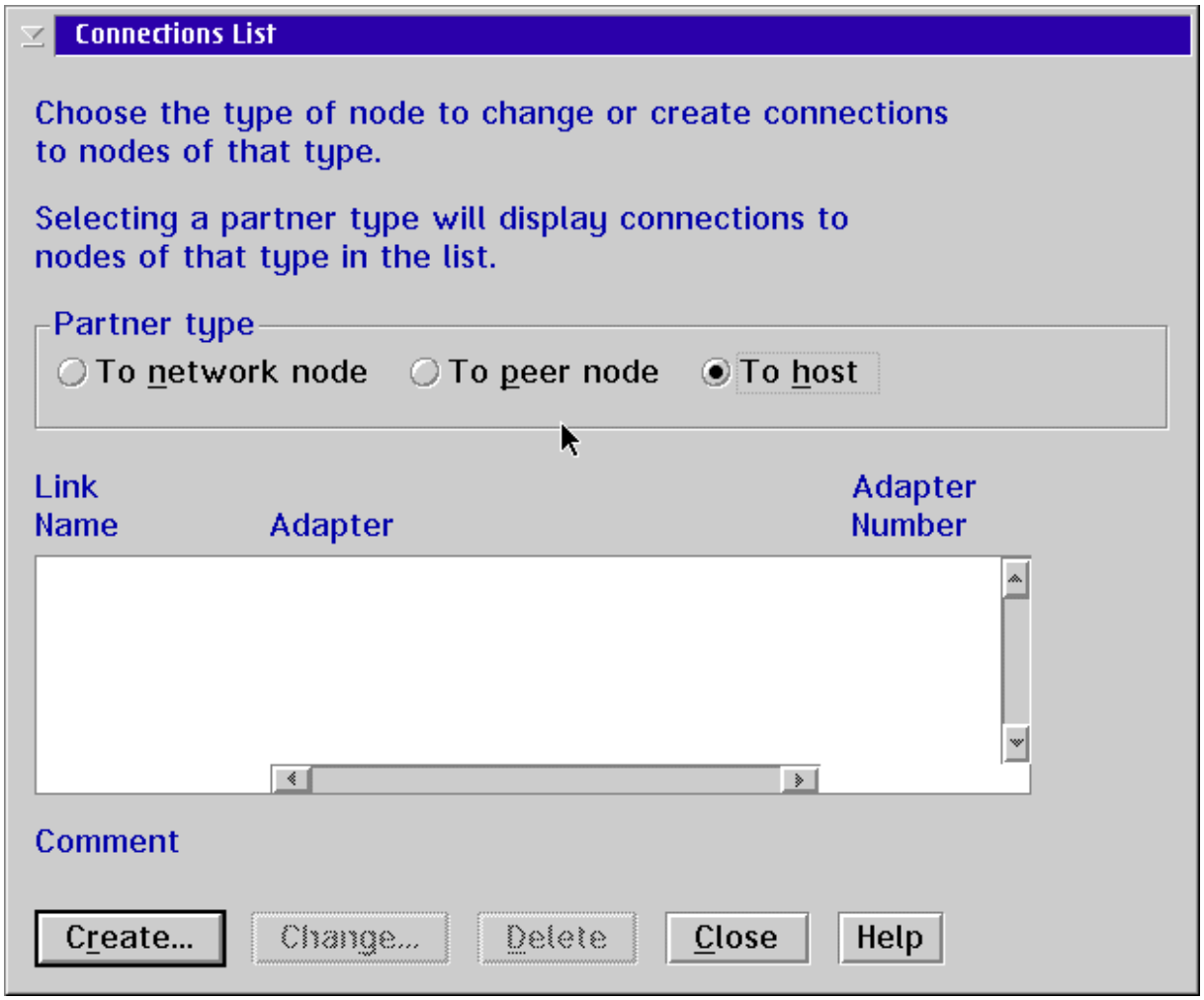


7. Select the **SNA local node characteristics** profile and then click **Configure...** to bring up the **Local Node Characteristics** window.

