Installing Natural under VM/CMS

This document describes how to install Natural under VM/CMS.

The following topics are covered:

- Prerequisites
- Preparing the VM System for Natural
- Preparing the Adabas System for Natural
- Building the Natural/CMS System
- Installation Tape for Natural under CMS
- Installation Procedure for Natural under CMS
- Installation Verification for Natural under CMS

For information on how to run Natural in a CMS environment, refer to Natural under VM/CMS in the Natural Operations documentation.

Notation vrs or vr: If used in the following document, the notation *vrs* or *vr* stands for the relevant **v**ersion, **r**elease, **s**ystem maintenance level numbers.

Prerequisites

The following products must be installed:

- A supported version of the VM/ESA or z/VM operating system must be installed. For the supported versions of the operating systems, refer to Operating/Teleprocessing Systems Required (in the current Natural Release Notes for Mainframes).
- A supported version of Adabas must be installed. For the supported versions, refer to Natural and Other Software AG Products in the current Natural Release Notes for Mainframes.
- As a rule of thumb, each major Software AG product requires approximately 20 MB space in the Adabas database to store the Natural objects supplied by Software AG.

Preparing the VM System for Natural

Natural is completely reentrant under CMS. It is recommended that Natural under CMS be installed as a Discontiguous Shared Segment (DCSS) to avoid unnecessary paging activity by VM.

For better performance, Natural uses a buffer pool in which Natural object programs are stored and executed. If you execute a Natural program, it is fetched from the database and stored in the buffer pool. If you subsequently invoke the same program, it will be executed directly in the buffer pool and thus repeated fetching from the database and accompanying IUCV overhead is avoided.

In a shared buffer pool, one Natural under CMS user can execute Natural programs that have been placed in the buffer pool by another Natural under CMS user. A shared buffer pool is implemented by installing the buffer pool in a writeable saved segment.

You are recommended to install two DCSSs: one for the Natural nucleus and one for the buffer pool. Of course, several buffer pools at different virtual addresses can be defined and several Natural nucleus DCSSs with different functionalities, for example, different static parameter settings (NATPARM) or different Assembler options of the CMS driver (NATCMS).

The buffer pool shared segment is defined as "SN" (see Step 1 of the installation procedure) and the first Natural session automatically initializes the buffer pool. When the last Natural user in VM exits Natural, the use count of the shared segment becomes 0, the buffer pool is purged from CP storage, and the next Natural session has to initialize the buffer pool again.

To avoid repeated initialization, the use count can be artificially held at 1 by including the following statement line in the PROFILE EXEC of a disconnected service machine, *segment* being the name of the Natural buffer pool shared segment:
SEGMENT LOAD *segment*

In this way, the Natural buffer pool is initialized only once and immediately available to a Natural session as long as the disconnected server is running.

Preparing the Adabas System for Natural

The Natural system programs are stored in the Natural system file FNAT. User-written Natural programs are stored in the Natural system file FUSER. These system files reside in Adabas files. Step 2 of the installation procedure describes how these Adabas files can be built in an Adabas system running under CMS.

Building the Natural/CMS System

Building the Natural/CMS system comprises the following steps:

- building the Natural nucleus and
- loading the Natural system file.

The Natural nucleus should be built

- as a module (for testing) and
- as a saved segment (for production use).

The Natural system file is loaded directly from tape using the installation EXEC, NATINPL; see Step 11 of the installation procedure.

The CMS driver NATCMS is included in the Natural module and in the saved segment. NATCMS ASSEMBLE consists of one macro that generates the driver.

Description of the Macro Parameters

For a detailed description of the macro parameters, refer to Step 8 of the installation procedure. The driver NATCMS and the parameter module NATPARM are assembled during the installation process. Optionally, the modules NATTEXT, NATTXT2, NATCONFG and NATPM can be modified and reassembled.

The list of text files to be included in the Natural module or DCSS is contained in REXX program NAT$LOAD EXEC (variable LOADLIST). To customize your Natural system, modify this EXEC with XEDIT by changing the LOADLIST as required.

