Natural

Installation for z/OS

Version 8.2.8

November 2024

ADABAS & NATURAL

This document applies to Natural Version 8.2.8 and all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

Document ID: NATMF-INSTALL-ZOS-828-20241106

Table of Contents

Preface

This documentation describes the installation of base Natural and Natural add-on products on z/OS.

1 About this Documentation

Document Conventions

Convention	Description
Bold	Identifies elements on a screen.
`Monospace font`	Identifies service names and locations in the format *`folder.subfolder.service`*, APIs, Java classes, methods, properties.
Italic	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text. References to other documentation sources.
`Monospace font`	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
|	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the | symbol.
[ ]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [ ] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

Online Information and Support

Product Documentation

You can find the product documentation on our documentation website at **https://documentation.softwareag.com**.

Product Training

You can find helpful product training material on our Learning Portal at **https://learn.softwareag.com**.

Tech Community

You can collaborate with Software GmbH experts on our Tech Community website at **https://tech-community.softwareag.com**. From here you can, for example:

- Browse through our vast knowledge base.
- Ask questions and find answers in our discussion forums.
- Get the latest Software GmbH news and announcements.
- Explore our communities.
- Go to our public GitHub and Docker repositories at **https://github.com/softwareag** and **https://containers.softwareag.com/products** and discover additional Software GmbH resources.

Product Support

Support for Software GmbH products is provided to licensed customers via our Empower Portal at **https://empower.softwareag.com**. Many services on this portal require that you have an account. If you do not yet have one, you can request it at **https://empower.softwareag.com/register**. Once you have an account, you can, for example:

- Download products, updates and fixes.
- Search the Knowledge Center for technical information and tips.
- Subscribe to early warnings and critical alerts.
- Open and update support incidents.
- Add product feature requests.

Data Protection

Software GmbH products provide functionality with respect to processing of personal data according to the EU General Data Protection Regulation (GDPR). Where applicable, appropriate steps are documented in the respective administration documentation.

I Installation Process and Major Natural Features on z/OS

2 Installation Process and Major Natural Features on z/OS

This document provides general information on the prerequisites and processes required to install base Natural and Natural add-on products. In addition, it describes installation tools and major Natural components required for installation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

General Prerequisites and System Support

Before beginning the installation process, consider the following:

- Be sure to read the current Natural *Release Notes* for Mainframes for information on software and hardware requirements, known issues and changes to the documentation. These *Release Notes* apply to base Natural and Natural add-on products.
- A supported version of the operating system on which Natural is to run must be installed. For the supported operating systems and versions, refer the **Product Version Availability** section of Software AG's Empower web site at ***https://empower.softwareag.com/***.
- A supported version of the TP monitor/online interface used with Natural must be installed. For the supported versions, refer to *TP Monitors/Online Interfaces* in the current Natural *Release Notes* for Mainframes.
- A supported version of Adabas must be installed to store the Natural system files. See also ***Natural System Files***.

  For the supported versions, refer to *Database Management Systems* in the current Natural *Release Notes* for Mainframes.
- A supported version of each database management or file system used to store the user data processed with Natural must be installed.

  For the supported versions, refer to *Database Management Systems* in the current Natural *Release Notes* for Mainframes.

Note: For information regarding Software AG product compatibility with IBM platforms and any IBM requirements for Software AG products, review the ***Software AG IBM Product Availability*** web page.

Installation Medium

The installation medium (for example, tape or CD-ROM) distributed for Software AG mainframe products contains all data sets required to install base Natural and the Natural add-on products.

The software required for the optional Natural components are contained in the data sets supplied for base Natural. The software required for the Natural add-on products are contained in separate product data sets which are listed in the product-specific sections of the *Installation for z/OS* documentation. In addition to the product data sets, the installation medium can contain the latest fix updates for the supplied products.

The names of the product data sets begin with a product code that identifies each product, as in the following table:

Product Code	Product Name
ETP	Entire Transaction Propagator
NAF	Natural Advanced Facilities
NAT	Natural
NAZBT	Natural Batch for zIIP
NAZCI	Natural for CICS for zIIP
NAZCO	Natural for Com-plete for zIIP
NCF	Natural Com-plete/SMARTS Interface (corresponds to Natural Com-plete Interface)
NCI	Natural CICS Interface
NCJ	Natural Japanese Language Pack
NDB	Natural for DB2
NDL	Natural for DL/I
NII	Natural IMS TM Interface
NOC	Natural Optimizer Compiler
NSC	Natural Security
NSF	Natural SAF Security
NTC	Natural Connection
NTI	Natural TSO Interface
NVS	Natural for VSAM
RNM	Natural Review

Software AG Product Delivery Report

Each installation medium is delivered with a Software AG Product Delivery Report providing the following information:

- A list of all data sets contained on the medium.
- The sequence in which the data sets are located on the medium.
- Attribute descriptions of each data set.

Installation Method

The installation of Software AG products on z/OS is performed by installation jobs that contain the JCL required to identify the job to the operating system and run the job.

There are two methods for creating and running the installation jobs:

- using the jobs generated by System Maintenance Aid (SMA), or
- using the jobs created from the sample installation jobs provided.

The *Installation for z/OS* documentation solely describes the installation procedure for the jobs generated by SMA. If you do not use SMA for installation, refer to the example installation jobs supplied on the installation medium.

SMA is supplied with base Natural.

System Maintenance Aid (SMA)

For each step of the installation procedure, System Maintenance Aid (SMA) generates an installation job according to your specifications in SMA. You then submit and run the generated job.

Before you can start generating the jobs, you have to load the `SMT111.TABS` data set from the installation medium into the SMA system file. `SMT111.TABS` contains the tables SMA requires to build the jobs.

SMA is supplied with base Natural. For instructions on loading the data set and using SMA, refer to the *System Maintenance Aid* documentation.

Readme File

For installation guidance and information on new or changed SMA parameters and Natural features, you can view the product-specific Readme files by using the appropriate SMA function.

To view a product-specific Readme

- From the product list on an SMA **Maintenance** screen, execute the `RM` (**Show Readme File**) command for the required product(s).

Sample Installation Jobs

The sample installation jobs that can be used as an alternative to SMA are provided in a PDS library contained on the data set *`product-code-vrs`*`.JOBS` (for example, `NAT828.JOBS`) shipped on the installation medium. All sample installation jobs provided are listed and described in the README document that accompanies the shipment.

You need to adapt the sample installation jobs to your requirements.

Installation Job Identification

Each installation job indicates the **product code** and version (for example, `NAT828`) of the corresponding product (for example, Natural).

Each step of the installation procedure is identified by a job name (for example, `I050`) and one or more steps (for example, Steps `0100` and `0101` for Job `I050`) that indicate the tasks performed by the job. The job name can have a prefix such as a **product code** (for example, `NATI050`). The prefix can be specified with the SMA parameter `JOB-PREFIX` (the default prefix is `SMA`).

A sample installation job from the PDS library can also have a suffix letter which indicates a variant of the job. For example: Job `I060L` is a variant of Job `I060` and used if support of the IBM Language Environment (LE) is required. In SMA, the same variant is executed with Job `I060` and the appropriate SMA parameter setting.

Overall Installation Procedure

The installation process comprises the following:

1. Creating the Natural system files.
2. Creating the Natural parameter module.
3. Creating the Natural nucleus.
4. Loading the Natural objects.
5. Installing the optional Natural components.
6. Installing the Natural add-on products.

Installation Verification

Verify the successful completion of the installation by starting Natural and testing the system functions as described in the relevant sections of the *Installation for z/OS* documentation.

Note: If Natural Security is installed, certain Natural functions and libraries can be restricted to specific users.

INPL Utility

The installation instructions frequently refer to the Natural INPL utility which is used to load the data sets (for example, `NAT`*`vrs`*`.INPL`) contained on the Natural installation medium into the **Natural system files**. The INPL utility is invoked with the Natural system command `INPL`. For detailed information on the INPL utility, refer to the *Utilities* documentation.

Natural Nucleus Components

The Natural nucleus consists of two functional parts: the environment-independent nucleus and the environment-dependent nucleus.

Note: If you maintain different versions of Natural, you must use distinctive names for the nuclei to identify each version.

This section covers the following topics:

Environment-Independent Nucleus

The environment-independent nucleus contains components that are independent of the operating system or TP system (online interface) being used. The same instance of the environment-independent nucleus can be used in different online and batch environments in different address spaces. The environment-independent nucleus is reentrant.

The environment-independent nucleus can reside in the extended link pack area (ELPA) where it can be shared between different address spaces.

A module (such as the environment-independent nucleus) loaded into the ELPA is protected against modification. Therefore, tests for modifications of the environment-independent nucleus should be performed in a separate environment. You can use the operator command SETPROG to load a modified environment-independent nucleus into the ELPA.

If the environment-independent nucleus resides in the ELPA, multiple batch jobs or TP regions (for example, CICS) share the same instance of the environment-independent nucleus. This results in a significant reduction of paging activities and virtual storage consumption.

Modules for Linking

The following modules must be linked to the environment-independent nucleus:

- Modules for base Natural
- Environment-independent modules of Natural add-on products
- Environment-independent user-supplied modules

When using System Maintenance Aid (SMA), the required modules are linked to the environment-independent nucleus during the appropriate installation job/step. Modules that can optionally be linked are mentioned in the *Installation Procedure*.

The installation of the environment-independent nucleus is described in *Link the Nucleus* in the *Installation Procedure*.

Specifying the Nucleus Name

The name of the environment-independent nucleus to be used is specified with the Natural profile parameter `NUCNAME` in the Natural parameter module during the installation of the environment-dependent nucleus. You can specify `NUCNAME` as a dynamic parameter in the primary parameter input, but you cannot specify `NUCNAME` in the input strings of the Natural profile parameter `PROFILE` or `SYS`.

The Natural parameter module is described in *Building a Natural Parameter Module* in the *Operations* documentation. `NUCNAME`, `PROFILE` and `SYS` are described in the *Parameter Reference* documentation.

If you maintain different versions of Natural, we recommend that you use distinctive names for the nucleus to clearly identify each version and environment, for example: `NAT828` for the environment-independent nucleus, `NAT828C` for the environment-dependent nucleus for a CICS interface, and `NAT828B` for the batch environment.

Environment-Dependent Nucleus

The environment-dependent nucleus contains components that depend on the operating or TP system being used.

In addition to the environment-independent nucleus, every single address space in which Natural runs requires an environment-dependent nucleus containing modules that perform actions specific to the operating or TP system. The environment-dependent nucleus assumes control from the operating or TP system at the start of a Natural session, loads the environment-independent nucleus and passes control to it.

Modules for Linking

The following modules must be linked to the environment-dependent nucleus:

- Environment-specific Natural interface modules
- Environment-specific work file and print file modules
- Environment-specific Natural parameter module (see also *Building a Natural Parameter Module* in the *Operations* documentation)
- Environment-dependent modules of Natural add-on products
- Adabas link routine (`ADALNK` or `ADAUSER`)
- Environment-dependent user-supplied modules defined as `CSTATIC` in the Natural parameter module. The Natural profile parameter `CSTATIC` is described in the *Parameter Reference* documentation.

When using System Maintenance Aid (SMA), the required modules are linked to the environment-dependent nucleus during the appropriate installation job/step. Modules that can optionally be linked are mentioned in the *Installation Procedure*.

The installation of the environment-dependent nucleus is described in *Link the Nucleus* in the *Installation Procedure*.

Modules for Static Linking

Both the Natural configuration module NATCONFG (described in the *Operations* documentation) and the Natural parameter module contain the Natural-supplied list of additional modules to be statically linked to the nucleus.

The Natural parameter module also contains the user-supplied list of additional modules to be statically linked to the nucleus as specified with the Natural profile parameter CSTATIC.

Each entry of these lists consists of a program name and a V-type address constant which must be resolved by linking the corresponding module to the Natural parameter module.

The Natural-supplied list provided with NATCONFG is used if the Natural parameter module is not linked to the environment-independent nucleus. If modules are statically linked to the environment-independent nucleus, a Natural parameter module that defines all these modules must also be linked to the environment-independent nucleus.

Optionally, you can specify an alternative Natural parameter module by using the Natural profile parameter PARM (described in the *Parameter Reference* documentation). An alternative parameter module takes precedence over a parameter module that is linked to either the environment-independent or the environment-dependent nucleus.

Merging Module Lists

During initialization of a Natural session, up to three lists of statically-linked modules (specified with the Natural profile parameter CSTATIC) are merged:

- Base list for the merge is the list of the Natural parameter module specified with the Natural profile parameter PARM;
- V-type address constants not resolved in this list are resolved using the Natural parameter module linked to the environment-dependent nucleus;
- V-type address constants not yet resolved are resolved using the Natural parameter module linked to the environment-independent nucleus.

If a user-supplied module is to be statically linked to the environment-independent nucleus, it must be specified in the Natural parameter module linked to the environment-independent nucleus as well as in the Natural parameter module specified with the Natural profile parameter PARM.

Modules for Dynamic Loading

When initializing a Natural session, you can also dynamically load the modules (supplied by Software AG or user-defined) that have been defined for static linking. For information on whether the module of a Natural add-on product is suitable for dynamic loading, read the documentation for your specific Natural add-on product.

For information on defining external names for static non-Natural programs and dynamic linking and controlling these programs, see the Natural profile parameters `RCA` and `RCALIAS` described in the *Parameter Reference* documentation.

Modules Called Dynamically

If a module is not defined for static linking, Natural attempts to load and execute the module using environment-dependent functions (for example, `EXEC CICS LINK` under CICS) when the corresponding Natural `CALL` statement is executed.

Natural System Files

The Natural system files are stored in an Adabas database.

The table below lists and describes the Natural system files that are usually available in a Natural environment. The availability of the system files and the data contained in the files depends on the Software AG products installed in addition to base Natural.

The settings for the system files are defined with Natural profile parameters of the same names (exception: scratch-pad file). You can follow the hyperlinks in the table below to read details about these parameters in the *Parameter Reference* documentation.

System File	Supplied with	File Contents
`FNAT`	Base Natural	All objects required for Natural system applications.
`FUSER`	Base Natural	User-specific objects required for user-defined applications.
`FPROF`	Base Natural	Parameter profiles specified by the profile parameter `PROFILE`, provided no database information is supplied as subparameter of `PROFILE`.
Scratch-pad file	Base Natural	Data that is not stored explicitly as a Natural object in another system file. See also *Natural Scratch-Pad File* in the *Operations* documentation.
`FDIC`	Base Natural	Natural Data Definition Modules (DDMs). If Predict is installed, `FDIC` also contains data for the Predict dictionary system.

System File	Supplied with	File Contents
		If the Natural Development Server is installed, `FDIC` also contains application data and holds object locking information.
`FREG`	Base Natural	Registry data that is not stored explicitly in another system file.
`FSEC`	Natural Security	Control information required for security definitions.
`FSPOOL`	Natural Advanced Facilities	Control and spooling information required to output a report on a screen or printer and obtain print statistics.

It is also possible to store Natural system files in a VSAM file system if **Natural for VSAM** is installed. The *Installation for z/OS* documentation describes the installation steps that apply when using an Adabas database for storage.

Defining a Scratch-Pad File

Like all other system files of Software AG products, the scratch-pad file is a logical file. The logical file number of the scratch-pad file is 212.

Since there is no mnemonic for the scratch-pad file such as `FNAT` and `FUSER` or `FDIC`, it has to be defined:

- either statically by using the macro `NTLFILE` in the Natural parameter module or
- dynamically by using the Natural profile parameter `LFILE`.

Examples of `NTLFILE` and `LFILE` Definitions:

`LFILE` Parameter:

```
LFILE=(212,physical-dbid,physical-fnr,password,cipher-key)
```

`NTLFILE` Macro:

```
NTLFILE 212,physical-dbid,physical-fnr,password,cipher-key
```

II Installing Natural on z/OS

3 Installing Natural on z/OS

This document describes the steps for installing Natural (product code NAT) on z/OS.

Related Topic:

For information on how to run Natural in a z/OS environment, see the *Operations* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support***.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
ICS*vrs*.LOAD	Load modules for International Components for Unicode for Software AG (ICS)
ICS*vrs*.SRCE	Source modules for International Components for Unicode for Software AG (ICS)
MLC*vrs*.JOBS	Sample installation jobs for Software AG's mainframe license check software The placeholder *vrs* in the library name represents the version of the license check software, which is not necessarily the same as the version of Natural. For detailed information on the license check software, see *Software AG Mainframe Product Licensing*.
MLC*vrs*.LOAD	Load modules for Software AG's mainframe license check software containing the LICUTIL license utility The placeholder *vrs* in the library name represents the version of the license check software, which is not necessarily the same as the version of Natural. For detailed information on the license check software and the LICUTIL utility, see *Software AG Mainframe Product Licensing*.
NAT*vrs*.LOAD	Load modules
NAT*vrs*.LICS	Product license file for Natural For information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

Data Set Name	Contents
NAZ*vrs*.LICS	Product license file for Natural Batch for zIIP This license file is also valid the Natural TSO Interface. For information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.
NAT*vrs*.SRCE	Source modules and macros
NAT*vrs*.SYSF	Natural system file definitions
NAT*vrs*.OBJS	Object modules
NAT*vrs*.JOBS	Sample installation jobs
NAT*vrs*.INPL	Natural objects
NAT*vrs*.EXPL	Natural example objects

Copying Data Sets to a z/OS Disk

Copy the data sets from the supplied installation medium to your disk before you perform the individual installation procedure for each component to be installed.

The way you copy the data sets depends on the installation method and the medium used:

- If you use System Maintenance Aid (SMA), refer to the copy job instructions provided in the *System Maintenance Aid* documentation.
- If you are not using SMA and want to copy the data sets from CD-ROM, refer to the README.TXT file on the CD-ROM.
- If you are not using SMA and want to copy the data sets from tape, follow the instructions in this section.