8. Confirm that the **Network ID** matches the NETID from SYS1.VTAMLST(ATCSTR00) and that the **Local Node name** (PU label) and the **Local node ID** (IDBLK and IDNUM) match the values from SYS1.VTAMLST(APPCPUS).

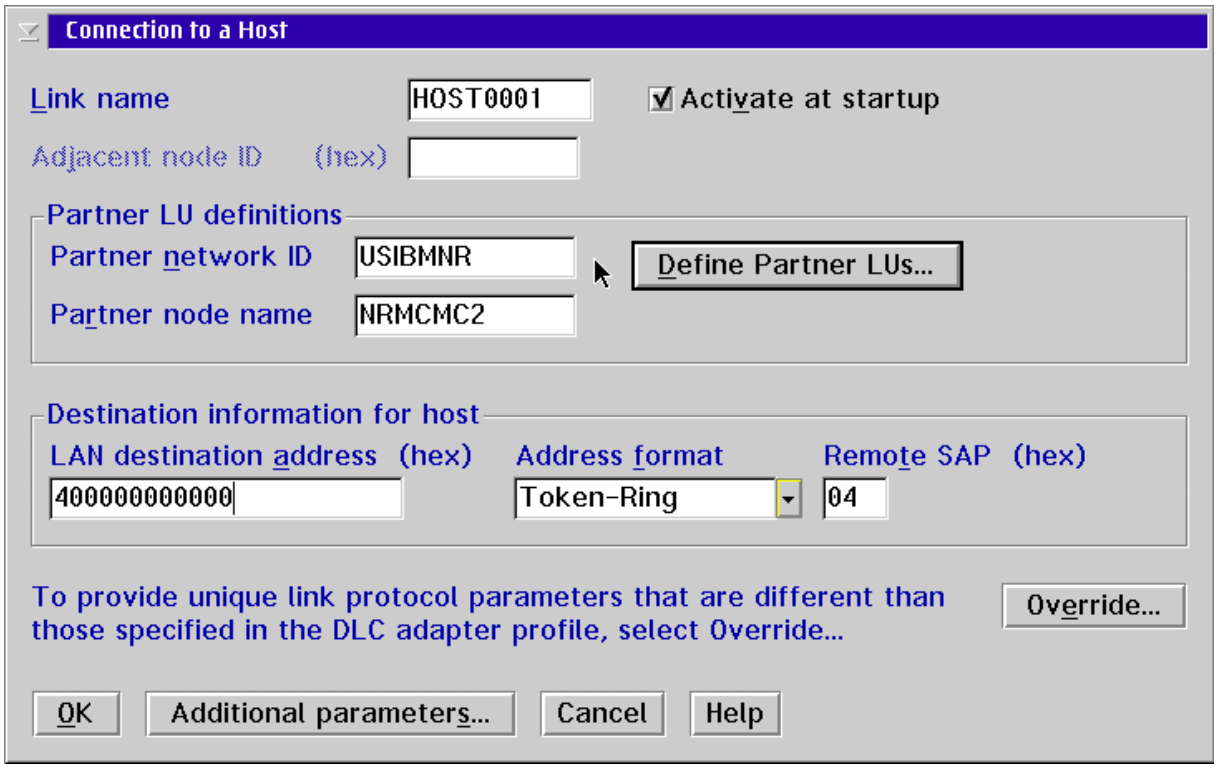


9. Click **OK** to return to the **Communications Manager Profile List** window. On this window select the **SNA Connections** profile, then **Configure...**.