User ID for Performing the Installation

The user ID used for performing the installation should have a minidisk of 10 cylinders on 3380-type disks or 9000 blocks FB-512. CP privilege class E is needed to issue the CP SAVESYS command. The size of the virtual machine allowed for the user ID must be adequate to accommodate the highest address of the saved segments that you plan to generate.

Installation Tape for Natural under CMS

The installation tape was created under OS/390; it has standard OS/390 labels and headers. It contains the datasets listed in the table below. The sequence of the datasets is shown in the **Report of Tape Creation** which accompanies the installation tape.

Dataset Name	Contents
NAT*nnn*.SYSF	Empty Natural system file.
NAT*nnn*.TAPE	CMS installation material. This dataset is in TAPE DUMP format and must be loaded onto the installation minidisk.
NAT*nnn*.ERRN	Natural error messages.
NAT*nnn*.INPL	Natural system objects.
NAT*nnn*.EXPL	Natural example objects.

The notation *nnn* in dataset names represents the version number of the product.

Copying the Tape Contents to Disk

1. To position the tape for the TAPE LOAD command, calculate the number of tape marks as follows:

   If the sequence number of NAT*nnn*.TAPE, as shown by the **Report of Tape Creation**, is *n*, you must position over 3*n* - 2 tape marks (that is, FSF 1 for the first dataset, FSF 4 for the second, etc.).

2. Access the disk that is to contain the Natural installation files as disk "A".

   The size of the disk must be at least 1500 4-KB blocks, for example, 10 cylinders on 3380-type disks or 12000 blocks FB-512.

3. Ask the system operator to attach a tape drive to your virtual machine at address X’181’ and mount the Natural installation tape.
4. Position the tape by issuing the CMS command:
   TAPE FSF *fsfs*
   where *fsfs* is the number of tape marks and is calculated as described above.
5. Load the Natural under CMS installation material by issuing the CMS command:
   TAPE LOAD * * A
6. Keep the tape drive attached to your virtual machine, because the tape is still needed during the installation procedure.

Installation Procedure for Natural under CMS

Step 1: Define the Natural Discontiguous Saved Segments to VM

Execute the DEFSEG class E command for the Natural nucleus and for the Natural buffer pool.

Examples:

```
DEFSEG NAT vr 300-4FF SR
DEFSEG NATBP vr 500-5FF SN
SAVESEG NATBP vr
```

Note:
Segment NATBP*vr* is saved as an empty segment. Segment NAT*vr* will be saved later when the Natural nucleus has been loaded into it.

Step 2: Load the FNAT System File

If you are installing into an existing Natural 3.1 FNAT file, skip this step.

Load the empty Natural system file (dataset NAT*nnn*.SYSF) using the ADALOD utility.

This file will contain all Natural objects supplied by Software AG. Its size depends on the number of products to be installed later. As a rule of thumb, 20 MB can be assumed for each major Software AG product.

The following ADALOD parameters must not be altered:

```
ISNREUSE=YES
VERSION=6
```

To avoid Natural errors NAT9988 and NAT7397 after reorganization of the FNAT system file using ADAULD/ADALOD, the parameter USERISN=YES should be left as set by System Maintenance Aid.

The file number *fnat* of the FNAT system file can be chosen as described under Natural profile parameter FNAT (see Profile Parameters in the Parameter Reference documentation).

Please also note the following when defining a system file:

On the Natural installation tape, an input file for the ADALOD utility is provided.

It is easiest to perform the ADALOD operation from disk. You are recommended to copy the file NAT*nnn*.SYSF from tape to disk and to make an additional copies for loading the FUSER, FDIC and FSEC system files:

```
FILEDEF IN  TAP1 SL n VOLID nnnnnn (RECFM VB LRECL 9996 BLKSIZE 10000
FILEDEF OUT DISK NATvrSYS LODLIB A
MOVEFILE IN OUT
```

To make additional copies, issue the following commands, for example:

```
COPYFILE NATvrSYS LODLIB A NATvrUSE LODLIB A
COPYFILE NATvrSYS LODLIB A NATvrDIC LODLIB A
COPYFILE NATvrSYS LODLIB A NATvrSCR LODLIB A
```

Modify the member NAT*vr*SYS LODLIB to suit your requirements. In particular replace the question mark (?) specified for the FILE parameter with the file number chosen for your FNAT system file.