This section explains how to copy all data sets from tape to disk.

Step 1: Copy Data Set COPY.JOB from Tape to Disk

- Modify the following sample job according to your requirements:

```
//SAGTAPE JOB SAG,CLASS=1,MSGCLASS=X
//* --------------------------------
//COPY EXEC PGM=IEBGENER
//SYSUT1 DD DSN=COPY.JOB,
// DISP=(OLD,PASS),
// UNIT=(CASS,,DEFER),
// VOL=(,RETAIN,SER=tape-volser),
// LABEL=(2,SL)
//SYSUT2 DD DSN=hilev.COPY.JOB,
// DISP=(NEW,CATLG,DELETE),
// UNIT=3390,VOL=SER=disk-volser,
// SPACE=(TRK,(1,1),RLSE),
// DCB=*.SYSUT1
//SYSPRINT DD SYSOUT=*
//SYSIN DD DUMMY
//
```

where:

`tape-volser` is the VOLSER of the tape, for example: `T12345`,
`hilev` is a valid high-level qualifier, and
`disk-volser` is the VOLSER of the disk.

- Execute the job to copy the data set `COPY.JOB` to your disk.

Step 2: Modify hilev.COPY.JOB on Your Disk

- Modify *`hilev`*`.COPY.JOB` according to your requirements:

  Set `EXPDT` to a valid expiration date, for example, `99365`.

  Set `HILEV` to a valid high-level qualifier, for example, `USERLIB`.

  Set `LOCATION` to a storage location, for example, `STORCLAS=ABC` or `UNIT=3390,VOL=SER=USR123`.

Step 3: Submit COPY.JOB

- Execute *`hilev`*`.COPY.JOB` to copy single, multiple, or all data sets to your disk.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

- Step 1: Allocate and Copy the SMA User Libraries
- Step 2: Prepare, Convert, Assemble and Link the License File
- Step 3: Link Natural Modules to an APF Library

Step 1: Allocate and Copy the SMA User Libraries

(Job I002, Steps 0010, 0020)

- Allocate the user-specific source, load and save libraries of System Maintenance Aid (SMA) and copy them to the `LOAD.SAVE` library.

Step 2: Prepare, Convert, Assemble and Link the License File

(Job I007, Steps 0101, 0102, 0104 and optional Steps 0111, 0112, 0114)

You must install a valid Natural license file. An additional license file is required if you want to install Natural Batch for zIIP to enable support of the IBM z/IIP (IBM System z Integrated Information Processor).

For detailed information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

1. Copy the license file from the supplied installation medium to disk or transfer it from the PC as described in *Transferring a License File from PC to a z/OS Host Using FTP* in *Software AG Mainframe Product Licensing*.
2. Check, convert, assemble and link the license file:

Step 0101	Check license file NAT*vrs*.LICS. This job runs the CHECK function of the LICUTIL license utility (see below).
Step 0102	Convert license file into an assembler source. This job runs the MAKE function of the LICUTIL license utility (see below).
Step 0104	Assemble and link the assembler source to generate load module NATLIC. This module is then linked to the nucleus in **Job I060**.

The functions and option settings provided by LICUTIL are described in *Using the License Utility: LICUTIL* in *Software AG Mainframe Product Licensing*.

3. This step is only required if you want to install Natural Batch for zIIP for a batch, batch server or TSO environment.

   Check, convert, assemble and link the license file supplied for Natural Batch for zIIP:

Step 0111	Check license file NAZ*vrs*.LICS. This job runs the CHECK function of the LICUTIL license utility.
Step 0112	Convert license file into an assembler source. This job runs the MAKE function of the LICUTIL license utility.
Step 0114	Assemble and link the assembler source to generate load module NAZLIC. This module is then linked to the nucleus in **Job I060**.

Step 3: Link Natural Modules to an APF Library

(Job I009, Steps 1200, 1210, 1220, 1230, 1232, 1240, 1250)

If you want to use one of the Natural components listed in the table below, link the appropriate Natural module to an Authorized Program Facility (APF) library.

The table below indicates when a component is required and the System Maintenance Aid (SMA) parameters used to specify the module names.

Step/Component to be Installed	Module	SMA Parameter
Step 1200: Global Buffer Pool[1] See also ***Step 4: Start the Global Buffer Pool***.	NATGBP82	NAT-GLOBAL-BP or EDT-GLOBAL-BP
Step 1210: Authorized Services Manager (ASM)[1] You must use an ASM in the following cases: ■ The Natural profile parameter BPPROP is set to PLEX or GLOBAL or GPLEX (buffer pool propagation is used).	NATASM91	NAT-ASM

Step/Component to be Installed	Module	SMA Parameter
■ Natural global buffer pools are allocated in the system key; see *Step 4: Start the Global Buffer Pool*. ■ Natural under CICS is used in a Parallel Sysplex environment (SIP function is required). ■ Natural under IMS TM is used in terminal-oriented, non-conversational mode (SIP function is required). ■ Natural under IMS TM is used, with the Accounting function writing SMF records. ■ Enablement of zIIP support is required. ■ Enablement of the Shared Memory Objects File Server of Natural for DB2 is required. ■ Natural Development Server with `SECURITY_CACHING=YES` is used. See also *Step 20: Create and Start the Natural Authorized Services Manager*.		
Step 1220: Natural Roll Server[1] You must use a Natural Roll Server in the following cases: ■ The server front-end of Natural RPC (Remote Procedure Call) is used. ■ Natural under IMS TM runs in a Parallel Sysplex environment. ■ Natural under CICS runs in a Parallel Sysplex or CICSplex environment. See also *Step 18: Create and Format the Roll File* and *Step 19: Create and Start the Natural Roll Server*.	`NATRSM91`	`ROLLSRV`
Steps 1230 and 1232: Optimize Monitor Buffer Pool[1] See also *Step 21: Create and Start the Optimize Monitor Buffer Pool*.	`NAT04I82`	`NAT-EOIMBP`
Step 1240: Message Buffer Pool [1] See also *Step 22: Create and Start the Message Buffer Pool*.	`NATMBP82`	`NAT-MTBP`
Step 1250: Impersonation with the Natural RPC (Remote Procedure Call)[2] We recommend that you link the RPC server front-end into an APF-authorized `LINKLIST` library. This eliminates the need to provide the whole `STEPLIB` concatenation in the execution JCL of the Natural server APF-authorized. In this case, you have to issue the z/OS `MODIFY` command `F LLA,REFRESH` after the link edit. See also *Step 23: Create Sample JCL for the Natural RPC Server*.	RPC Server Front-End	`NAT-RPC-FRONT`

[1] described in the *Operations* documentation

[2] described in the *Natural RPC (Remote Procedure Call)* documentation

Step 4: Start the Global Buffer Pool

(Job I015, Steps 0100, 0101, 0102, 0104)

These steps are only required if you want to use a global buffer pool. For further information on the global buffer pool, see *Natural Global Buffer Pool* in the *Operations* documentation.

Installation of the Natural Authorized Services Manager (ASM) is mandatory if `ALLOWUSERKEYCSA(NO)` applies by default or has explicitly been specified in `SYS1.PARMLIB(DIAG`*xx*`)`. See also *Allocation of the Natural GBP* in the *Operations* documentation.

- Create the jobs required to start and stop a global buffer pool:

Step	Job	Function
0100	`GBNASTRT`	Start global buffer pool
0101	`GBNASTOP`	Stop global buffer pool
0102	`GBEDSTRT`	Start editor global buffer pool
0104	`GBEDSTOP`	Stop editor global buffer pool

- If you want to use a Natural global buffer pool, start the job `GBNASTRT` before using Natural.
- If you want to use an editor global buffer pool, start the job `GBEDSTRT` before using Natural.

Step 5: Load the FNAT System File Definition

(Job I050, Step 0100)

Skip this step if you want to use an existing Natural `FNAT` system file.

Load the new Natural `FNAT` system file definition:

1. Specify the database ID and file number of the Adabas file where to load the new `FNAT` system file definition by using the Adabas ADALOD utility.

   In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 13: Build the Natural Parameter Module***.
2. Load the `FNAT` system file definition contained in the `NAT`*vrs*`.SYSF` data set by using the Adabas ADALOD utility.

   The following ADALOD utility parameter must *not* be changed:

```
ISNREUSE=YES
```

The following ADALOD utility parameter setting is recommended:

```
USERISN=YES
```

If you reorganize an `FNAT` file or if you unload from or load data to the `FNAT` file (for example, by using `ADAULD`/`ADALOD`), you must specify the parameter `USERISN=YES` for the `ADALOD` utility to avoid Natural errors NAT7397 and NAT9988 which require that you re-INPL the Natural `FNAT` system file.

If you specify the parameter `USERISN=YES` when you load a new `FNAT` system file, and you unload data from this `FNAT` file, the `ADALOD` utility assumes `USERISN=YES` as a default setting when re-loading the data into the `FNAT` file.

Step 6: Load the FUSER System File Definition

(Job I050, Step 0101)

Skip this step if you want to use an existing Natural `FUSER` system file.

Load the new Natural `FUSER` system file definition:

1. Specify the database ID and file number of the Adabas file where to load the new `FUSER` system file definition by using the Adabas ADALOD utility.

   In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 13: Build the Natural Parameter Module***.
2. Load the `FUSER` system file definition contained in the `NAT`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

   The following ADALOD utility parameter must *not* be changed:

   ```
   ISNREUSE=YES
   ```

3. If you want to use existing Natural applications, copy all user-written objects to the empty `FUSER`.
4. If you want to use Natural Application Programming Interfaces (APIs), see *Using a Natural API* in the *SYSEXT Utility* documentation for further guidance.

Step 7: Load the Scratch-Pad File Definition

(Job I050, Step 0102)

This step is only required if you want to use read-only system files. See also *Natural Scratch-Pad File* in the *Operations* documentation.

You can skip this step if you want to use an existing Natural scratch-pad file.

Load the new Natural scratch-pad system file definition:

1. Set the System Maintenance Aid (SMA) parameter `NAT-SCRF` to `Y` (Yes).
2. Specify the database ID and file number of the Adabas file where to load the scratch-pad file by using the Adabas ADALOD utility.

   In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 13: Build the Natural Parameter Module***.
3. Load the scratch-pad system file definition contained in the `NAT`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

   The following ADALOD utility parameter must *not* be changed:

   ```
   ISNREUSE=YES
   ```

Step 8: Load the FREG System File Definition

(Job I050, Step 0104)

This step is only required if registry information must be available to control concurrent user sessions limited with the Natural profile parameter `UCONMAX` (see the *Parameter Reference* documentation).

You can skip this step if you want to use an existing Natural `FREG` system file.

Load the new Natural `FREG` system file definition:

1. Set the System Maintenance Aid (SMA) parameter `NAT-FREG` to `Y` (Yes).
2. Specify the database ID and file number of the Adabas file where to load the `FREG` system file by using the Adabas ADALOD utility.

   In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 13: Build the Natural Parameter Module***.
3. Load the `FREG` system file definition contained in the `NAT`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

The following ADALOD utility parameter must *not* be changed:

```
ISNREUSE=YES
```

Step 9: Load the FDIC System File Definition

(Job I050, Step 0103)

Skip this step:

- if you want to install Predict. In this case, use the corresponding installation step described in the Predict *Installation* documentation.
- if you want to use an existing Natural `FDIC` system file.

Load the new Natural `FDIC` system file definition:

1. Specify the database ID and file number of the Adabas file where to load the new `FDIC` system file definition by using the Adabas ADALOD utility.

   In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 13: Build the Natural Parameter Module***.
2. Load the `FDIC` system file definition contained in the `NAT`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

   The following ADALOD utility parameter must *not* be changed:

   ```
   ISNREUSE=YES
   ```

Step 10: Load the FSEC System File Definition

(Job I050, Step 9900)

Skip this step, if you do not use Natural Security.

- If you use Natural Security, refer to ***Installing Natural Security***.

Step 11: Build the Natural Configuration Module

(Job I055, Step 0110)

This step is only required if you need to change the delivered `NATCONFG` module, for example, to adapt the `NTDVCE` macro definition to your requirements.

1. Change and assemble the source contained in the `*hilev*.NAT*vrs*.SRCE` data set.
2. Link the resulting Natural configuration module `NATCONFG` to the environment-independent nucleus (see ***Step 14: Link the Nucleus***).

   For more information on the configuration tables in `NATCONFG`, refer to *Natural Configuration Tables* in the *Operations* documentation.

Step 12: Build the Natural-Specific IBM Language Environment Options

(Job I055, Step 0120 or 0130)

Build the Natural-specific runtime options for the IBM Language Environment (LE).

Step 0120 is only required if you need to adapt the LE options at the `.MVSDEF` label in the delivered `NATLEOPT` module to your requirements.

1. Set the System Maintenance Aid (SMA) parameter `NAT-LEOPT` to `Y` (Yes); the default setting is `N` (No).
2. Change the required LE options in the `NATLEOPT` source module contained in the `NAT*vrs*SRCE` data set at the `.MVSDEF` label.
3. Assemble and link the `NATLEOPT` source module contained in the `NAT*vrs*SRCE` data set.
4. Link the resulting `NATLEOPT` module to the environment-dependent nucleus (see ***Step 14: Link the Nucleus***).

Step 0130 is only required if you have any non-Natural programs running in 24-bit addressing mode:

1. Set the SMA parameter `NAT-LEOPT-AMODE24` to `Y` (Yes); default is `N` (No).
2. Assemble the `NATLEOPT` module contained in the `NAT*vrs*SRCE` data set.
3. Link the resulting `NATLEOPT` module to the environment-dependent nucleus (see ***Step 14: Link the Nucleus***).

Step 13: Build the Natural Parameter Module

(Job I060, Steps 0010, 0015)

Build the Natural parameter module for batch mode.

1. Modify the settings of the Natural profile parameters supplied with this job, if required. The parameters and corresponding macros (if applicable) are described in the *Parameter Reference* documentation. The most important parameter/macro settings are described below.

   - Configure the z/OS batch interface: Modify the settings of the parameters supplied with the `NTOSP` macro to meet your requirements. For descriptions of these parameters, see the corresponding dynamic profile parameter `OSP`.
   - Adapt the following parameters:

     ```
     FNAT=(database-id,file-number)
     FUSER=(database-id,file-number)
     FDIC=(database-id,file-number)
     ```

     where *database-id* and *file-number* are either the database ID and file number you specified when loading the new `FNAT`, `FUSER` and `FSEC` system files (see ***Step 5***, ***Step 6*** and ***Step 9***, respectively), or the database ID and file number of your existing Natural system files.

     These parameters are supplied with the `NTPRM` macro described in the *Operations* documentation.
   - If you want to to limit the number of concurrent users with the Natural profile parameter `UCONMAX`, proceed as follows:

     Supply the following parameter with the `NTPRM` macro:

     ```
     FREG=(database-id,file-number)
     ```

     where *database-id* and *file-number* are either the database ID and file number you specified when loading the new Natural `FREG` system file (see ***Step 8***), or the database ID and file number of your existing Natural `FREG` system file.
   - If you want to use read-only system files, proceed as follows:

     Supply the following parameter with the `NTPRM` macro:

     ```
     ROSY=ON
     ```

     Specify the `NTLFILE` macro (see the parameter `LFILE`):

```
NTLFILE 212,database-id,file-number
```

where *database-id* and *file-number* are the database ID and file number you specified when loading the new Natural scratch-pad file (see *Step 7*), or the database ID and file number of your existing Natural scratch-pad file.

- If you want to use a Natural global buffer pool, perform the following steps:

  Specify the `NTBPI` macro (see the `BPI` parameter):

  ```
  NTBPI TYPE=NAT,NAME=gbp-name
  ```

  where *gbp-name* is the name of the Natural global buffer pool to be used.

  Supply the following parameter with the `NTPRM` macro:

  ```
  SUBSID=subsystem-name
  ```

  where *subsystem-name* is the name of the Natural subsystem specified when creating the global buffer pool.

  Make sure that the **System Maintenance Aid (SMA)** parameter `NAT-GLOBAL-BP` is set to `Y` (Yes). This is the default setting.

  For detailed information on the Natural global buffer pool, see *Natural Global Buffer Pool under z/OS* in the *Operations* documentation.

2. Assemble and link the Natural parameter module.

Step 14: Link the Nucleus

(Job I060, Steps 0020, 0105)

1. If you want Natural to run in the IBM Language Environment (LE), set the **System Maintenance Aid (SMA)** parameter `NAT-LE` to `Y` (Yes). The default setting is `N` (No).
2. Link the **environment-dependent nucleus** (Step 0020) for batch Natural.

   The list of modules to be linked for the environment-dependent nucleus is supplied with Step 0020.

   Do *not* link the environment-dependent nucleus with the linkage editor option `RENT`.

   If you want Natural to run in the IBM Language Environment (LE), specify `ENTRY LESTART` instead of `ENTRY CMSTART`.
3. Link the **environment-independent nucleus** (Step 0105).

   The list of modules to be linked for the environment-independent nucleus is supplied with Step 0105.

Ensure that the Natural profile parameter `NUCNAME` (see the *Parameter Reference* documentation) specified in the Natural parameter module contains the name of the module resulting from this link step.

Step 15: Load New Natural Objects and Natural Error Messages

(Job I061, Step 0100)

- Load the Natural objects and Natural error messages from the `NAT`*`vrs`*`.INPL` data set into the Natural system files by using the Natural **INPL utility**.

  The Natural error messages comprise short and long message texts and the German (`ULANG=2`) short message texts. You can use the `ERRUPPER` program of the Natural SYSERR utility to convert the message texts to upper case.

  For details on the `ULANG` profile parameter and `ERRUPPER`, see the *Parameter Reference* and the *Utilities* documentation, respectively.