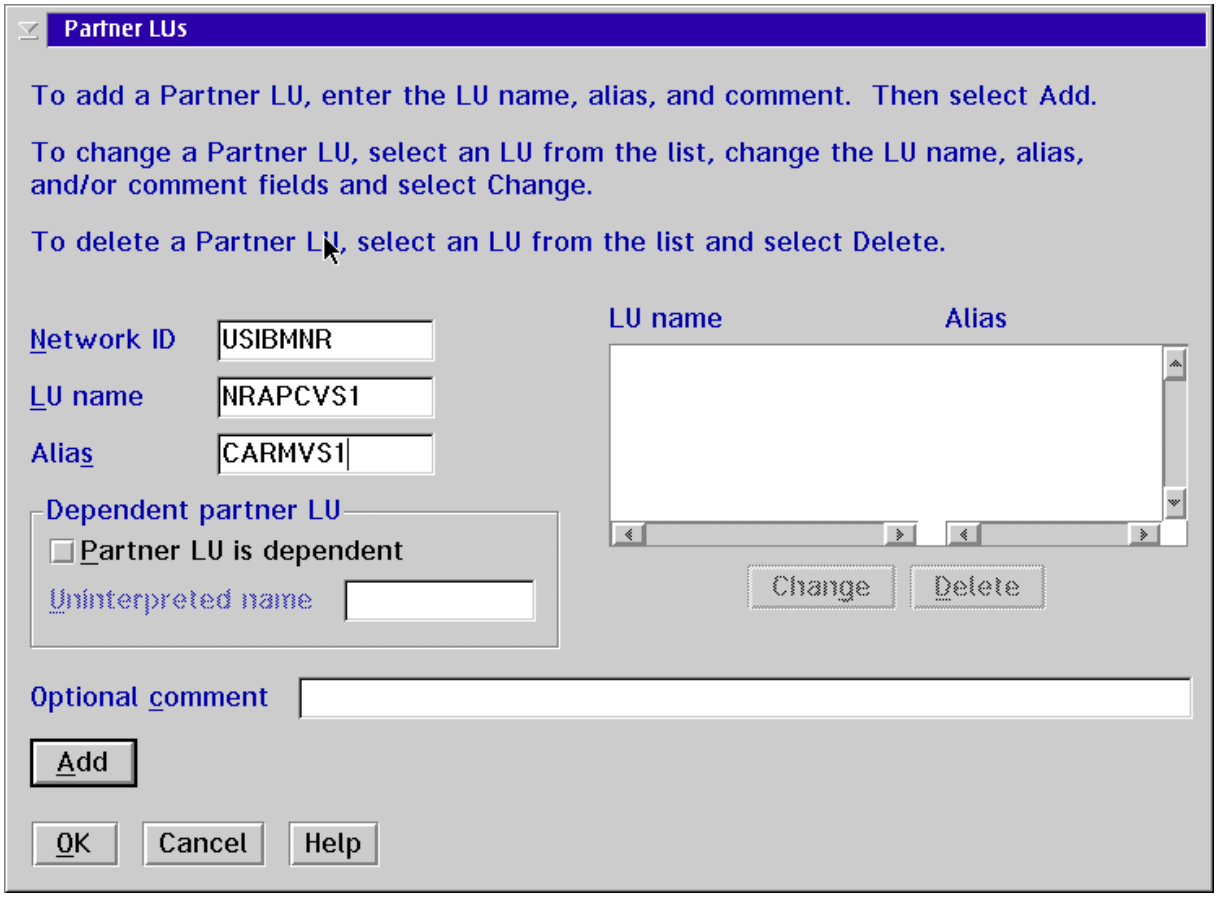
10. If there are already LU2 sessions defined, then a host connection might already exist. If this is true, then select this connection and then select **Change**... to continue, otherwise select **Create...**.