You can now invoke the ADALOD EXEC for loading the Natural system file:

```
ADALOD NATvrSYS
```

Step 3: Load the FUSER System File

You have the following options:

- You can use a new FUSER file for Version 3.1.
- You can use an existing Version 2.3 FUSER file to be shared by Versions 2.3 and 3.1.
- You can use an existing Version 2.2 FUSER file to be used by Version 3.1 only.
- You can use an existing Version 2.2 FUSER file to be shared by Versions 2.2 and 3.1.

Reuse an Existing 3.1 FUSER System File

If you want to use the existing Natural Version 3.1 FUSER system file, skip this step.

Use a New 3.1 FUSER System File - First-Time Installation

If you do **not** want to share the FUSER system file, proceed as follows:

Load the empty Natural user file contained in dataset NATnnn.SYSF using the ADALOD utility.

In this file, all user-written Natural programs are stored.

The following ADALOD parameters **must not** be altered:

```
ISNREUSE=YES
VERSION=6
```

The file number *fuser* of the FUSER system file can be chosen as described under Natural profile parameter FUSER (see Parameter Reference in the Natural Reference documentation).
For the use of a new and empty FUSER system file for Natural Version 3.1, no additional system-file-related actions are necessary.

Reuse an Existing 2.3 FUSER System File - Migration from Natural Version 2.3

If you want to use the existing Natural Version 2.3 FUSER system file and you do not want to share the FUSER system file, skip this step.

Using a Version 2.3 FUSER File to be shared by Natural Versions 2.3 and 3.1

If you use an existing Natural Version 2.3 FUSER system file to be shared by Natural Versions 2.3 and 3.1, you must upgrade your Natural Version 2.3 installation to Version 2.3.3 or 2.3.4.

Caution:
Do not use any Natural Version 2.3.2 or 2.3.1 utilities to manipulate libraries that contain objects of the type "class"! This would cause internal inconsistencies to the effect that Natural 3.1 would then no longer be able to find these objects in the FUSER file.

Using a Version 2.2 FUSER File to be shared by Natural Versions 2.2 and 3.1

If you use an existing Version 2.2 FUSER system file to be shared by Natural Versions 2.2 and 3.1, the version of the shared file must be at least 2.2.8.

Note:
If you already performed the steps described below (in the course of your Natural 2.3 installation) to use an existing FUSER file to be shared by Natural Versions 2.2 and 2.3, that file can be considered a Version 2.3 file. For such a file, see the preceding section Using a Version 2.3 FUSER File to be shared by Natural Versions 2.3 and 3.1.

To use a shared 2.2/3.1 FUSER file, before you install Natural Version 3.1, apply the following update INPL datasets to your Natural Version 2.2:

- NA2875 (if INPL Update NA228A2 not yet applied)
- NT2801 (only if Natural Connection is installed)
- NE2841 (only if Natural Security is installed and INPL Update NE22866 not yet applied)
- NA228B4 (only if Natural Security is installed)
- NQ3404 (only if Natural for DB2 is installed)
- NQ3405 (only if Natural for SQL/DS is installed)

Install Natural Version 3.1 as described in the operating-system-specific installation documents.

After you have installed Natural Version 3.1, replace all USR* modules you have copied from library SYSEXT into application libraries located in the Version 2.2 FUSER with the objects from the Version 3.1 library SYSEXT. The objects in the Version 3.1 library SYSEXT are cataloged with Version 2.2.

After you have discarded your Natural Version 2.2 environments, you should keep only modules belonging to your applications in library SYSTEM in FUSER and delete all Software AG objects from that library. If you are not sure which objects are part of your application and which are part of Natural, refer to the information given in SAGSIS Problem No. 176762.

The reasons for the above steps are as follows:

Under Version 2.2, Natural system programs were loaded with INPL into the library SYSTEM on the FUSER file; these programs are not compatible with Natural Version 3.1. The above update INPL datasets replace these programs with ones that can be executed under Versions 2.2 and 3.1.