Step 16: Load the Japanese Messages

(Job I061, Step 8300, 8302)

This step is optional and only required if you want to replace the English long message texts by their Japanese equivalents or if you want to load the Japanese short message texts. The Japanese message texts are contained in the Natural Japanese Language Pack (product code NCJ), a separate product that can be loaded optionally. If you do not load the Japanese message texts, the English message texts are used instead.

1. Replace the English long message texts (Step 8300) by loading the Japanese long message texts from the `NCJ`*`vrs`*`.INPL` data set into the Natural system file with the Natural INPL utility.
2. Load the Japanese (`ULANG=59`) short message texts (Step 8302) from the `NCJ`*`vrs`*`.ERRN` data set into the Natural system file by using the `ERRLODUS` program of the Natural SYSERR utility (described in the *Utilities* documentation).

   For details on the `ULANG` profile parameter and `ERRLODUS`, see the *Parameter Reference* and the *Utilities* documentation, respectively.

Step 17: Load the Natural Example Objects

(Job I061, Step 0103)

- Load the Natural example objects from the `NAT`*`vrs`*`.EXPL` data set into the Natural system file by using the Natural INPL utility.

Step 18: Create and Format the Roll File

(Job I200, Step 0101)

This step is only required if you want to use the Natural Roll Server. For information on the different types of roll files, see *Roll File and LRB* in the *Operations* documentation, and *Natural under CICS* and *Natural under IMS TM* in the *TP Monitor Interfaces* documentation.

- If you use the roll file of a previous version, it is sufficient to execute the `NATRSRFI RESET` function. See *Formatting the Roll File* in the *Operations* documentation.
- If you use a new roll file, create and start the job `FORMRF1` (supplied with Step 0101) before using Natural.

Step 19: Create and Start the Natural Roll Server

(Job I200, Step 0102)

This step is only required if you want to use the Natural Roll Server described in *Natural Roll Server Operation* in the *Operations* documentation.

- Create and start the job `SAGRSM` (supplied with Step 0102) before using Natural. See *Starting the Roll Server* in the *Operations* documentation.

  Depending on the setting of the SMA parameter `NATRSM83`, either `NATRSM82` (`NATRSM83=NO`) or `NATRSM83` (`NATRSM83=YES`) is used to start the Roll Server.

Step 20: Create and Start the Natural Authorized Services Manager

(Job I200, Step 0103)

This step is only required if you want to use the Natural Authorized Services Manager (ASM) described in *Authorized Services Manager under z/OS* in the *Operations* documentation.

- Create and start the job `SAGASM` before using Natural.

Step 21: Create and Start the Optimize Monitor Buffer Pool

(Job I200, Step 0105)

This step is only required if you want to use the Optimize Monitor Buffer Pool described in *Optimize Monitor Buffer Pool* in the *Operations* documentation.

- Create and start the job `SAGEOI` (supplied with Step 0105) before using Natural. See *Starting the Optimize Monitor Buffer Pool* in the *Operations* documentation.

Step 22: Create and Start the Message Buffer Pool

(Job I200, Step 0107)

This step is only required if you want to use a message buffer pool described in *Message Buffer Pool* in the *Operations* documentation.

- Create and start the job `SAGMTBP` (supplied with Step 0107) before using Natural. See also *Operating the Message Buffer Pool* in the *Operations* documentation.

Step 23: Create Sample JCL for the Natural RPC Server

(Job I200, Steps 0109, 0115, 0120)

These steps are only required if you want to use Natural RPC.

Sample Natural RPC server:

1. Set the parameters in the **System Maintenance Aid (SMA)** group `RPC` accordingly; in particular, set the parameter `NAT-RPC` to `Y` (Yes).

   For further information, see *Starting a Natural RPC Server* and *Starting a Batch Server in a Mainframe Environment* in the *Natural RPC (Remote Procedure Call)* documentation.
2. Create the `CMPRMIN` sample input to execute a Natural RPC server in batch mode (Step 0109).
3. Create the sample JCL to execute a standard Natural RPC server task without RPC server front-end (Step 0115).
4. Create the sample JCL to execute a Natural RPC server task by the RPC server front-end (Step 0120). This JCL is necessary for impersonation.

Installation Verification

This section provides instructions for verifying the successful installation of Natural.

- Test Batch Natural
- Test Online Natural

Test Batch Natural

You can use the following sample JCL to invoke Natural in batch mode and check whether the Natural system files are available:

```
//JOBNAME JOB (,,,999),CLASS=K,MSGCLASS=X,MSGLEVEL=(1,1)
//*
//NATBAT   EXEC PGM=NATvrsBA,COND=(0,LT)
//STEPLIB   DD DSN=NATURAL.BATCH.LIBRARY,DISP=SHR
//          DD DSN=ADAvrs.LOAD,DISP=SHR
//DDCARD    DD *
ADARUN DB=001,DE=3390,SVC=249,MODE=MULTI
//CMPRINT   DD SYSOUT=X
//CMPRT01   DD SYSOUT=X
//CMWKF01   DD DUMMY
//SYSOUT    DD DUMMY
//CMSYNIN    *
EDIT
WRITE 'TESTBAT'
END
.E
RUN
SAVE TESTBAT
FIN
//
```

This job starts Natural, creates the example program `TESTBAT`, and executes the program with the system command `RUN`.

Test Online Natural

You can use the following verification procedure to test Natural system functions in online mode and check whether the Natural system files are available.

1. Log on to the Natural user library `SYSTEM`:

   ```
   LOGON SYSTEM
   ```

2. Enter the following Natural system command:

```
MAINMENU
```

3. Select **Development Functions** and enter the following:

   C in the **Code** field,
   P in the **Type** field, and
   TEST in the **Name** field.

4. In the editing area of the program editor, type the following:

```
WRITE 'HELLO'
END
```

5. Save the source code and exit the program editor.

6. In the **Development Functions** menu, enter the following:

   L in the **Code** field and
   TES* in the **Name** field.

7. On the **LIST Objects in a Library** screen, enter the RU line command for the TEST program.

8. Enter the following Natural system command:

```
SYSDDM
```

9. In the SYSDDM utility menu, enter the following:

   R in the **Code** field and
   EMPLOYEES in the **DDM Name** field.

10. After pressing ENTER, enter the following:

    C in the **Code** field,
    the appropriate Natural system file number in the **FNR** field,
    the appropriate database ID in the **DBID** field, and
    Y in the **Replace** field.

    The specified DDM has been adapted to your environment.

11. Repeat Steps 9 and 10 for the VEHICLES DDM.

12. You can check whether the DDMs EMPLOYEES and VEHICLES are now available in your environment by logging on to the Natural system library SYSEXSYN and executing the example programs (for example, AEDEX1R) with the system command RUN.

III Installing International Components for Unicode for Software AG on z/OS

4 Installing International Components for Unicode for Software AG on z/OS

This document describes the steps for installing International Components for Unicode for Software AG (ICS) on z/OS which allows Natural to convert code pages and support Unicode.

International Components for Unicode for Software AG (ICS) requires the use of an ICS module and an ICU data library. In addition, you can use ICU data items to load ICU components that are not contained in the ICU data library. The ICS module does not have to be linked to the Natural nucleus if neither code page conversion nor Unicode support are required.

The use of ICU functionality increases the required Natural thread size.

Note: For increased flexibility, it is also possible to load the ICS module during initialization of the Natural session. A dynamically loaded ICS module overrides the statically linked ICS module. You can also load an ICU data library during initialization of the Natural session. A dynamically loaded ICU data library overrides any statically linked ICU data library.

The ICS module, the ICU data libraries and the ICU data items are explained in *Enabling Unicode and Code Page Support* in the *Unicode and Code Page Support* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The ICS module, the ICU data libraries and the ICU data items are contained on the `ICSvrs.LOAD` and `ICSvrs.SRCE` data sets supplied on the **installation medium** for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

- Step 1: Link the ICS Module
- Step 2: Link an ICU Data Library
- Step 3: Load the ICS Module at Session Start
- Step 4: Load an ICU Data Library at Session Start

- Step 5: Load ICU Data Items on Request in a Session

Step 1: Link the ICS Module

1. Add the following `INCLUDE` statement to the link instructions for the **environment-independent nucleus**:

   ```
   INCLUDE ICSLIB(SAGICU)
   ```

   For support of IBM architecture level 9, instead of `SAGICU`, you can use the alternative ICS module `SAGICUA9`:

   - Set the **System Maintenance Aid (SMA)** parameter `NAT-ARCHLEVEL9` to `Y` (default is `N`).

     Or:

   - Add the following `INCLUDE` statement to the link instructions for the **environment-independent nucleus**:

     ```
     INCLUDE ICSLIB(SAGICUA9)
     ```

   - See also alternative ICS modules in the *Unicode and Code Page Support* documentation.

   Note: The ICU data library `ICSDT58J` is contained in the ICS module `SAGICU` (or `SAGICUA9` respectively) and available by default.

2. Link the ICS module to the environment-independent nucleus as described in *Link the Nucleus* in *Installing Natural*.

Step 2: Link an ICU Data Library

Data libraries provided by Software AG are not supported with ICS 311. They will still be supported as part of the ICS Transition Version 222 .

ICS 311 uses the entirety of ICU localization data as described in Step. 5.

This step is only required if you want to use another data library in addition to `ICSDT58J`.

1. Add one of the following `INCLUDE` statements to the link instructions for the **environment-independent nucleus** depending on the ICU data library to be used:

```
INCLUDE ICSLIB(ICSDT58E)
```

Or:

```
INCLUDE ICSLIB(ICSDT58X)
```

2. Link the ICU data library to the **environment-independent nucleus** as described in *Link the Nucleus* in *Installing Natural*.

   If you link the `ICSDT58X` data library, link the **environment-independent nucleus** into a PDSE instead of a PDS to avoid IBM error IEW2641S.

Step 3: Load the ICS Module at Session Start

1. Make sure that the ICS load library from the `ICSvrs.LOAD` data set is available to the execution JCL of your Natural or TP monitor interface. Depending on your environment, perform one of the following options:
   - In batch mode, under TSO and in all IMS TM environments:

     Add `ICSvrs.LOAD` to the `STEPLIB` concatenation of your execution JCL.
   - Under CICS:

     Add `ICSvrs.LOAD` to the `DFHRPL` concatenation of your CICS execution JCL.
   - Under Com-plete:

     Add `ICSvrs.LOAD` to the `COMPLIB` concatenation of your Com-plete execution JCL.
2. At the start of a Natural session, set the Natural profile parameter `RCA` as follows:

```
RCA=SAGICU
```

   `RCA` is described in the *Parameter Reference* documentation.

   The ICS module `SAGICU` is described in the *Unicode and Code Page Support* documentation.

   Instead of the ICS module `SAGICU`, you can also load the ICS module `SAGICUA9`. In addition to `SAGICU`, this module supports IBM architecture level 9: see alternative ICS modules in the *Unicode and Code Page Support* documentation.

   If you want to load `SAGICUA9`, use the following parameter setting:

```
RCA=SAGICU RCALIAS=(SAGICU,SAGICUA9)
```

The Natural profile parameter `RCALIAS` is described in the *Parameter Reference* documentation.

Step 4: Load an ICU Data Library at Session Start

Data libraries provided by Software AG are not supported with ICS 311. They will still be supported as part of the ICS Transition Version 222 .

ICS 311 uses the entirety of ICU localization data as described in Step. 5.

1. Make sure that the ICS load library from the `ICS`*vrs*`.LOAD` data set is available to the execution JCL of your Natural or TP monitor interface. Depending on your environment, perform one of the following options:
   - In batch mode, under TSO and in all IMS TM environments:

     Add `ICS`*vrs*`.LOAD` to the `STEPLIB` concatenation of your execution JCL.
   - Under CICS:

     Add `ICS`*vrs*`.LOAD` to the `DFHRPL` concatenation of your CICS execution JCL.
   - Under Com-plete:

     Add `ICS`*vrs*`.LOAD` to the `COMPLIB` concatenation of your Com-plete execution JCL.
2. At the start of a Natural session, set the Natural profile parameters `RCA` and `CFICU` for the ICU data library to be used:

   For `ICSDT58E`:

   ```
   RCA=ICSDT58E  CFICU=(DATFILE=ICSDT58E)
   ```

   For `ICSDT58X`:

   ```
   RCA=ICSDT58X  CFICU=(DATFILE=ICSDT58X)
   ```

   `RCA` and `CFICU` are described in the *Parameter Reference* documentation.

Step 5: Load ICU Data Items on Request in a Session

This step depends on the ICS version.

- For ICS Transition Version 222
- For ICS 311

For ICS Transition Version 222

This step is optional and only required if you want to dynamically load an ICU data item on request during a Natural session instead of an entire ICU data library. For more information, see the *Unicode and Code Page Support* documentation.

1. Make sure that the ICS load library from the `ICS`*vrs*`.LOAD` data set is available to the execution JCL of your Natural or TP monitor interface. Depending on your environment, perform one of the following options:

   - In batch mode, under TSO and in all IMS TM environments:

     Add >`ICS`*vrs*`.LOAD` to the `STEPLIB` concatenation of your execution JCL.

   - Under CICS:

     Add `ICS`*vrs*`.LOAD` to the `DFHRPL` concatenation of your CICS execution JCL.

   - Under Com-plete:

     Add `ICS`*vrs*`.LOAD` to the `COMPLIB` concatenation of your Com-plete execution JCL.

2. Depending on your TP environment and the setting of the Natural `CFICU` profile parameter, perform one of the following options:

   - Under CICS, with `CFICU=(DATITEM=NONE)` set:

     Add one PPT entry for each ICU data item.

     See also the **corresponding step** in *Installing Natural CICS Interface*.

   - Under Com-plete, with `CFICU=(DATITEM=NONE)` set:

     Add `THREAD-ESQA-SIZE=15K` as a keyword parameter to the startup options for your Com-plete.

For ICS 311

1. You can specify the name of the dataset containing the ICU data items from ICSvrs.LOAD dynamically at the start of the session using the CFICU STEPLIB parameter .
   - See section *Data Scope and Data Handling* in *Unicode and Code Page Support*
   - Add the load library containing the data items to the execution JCL of your Natural or TP monitor interface as described in Step 2.
2. You can also statically add the load library containing the data items from the ICSvrs.LOAD data set to the execution JCL of your Natural or TP monitor interface.
   - In batch mode, under TSO and in all IMS TM environments:

     Add `ICSvrs.LOAD` to the STEPLIB concatenation of your execution JCL.
   - Under CICS:

     Add `ICSvrs.LOAD` to the DFHRPL concatenation of your CICS execution JCL.
   - Under Com-plete:

     Add `ICSvrs.LOAD` to the COMPLIB concatenation of your Com-plete execution JCL.

   ICS uses both allocation methods to search for data items, starting (if given) from the CFICU STEPLIB dataset and the statically specified Natural Steplibs in the JCL.

Installation Verification

After the last step of the installation procedure has been completed, proceed as follows:

1. Configure and activate your Unicode and code page environment by following the instructions in *Configuration and Administration of the Unicode/Code Page Environment* and *Profile Parameters and Macros* in the *Unicode and Code Page Support* documentation.

   For information on the code pages and ICU data files available in your current Natural environment, you can use the SYSCP utility (described in the *Utilities* documentation).
2. After successful activation, you can execute the example programs described in the *Unicode and Code Page Support* documentation.

IV Installation for REQUEST DOCUMENT and PARSE XML Statements on z/OS

5 Installation for REQUEST DOCUMENT and PARSE XML Statements on z/OS

This document describes the installation steps for enabling the use of the Natural statements `REQUEST DOCUMENT` and `PARSE XML` on z/OS.

Related Topics:

For information on the functions provided by `REQUEST DOCUMENT` and `PARSE XML`, see the following documents:

- *Statements for Internet and XML Access* in the *Programming Guide*
- `REQUEST DOCUMENT` in the *Statements* documentation
- `PARSE XML` in the *Statements* documentation

Prerequisites

The following requirements must be met to execute the `REQUEST DOCUMENT` and `PARSE XML` statements:

- The ICU library must be installed to convert data from one encoding to another (at least internally). For details, see the relevant section in the *Unicode and Code Page Support* documentation.
- A TCP/IP stack must be available and enabled for the execution environment.
- A DNS (Domain Name System) server or DNS services must be available in the execution environment to resolve internet addresses (`gethostbyname` function).

For Internet Protocol Version 6 (IPv6) support, the following additional prerequisites apply:

- An activated IPv6 stack must be available on the local host.
- The local network must support IPv6.
- An accessible and IPv6-capable DNS server must be available.
- For IPv6 internet communication, an IPv6 connection from the service provider must be available.
- If both IPv4 and IPv6 are used, a dual stack must be supported.
- IPv6 support must be configured with the appropriate keyword subparameters of the Natural profile parameter `XML` described in the *Parameter Reference* documentation.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Procedure

Be sure to read *Installation Process and Major Natural Features* before you start the installation procedure.

The installation procedure comprises the following:

Step 1: Link the Module NATXML or NATXMLA9 to the Nucleus

The module `NATXML` is required to execute the statements `REQUEST DOCUMENT` and `PARSE XML`. If you want the `PARSE XML` statement to support IBM architecture level 9, alternatively, you can use the module `NATXMLA9`. See also *Support for Architecture Levels*.