11. Select the appropriate adapter to display the **Connections to a Host** window**.**



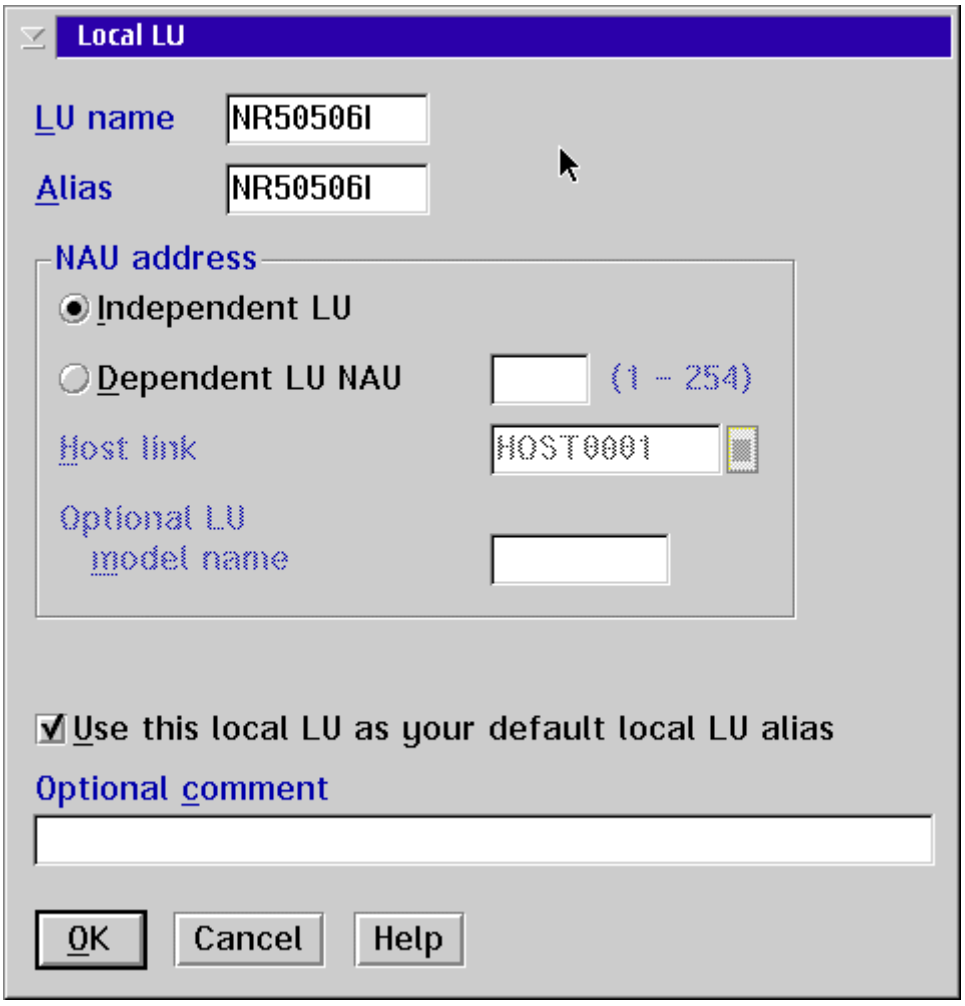
12. For the Partner LU definitions, specify the **Partner network ID and Partner node name**, obtained from SYS1.VTAMLST(ATCSTR00), which in this example are USIBMNR and NRMCMC2. Specify the **LAN Destination address**, which should be the LAN adapter address of the host (e.g. the TIC address of the communication controller). Also select the appropriate Address format (Token-Ring or Ethernet). Next, click **Define Partner LUs...** to display the **Partner LUs** window.

13. On the **Partner LUs** window, type the **Network ID** and **LU name** of the MVS/APPC subsystem. The **Network ID** is obtained from SYS1.VTAMLST(ATCSTR00) and the **LU name** is obtained from SYS1.PARMLIB(APPCPMxx). The **Alias** will be used as the TARGET_SYSTEM in the dfm.rc configuration file. When finished, **select ADD**.



14. Select **OK** or **Close** until the **Communication Manager Profile List** window is displayed. On this window select the **SNA features** profile and select **Configure...**.