With Version 2.2, Software AG objects to be loaded into the library SYSTEM were loaded into both the system files FNAT and FUSER; as of Version 2.3, they are only loaded into the FNAT file (that is, SYSTEM on FUSER no longer contains Software AG objects). Also, as of Version 2.3, the library SYSTEM on the FNAT file is the default steplib for user applications; with Version 2.2, it is not.

Attention:
Do not use any Version 2.2 Natural utilities to manipulate libraries that contain objects of the type "class"! This would cause internal inconsistencies to the effect that Natural 3.1 would then no longer be able to find these objects in the FUSER file.

Using a Version 2.2 FUSER File for Natural Version 3.1 Only - Migration from Natural Version 2.2

If you use an existing Version 2.2 FUSER system file for Natural Version 3.1, the version of the shared file must be at least 2.2.8.

To use a Version 2.2 FUSER file for Natural Version 3.1 only, that is, without using Natural Version 2.2 in parallel on that file, perform the following steps:

1. With the Version 2.2 SYSMAIN utility, move the entire contents of the Version 2.2 library SYSTEM on the FUSER file to a backup library.
2. Install Natural Version 3.1.
3. With the Version 3.1 SYSMAIN utility, copy all of your own application objects - but no Software AG objects that are part of Natural itself! - from the backup library back to the library SYSTEM of the FUSER file.
   If you are not sure which objects are part of your application and which are part of Natural, refer to the information given in SAGSIS Problem No. 176762.

The reasons for the above steps are as follows:

- Under Version 2.2, Natural system programs were loaded with INPL into the library SYSTEM on the FUSER file; these programs are not compatible with Natural Version 3.1. The above update INPL datasets replace these programs with ones that can be executed under Versions 2.2 and 3.1.
- With Version 2.2, Software AG objects to be loaded into the library SYSTEM were loaded into both the system files FNAT and FUSER; as of Version 2.3, they are only loaded into the FNAT file (that is, SYSTEM on FUSER no longer contains Software AG objects). Also, as of Version 2.3, the library SYSTEM on the FNAT file is the default steplib for user applications; with Version 2.2, it is not.

The file number *fuser* of the FUSER system file can be chosen as described under Natural profile parameter FUSER (see Profile Parameters in the Parameter Reference documentation).

Modify the member NAT*vr*USE LODLIB to suit your requirements. In particular replace the question mark (?) specified for the FILE parameter with the file number chosen for your FUSER system file.

You can now invoke the ADALOD EXEC for loading the Natural system file:

```
ADALOD NATvrUSE
```

Step 3.1: Load the FDIC System File

Skip this step

- if you want to install Predict (in this case, use the corresponding installation step in the Predict Installation documentation), or
- if you want to use an existing FDIC system file (an existing FDIC system file can be shared by Natural Versions 2.2 and 3.1, or Versions 2.3 and 3.1), or
- if you do not use your own FDIC system file.

If Predict is used, the sharing of the FDIC system file requires that Predict Version 3.4.2 has been installed.

Load the empty FDIC file contained in dataset NAT*nnn*.SYSF using the ADALOD utility, as described below.

The following ADALOD parameters must not be altered:

```
ISNREUSE=YES
VERSION=6
```

The file number *fdic* of the FDIC system file can be chosen as described under Natural profile parameter FDIC (see Profile Parameters in the Parameter Reference documentation).

Modify the member NAT*vr*DIC LODLIB to suit your requirements. In particular replace the question mark (?) specified for the FILE parameter with the file number chosen for your FDIC system file.

You can now invoke the ADALOD EXEC for loading the Natural system file:

```
ADALOD NATvrDIC
```

Step 3.2: Load the FSEC System File

Skip this step,

- if you do not use Natural Security, or
- if you want to use an existing FSEC system file, or
- if you do not want to use an own FSEC system file.

If you use Natural Security, refer to Installing Natural Security (in the Natural Installation Guide for Mainframes).

An existing Version 2.3.3 or 2.3.4 FSEC system file can be shared by Natural Security Versions 2.3 and 3.1. See Using Multiple Versions of Natural Security (in the Release Notes for Natural Version 3.1 in the RN Archive on the Natural Documentation CD).

If you use Natural Security, refer to Installing Natural Security (in the Natural Installation Guide for Mainframes).

Step 4: Load the Scratch-Pad File

The scratch-pad system file can be used exclusively by the new Natural version or it can be shared by different versions of Natural.