1. Set the **System Maintenance Aid (SMA)** parameter `NATXML` to `Y` (default is `N`).
2. The `NATXML` module is then linked to the **environment-independent nucleus** by using the following `INCLUDE` statement:

```
INCLUDE NATLIB(NATXML)
```

Or:

For support of IBM architecture level 9:

1. Set the **SMA** parameters `NATXML` and `NAT-ARCHLEVEL9` to `Y` (default is `N`).
2. The alternative `NATXMLA9` module is then linked to the **environment-independent nucleus** by using the following `INCLUDE` statement:

```
INCLUDE NATLIB(NATXMLA9)
```

Step 2: Enable the Environment-Dependent Nucleus for LE Execution

The `REQUEST DOCUMENT` and `PARSE XML` statements require the IBM Language Environment (LE) for execution. If you want Natural to run in the IBM Language Environment (LE), perform the following steps:

1. Set the **System Maintenance Aid (SMA)** parameter `NAT-LE` to `Y` (Yes). The default setting is `N` (No).
2. Additionally, if you want to modify the LE options in the `NATLEOPT` source module or if you use non-Natural programs running in 24-bit mode, set the appropriate SMA parameter as described in ***Build the Natural-Specific IBM Language Environment Options* in *Installing Natural***.
3. Link the environment-dependent nucleus to support LE.

This applies to all batch and TP monitor system environments except Com-plete and CICS.

Step 3: Link the Required Modules to the Nucleus

Link the modules indicated in this section to the nucleus depending on the environment to be used.

In the following instructions, *hilev* denotes a valid high-level qualifier.

Batch and TSO

- Add the LE library (usually *hilev*.`SCEELKED`) to the `SYSLIB` definition of the link step to resolve the references to LE functions.
- Link the LE and TCP/IP access modules to the **environment-dependent nucleus** by using the appropriate `INCLUDE` statements:

```
INCLUDE NATLIB(NAT2LE)
INCLUDE NATOLIB(NAT2TCP)
```

- Do *not* specify the `NCAL` parameter for the link step.

CICS

- Add the LE library (usually *hilev*.SCEELKED) to the SYSLIB definition of the link step to resolve the references to LE functions.
- Add the CICS socket library (usually *hilev*.SEZARNT1, *hilev*.SEZATCP or *hilev*.SEZACMTX) to the SYSLIB definition of the link step to resolve the reference to the CICS socket module.
- Link the CICS socket module to the **environment-dependent nucleus** by using the appropriate INCLUDE statement:

```
INCLUDE NATLIB(NAT2LE)
INCLUDE NCIOLIB(NCI2TCP)
INCLUDE CICSSOCK(EZACIC17)
```

- Do *not* specify the NCAL parameter for the link step.
- Configure the CICS TCP/IP environment as described in the IP CICS Socket Guide by IBM.

Com-plete

- Link the LE access module to the **environment-dependent nucleus** by using the appropriate INCLUDE statement:

```
INCLUDE NATLIB(NAT2LE)
```

- Copy the NCFTCP*vr* module from the Natural Com-plete Interface load library to the Com-plete load library.
- For support of the IBM TCP/IP stack, define the CDI (Communication Driver Interface) as described in *Standard CDI Definitions* in the *Com-plete* documentation.
- Add the POSIX SERVER statement to the Com-plete parameter module SYSPARM.

IMS TM

- Add the LE library (usually *hilev*.SCEELKED) to the SYSLIB definition of the link job to resolve the references to LE functions.
- Link the LE and TCP/IP access modules to the **environment-dependent nucleus** by using the appropriate INCLUDE statements:

```
INCLUDE NATLIB(NAT2LE)
INCLUDE NATOLIB(NAT2TCP)
```

- Do *not* specify the NCAL parameter for the link step.

Support for Architecture Levels

If your Natural system runs on z/OS or z/VSE with an IBM processor with architecture level 9 or higher, you can replace the module NATXML by NATXMLA9. NATXMLA9 is built to use advanced machine instructions introduced with IBM's ESA/390 and z/Architecture. You can use the system command TECH(see the *System Commands* documentation) to find out the architecture level supported on your current machine.

NATXMLA9 improves execution performance, especially for the statements REQUEST DOCUMENT and PARSE XML that use Unicode variables or perform code-page encoding operations. For more information on architecture levels, refer to the related documentation from IBM (z/Architecture, Principles of Operation).

Caution: An operation exception error (abend code S0C1) can occur if the NATXMLA9 module is used, but the underlying machine architecture level is lower than 9.

Installation Verification

After the last step of the installation procedure has been completed, proceed as follows:

1. Activate the statements in the runtime environment; see *Activation/Deactivation* in the section *Statements for Internet and XML Access* in the *Programming Guide*.

   For information on the profile settings that enable the support of the REQUEST DOCUMENT and/or PARSE XML statement, see the following documents:

   - *Profile Settings* in the section *Statements for Internet and XML Access* in the *Programming Guide*
   - Profile parameter XML in the *Parameter Reference* documentation

2. Try the example programs contained in the Natural system library SYSEXV.

V Installing Natural Net Data Interface on z/OS

6 Installing Natural Net Data Interface on z/OS

This document describes the steps for installing the Natural Net Data Interface `NATNETTO` on z/OS.

Related Topic:

For operational information, see *Natural Net Data Interface NATNETTO* in the *Operations* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Device Configuration in NATCONFG

Logical net data devices are configured with the `IONET` flag byte, all other flag and value settings must be made as in the sample definition given below. The module entry is `VCNETTO`, additional device entries must be specified with `WXTRN=OFF`. The settings of `FLAG1`, `FLAG2` and `RTAL` must be according to the example below.

If the data delimited option (`NEDLM`) is set, the delimiter character which separates the fields in the value buffer can be set by using the `BEL` keyword subparameter of the `NTDVCE` macro.

IONET Settings

IONET	DS	XL1	NETDATA CONTROL FLAG
NECUFNR	EQU	X'01' 1	CURSOR POSITION = FIELDNR
NEMSG	EQU	X'02' .... ..1.	SEND MESSAGE LINE (if not set, message line will be skipped)
NEABO	EQU	X'04' .... .1..	ATTRIBUTE BUFFER OPTION

NEFBO	EQU	X'08' .... 1...	FORMAT BUFFER OPTION
NEFLG	EQU	X'10' ...1	FIELD LENGTH OPTION
NEDLM	EQU	X'20' ..1.	DATA DELIMITED OPTION
NEFIX	EQU	X'40' .1..	FIXED FORMAT OPTION
NEFBOPTE	EQU	X'80' 1...	EXTENDED FORMAT BUFF. OPT.

NATCONFG already has a device entry for NATNETTO.

The TTYPE is NETF. The protocol options are set as follows:

- The value buffer structure is fixed (without delimitation between the fields).
- Format buffer, extended format buffer and attribute buffer options are set.
- The cursor position is in the field number notation.

Message line and PF-key line are suppressed.

Example:

```
NTDVCE TYP=NETF,NAME=NETTF,ENTRY=VCNETTO,MSG=BOT,           HS06-
       FLAG1=CMNIXD,FLAG2=CMTNOPT,RTAL=255,                 HS07-
       FLAGS=(IONET,-,CO,IONET,+,NEFIX+NEFBO+NEABO+NECUFNR+NEFB-
       OPTE,WINDTITI,+,PFKNDISP)                            HS06
```

VI Installing Entire System Server Interface on z/OS

7 Installing Entire System Server Interface on z/OS

The Entire System Server Interface is required if the Entire System Server is to be used.

This document describes the steps for installing the Entire System Server Interface on z/OS. You can choose between default installation (recommended) and customized installation.

Related Topic:

For information on installing and using the Entire System Server, refer to the relevant product documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

Before you can use the Entire System Server Interface, you must install a supported version of Entire System Server specified under *Software AG Product Versions Supported by Natural* in the current Natural *Release Notes* for Mainframes.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Default or Customized Installation

If you want to use the default value settings in the modules `ESYNODTB` and `NATPNIP` (used by the Entire System Server and Natural ISPF), proceed with ***Link the Entire System Server Interface to the Nucleus***.

If you do *not* want to use the default value settings, edit the modules `NATPNIP` and `ESYNODTB` described in this section.

- NATPNIP

- ESYNODTB

NATPNIP

The NATPNIP module contains the following parameters and default values:

```
NAMVIEWP BUFLEN=12288,NUMREQ=5,MAXCBL=3000,MAXEDL=6000,EXTUSER=INIT-USER
```

The parameters are explained below:

BUFLEN	Length of all Adabas buffers in bytes
NUMREQ	Number of possible nested FIND loops in Natural calling the Entire System Server
MAXCBL	Complex FIND buffer length
MAXEDL	Editor session buffer length MAXEDL is used by the NSPF editor and incore database. The default value is 6000, which should be sufficient for an NSPF editor session and typical incore database applications. However, for large layouts within an incore database file that value might not be large enough and the following message is issued: NAT3077: Not enough space for extent. DB/FNR/Subcode :1:/:2:/:3:. (see the *Messages and Codes* documentation). In this case, the value of MAXEDL has to be increased.
EXTUSER	External user ID passed to the Entire System Server for security checks See also EXTUSER in the following section.

EXTUSER

The parameter EXTUSER describes how to inherit security definitions from an external security system such as RACF, ACF2 and TOP-SECRET.

The appropriate parameter setting depends on whether a multi-user address space or a single-user address space is used in your environment:

- A multi-user address space provides the option to maintain different user security definitions, for example, one for a CICS and one for a Com-plete user).
- A single-user address space supports a subsystem, for example, a Natural subtask for Entire Output Management or Entire Operations Managment, or a Natural RPC, Natural Web/IO Interface or batch server.

  Recommended values for EXTUSER are:

EXTUSER=INIT-USER	Recommended for a multi-user address space. The contents of the Natural system variable *INIT-USER must be identical to the user definiton in the external security system (for example, RACF). The Entire System Server transfers the value of *INIT-USER to the external security system, and all calls to security restricted resources are handled under this user ID. In this case, the security definition from a CICS or Com-plete user (for example) is inherited by Entire System Server, and a new logon is not required. If the value of *INIT-USER is not found in RACF (for example), an error occurs indicating that a logon is required. (*INIT-USER is described in the *System Variables* documentation.)
EXTUSER=USER	Recommended for a multi-user address space in a Natural Security environment. Processing is similar to EXTUSER=INIT-USER except that the Natural system variable *USER (described in the *System Variables* documentation) is used. (*USER is described in the *System Variables* documentation.)
EXTUSER=ADDRESS-SPACE	Recommended for a TSO, batch or server environment. The security description of this address space is inherited for security evaluation.

ESYNODTB

The ESYNODTB module contains the following parameters and default values:

```
NAMXNOD ID=148,NAME=PRODUCTION-1
NAMXNOD ID=149,NAME=PRODUCTION-2
NAMXNOD ID=1490,NAME=DBID-ABOVE-255,LAST=Y
END
```

The parameters and default values are explained below:

ID	Entire System Server node number (also known as DBID)
NAME	Entire System Server node name
LAST	Indicator for last entry in table

Optional Node Name for Entire System Server Calls

Calls to the Entire System Server from Natural are usually handled with the `NODE` parameter which specifies the node number to be used for the call, for example:

```
FIND ACTIVE-JOBS WITH JOB-NAME = 'ADA*' AND NODE = 148
```

If the node number is defined in the `ESYNODTB` module, alternatively, you can specify the logical name of the required Entire System Server with the `NODE-NAME` parameter, for example:

```
FIND ACTIVE-JOBS WITH JOB-NAME = 'ADA*' AND NODE-NAME = 'PRODUCTION-2'
```

Assemble the Parameter Module for the Entire System Server Interface Component

Natural ISPF

If Natural ISPF is used as the INCORE database:

- (Job I055, Step 1106)

  Link the parameter module `NATPNIP`. In this case, the module `ESYNODTB` is not required.

Entire System Server

If the Entire System Server is used:

- (Job I055, Steps 1106, 1107)

  Assemble and link the modules `NATPNIP` (Step 1106), and, optionally `ESYNODTB` (Step 1107).

Link the Entire System Server Interface to the Nucleus

(Job I060, Step 3720)

- Link the following Entire System Server Interface modules to either the **environment-independent nucleus** or the **environment-dependent nucleus** by using the corresponding `INCLUDE` statements:

`INCLUDE NATLIB(NATPNIP)`	Entire System Server Interface parameters
`INCLUDE NATLIB(ESXNUC)`	Entire System Server Interface module
`INCLUDE NATLIB(ESYNODTB)`	Optional, node table

Installing and Activating the Write-to-Spool Feature

If you want to use the Write-to-Spool feature, either link the access method to your nucleus or load the method dynamically. See also the Natural parameters `RCA` and `RCALIAS`.

You can define and assemble the defaults for your nucleus by using the source member `NATPWSDF` before linking the defaults to the nucleus. You can find the source member `NATPWSDF` in the source library of Natural.

The default settings of source member `NATPWSDF` are as follows:

```
NAMPWSPL NODE=148,
PROGRAM=,
CLASS=A,
HOLD=YES,
CNTL=A,
FORM=,
RMT=,
FORMDEF=,
PAGEDEF=
```

The table below shows the modifiable parameters of source member `NATPWSDF` and a detailed description of these parameters:

Parameter	Description
`Node`	NPR target node. The node number can consist of up to 5 digits. It addresses the destination started task of the Entire System Server and where the output is written.
`Program`	JES Writer which can contain up to 8 characters. JES provides control to the Writer program. If JES does not find it, it is ignored. Possible value: `*OUTPUT` means that the input from the Natural statement `DEFINE PRINTER` is used to be interpreted as JES Writer.

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td><code>Class</code></td><td><code>SYSOUT</code> class within JES where the output has to be written. It can contain only one character or digit.

It is a descriptor for further software (for example, Entire Output Management) to detect the output stream for processing.</td></tr>
<tr><td><code>Hold = yes/no</code></td><td>Specifies whether the output stream is to be held within the JES spool in case the task previously started by the Entire System Server terminates.</td></tr>
<tr><td><code>CNTL</code></td><td>Represents the control character for the <code>SYSOUT</code> data set.

<code>CNTL</code> contains one character:<table><tr><td><code>A</code></td><td>ASA control character</td></tr><tr><td><code>M</code></td><td>Machine control character</td></tr></table></td></tr>
<tr><td><code>Form</code><code>RMT</code></td><td>Describes the form control buffer for JES. This value is transferred to JES which handles the processing.

<code>RMT</code> represents the JES remote user ID if <code>SYSOUT</code> has to be routed to a different JES system.

You can find the name of the JES system in the destination field within the <code>DEFINE PRINTER</code> statement (for example, <code>DEFINE PRINTER OUTPUT='DAEM'</code>).</td></tr>
<tr><td><code>Formdef</code>
<code>Pagedef</code></td><td>Can contain up to 6 characters.</td></tr>
</table>

After editing the `NATPWSDF` source member with customized values, you can assemble and link it. If you want to use the default settings, you can omit this step.

If you want to use the Write-to-Spool feature with statically linked access method at your site, relink the Natural module as follows:

```
INCLUDE NATLIB(NATPWSPL)     The Write-to-Spool access method for Natural
INCLUDE NATLIB(NATPWSDF)     The Write-to-Spool defaults
                             (your adapted parameter module)
```

If you want to use dynamic load, you can either use the delivered module `NATPWSAM` with default parameters or you can link your adapted parameter module:

```
INCLUDE NATLIB(NATPWSPL)
INCLUDE USRLIB(NATPWSPA)     Your adapted module
NAME NATWSPvr(R)             Your adapted Write-to-Spool module.
                             This name must be used in RCALIAS=(NATAM11,NATWSPvr).
```

For further information, see System Spool Access in the *Operations* documentation.

Install the Entire System Server in Single-User Mode

(Optional installation for only batch mode or TSO.)

This section describes the advantages of Entire System Server in single-user mode and the steps required for installation.

Advantages of Single-User Mode

Running the Entire System Server in single-user mode is advantageous, for example, in the following cases:

- Executing long running batch jobs comprising a large number of calls to the Entire System Server.
- Performing test scenarios using a Natural session under TSO performing many calls to the Entire System Server, without disturbing the production environment.
- Exploring new Entire System Server functionality or versions.

From a Natural point of view, the Entire System Server single-user mode is accessible as Entire System Server node 148, irrespective of whether such a node does already exist on your machine or network.

The following is an example of a Natural program that is running in a single-user environment:

```
FIND ACTIVE-JOBS WITH NODE = 148 AND JOB-NAME = 'XCOM*'
```

This statement calls a single-user Entire System Server that runs within the same address-space. Calling a different Entire System Server node that runs elsewhere in the network is possible by using a different node number, as shown in the following example:

```
FIND ACTIVE-JOBS WITH NODE = 53 AND JOB-NAME = 'NUC*'
```

This statement calls a multi-user Entire System Server with node number 53 out of the same Natural program which called the single-user Entire System Server session.

Installation for Batch Mode

1. Create a new PDS load library, which must be APF-authorized.
2. Copy all members of the Entire System Server load library into the new load library.
3. Link the module NATPSNGL, which handles Entire System Server single-user features, to the **environment-dependent nucleus** for batch Natural.

   Alternatively, you can use the RCA parameter to dynamically load this module by setting RCA=NATPSNGL.

   In both cases, the environment-dependent nucleus must be authorized by parameter AC=1 and linked into the new load library.
4. Add the mandatory cards PARMS and SYSPRINT to your JCL to handle the Entire System Server-relevant steps. In addition, you can add the optional cards ESYTRACE and CLOG.

```
//ESYTRACE DD  SYSOUT=*              Internal trace
//SYSPRINT DD  SYSOUT=*             Modules/Zap directory of Entire System Server
//CLOG     DD  DISP=SHR,DSN=xxx      Command log data set
//PARMS    DD  DISP=SHR,DSN=xxx      Entire System Server parameter
```

5. Add an Adabas load library to your JCL, which also has to be APF-authorized.
6. Edit your Entire System Server parameter member. Here, the parameter NODE will be ignored, since Natural routes any calls to node number 148 through to the single-user Entire System Server node.