The workstation needs to know which LU name it should use when connecting to the host applications. This LU name is specified by creating a local LU profile by selecting the **Local LUs** feature and then clicking **Create...**. The local LU is identified in SYS1.VTAMLST(APPCPUS) by the LU which has a LOCADDR equal to 0 (LOCADDR=0). This local LU name should also be specified via the environment variable, APPCLLU. See the section entitled *Sample VTAM Definitions* for an example.



15. Select **OK** and **Close** until OS/2 Access Features verifies the configuration. After the verification is complete, follow the instructions to activate the changes.
16. Open the Personal Communications folder and start the Access Feature by double- clicking on the icon.

Configure DFM

The workstation support for DFM is provided by the SmartData Utilities component of IBM VisualAge for COBOL. If you have IBM VisualAge for COBOL installed, specifically the SmartData Utilities component, then you will have an *\ibmcobol\samples\sdu* directory with sample configuration files. If you do not have IBM VisualAge for COBOL, you can download vsamos2.zip from *ftp://ps.software.ibm.com/ps/products/visualagegen/info/v4.0* and perform the following steps:

1. Create a directory called vgdfm
2. Copy the zip file to the vgdfm directory and unzip it using options -o and -d.

Modify the DFM configuration file (config.dfm) from either the IBM COBOL samples\sdu directory or the vgdfm samples directory as follows:

1. Locate the DFM_TARGET statement. There should be one DFM_TARGET statement for each server system that you plan to access.
2. Specify the LU alias of the server system in the REMOTE_LU parameter as defined in the IBM Personal Communications configuration files, **Partner LU alias**.
3. Specify a MAX_SEND_LIMIT of 32767.
4. Specify the userid that will be used to access files on the server system in the USERID parameter.
5. Locate the LOCAL_LU statement and specify the LU name of the local system as defined in the IBM Personal Communications configuration files, **Local LU**.
6. Locate the MODE_NAME statement and specify a mode name (log mode) that is known on both the OS/390 and the workstation, such as **#INTER**.
7. Locate the DEFAULT_DFM_TARGET statement and specify the LU alias of the server system (same as in step 2 above).

Modify the start DFM command (startdfm.cmd) as follows:

1. Locate the DFMDRIVE statement and specify the drive letter of an unassigned drive and the LU alias of the target system you wish to access.

If you do not have IBM VisualAge for COBOL installed, you will need to set the following environment variables:

```
FMTCDRA=X:\VGDFM\CONVTABL
LIBPATH=X:\VGDFM;...
PATH=X:\VGDFM;...
```

Starting DFM

After the configuration steps are complete, start DFM by running the startdfm command file. If everything started successfully, you should be able to issue the dir command with the drive letter specified on the DFMDRIVE statement and see a list of the files on your OS/390 system.

Stopping DFM

There are two ways to stop DFM:

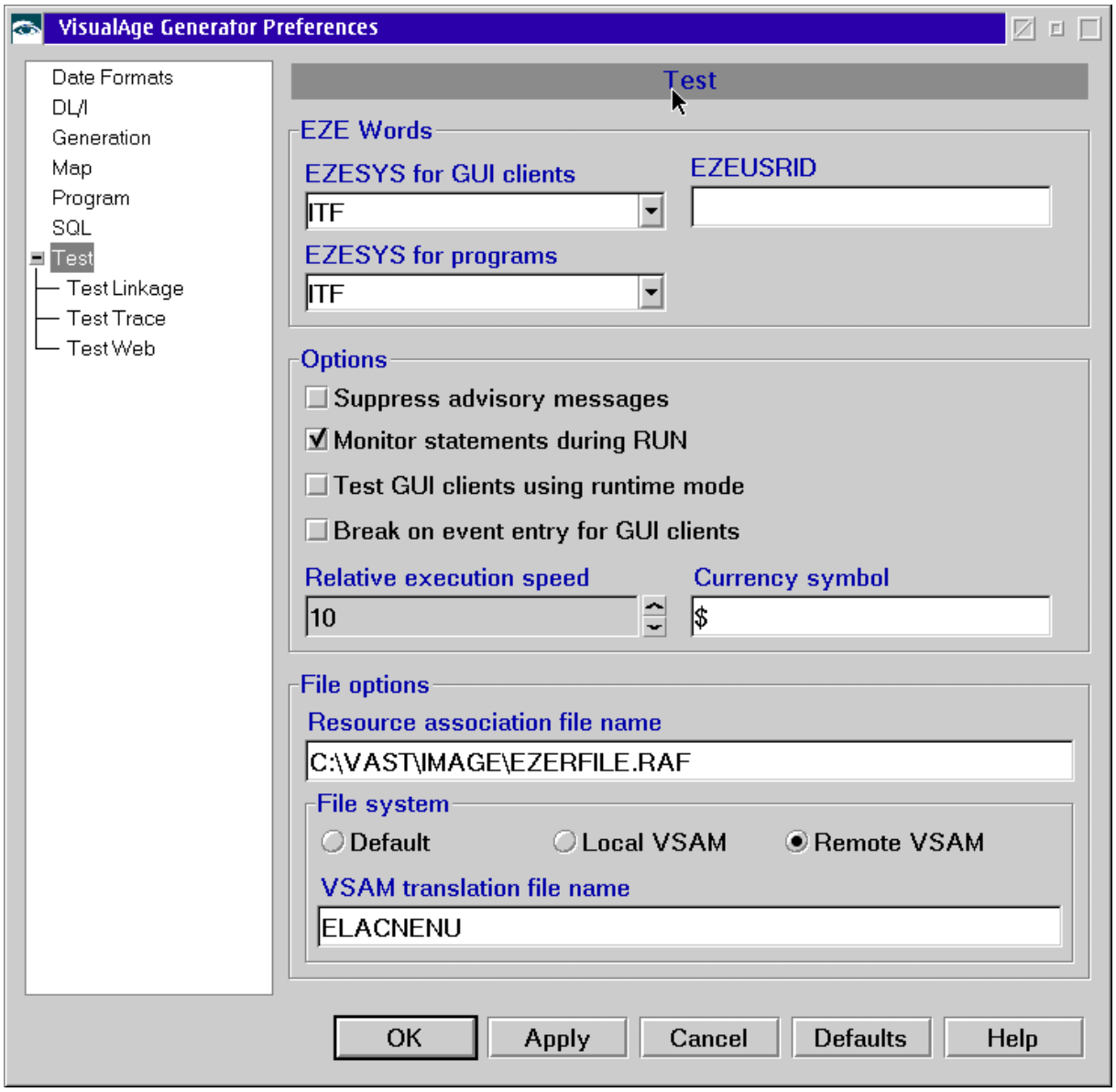
1. Shutdown and restart your workstation. When you restart your workstation, do not start DFM.
2. Run the command DFMDRIVE RELEASE * to release all of your DFM drive assignments.

Additional information on configuring, starting, and stopping DFM can be found in *Smartdata Utilities for OS/2: VSAM in a Distributed Environment*, SC26-7063. There is also information in the online documentation that ships with IBM VisualAge for COBOL.