If you do not want to use a scratch-pad file, skip this step.

If you do want to use a scratch-pad file; that is, if you want to use read-only system files (ROSY=ON), see also Natural Scratch-Pad File (in the Natural Operations for Mainframes documentation). Proceed as follows:

Load the empty scratch-pad file contained in dataset NAT*nnn*.SYSF using the ADALOD utility, as described below.

The following ADALOD parameters must not be altered:

```
ISNREUSE=YES
VERSION=6
```

For the optional scratch-pad file inclusion, the following NATPARM parameters must be added or, if already present, updated with:

```
LFILE=(212,dbid,fnr)
ROSY=ON
```

Modify the member NAT*vr*SCR LODLIB to suit your requirements. In particular replace the question mark (?) specified for the FILE parameter with the file number chosen for your scratch-pad file.

You can now invoke the ADALOD EXEC for loading the Natural system file:

```
ADALOD NATvrSCR
```

Step 5: Customize the Natural Parameter Module

The file NATPARM ASSEMBLE contains sample settings of Natural profile parameters.

Use XEDIT to set the parameters FNAT, FUSER, FSEC and FDIC to the correct values for your installation.

Note that these parameters are in effect for the INPL procedure in Step 10.

You must define the Natural buffer pool using the NTBPI macro.

Example:

If you defined a buffer pool shared segment named NATBP*vr*, code:

```
NTBPI TYPE=NAT,NAME=NATBPvr
NTBPI TYPE=NAT,SIZE=1024
```

Natural will be instructed to load the shared segment NATBP*vr* and use it as its buffer pool. If the shared segment cannot be loaded, a buffer pool of 1024KB is allocated from CMS free storage and the initialization error message NAT1074 is displayed.

You can suppress the display of initialization error messages by coding:

```
IMSG=OFF
```

You may wish to include

```
HCAM=CMS
```

to enable the Hardcopy Function (%H) (as described in the Natural Operations documentation). See also Hardcopy Output (in the Natural Reference documentation).

Set other profile parameters as required by your installation.

For a description of these parameters, refer to Profile Parameters (in the Natural Reference documentation).

VM/ESA does not support CPU usage time measurement; as a result, the profile parameter MT reacts to elapsed time instead of CPU usage time. Therefore, set the MT parameter to MT=0.

Step 6: Customize the INCLUDE List for Linking of Natural

The program NAT$LOAD EXEC is used in the following two steps to build Natural for CMS.

You may wish to use XEDIT to customize the contents of variable LOADLIST, for example, to include your own routines that you defined as CSTATIC in NATPARM ASSEMBLE.

Step 7: Linking the Adabas Interface

Before linking Natural, copy the Adabas interface from the Adabas text library.

You can use the following CMS commands to perform this task:

```
FILEDEF IN DISK ADAVnnn TXTLIB fm (MEMBER ADABAS
FILEDEF OUT DISK ADABAS TEXT A
MOVEFILE IN OUT
```

where *ADAVnnn* stands for your current Adabas text library and *fm* for the filemode where you access this text library.

Step 8: Generate a Natural Module

Issue the following CMS command:

```
NATBLDM
```

You are prompted for the name of the Natural module.

Enter a valid CMS file name, for example, "NAT*vrs*".

NATBLDM checks NATCMS TEXT and NATPARM TEXT.

If a TEXT file is not found or if it is older than the corresponding source file, NATBLDM asks you whether you want to assemble (reassemble) the source file. If so, you are given the opportunity to XEDIT the source first, in order to define installation-dependent parameters.

Note that NATCMS TEXT does not exist during an initial installation and an assembly is forced.

Enter "YES" when asked whether you want to edit NATCMS.

Set the parameters that are described in NATCMS ASSEMBLE as required to conform to your site standards.