Installation for TSO

1. Add the name of the nucleus as AUTHPGM in the TSO definition member named IKJTSO00. Usually, this member is in data set SYS1.PARMLIB.
2. Proceed analogously as described in the batch mode installation above.

VII Installing Software AG Editor on z/OS

8 Installing Software AG Editor on z/OS

The Software AG Editor is an optional Natural component that is required by several Natural utilities (for example, SYSRPC and SYSBPM), Natural add-on products (for example, Natural ISPF) and other Software AG products (for example, Predict).

This document describes the steps for installing the Software AG Editor on z/OS.

Related Topics:

- For operational information, see *Operating the Software AG Editor* in the *Operations* documentation.
- For information on the features and functions of the *Software AG Editor*, see the relevant section in the *Editors* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Support of a Parallel Sysplex Environment

The Software AG Editor must run without a buffer pool to support a Parallel Sysplex environment under CICS, that is, to be able to switch the z/OS host during a Natural session.

For this purpose, the Natural profile parameter `EDPSIZE` (described in the *Parameter Reference* documentation) is supplied where you can specify the size of an auxiliary editor buffer pool. All editor data is kept in the user storage thread. The total editor work space per user is limited by the `EDPSIZE` parameter. No editor work file is required. The recovery feature mechanism of the Software AG Editor is not supported.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

The **System Maintenance Aid (SMA)** parameter `SAG-EDITOR` is set to `Y` (Yes) by default to allow installation of the Software AG Editor.

Step 1: Adapt the Editor Buffer Pool Parameter Macro NTEDBP

1. Modify the editor buffer pool settings supplied with the `NTEDBP` macro in the Natural parameter module to meet your requirements. For a description of this macro, see the corresponding dynamic profile parameter `EDBP`.
2. Assemble the Natural parameter module and link it to the Software AG Editor work file formatting utility (`NATEDFM`) contained in the Natural load library. The Software AG Editor work file formatting utility is described in *Editor Work File* in the *Operations* documentation.

   The editor buffer pool parameters contained in the Natural parameter module are stored in the editor buffer pool work file control record during formatting (see ***Step 3: Format the Editor Work File***).

For the Initial Installation:

You can leave the defaults. In this case, it is not necessary to assemble and link the Natural parameter module.

Step 2: Allocate the Editor Work File

(Job I008, Steps 1900, 1901, 1903, 1905)

Under Com-plete, this step is only required if you want to use a global editor buffer pool.

A VSAM RRDS is used as the editor work file. To best exploit the VSAM data set space, the record length should be defined 8 bytes less than the control interval length; see also *Editor Work File* in the *Operations* documentation.

- Depending on your TP monitor environment, execute the following steps to allocate the data set:

```
Step 1900 ALLOCATE EDITOR WORK FILE BATCH
     1901 ALLOCATE EDITOR WORK FILE CICS
     1903 ALLOCATE EDITOR WORK FILE TSO
     1905 ALLOCATE EDITOR WORK FILE GLOBAL
```

Step 3: Format the Editor Work File

(Job I081, Steps 1900, 1901, 1903, 1905)

Under Com-plete, this step is only required if you want to use a global editor buffer pool.

1. Use the Software AG Editor work file formatting utility (`NATEDFM`) to format and load the control record in the editor work file.
2. Depending on your TP monitor environment, execute the following steps to format the data set:

```
Step 1900 FORMAT EDITOR WORK FILE BATCH
     1901 FORMAT EDITOR WORK FILE CICS
     1903 FORMAT EDITOR WORK FILE TSO
     1905 FORMAT EDITOR WORK FILE GLOBAL
```

You may receive error message `IEC070I 203-204`, which can be ignored.

Step 4: Modify the Startup JCL and Subsystem Definitions

You can specify the data set for the work file by using the keyword subparameter `DSNAME` or `DDNAME` of the parameter macro `NTEDBP` (see *EDBP - Software AG Editor Buffer Pool Definitions* in the *Parameter Reference* documentation).

The data set name specified with `DDNAME` must correspond to the data set definition in your JCL.

- **Under TSO and in Batch Mode:**

  Add a DD statement for the work file:

  ```
  //CMEDIT DD DSN=data-set-name,DISP=SHR
  ```

  where *`data-set-name`* is the name of the data set to be used for the work file.

  You can skip this step if you have specified the correct data set name in the editor buffer pool's parameter macro in the Natural parameter module; Natural then allocates the file dynamically.

- **Under Com-plete:**
  - If you want to use a global editor buffer pool, add a DD statement for the editor work file:

```
//dd-name DD DSN=data-set-name,DISP=SHR
```

where:
`dd-name` is the name of the work file to be used by the global editor buffer pool,
`data-set-name` is the name of the data set to be used for the work file.

In addition, the DD name has to be defined to Com-plete by using the UUTIL utility function FM (described in the relevant section of the *Com-plete* documentation).

- If you want to use a local editor buffer pool, define an SD file as the editor work file. The name of the SD file is indicated in the keyword subparameter `DDNAME` of the `NTEDBP` macro. Therefore, the keyword subparameter `DSNAME` has no significance.

  The number of work file records is set with the keyword subparameter `RECNUM` and the work file record length is set with the keyword subparameter `LRECL` of the `NTEDBP` macro.

  For a local editor buffer pool, add the definitions of the editor buffer pool to the `SERVER` parameter of your startup parameters as indicated in ***Define the Natural Com-plete/SMARTS Interface Server*** in the section *Installing Natural Com-plete/SMARTS Interface*.

  For explanations of the keyword subparameters and macros mentioned above, see *EDBP - Software AG Editor Buffer Pool Definitions* in the *Parameter Reference* documentation.

- **Under CICS:**

  Add an entry in the CICS File Control Table (Job I005).

Step 5: Build the Natural Parameter Module

(Job I080)

1. Add the following parameter to your Natural parameter module to specify the size of the editor area:

   ```
   SSIZE=nn
   ```

   where `nn` must be set to at least 54 (the default is 64).

2. The Software AG Editor requires either a local or a global editor buffer pool (see also *Natural Buffer Pools* in the *Operations* documentation).

   Under IMS TM, the use of a global editor buffer pool is mandatory.

   - If you want to use a local editor buffer pool, specify the `NTBPI` macro as follows:

```
NTBPI TYPE=EDIT
```

The size of the region must be large enough to allocate the local buffer pool.

For more information on `NTBPI`, see *NTBPI Macro Syntax* in the *Parameter Reference* documentation.

- If you want to use a global editor buffer pool, proceed as follows:

  Specify the `NTBPI` macro as follows:

  ```
  NTBPI TYPE=EDIT,NAME=gbp-name
  ```

  where *gbp-name* is the name of the global editor buffer pool to be used.

  Supply the following parameter with the `NTPRM` macro (described in the *Operations* documentation):

  ```
  SUBSID=subsystem-name
  ```

  where *subsystem-name* is the name of the Natural subsystem specified when creating the global buffer pool.

  For detailed information on `SUBSID`, see *SUBSID - Subsystem ID under z/OS and z/VSE* in the *Parameter Reference* documentation.

3. Assemble and link the Natural parameter module.

Step 6: Define the Global Editor Buffer Pool

The global editor buffer pool can be shared by several regions. It is defined and started using the same procedure as for Natural global buffer pools; see *Natural Global Buffer Pool under z/OS* in the *Operations* documentation. The parameter setting `TYPE=EDIT` identifies the buffer pool as an editor buffer pool.

All users of the same global editor buffer pool must share the same editor work file; otherwise, an error occurs.

Step 7: Link the Software AG Editor to the Nucleus

(Job I080)

- Link the following Software AG Editor module to either the **environment-independent nucleus** or the **environment-dependent nucleus** by using the corresponding `INCLUDE` statement:

```
INCLUDE NATLIB(NATEDT)
```

- Instead of linking the Software AG Editor module to the nucleus, you can dynamically load it during initialization of a Natural session. In this case, the `NATEDT` editor module must be linked as `EDITOR` load module and the Natural session must be started with the profile parameter setting `RCA=EDITOR` (see also *RCA - Resolve Addresses of Statically Linked Modules* described in the *Parameter Reference* documentation).

Installation Verification

You can verify the successful installation of the Software AG Editor by performing the following:

- Invoke Natural and enter the following system command:

  ```
  SYSEDT
  ```

  The SYSEDT Utility Main Menu appears, which can be used to display all buffer pool parameters and usage statistics; see *SYSEDT Utility - Editor Buffer Pool Administration* in the *Utilities* documentation.

You can only test the full operation of the Software AG Editor if another Software AG product (for example, Natural ISPF or Predict) that uses Software AG Editor functionality is installed.

VIII Installing Natural CICS Interface on z/OS

9 Installing Natural CICS Interface Version 8.2.8 on z/OS

This document describes the steps for installing Natural CICS Interface Version 8.2.8 (product code NCI) on z/OS.

Related Topics:

For information on how to operate Natural in a CICS environment, see *Using Natural with TP Monitors* and *Natural under CICS* in the *TP Monitor Interfaces* documentation and the following topics:

- *NCISCPCB Generation Parameters*
- *NCMPRM Macro Parameters*
- *Customization of VSAM RRDS Roll Files*
- *NCISCPRI Warnings and Error Messages*

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

A supported version of the following product must be installed before you can install the Natural CICS Interface:

- Adabas CICS Interface (product code ACI), version as specified under *Software AG Product Versions Supported by Natural* in the current Natural *Release Notes* for Mainframes.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NCI*vrs*.LOAD	Load modules
NCI*vrs*.SRCE	Source modules and macros
NCI*vrs*.OBJS	Object modules

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Prefix Used for Natural CICS Interface Components

When used in this document, *prefix* denotes a common Natural CICS Interface prefix of 1 to 5 characters, for example, NCI43. This prefix is determined by the value of the parameter PREFIX in the Natural CICS Interface parameter module, for example in **Step 4** of the *Installation Procedure*. PREFIX is described in the *TP Monitor Interfaces* documentation.

prefix is followed by specific characters to make up the names of the following objects:

*prefix*CB	Natural CICS Interface system directory, for example, NCI43CB
*prefix*R1 to *prefix*R9	Natural CICS Interface VSAM RRDS roll files (optional)
*prefix*XFA	Natural CICS Interface 3270 Bridge XFAINTU exit

Installation Procedure

Before you start the installation procedure for the Natural CICS Interface, be sure to read the following:

- *System Control under CICS* in the *TP Monitor Interfaces* documentation
- ***Installation Process and Major Natural Features***

The installation procedure comprises the following:

Step 1: Customize CICS

(Job I005, Steps 2211 - 2216, 2230 - 2235, 2240)

1. Steps 2211 - 2216 and 2230 - 2235:

   Create CICS RDO entries as described in ***CICS Resource Definitions*** and apply the batch resource definitions with the DFHCSDUP utility program.
2. Step 2240 (optional):

   This step is only required if you want to dynamically load an ICU data item without using the SVC instruction on request during a Natural session instead of an entire ICU data library:

   Set `CFICU=(DATITEM=NONE)` and add one PPT entry for each ICU data item.

   See also the **corresponding step** in *Installing International Components for Unicode for Software AG*.

   ICU data items and ICU data libraries are described in the *Unicode and Code Page Support* documentation.

Step 2: Allocate the VSAM RRDS Roll Files for the Natural CICS Interface

(Job I008, Step 2200)

This step must be performed only if VSAM roll files are used as CICS roll facility.

- Allocate the VSAM RRDS roll files for the Natural CICS Interface.

  The Natural CICS Interface uses VSAM RRDS roll files for optimum performance, which means without CI/CA splits.

Step 3: Build the Roll-File Initialization Module

(Job I070, Step 2205)

This step must be performed only if VSAM roll files are used as roll facility.

- Assemble and link the `NCISCPRI` batch program of the Natural CICS Interface to initialize a roll file.

  This step creates an executable batch module which is used in ***Step 15: Link the VSAM Roll-File Initialization Module***.

Step 4: Build the Natural CICS Interface Parameter Module

(Job I070, Steps 2220, 2225)

- Edit, assemble and link the Natural CICS Interface parameter module `NCIPARM`.

  The Natural CICS Interface parameter module `NCIPARM` contains a macro named `NCMPRM` which contains parameters specific to the Natural CICS Interface.

  You can generally use the default values for all parameters. Modify only the values of those parameters whose default values do not suit your requirements. The only mandatory parameter without a default value is the common Natural CICS Interface prefix.

  To simplify the Natural CICS Interface parameter module installation process, the source module `NCIPARM` contains the `NCMPRM` macro request with parameter `PREFIX=&SYSPARM`. Thus, when generating a Natural CICS Interface parameter module, assemble the `NCIPARM` source module with assembler option `SYSPARM=`*`prefix`* rather than editing the source module.

  The individual parameters are described in the section *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation.

Note: The specified parameters are copied into the Natural CICS Interface system directory module `NCISCPCB` (linked as described in **Step 7**) when this module is initialized with your first Natural session. To ascertain that parameter changes become effective immediately:

- build the Natural parameter module.
- link the environment-dependent nucleus as described in **Step 13**.
- issue `CECI RELEASE PROGRAM(...)` for the Natural CICS Interface system directory module.
- issue `CEMT SET PROGRAM(...) NEWCOPY` for both the environment-dependent nucleus and the Natural CICS Interface system directory module.

Step 5: Build the Natural CICS Interface Starter Module NCISTART

(Job I070, Step 2230)

- Set the CICS translator option `LEASM` to enable support for the IBM Language Environment (LE); see also *Natural CICS Interface and IBM Language Environment (LE)*.
- Make sure that the IBM Language Environment macro library is available in the `SYSLIB` chain in the assembler step.
- Translate, assemble and link the Natural CICS Interface starter module `NCISTART`. Repeat these steps after you have installed a new CICS version.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCISTART`, the following modules receive an IEW0461 or IEW2454W error message: `NCIROOT`, `DFHEAI0`, `DFHEI1` and some IBM LE modules (`CEE...`). This is normal and is resolved in the final link step.

Step 6: Build the Natural CICS Interface Root Module NCIROOT

(Job I070, Step 2235)

- Translate, assemble and link the Natural CICS Interface module `NCIROOT`. Repeat these steps after you have installed a new CICS version.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCIROOT`, the following modules receive an IEW0461 or IEW2454W error message: `NCIPARM`, `NCISERV`, `DFHEAI0` and `DFHEI1`. This is normal and is resolved in the final link.

Step 7: Build the Natural CICS Interface System Directory Module

(Job I070, Steps 2245, 2250)

- Edit, assemble and link the `NCISCPCB` module.

  The Natural CICS Interface system directory is generated by assembling and linking the source module `NCISCPCB`.

  A sample job is contained in the `NAT`*`vrs`*`.JOBS` data set and a comprehensive sample source in the `NCI`*`vrs`*`.SRCE` data set.

  For descriptions of the individual macros and parameters contained in `NCISCPCB`, see *NCISCPCB Generation Parameters* in the *TP Monitor Interfaces* documentation.

Step 8: Build the Natural CICS Interface External CALLNAT Interface Module

(Job I070, Step 2270)

This step must be performed only if you want to use the external `CALLNAT` interface module of the Natural CICS Interface. See also *Environment Dependencies* in *Natural 3GL CALLNAT Interface - Purpose, Prerequisites, Restrictions* in the *Operations* documentation.

- Translate, assemble and link the external `CALLNAT` interface module `NCIXCALL`. See also `NCIXCALL` as described for the `CALLNAT` in *Environment Dependencies* in the *Operations* documentation.

  Repeat these steps after you have installed a new CICS version.

  If you have an `NCIXCALL` module from a previous Natural version, specify a new name for this module (for example, `NCIXCIOV`) by using the `SYSPARM` parameter contained in `NCIXCALL`. The `NCIXCALL` module from the previous Natural version must be linked (see ***Step 16: Link the Natural CICS Interface External CALLNAT Interface Module***) to assign it the new name.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCIXCALL`, the following modules receive an IEW0461 or IEW2454W error message: `DFHEAI0` and `DFHEI1`. This is normal and is resolved in the final link step.

Step 9: Build the Natural CICS Interface Node Error Program

(Job I070, Step 2275)

This step must be performed only if you want to use the node error program (NEP) of the Natural CICS Interface.

- Translate, assemble and link the Natural CICS Interface module `NCIZNEP`. Repeat these steps after you have installed a new CICS version.

  For information on `NCIZNEP`, see *NCIZNEP Functionality* in the *TP Monitor Interfaces* documentation.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCIZNEP`, the following modules receive an IEW0461 or IEW2454W error message: `DFHEAI0` and `DFHEI1`.This is normal and is resolved in the final link step.

Step 10: Build the Natural CICS Interface XFAINTU Exit

(Job I070, Step 2280)

This step must be performed only if you want to use Natural via the CICS 3270 Bridge.

- Translate, assemble and link the Natural CICS Interface module `NCIXFATU`. Repeat these steps after you have installed a new CICS version.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCIXFATU`, the following modules receive an IEW0461 or IEW2454W error message: `DFHEAI0` and `DFHEI1`. This is normal and is resolved in the final link step.

Step 11: Build the Natural CICS Interface Front-End Driver NCISFED

(Job I070, Step 2290)

This step must be performed only if you want to use the Natural RPC server front-end under CICS. This step is only generated if the **System Maintenance Aid (SMA)** parameter `NAT-RPC` is set to `Y` (Yes). `NAT-RPC` is used in connection with the SMA parameter `NCI-RPC-FRONT`.

- Set the CICS translator option `LEASM` for enablement of the IBM Language Environment (LE); see also *Natural CICS Interface and IBM Language Environment (LE)* in the *TP Monitor Interfaces* documentation.
- Make sure that the IBM Language Environment (LE) macro library is available in the `SYSLIB` chain in the assembler step.
- Translate, assemble and link the Natural CICS Interface front-end driver `NCISFED`. Repeat these steps after you have installed a new CICS version.