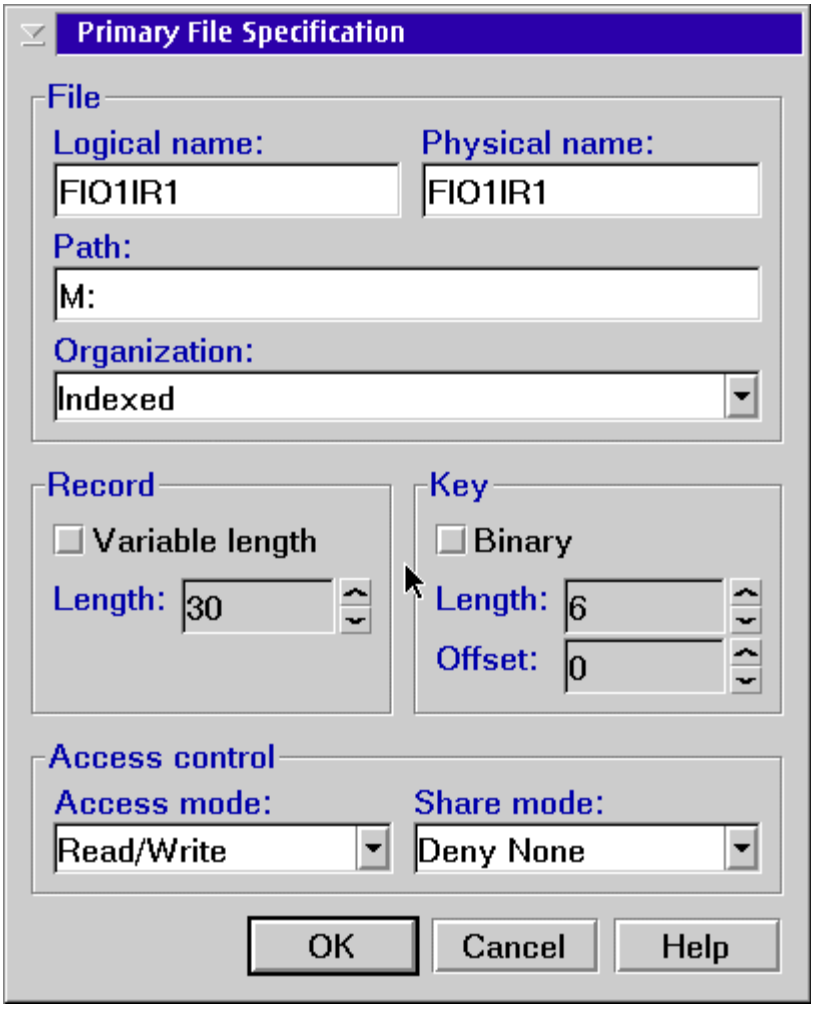
VIII. Accessing VSAM files from ITF on OS/2

Before you can access VSAM files from ITF, you must modify the VisualAge Generator Preferences. Select the Preferences from the **Options** menu on the **VisualAge Organizer** window to display the **VisualAge Preferences** pages. Select the **VAGen - Test** tab. At the bottom of the page, select either the **Local VSAM** or **Remote VSAM** radio button and click **OK** to have ITF use local or remote VSAM files for all file access. (In a later FixPak, this option will be moved to the Resource Association Editor so that the type of file accessed can be specified on a file basis.) If you want the data converted to EBCDIC, a conversion table name must be specified in the **VSAM translation file name** field. The field should be preset with a default value based on your language setting. The list of valid conversion tables is documented in the *VisualAge Generator Client/Server Communications Guide, Appendix B*. When you have finished modifying the preferences, select OK. If you have changed your preferences to use **Remote VSAM** and you don't have APPC set up and working, you will receive error F207, which indicates a communications error.

If you have selected **Local VSAM**, ITF will create and access VSAM files residing on your local drive. No translation is required, so the **VSAM translation file name** field is ignored and the data is written in ASCII.


VisualAge Generator Preferences
Date Formats
DL/I
Generation
Map
Program
SQL
Test
Test Linkage
Test Trace
Test Web
Test
EZE Words
EZESYS for GUI clients
ITF
EZEUSRID
EZESYS for programs
ITF
Options
Suppress advisory messages
Monitor statements during RUN
Test GUI clients using runtime mode
Break on event entry for GUI clients
Relative execution speed
10
Currency symbol
$
File options
Resource association file name
C:\VAST\IMAGE\EZERFILE.RAF
File system
Default
Local VSAM
Remote VSAM
VSAM translation file name
ELACNENU
OK
Apply
Cancel
Defaults
Help

In addition to changing your preferences, you also need to specify the physical name and path in the ITF Resource Association File editor. In the **Physical name** field, specify the file name as it is on your OS/390 system but without the high level qualifier. In the **Path** field, specify the drive letter of the DFM drive. In the example below, the dataset name on the OS/390 is PROFFER.FIO1IR1. In the **Physical name field**, FIO1IR1 is specified and the drive letter M is specified in the **Path** field.