Parameters in Macro NATCMS

The following parameters can be specified in the NATCMS macro:

Parameter	Description
ATTNKEY=*key*	This parameter specifies the attention key that is used to interrupt a running Natural program, which means that the Natural error message NAT1016 is issued. Valid keys are PA1 to PA3 and PF1 to PF24. Specify NONE if no attention key is to interrupt a Natural program. For compatibility reasons with Natural Version 2.1, all attention keys issue the error message NAT1016 if the ATTNKEY parameter is omitted.
LOADSS=(*name1*,name2**,...)**	This parameter specifies the names of programs that reside in saved segments and are to be loaded dynamically during execution of the Natural CALL statement. If the name of a program differs from the name of the saved segment in which it is contained, specify the two names in parentheses. If, for example, you specify LOADSS=(ALPHA, (BETA, GAMMA)) and a Natural program executes CALL ’ALPHA’, the saved segment named ALPHA is loaded and control is passed to it. When a Natural program executes CALL ’BETA’, the saved segment named GAMMA is loaded and given control. Control is always passed to the start address of the saved segment. If an attempt to load a saved segment fails, normal dynamic load logic is executed, which means that a LOAD macro searches for TEXT files and for TXTLIB and LOADLIB members.
MAXSIZE=*nnn*	This parameter specifies the amount of CMS free storage (in KB) to be obtained for Natural; the default setting is 512. A standard way of calculating the space needed is to add all buffer sizes (ESIZE, etc.) explicitly defined in your NATPARM parameter module, plus 40 KB; see also Using the MAXSIZE Parameter (in the Natural Operations for Mainframes documentation).
OPID=*name*	This parameter specifies the name of the CMS machine to which the operator message is sent after a CALL ’CMWTO’ request has been issued from a Natural program. A value of "*" causes the message to be sent to the current CMS machine; the default value is "OP".

NATBLDM also generates a load map whose file name is the same as the file name of the module, with a file type of "MAP". Keep this map, because it may be helpful in locating errors.

Step 9: Generate a Natural DCSS

Issue the following CMS command:

```
NATBLDS
```

You are prompted for the name of the Natural DCSS (discontiguous shared segment) that you defined in installation Step 1.

Like NATBLDM in Step 8, NATBLDS checks NATCMS TEXT and NATPARM TEXT, and if necessary, allows you to edit and reassemble the respective source before building the saved segment.

NATBLDS also generates a load map whose file name is the same as the name of the DCSS, with a file type of "MAP". Keep this map, because it may be helpful in locating errors.

Natural then offers to build the "bootstrap" for the DCSS which will load and then pass control to the saved segment. If you enter "YES", Natural will ask you for the name you want to use to invoke Natural.

You can also build the bootstrap yourself using the following CMS command:

```
XEDIT NATBOOT ASSEMBLE
```

Set the parameter NSS to the name of the Natural DCSS and file it under the name you want to use, for example "NAT*vr*".

Issue the following CMS commands:

```
GLOBAL MACLIB NATnnn DMSGPI
ASSEMBLE NATvr
LOAD NATvr (ORIGIN TRANS
GENMOD NATvr
```

Step 10: Load the Natural System File and Error Messages

If the tape drive used when copying the contents of the installation tape to disk was detached from your virtual machine, ask the system operator to attach a tape drive to your virtual machine at address X’181’ and mount the Natural installation tape.

Before you can start the Natural INPL, the Adabas environment for your CMS machine must have been set up (as described in the Adabas documentation).

Issue the following CMS command:

```
NATINPL
```

You are prompted for the name of the command to invoke Natural.

Enter one of the following:

- the name of the Natural module built in Step 8, or
- the name of the Natural DCSS bootstrap created in Step 9.

NATINPL then positions the tape and loads the Natural system file and error messages.

This is the most time-consuming step of the installation procedure. The elapsed time varies greatly with machine type and system load and can in some cases exceed an hour.

The Natural system file definitions as coded in the Natural parameter module (which was created in Step 3) apply.

Three reports are produced on your virtual printer.

Check these reports to ensure that no errors have occurred.

Step 11: Make Natural Modules Available to the Users

Copy the Natural module and the DCSS bootstrap to a public disk or have your system programmer copy them to the CMS Y-disk.

Installation Verification for Natural under CMS

To verify your installation perform the following steps:

1. Issue as CMS command the name of the Natural module created in Step 8.
2. Check that the following results are available:
   - Communication between Adabas and Natural is working.
   - The Natural system files have been loaded.
   - Batch Natural is operational.