If the file doesn't already exist on your OS/390 system, VisualAge Generator will create it for you the first time your program tries to add a record.

IX. Accessing VSAM files from C++ Generated Programs on OS/2

Access to VSAM files from a C++ generated program is determined by the resource association file (RSC). Specify /FILETYPE=VSAM in the ASSOCIATE entry for a VSAM file. To access a remote VSAM file, preface the file name with the DFM drive letter. See the following example:

```
ASSOCIATE FILE=FIO1IR1 /FILETYPE=VSAM /SYSNAME=D:\PROFFER.FIO1IR1
      /CONTABLE=ELACNENU
```

If you do not have APPC set up and working, you will receive error F207 indicating a communications error. Refer to the *VisualAge Generator Server Guide for OS/2, Windows NT, HP-UX, and AIX* for more information on using VSAM and resource association files.

X. Diagnosing Error Conditions

Diagnosing error conditions when using VSAM with ITF
A trace facility has been provided to assist in diagnosing error conditions. The trace is controlled by the HPTTROPT environment variable. Specifying HPTTROPT=1 turns on the trace, specifying HPTTROPT=0 turns off the trace. The trace output is written to a file named hpttrace.out unless you change the name using the HPTTROUT environment variable.

Diagnosing error conditions when using VSAM with C++ generated programs
The trace facility for C++ generated programs is controlled by the FCWTROPT environment varaible. Specifying FCWTROPT=31 will turn on trace for file I/O as well as other C++ program- related events. The trace output is written to a file named fcwtrace.out unless you change the name using the FCWTROUT environment variable. Refer to the appendix in the *VisualAge Generator Server Guide for OS/2, Windows NT, HP-UX, and AIX* for more information on the trace environment variables.

The I/O return codes found in both the HPT trace and the FCW trace files are VSAM reply messages. They are documented in *VSAM in a Distributed Environment*, SC26-7064. Some of the more common ones are listed below:

‘1207’	Duplicate File Name
‘1208’	Duplicate key, different index
‘1209’	Duplicate key, same index
‘120B’	End of file
‘120C’	File is full
‘120D’	File in use
‘120E’	File not found
‘1225’	Record not found
‘1250’	Function not supported
‘1251’	Parameter not supported
‘125A’	File damaged
‘125F’	Parameter not supported on target system
‘F207’	Communications error

XI. Sample VTAM Definitions

SYS1.VTAMLST(ATCSTR00) . . .

```
SSCPNAME=NRMCMC2,
NETID=USIBMNR,
...
```

SYS1.VTAMLST(APPCPUS) - Sample Static PU Definition

```
...
NRR50506 PU    ADDR=04,
X                 IDBLK=05D,
   X                 IDNUM=50506,
      X                 DISCNT=NO,
         X                 IRETRY=NO,
            X                 ISTATUS=ACTIVE,
               X                 MAXDATA=1024,
                  X                 MAXOUT=7,
                     X                 PUTYPE=2,
                        X                 PACING=0,
                           X                 VPACING=0,
                              X                 USSTAB=ALLUSS,
                                 X
DLOGMOD=ISTINCLM,                                 X
   SSCPFM=USSSCS,                                    X
      MODETAB=HUBMODE
NR50506I LU
LOCADDR=0,SSCPFM=FSS,USSTAB=ISTINCDT,DLOGMOD=#INTER
```