  If you are not using the most recent CICS version, the translate step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step will end with a return code of 0 by using conditional assemblies to bypass potential CICS translator messages.

  When linking `NCISFED`, the following modules receive an IEW0461 or IEW2454W error message: `DFHEAI0`, `DFHEI1` and some IBM LE modules (`CEE...`). This is normal and is resolved in the final link step.

Step 12: Build the Natural Parameter Module

(Job I080, Steps 2210, 2220)

Build the Natural parameter module for the Natural CICS Interface:

1. Modify the settings of the supplied Natural profile parameters as required and in accordance with the settings you specified when building the Natural parameter module for batch mode during the ***Installation Procedure*** for base Natural.

   Make sure that the profile parameters `FNAT` and `FUSER` are set to the same values you specified when loading the system file. The parameters and corresponding macros (if applicable) are described in the *Parameter Reference* documentation.
2. Assemble and link the Natural parameter module.

Step 13: Link the Environment-Dependent Nucleus

(Job I080, Step 2230)

- Link the **environment-dependent nucleus** for the Natural CICS Interface with the following modules:

  `NCIPARM` built in **Step 4**,
  `NCISTART` built in **Step 5**,
  `NCIROOT` built in **Step 6**, and
  the Natural parameter module built in **Step 12**.

  Include the CICS stub module `DFHELII` (do not use `DFHEAI`).

  When linking the environment-dependent nucleus or its subcomponents, you may receive `IEW2646I` or `IEW2660W` messages, which can be ignored.

Step 14: Link the Natural CICS Interface System Directory

(Job I080, Step 2250)

- Link the Natural CICS Interface system directory into your CICS user library under the module name *prefix*`CB` (see ***Prefix Used for Natural CICS Interface Components***).

  The Natural CICS Interface system directory must be linked with the `NORENT` option.

Step 15: Link the VSAM Roll-File Initialization Module

(Job I080, Step 2265)

This step must be performed only if VSAM roll files are used as CICS roll facility.

- Link the VSAM roll-file initialization module `NCISCPRI` into your CICS user library.

Step 16: Link the Natural CICS Interface External CALLNAT Interface Module

(Job I080, Steps 2270, 2271)

This step must be performed only if you want to use the external `CALLNAT` interface module of the Natural CICS Interface.

- Link the external `CALLNAT` interface module `NCIXCALL`.

  Step 2270 is needed if the `NCIXCALL` module has been installed in the same CICS region with a previous Natural version. The previous Natural version `NCIXCALL` module must then be assigned a new name, for example `NCIXCIOV`. Thus, you can preserve the name of the `NCIXCALL` module used in the previous version and need not link it to all your 3GL programs using it.

Step 2271 links the module `NCIXCALL` for the current Natural version.

Step 17: Link the Natural CICS Interface Node Error Program

(Job I080, Step 2275)

This step must be performed only if you want to use the node error program (NEP) of the Natural CICS Interface. See also *CICS Node Error Program Considerations for Natural* in the *TP Monitor Interfaces* documentation.

- Link the Natural CICS Interface module `NCIZNEP`.

Step 18: Link the Natural CICS Interface XFAINTU Exit

(Job I080, Step 2280)

This step must be performed only if you want to use Natural with the CICS 3270 Bridge. See also *CICS 3270 Bridge Support* in the *TP Monitor Interfaces* documentation.

- Link the Natural CICS Interface module `NCIXFATU` under the name *`prefix`*`XFA`; see ***Prefix Used for Natural CICS Interface Components***.

Step 19: Link the Natural RPC Server Front-End

(Job I080, Step 2290)

This step must be performed only if you want to use the Natural RPC server front-end under CICS. This step is only generated if the **System Maintenance Aid (SMA)** parameter `NAT-RPC` is set to `Y` (Yes). `NAT-RPC` is used in connection with the SMA parameter `NCI-RPC-FRONT`.

- Define the name of the Natural RPC server front-end with the SMA parameter `NCI-RPC-FRONT`.

Step 20: Initialize the VSAM Roll Files

(Job I081, Step 2200)

This step must be performed only if VSAM roll files are used as CICS roll facility.

- Initialize the VSAM roll files.

  This step must be repeated for all roll files used if roll files are the primary roll facility.

  A VSAM RRDS file is a direct (random) access type file that must be formatted.

  For the Natural CICS Interface VSAM roll files, formatting is done by the `NCISCPRI` batch program. To execute `NCISCPRI`, the Natural roll file to be initialized has to be assigned the file name `ROLL` in the JCL DD statement. No other parameter input is required for `NCISCPRI`; all data required for file initialization is obtained by `SHOWCB` VSAM macro calls.

For descriptions of the messages that can be output during this step, see *NCISCPRI Warnings and Error Messages* in the *TP Monitor Interfaces* documentation.

CICS Resource Definitions

This section describes resource definitions required or recommended for customizing your CICS system.

Note: We generally recommend that you keep all Natural version-dependent components such as programs, transactions and files in a separate resource group. Such a group is represented by *`natgroup`* in this section.

Program Definitions

To take full advantage of the CICS storage protection and transaction isolation facilities, it is strongly recommended that you specify `EXECKEY(USER)` as the default value for all programs. This section explains if `EXECKEY(CICS)` is required for a definition. In all other cases, use `EXECKEY(USER)`.

The following table provides information about the value combinations of the `API` and `CONCURRENCY` program attributes. The appropriate value combination must be specified consistently for all programs that call one another using direct branch (BASR) instructions:

Program attributes	Remarks

`API(CICSAPI)`
 	
`CONCURRENCY(QUASIRENT)`
	Use these attributes if not all affected programs are threadsafe.

`API(OPENAPI)`
 	
`CONCURRENCY(REQUIRED)`
	Use these attributes if you want to take advantage of the CICS open transaction environment (OTE) and can confirm that all affected programs are threadsafe.
	
	For using the CICS OTE, adapt the program definitions as described in the following section. For general information on using Natural in the CICS OTE, see *CICS Open Transaction Environment Considerations* in the *TP Monitor Interfaces* documentation.

Program attributes	Remarks
	For further information, see also *Threadsafe Considerations* in the *TP Monitor Interfaces* documentation.

`API(OPENAPI)`
 	
`CONCURRENCY(THREADSAFE)`
	Same as `API(OPENAPI) CONCURRENCY(REQUIRED)`.

`API(CICSAPI)`
 	
`CONCURRENCY(REQUIRED)`
	This attribute combination is not supported by the Natural CICS Interface.

`API(CICSAPI)`
 	
`CONCURRENCY(THREADSAFE)`
	This attribute combination is not supported by the Natural CICS Interface.

`API(OPENAPI)`
 	
`CONCURRENCY(QUASIRENT)`
	This attribute combination is prohibited by CICS.

The value combination affects all user-written 3GL programs, as well as front-end programs that call the environment-dependent nucleus of Natural. The front-end programs can be delivered with Natural add-on products or be user-written. Examples of affected programs include NCIRSFE (Natural RPC server front-end), NATCNRFE (Natural Web I/O Interface Server CICS Adapter and Natural Development Server CICS Adapter), and the programs supplied with the Natural CICS Interface listed in the following section.

Environment-Dependent Nucleus

- Add a program definition for the environment-dependent nucleus:

```
DEFINE PROGRAM(dep-nuc) GROUP(natgroup) LANGUAGE(ASSEMBLER)          *
          DESCRIPTION(ENVIRONMENT-DEPENDENT NUCLEUS)
```

  where *dep-nuc* is the Natural CICS Interface module built during the **link step**.

  The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
```

```
API(OPENAPI)
```

```
CONCURRENCY(REQUIRED)
```

Important:

Program attributes (for example, `EXECKEY` or `DATALOCATION`) are inherited from `NCISTART` because standard linkage conventions (BASR 14,15) are used for the program calls. Examples are calls for the environment-independent nucleus, the Adabas CICS Interface or Natural calls (`SET CONTROL 'P=S'`) for external programs.

Note: If you use the CICS OTE and your application issues many Db2 requests, using `EXECKEY(CICS)` may improve performance because it prevents CICS from switching from an L9 to an L8 open TCB and back again for every SQL call.

Environment-Independent Nucleus

This definition is optional.

- Add a program definition for the **environment-independent nucleus**:

```
DEFINE PROGRAM(ind-nuc) GROUP(natgroup) LANGUAGE(ASSEMBLER)          *
         DESCRIPTION(NATURAL ENVIRONMENT-INDEPENDENT NUCLEUS)
```

where *`ind-nuc`* is the name of the **environment-independent nucleus** specified with the Natural profile parameter `NUCNAME`. The default name is `INDNUC`*`vr`*. You need not specify `EXECKEY` or `DATALOCATION` for the environment-independent nucleus as all attributes of the `NCISTART` program are inherited since standard linkage conventions (BALR 14,15) are used.

To access the environment-independent nucleus in the ELPA, specify `USELPACOPY(YES)` for this program definition and `LPA=YES` in the CICS startup parameters.

Selectable Units Module NATSUPGM

This definition is optional.

This definition is only required if you want to use Natural features supplied as selectable units (see the *Operations* documentation) with the `NATSUPGM` load module. `NATSUPGM` is loaded dynamically as an external module that is called during program execution.

- Add a program definition to load the selectable units module `NATSUPGM`:

```
DEFINE PROGRAM(NATSUPGM) GROUP(natgroup) LANGUAGE(ASSEMBLER)            *
         DESCRIPTION(NATURAL SELECTABLE UNITS MODULE)
```

Natural CICS Interface System Directory

- Add a program definition for the Natural CICS Interface system directory:

```
DEFINE PROGRAM(prefixCB) GROUP(natgroup) LANGUAGE(ASSEMBLER)             *
         DESCRIPTION(NATURAL CICS INTERFACE SYSTEM DIRECTORY)
```

External CALLNAT Interface Module

This definition is optional.

- Add a program definition for the external `CALLNAT` interface module:

```
DEFINE PROGRAM(ncixcall) GROUP(natgroup) LANGUAGE(ASSEMBLER)            *
         DESCRIPTION(NATURAL CICS INTERFACE EXTERNAL CALLNAT MODULE)
```

where *ncixcall* is the name of the `NCIXCALL` module specified in ***Step 8: Build the Natural CICS Interface External CALLNAT Interface Module***.

The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
```

```
API(OPENAPI)
```

```
CONCURRENCY(REQUIRED)
```

The values of `EXECKEY`, `CONCURRENCY` and `API` for *ncixcall* must be the same as for the **environment-dependent nucleus** because Natural is called by *ncixcall* using standard linkage conventions (direct branch using a BASR instruction) instead of the `EXEC CICS LINK` command.

Node Error Program

This definition is optional.

- Add a program definition for the node error program (NEP) of the Natural CICS Interface:

```
DEFINE PROGRAM(nciznep) GROUP(natgroup) LANGUAGE(ASSEMBLER)            *
         EXECKEY(CICS)                                                  *
         DESCRIPTION(NATURAL CICS INTERFACE NODE ERROR PROGRAM)
```

where *nciznep* is the NEP name specified in ***Step 9: Build the Natural CICS Interface Node Error Program***.

Global User Exit

This definition is optional.

- Add a program definition for the XFAINTU global user exit:

```
DEFINE PROGRAM(prefixXFA) GROUP(natgroup) LANGUAGE(ASSEMBLER)          *
         EXECKEY(CICS)                                                  *
         DESCRIPTION(NATURAL CICS INTERFACE XFAINTU GLUE)
```

Natural RPC Server Front-End

This definition is optional.

This definition is only required if you want to use the Natural RPC server front-end *ncisfe*. This definition is only generated if the **System Maintenance Aid (SMA)** parameter NCI-RPC-FRONT is set.

- Add a program definition for the Natural RPC server front-end:

```
DEFINE PROGRAM(ncisfe) GROUP(natgroup) LANGUAGE(ASSEMBLER)            *
         DESCRIPTION(NATURAL RPC SERVER FRONT-END)
```

The name of the Natural RPC server front-end *ncisfe* must be identical to the name specified in ***Step 19: Link the Natural RPC Server Front-End***.

The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
```

```
API(OPENAPI)
```

```
CONCURRENCY(REQUIRED)
```

The values of `EXECKEY`, `CONCURRENCY` and `API` for *ncirsfe* must be the same as for the **environment-dependent nucleus** because Natural is called by *ncirsfe* using standard linkage conventions (direct branch using a BASR instruction) instead of the `EXEC CICS LINK` command.

Transaction Definitions

We recommend that you define or choose a CICS profile for the Natural transactions similar to the following:

```
DEFINE PROFILE(natprof) GROUP(natgroup)                                    *
        DESCRIPTION(CICS PROFILE FOR NATURAL TRANSACTIONS)                 *
        SCRNSIZE(ALTERNATE) INBFMH(ALL)
```

where *natprof* is the name of the CICS profile assigned to the Natural transactions.

We also recommend that you define a CICS transaction class for the Natural transactions similar to the following:

```
DEFINE TRANCLASS(natclass) GROUP(natgroup) MAXACTIVE(999)                  *
        DESCRIPTION(CLASS FOR NATURAL TRANSACTIONS) ↩
```

where *natclass* is the name of the CICS transaction class assigned to the Natural transactions.

A CICS transaction class dedicated to Natural helps control storage usage by Natural (see also *Controlling Storage Usage* in the *TP Monitor Interfaces* documentation). Assign this transaction class to the definitions of all transactions that directly or indirectly call Natural.

You can define the following:

- Natural Transaction
- Natural Message Switching Transaction
- Node Error Program
- Natural RPC Server Front-End

Natural Transaction

- Add a definition for the Natural transaction:

```
DEFINE TRANSACTION(ncitransact) GROUP(natgroup)                    *
         PROGRAM(dep-nuc) TWASIZE(128) DUMP(NO) SPURGE (YES)       *
         PROFILE(natprof) TRANCLASS(natclass)
```

where:

ncitransact is the name of the Natural CICS Interface user transaction ID.
dep-nuc is the Natural CICS Interface module built during the **link step**.

We recommend that you set the following parameter values in the CICS transaction definitions:

```
TASKDATALOC(ANY)
```

```
ISOLATE(YES)
```

TASKDATALOC(ANY) can have an impact on non-Natural programs called by Natural; for details, see the relevant IBM literature on CICS.

For the impact of transaction isolation, see also *THRDSZE - Thread Size* in the *TP Monitor Interfaces* documentation.

Natural Message Switching Transaction

- Add a definition for the Natural internal message switching transaction:

```
DEFINE TRANSACTION(nmsg) GROUP(natgroup)                           *
         PROGRAM(dep-nuc) TWASIZE(128) DUMP(NO) SPURGE (YES)       *
         PROFILE(natprof) TRANCLASS(natclass)
```

where:

dep-nuc is the Natural CICS Interface module built during the **link step**.

nmsg is the name of the Natural CICS Interface message switching transaction ID as defined with the MSGTRAN parameter described in *Parameters in Macro NCMPRM* in the *TP Monitor Interfaces* documentation. The default name is NMSG.

We recommend that you set the following parameter values in the CICS transaction definitions:

```
TASKDATALOC(ANY)
```

```
ISOLATE(YES)
```

`TASKDATALOC(ANY)` can have an impact on non-Natural programs called by Natural; for details, see the relevant IBM literature on CICS.

For the impact of transaction isolation, see also *THRDSZE - Thread Size* in the *TP Monitor Interfaces* documentation.

Node Error Program

This definition is optional.

- Add a definition for the node error program (NEP) of the Natural CICS Interface:

```
DEFINE TRANSACTION(neptran) GROUP(natgroup)                              *
         PROGRAM(nciznep) DUMP(NO) PRIORITY(255)                         *
         TASKDATAKEY(CICS) TASKDATALOC(ANY)                              *
         PROFILE(natprof)
```

where:

neptran is the NEP transaction code defined with the `NEPTRAN` generation parameter in the `SYSPARM` specification in the `NCIZNEP` module built in ***Step 9: Build the Natural CICS Interface Node Error Program***.

nciznep is the NEP name specified in ***Step 9: Build the Natural CICS Interface Node Error Program***.

`NCIZNEP` and `NEPTRAN` are described in the *TP Monitor Interfaces* documentation.

Natural RPC Server Front-End

- Add a definition for the Natural RPC server front-end transaction:

```
DEFINE TRANSACTION(ncisfetransact) GROUP(natgroup)                       *
         PROGRAM(ncisfe) TWASIZE(128) DUMP(NO) SPURGE (YES)              *
         PROFILE(natprof) TRANCLASS(natclass)
```

where:

ncisfetransact is the name of the Natural RPC server front-end transaction ID.
ncisfe is the name of the Natural RPC server front-end specified in ***Step 19: Link the Natural RPC Server Front-End***.

File Definitions

These definitions are only required if VSAM roll files are to be used.

- Add one entry in the FCT for each Natural CICS Interface VSAM roll file:

```
DEFINE FILE(prefixR1) GROUP(natgroup)                                   *
        BROWSE(YES) ADD(YES) DELETE(YES) UPDATE(YES) READ(YES)          *
        RECORDFORMAT(F) STRINGS(3) DATABUFFERS(5)
```

  Local shared resources (LSR) should be used whenever possible. If multiple LSR pools are supported, one pool should be dedicated exclusively to Natural CICS Interface roll files.

Transient Data Destinations

- Error Messages
- Natural NATRJE Utility
- Natural CICS Interface Session Statistics
- Natural CICS Interface Profile Parameter File

Error Messages

This definition is optional but highly recommended to log Natural CICS Interface informational messages and Natural abend codes and corresponding error messages.

Add entries in the DCT for the Natural CICS Interface error message logging facility. For Natural error messages, you can use:

- A destination that is already defined in CICS (for example, CSSL); in this case, no extra DCT entry is required.
- An extra partition destination as a synonym for an existing CICS message destination:

```
DEFINE TDQUEUE(nerr) GROUP(natgroup) TYPE(INDIRECT)                     *
        INDIRECTNAME(name)
```

  where:

  `nerr` is the name of the Natural CICS Interface error message destination as defined with the `MSGDEST` parameter described in *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation. The default name is `NERR`.

  `name` is the name of the corresponding indirect destination.

- An extra file:

```
DEFINE TDQUEUE(nerr) GROUP(natgroup) TYPE(EXTRA)                    *
         DDNAME(NATMSG) OPEN(INITIAL) TYPEFILE(OUTPUT)              *
         RECORDFORMAT(VARIABLE) BLOCKFORMAT(UNBLOCKED)              *
         RECORDSIZE(nnn)
```

where `nerr` is the name of the Natural CICS Interface error message destination as defined with the `MSGDEST` parameter described in *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation. The default name is `NERR`.

You can, for example, change the `BLOCKFORMAT` format from `UNBLOCKED` to `BLOCKED`. Natural and the Natural CICS Interface messages have a length of up to 120 bytes. Therefore, the record size (`RECORDSIZE (nnn)`) should be at least 124 bytes for variable record format or 120 bytes for fixed record format.

When using a disk file:

Sufficient disk space must be reserved for this data set; a DD statement must be added to the CICS startup JCL.

Natural NATRJE Utility

- Add one entry in the DCT for the Natural NATRJE utility (described in the *Utilities* documentation). When submitting a job to JES with the following entry, the internal reader is started on `CLOSE` of the destination:

```
DEFINE TDQUEUE(nrje) GROUP(natgroup) TYPE(EXTRA)                    *
         DDNAME(NATRJE) OPEN(DEFERRED) TYPEFILE(OUTPUT)             *
         RECORDFORMAT(FIXED) BLOCKFORMAT(UNBLOCKED) RECORDSIZE(80)
```

where `nrje` is the name of the Natural CICS Interface submit destination as defined with the `RJEDEST` parameter described in *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation. The default name is `NRJE`.

Additionally, add the following DD statement to the CICS startup JCL:

```
//NATRJE DD SYSOUT=(*,INTRDR)
```

When submitting a job to JES with the following *two* entries, the Natural CICS Interface deals with an indirect destination that will not be closed:

```
DEFINE TDQUEUE (nrje) GROUP(natgroup) TYPE(INDIRECT)                *
         INDIRECTNAME(name)

DEFINE TDQUEUE(name) GROUP(natgroup) TYPE(EXTRA)                    *
         DDNAME(NATRJE) OPEN(DEFERRED) TYPEFILE(OUTPUT)             *
         RECORDFORMAT(FIXED) BLOCKFORMAT(UNBLOCKED) RECORDSIZE(80)
```

where:

nrje is the name of the Natural CICS Interface submit destination as defined with the RJEDEST parameter described in *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation. The default name is NRJE.

name is the name of the corresponding indirect destination.

You can use either a /*EOF card as the very last card in the job stream or the corresponding NATRJE exit. When detecting the /*EOF card, JES submits the previous job stream.

Natural CICS Interface Session Statistics

This definition is optional.

- Add one entry in the DCT for the Natural CICS Interface session statistics:

```
DEFINE TDQUEUE(nlog) GROUP(natgroup) TYPE(EXTRA)                            *
         DDNAME(NATLOG) OPEN(INITIAL) TYPEFILE(OUTPUT)                      *
         RECORDFORMAT(VARIABLE) BLOCKFORMAT(BLOCKED)                        *
         RECORDSIZE(4624) BLOCKSIZE(4628)
```

where *nlog* is the name of the Natural CICS Interface logging destination as defined with the parameter LOGDEST described in the *TP Monitor Interfaces* documentation. The default name is NLOG.

Sufficient disk space must be reserved for this data set; a DD statement must be added to the CICS startup JCL.

Natural CICS Interface Profile Parameter File

This definition is optional.

- Add one entry in the DCT for the Natural CICS Interface profile parameter file:

```
DEFINE TDQUEUE(nprm) GROUP(natgroup) TYPE(EXTRA)                            *
         DDNAME(CMPRMIN) OPEN(DEFERRED) TYPEFILE(INPUT)                     *
         RECORDFORMAT(FIXED) BLOCKFORMAT(BLOCKED)                           *
         RECORDSIZE(80) BLOCKSIZE(nnn)
```

where:

nprm is the name of the Natural CICS Interface profile parameter input destination as defined with the PRMDEST parameter described in *NCMPRM Macro Parameters* in the *TP Monitor Interfaces* documentation. The default name is NPRM.

nnn is a multiple of 80.

A DD statement must be added to the CICS startup JCL.

Other Definitions

- Add the following system abend codes to a CICS System Recovery Table (SRT):

`0D6`	Protects CICS against failing Natural Roll Server and Natural Authorized Services Manager requests (using PC instructions) by Natural.
`01D`	Protects CICS against failing data space cache requests by Natural.
`DC2`	Protects CICS against failing memory object cache requests by Natural.

Installation Verification

You can verify the successful installation of the Natural CICS Interface by performing the following steps:

1. From a CICS session, type in the Natural transaction ID to start a Natural session.
2. Proceed with the steps described in the section ***Test Online Natural***.

10 Installing Natural CICS Interface Version 8.3.5 on z/OS

This document describes the steps for installing Natural CICS Interface Version 8.3.5 (product code NCI) on z/OS.

Related Topics:

For information on how to operate Natural in a CICS environment, see *Using Natural with TP Monitors* and *Natural under CICS* in the *TP Monitor Interfaces* documentation and the following topics:

- *NCISCPCB Generation Parameters*
- *CICSP - Environment Parameters for Natural CICS Interface* (`NTCICSP` macro) in the *Parameter Reference* documentation
- *Customization of VSAM RRDS Roll Files*
- *NCISCPRI Warnings and Error Messages*

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

A supported version of the following product must be installed before you can install the Natural CICS Interface:

- Adabas CICS Interface (product code ACI), version as specified under *Software AG Product Versions Supported by Natural* in the current Natural *Release Notes* for Mainframes.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NCI*vrs*.LOAD	Load modules
NCI*vrs*.SRCE	Source modules and macros
NCI*vrs*.OBJS	Object modules
NCI*vrs*.JOBS	Sample installation jobs

Data Set Name	Contents
NCI*vrs*.LICS	Product license file for Natural for CICS for zIIP For information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Prefix Used for Natural CICS Interface Components

When used in this document, *prefix* denotes a common Natural CICS Interface prefix of 1 to 5 characters, for example, NCI*vr*. This prefix is determined by the value of the parameter PREFIX in the NTCICSP macro of the Natural parameter module, for example, in **Step 5** of the *Installation Procedure*. NTCICSP and PREFIX are described in the *Parameter Reference* documentation.

prefix is followed by specific characters to make up the names of the following objects:

*prefix*CB	Natural CICS Interface system directory, for example, NCI*vr*CB
*prefix*R1 to *prefix*R9	Natural CICS Interface VSAM RRDS roll files (optional)
*prefix*XFA	Natural CICS Interface 3270 Bridge XFAINTU exit

Installation Procedure

Before you start the installation procedure for the Natural CICS Interface, be sure to read the following:

- *System Control under CICS* in the *TP Monitor Interfaces* documentation
- ***Installation Process and Major Natural Features***

The installation procedure comprises the following:

Step 1: Customize CICS

(Job I005, Steps 2211 - 2216, 2230 - 2235, 2240 - 2245)

1. Steps 2211 - 2216 and 2230 - 2235:

   Create CICS RDO entries as described in ***CICS Resource Definitions*** and apply the batch resource definitions with the DFHCSDUP utility program.
2. Steps 2240 - 2245 (optional):

   These steps are only required if you want to dynamically load an ICU data item without using the SVC instruction on request during a Natural session instead of an entire ICU data library:

   Set `CFICU=(DATITEM=NONE)` and add one PPT entry for each ICU data item.

   See also the **corresponding step** in *Installing International Components for Unicode for Software AG*.

   ICU data items and ICU data libraries are described in the *Unicode and Code Page Support* documentation.

Step 2: Prepare, Convert, Assemble and Link the License File for Natural for CICS for zIIP

(Job I007, Steps 2201, 2202, 2204)

This step is optional and only required if you want to install Natural for CICS for zIIP.

You must install a valid Natural license file. An additional license file is required if you want to install **Natural for CICS for zIIP** to enable support of the IBM z/IIP (IBM System z Integrated Information Processor).

For detailed information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

1. Copy the license file from the supplied installation medium to disk or transfer it from the PC as described in *Transferring a License File from PC to a z/OS Host Using FTP* in *Software AG Mainframe Product Licensing*.

2. Check, convert, assemble and link the license file supplied for Natural for CICS for zIIP:

Step 2201	Check license file `NCIvrs.LICS`. This job runs the CHECK function of the LICUTIL license utility (see below).
Step 2202	Convert license file into an assembler source. This job runs the MAKE function of the LICUTIL license utility (see below).
Step 2204	Assemble and link the assembler source to generate load module `NCILIC`. This module is then linked to the nucleus in **Job I080**.

The functions and option settings provided by LICUTIL are described in *Using the License Utility: LICUTIL* in *Software AG Mainframe Product Licensing*.

Step 3: Allocate the VSAM RRDS Roll Files for the Natural CICS Interface

(Job I008, Step 2200)

This step must be performed only if VSAM roll files are used as CICS roll facility.

- Allocate the VSAM RRDS roll files for the Natural CICS Interface.

  The Natural CICS Interface uses VSAM RRDS roll files for optimum performance, which means without CI/CA splits.

Step 4: Build the Natural CICS Interface System Directory Module

(Job I070, Steps 2245, 2250)

- Edit, assemble and link the `NCISCPCB` module.

  The Natural CICS Interface system directory is generated by assembling and linking the source module `NCISCPCB`.

  A sample job is contained in the `NATvrs.JOBS` data set and a comprehensive sample source in the `NCIvrs.SRCE` data set.

  For descriptions of the individual macros and parameters contained in `NCISCPCB`, see *NCISCPCB Generation Parameters* in the *TP Monitor Interfaces* documentation.

Step 5: Build the Natural Parameter Module

(Job I080, Steps 2210, 2220)

Build the Natural parameter module for the Natural CICS Interface:

1. The `NTCICSP` macro in the Natural parameter module contains parameters specific to the Natural CICS Interface. You can generally use the default values for all parameters.

   You can generally use the default values for all parameters. Modify only the values of those parameters whose default values do not suit your requirements. The only mandatory parameter without a default value is the common Natural CICS Interface prefix.

   To simplify the Natural parameter module installation process, the source module `NTCICSP` contains the `NTCICSP` macro request with parameter `PREFIX=&SYSPARM`. Thus, when generating a parameter module for the Natural CICS Interface, assemble the Natural parameter module with the assembler option `SYSPARM=`*`prefix`* rather than editing the source module.

   The individual `NTCICSP` macro parameters are described in *CICSP - Environment Parameters for Natural CICS Interface* in the *Parameter Reference* documentation.
2. Modify the settings of the supplied Natural profile parameters as required and in accordance with the settings you specified when building the Natural parameter module for batch mode during the *Installation Procedure* for base Natural.

   Make sure that the profile parameters `FNAT` and `FUSER` are set to the same values you specified when loading the system file. The parameters and corresponding macros (if applicable) are described in the *Parameter Reference* documentation.
3. Assemble and link the Natural parameter module.

Note: The parameters specified with the `NTCICSP` macro are copied into the Natural CICS Interface system directory module `NCISCPCB` (linked as described in **Step 7**) when this module is initialized by the first Natural session using it. To ascertain that parameter changes become effective immediately:

- build the Natural parameter module.
- link the environment-dependent nucleus as described in **Step 6**.
- issue `CECI RELEASE PROGRAM(...)` for the Natural CICS Interface system directory module.
- issue `CEMT SET PROGRAM(...) NEWCOPY` for both the environment-dependent nucleus and the Natural CICS Interface system directory module.

Step 6: Link the Environment-Dependent Nucleus

(Job I080, Step 2230)

- Link the **environment-dependent nucleus** for the Natural CICS Interface with the following modules:

  `NCINUCM`, `NCINUC` and the Natural parameter module built in **Step 5**.

  Include the CICS stub module `DFHELII` (do not use `DFHEAI`).

  When linking the environment-dependent nucleus or its subcomponents, you may receive `IEW2646I` or `IEW2660W` messages, which can be ignored.

See also *Natural Nucleus under CICS* in the *TP Monitor Interfaces* documentation.

Step 7: Link the Natural CICS Interface System Directory

(Job I080, Step 2250)

- Link the Natural CICS Interface system directory into your CICS user library under the module name *prefix*`CB` (see ***Prefix Used for Natural CICS Interface Components***).

  The Natural CICS Interface system directory must be linked with the `NORENT` option.

Step 8: Link the Natural CICS Interface External CALLNAT Interface Module

(Job I080, Steps 2270, 2271)

This step must be performed only if you want to use the external `CALLNAT` interface module of the Natural CICS Interface.

For more information, see *Natural 3GL CALLNAT Interface - Purpose, Prerequisites, Restrictions* in the *Operations* documentation.

- Link the external `CALLNAT` interface module `NCIXCALL` by using the `NCIXCALM` module.

  See also and *Natural Nucleus under CICS* in the *TP Monitor Interfaces* documentation.

  Step 2270 is needed if the `NCIXCALL` module has been installed in the same CICS region with a previous Natural version. The previous Natural version `NCIXCALL` module must then be assigned a new name, for example `NCIXCIOV`. Thus, you can preserve the name of the `NCIXCALL` module used in the previous version and need not link it to all your 3GL programs using it.

  Step 2271 links the module `NCIXCALL` for the current Natural version.

Step 9: Link the Natural CICS Interface Node Error Program

(Job I080, Step 2275)

This step must be performed only if you want to use the node error program (NEP) of the Natural CICS Interface. See also *CICS Node Error Program Considerations for Natural* in the *TP Monitor Interfaces* documentation.

- Link the Natural CICS Interface module `NCIZNEP` by using the `NCIZNEPM` module.

  See also and *Natural Nucleus under CICS* in the *TP Monitor Interfaces* documentation.

Step 10: Link the Natural CICS Interface XFAINTU Exit

(Job I080, Step 2280)

This step must be performed only if you want to use Natural with the CICS 3270 Bridge. See also *CICS 3270 Bridge Support* in the *TP Monitor Interfaces* documentation.

- Link the Natural CICS Interface module `NCIXFATU` under the name *`prefix`*`XFA` (see ***Prefix Used for Natural CICS Interface Components***) by using the `NCIXFATM` module.

  See also and *Natural Nucleus under CICS* in the *TP Monitor Interfaces* documentation.

Step 11: Link the Natural CICS Interface zIIP Shutdown Statistics Program

(Job I080, Step 2285)

This step must be performed only if you want to install **Natural for CICS for zIIP**, and want to print Natural zIIP statistics when the CICS environment is shut down.

- Link the Natural CICS Interface zIIP shutdown statistics program.

Step 12: Link the Natural RPC Server Front-End

(Job I080, Step 2290)

This step must be performed only if you want to use the Natural RPC server front-end under CICS.

- Link the Natural RPC server front-end module `NCIRSFE` under the defined name by using the `NCISFEDM` module.

Step 13: Initialize the VSAM Roll Files

(Job I081, Step 2200)

This step must be performed only if VSAM roll files are used as CICS roll facility.

- Initialize the VSAM roll files.

  This step must be repeated for all roll files used if roll files are the primary roll facility.

  A VSAM RRDS file is a direct (random) access type file that must be formatted.

  For the Natural CICS Interface VSAM roll files, formatting is done by the `NCISCPRI` batch program. To execute `NCISCPRI`, the Natural roll file to be initialized has to be assigned the file name `ROLL` in the JCL DD statement. No other parameter input is required for `NCISCPRI`; all data required for file initialization is obtained by `SHOWCB` VSAM macro calls.

For descriptions of the messages that can be output during this step, see *NCISCPRI Warnings and Error Messages* in the *TP Monitor Interfaces* documentation.

CICS Startup Parameters

The Natural CICS Interface modules described in this section use startup parameters to initialize Natural CICS Interface components. The `EXEC CICS ASSIGN` command retrieves the value set by these startup parameters with the `INITPARM` option using the following syntax:

```
INITPARM=(module='parameter',...)
```

where:

module is the name of the module that uses a startup parameter. This is the name indicated in the individual module link steps described in this section.
parameter the name of the corresponding parameter.

The relevant Natural CICS Interface modules and corresponding parameters are described in the following section:

- NCIXCALL Module - External CALLNAT Interface
- NCIXFATU Module - CICS Global User Exit
- NCIZNEP Module - CICS Node Error Program
- NCIRSFE Module - Natural RPC Server Front-End

- Example of INITPARM

NCIXCALL Module - External CALLNAT Interface

parameter is the name of an NCIXCALL module from a previous Natural version (for example, NCIXCIOV), if available. The NCIXCALL module from the previous Natural version must be linked to assign it a new and different name (see ***Step 8: Link the Natural CICS Interface External CALLNAT Interface Module***).

For more information, see *Natural 3GL CALLNAT Interface - Purpose, Prerequisites, Restrictions* in the *Operations* documentation.

NCIXFATU Module - CICS Global User Exit

parameter is the name of the Natural CICS Interface Node Error Program linked in ***Step 9: Link the Natural CICS Interface Node Error Program***.

Even if you do not want to modify the default node error program (NEP) DFHZNEP provided by CICS that executes NCIZNEP and terminates a session when a user disconnects a terminal from the CICS region, you need to install and setup NCIZNEP.

The installation is described in *Step 9: Link the Natural CICS Interface Node Error Program* and the required startup parameters are described in ***NCIZNEP Module - CICS Node Error Program***.

For further information, see *CICS Node Error Program Considerations for Natural* in the *TP Monitor Interfaces* documentation. For more information on the NCIXFATU module, see *CICS 3270 Bridge Support* in the *TP Monitor Interfaces* documentation.

NCIZNEP Module - CICS Node Error Program

For information on the NCIZNEP module, see *CICS Node Error Program Considerations for Natural* in the *TP Monitor Interfaces* documentation.

The individual NCIZNEP parameters are described in the following section:

MSGTRAN - Internal Message Switching Transaction ID

This parameter specifies the transaction ID internally used by the Natural message switching and asynchronous session flushing facilities.

This parameter has the same meaning as the MSGTRAN parameter in NTCICSP (see the *Parameter Reference* documentation) and must be specified identically.

The transaction ID specified with this parameter must be different from any transaction ID used to invoke Natural, and it must be defined in CICS.

Possible values are:

Value	Explanation
transaction-id	A CICS transaction ID for which the PROGRAM attribute specifies the name of the environment-dependent nucleus linked in ***Step 6: Link the Environment-Dependent Nucleus***. The Natural CICS Interface clean-up function is done by starting an asynchronous task to resume the terminal session and to terminate it logically. Therefore, normally the original transaction ID of the session is used. This original transaction ID cannot be used if there is a front-end program calling Natural, as most likely the front-end is not prepared for being invoked asynchronously without a terminal. In such situations, the message switching transaction ID of the Natural CICS Interface is used to deal with Natural directly.
NMSG	This is the default value.

NEPTRAN - Transaction ID for the NCIZNEP Module

This parameter specifies the transaction ID for the Natural/CICS Interface node error program (NEP) NCIZNEP in an MRO environment, when the parameter PURGE (see below) is set to YES.

Possible values are:

Value	Explanation
transaction-id	A CICS transaction ID for which the PROGRAM attribute specifies the name of the NCIZNEP module linked in ***Step 9: Link the Natural CICS Interface Node Error Program***.
NETR	This is the default value.

PURGE - Purge Active Natural Task

This parameter defines how NCIZNEP is to treat Natural sessions currently active, when the Natural/CICS Interface node error program (NEP) is invoked.

Possible values are:

Value	Explanation
NO	This is the default value for compatibility reasons. The active Natural task is not purged. The active task will continue to run until a terminal I/O later on will result in abend NT08 due to a CICS TERMERR condition, as the terminal no longer exists.
YES	The active Natural task is purged immediately.

In MRO environments, a node error program is triggered in the CICS TOR; as the Natural session most likely is active in a CICS AOR, the task purge cannot be done in the TOR. Therefore, a transaction ID is required (see NEPTRAN above) to start a “partner” NEP task in the AOR to do the task purge.

Note: `PURGE=YES` requires that the relevant Natural transactions are defined as purgeable (`SPURGE(YES)`).

TSKEY - Prefix for Natural CICS Temporary Storage Key

This parameter defines the constant prefix of the temporary storage queue holding the Natural CICS Interface pseudo-conversational restart data.

Possible values are:

Value	Explanation
xxxx	*xxxx* defines the prefix for pseudo-conversational restart data.
NCOM	This is the default value.

This parameter has the same meaning as the second subparameter of the parameter `TSKEY` in the `NCMDIR` macro (see the *TP Monitor Interfaces* documentation) and must be specified identically.

NCIRSFE Module - Natural RPC Server Front-End

NATTRAN – CICS Transaction ID for Name of Environment-Dependent Nucleus

This parameter defines the CICS transaction ID that is used to retrieve the name of the environment-dependent nucleus linked in *Step 6: Link the Environment-Dependent Nucleus* if the name is not supplied as `START` data. The `PROGRAM` attribute of this transaction ID specifies the name of the environment-dependent nucleus.

Possible values are:

Value	Explanation
transaction-id	A CICS transaction ID for which the `PROGRAM` attribute specifies the name of the environment-dependent nucleus linked in *Step 6: Link the Environment-Dependent Nucleus*.
NC83	This is the default value.

MSGDEST – Message Destination for Natural RPC Server Front-End

This parameter defines the message destination for the Natural RPC server front-end.

Possible values are:

Value	Explanation
message-destination	A CICS message destination ID to which the messages of the Natural RPC server front-end are to be sent.
CSSL	This is the default value.

TRACE – Issue Trace Requests on Entry and Return

This parameter defines whether CICS trace requests are issued on entry to and return from the NCIRSFE module.

Possible values are:

Value	Explanation
destination-id	CICS trace requests are issued on entry to and return from NCIRSFE.
CSSL	CICS trace requests are not issued. This is the default value.

GLOBAL – Establish Unique Natural RPC Server IDs

This parameter defines unique Natural RPC server IDs over more than one CICS region.

Possible values are:

Value	Explanation
NO	The Natural RPC server ID consists of the Natural RPC server front-end transaction ID padded with dollar signs ($). This is the default value.
YES	The Natural RPC server ID consists of the Natural RPC server front-end transaction ID appended to the CICS system ID, or in other words, to the local SYSID.

Example of INITPARM

The following is an example of an INITPARM specification:

```
INITPARM=(
  NCIXCALL='NCIXCOLD',                              * NCIXCALL module
  NCI22ATU='NCIZNEP',                               * NCIXFATU module
  NCIZNEP='MSGTRAN=NMSG,TSKEY=NCOM,PURGE=YES',      * NCIZNEP module
  NCI33SFE='NATTRAN=NC83,MSGDEST=CSSL'              * NCIRSFE module
)
```

The example above assumes the following:

- NCIXCALL is the name of the NCIXCALL module linked in *Step 8: Link the Natural CICS Interface External CALLNAT Interface Module*.

- The `NCIXCALL` module from the previous Natural version has been linked to assign it the new name `NCIXCOLD`.
- `NCIZNEP` is the name of the `NCIZNEP` module linked in *Step 9: Link the Natural CICS Interface Node Error Program*.
- `NCI22ATU` is the name of the `NCIXFATU` module linked in *Step 10: Link the Natural CICS Interface XFAINTU Exit*.
- `NCI33SFE` is the name of the `NCIRSFE` module linked for the Natural RPC server in *Step 12: Link the Natural RPC Server Front-End*.

CICS Resource Definitions

This section describes the resource definitions required or recommended for customizing your CICS system.

Note: We generally recommend that you keep all Natural version-dependent components such as programs, transactions and files in a separate resource group. Such a group is represented by *`natgroup`* in this section.

Program Definitions

To take full advantage of the CICS storage protection and transaction isolation facilities, it is strongly recommended that you specify `EXECKEY(USER)` as the default value for all programs. This section explains if `EXECKEY(CICS)` is required for a definition. In all other cases, use `EXECKEY(USER)`.

The following table provides information about the value combinations of the `API` and `CONCURRENCY` program attributes. The appropriate value combination must be specified consistently for all programs that call one another using direct branch (BASR) instructions:

Program attributes	Remarks

`API(CICSAPI)`
 	
`CONCURRENCY(QUASIRENT)`
	Use these attributes if not all affected programs are threadsafe.

Program attributes	Remarks

`API(OPENAPI)`
 	
`CONCURRENCY(REQUIRED)`
	Use these attributes if you want to take advantage of the CICS open transaction environment (OTE) and can confirm that all affected programs are threadsafe.
	
	For using the CICS OTE, adapt the program definitions as described in the following section. For general information on using Natural in the CICS OTE, see *CICS Open Transaction Environment Considerations* in the *TP Monitor Interfaces* documentation.
	
	For further information, see also *Threadsafe Considerations* in the *TP Monitor Interfaces* documentation.

`API(OPENAPI)`
 	
`CONCURRENCY(THREADSAFE)`
	Same as `API(OPENAPI) CONCURRENCY(REQUIRED)`.

`API(CICSAPI)`
 	
`CONCURRENCY(REQUIRED)`
	This attribute combination is not supported by the Natural CICS Interface.

`API(CICSAPI)`
 	
`CONCURRENCY(THREADSAFE)`
	This attribute combination is not supported by the Natural CICS Interface.

`API(OPENAPI)`
 	
`CONCURRENCY(QUASIRENT)`
	This attribute combination is prohibited by CICS.

The value combination affects all user-written 3GL programs, as well as front-end programs that call the environment-dependent nucleus of Natural. The front-end programs can be delivered with Natural add-on products or be user-written. Examples of affected programs include NCIRSFE (Natural RPC server front-end), NATCNRFE (Natural Web I/O Interface Server CICS Adapter and Natural Development Server CICS Adapter), and the programs supplied with the Natural CICS Interface listed in the following section.

- Natural zIIP Shutdown Statistics

Environment-Dependent Nucleus

- Add a program definition for the environment-dependent nucleus:

```
DEFINE PROGRAM(dep-nuc) GROUP(natgroup) LANGUAGE(ASSEMBLER)          *
         DESCRIPTION(ENVIRONMENT-DEPENDENT NUCLEUS)
```

where `dep-nuc` is the environment-dependent nucleus linked in ***Step 6: Link the Environment-Dependent Nucleus***.

The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
```

```
API(OPENAPI)
```

```
CONCURRENCY(REQUIRED)
```

Note: If you use the CICS OTE and your application issues many Db2 requests, using `EXECKEY(CICS)` may improve performance because it prevents CICS from switching from an L9 to an L8 open TCB and back again for every SQL call.

Environment-Independent Nucleus

This definition is optional.

- Add a program definition for the **environment-independent nucleus**:

```
DEFINE PROGRAM(ind-nuc) GROUP(natgroup) LANGUAGE(ASSEMBLER)            *
         DESCRIPTION(NATURAL ENVIRONMENT-INDEPENDENT NUCLEUS)
```

where `ind-nuc` is the name of the **environment-independent nucleus** specified with the Natural profile parameter `NUCNAME`. The default name is `INDNUCvr`. You need not specify `API`, `CONCURRENCY`, `DATALOCATION` or `EXECKEY` for the environment-independent nucleus as all attributes of the environment-dependent nucleus are inherited since standard linkage conventions (direct branch using a BASR instruction) are used.

To access the environment-independent nucleus in the ELPA, specify `USELPACOPY(YES)` for this program definition and `LPA=YES` in the CICS startup parameters.

Selectable Units Module NATSUPGM

This definition is optional.

This definition is only required if you want to use Natural features supplied as selectable units (see the *Operations* documentation) with the NATSUPGM load module. NATSUPGM is loaded dynamically as an external module that is called during program execution. You need not specify API, CONCURRENCY, DATALOCATION or EXECKEY for this module as all attributes of the environment-dependent nucleus are inherited since standard linkage conventions (direct branch using a BASR instruction) are used.

- Add a program definition to load the selectable units module NATSUPGM:

```
DEFINE PROGRAM(NATSUPGM) GROUP(natgroup) LANGUAGE(ASSEMBLER)              *
         DESCRIPTION(NATURAL SELECTABLE UNITS MODULE)
```

Natural CICS Interface System Directory

- Add a program definition for the Natural CICS Interface system directory:

```
DEFINE PROGRAM(prefixCB) GROUP(natgroup) LANGUAGE(ASSEMBLER)              *
         DESCRIPTION(NATURAL CICS INTERFACE SYSTEM DIRECTORY)
```

You need not specify API, CONCURRENCY, DATALOCATION or EXECKEY for this module as it is not executable. The attribute EXECKEY defaults to EXECKEY(USER) and must not be changed.

External CALLNAT Interface Module

This definition is optional.

- Add a program definition for the external CALLNAT interface module:

```
DEFINE PROGRAM(ncixcall) GROUP(natgroup) LANGUAGE(ASSEMBLER)              *
         DESCRIPTION(NATURAL CICS INTERFACE EXTERNAL CALLNAT MODULE)
```

  where *ncixcall* is the name of the NCIXCALL module specified in ***Step 8: Link the Natural CICS Interface External CALLNAT Interface Module***.

  The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
API(OPENAPI)
CONCURRENCY(REQUIRED)
```

The values of `EXECKEY`, `CONCURRENCY` and `API` for *ncixcall* must be the same as for the **environment-dependent nucleus** because Natural is called by *ncixcall* using standard linkage conventions (direct branch using a BASR instruction) instead of the `EXEC CICS LINK` command.

Routing Module for Quasi-Reentrant Standard Linkage Calls (%P=SQ)

This definition is only required if you want to use the `%P=SQ` terminal command (see the *Terminal Commands* documentation) or the `PGP` profile parameter with the `STDLQ` property set (see the *Parameter Reference* documentation).

- Add a program definition for the routing module for quasi-reentrant standard linkage calls (`%P=SQ`) in a threadsafe environment:

```
DEFINE PROGRAM(NCILINKQ) GROUP(natgroup) LANGUAGE(ASSEMBLER)          *
       CONCURRENCY(QUASIRENT) API(CICSAPI)                            *
             DESCRIPTION(ROUTING MODULE FOR QUASI-REENTRANT SL CALLS)
```

We recommend that you set the following parameter value in the CICS program definition:

```
DATALOCATION(ANY)
```

Node Error Program

This definition is optional.

- Add a program definition for the node error program (NEP) of the Natural CICS Interface:

```
DEFINE PROGRAM(nciznep) GROUP(natgroup) LANGUAGE(ASSEMBLER)           *
         EXECKEY(CICS)                                                *
         DESCRIPTION(NATURAL CICS INTERFACE NODE ERROR PROGRAM)
```

where *nciznep* is the NEP name specified in ***Step 9: Link the Natural CICS Interface Node Error Program***.

Global User Exit

This definition is optional.

- Add a program definition for the XFAINTU global user exit:

```
DEFINE PROGRAM(prefixXFA) GROUP(natgroup) LANGUAGE(ASSEMBLER)           *
         EXECKEY(CICS)                                                  *
         DESCRIPTION(NATURAL CICS INTERFACE XFAINTU GLUE)
```

Natural RPC Server Front-End

This definition is only required if you want to use the Natural RPC server front-end *ncisfe*.

- Add a program definition for the Natural RPC server front-end:

```
DEFINE PROGRAM(ncirsfe) GROUP(natgroup) LANGUAGE(ASSEMBLER)             *
         DESCRIPTION(NATURAL RPC SERVER FRONT-END)
```

  where *ncirsfe* is the name of the NCIRSFE module specified for the Natural RPC server front-end in ***Step 12: Link the Natural RPC Server Front-End***.

  The following attribute settings for the program definition are mandatory when using the CICS OTE and recommended otherwise:

```
DATALOCATION(ANY)
```

```
API(OPENAPI)
```

```
CONCURRENCY(REQUIRED)
```

  The values of API, CONCURRENCY and EXECKEY for *ncirsfe* must be the same as for the **environment-dependent nucleus** because Natural is called by *ncirsfe* using standard linkage conventions (direct branch using a BASR instruction) instead of the EXEC CICS LINK command.

Natural zIIP Shutdown Statistics

These definitions are only required if you want to print Natural zIIP statistics when the CICS environment is shut down (see also *zIIP Processing Reports Available* in the *Natural for zIIP* documentation). Using Natural for zIIP requires using the CICS OTE.

The Natural zIIP shutdown statistics are written to the CSSL queue (directed to DD name MSGUSR).

1. Add a program definition to load the NCIZPST module:

```
DEFINE PROGRAM(NCIZPST) GROUP(natgroup) LANGUAGE(ASSEMBLER)           *
        API(OPENAPI) CONCURRENCY(REQUIRED)                          *
        DESCRIPTION(NATURAL ZIIP SHUTDOWN STATISTICS)
```

Add a program definition to load the `NATZPST` module:

```
DEFINE PROGRAM(NATZPST) GROUP(natgroup) LANGUAGE(ASSEMBLER)           *
        DESCRIPTION(NATURAL ZIIP SHUTDOWN STATISTICS)
```

2. Add the `NCIZPST` module to the CICS PLTSD as a first phase PLT program.

Transaction Definitions

We recommend that you define or choose a CICS profile for the Natural transactions similar to the following:

```
DEFINE PROFILE(natprof) GROUP(natgroup)                                *
        DESCRIPTION(CICS PROFILE FOR NATURAL TRANSACTIONS)             *
        SCRNSIZE(ALTERNATE) INBFMH(ALL)
```

where *natprof* is the name of the CICS profile assigned to the Natural transactions.

We also recommend that you define a CICS transaction class for the Natural transactions similar to the following:

```
DEFINE TRANCLASS(natclass) GROUP(natgroup) MAXACTIVE(999)              *
        DESCRIPTION(CLASS FOR NATURAL TRANSACTIONS)
```

where *natclass* is the name of the CICS transaction class assigned to the Natural transactions.

A CICS transaction class dedicated to Natural helps control storage usage by Natural (see also *Controlling Storage Usage* in the *TP Monitor Interfaces* documentation). Assign this transaction class to the definitions of all transactions that directly or indirectly call Natural.

You can define the following:

- Natural Transaction
- Natural Message Switching Transaction
- Node Error Program

- Natural RPC Server Front-End

Natural Transaction

- Add a definition for the Natural transaction:

```
DEFINE TRANSACTION(ncitransact) GROUP(natgroup)                        *
        PROGRAM(dep-nuc) TWASIZE(128) DUMP(NO) SPURGE (YES)            *
        PROFILE(natprof) TRANCLASS(natclass)
```

where:

ncitransact is the name of the Natural CICS Interface user transaction ID.
dep-nuc is the environment-dependent nucleus linked in ***Step 6: Link the Environment-Dependent Nucleus***.

We recommend that you set the following parameter values in the CICS transaction definitions:

```
TASKDATALOC(ANY)
```

```
ISOLATE(YES)
```

`TASKDATALOC(ANY)` can have an impact on non-Natural programs called by Natural; for details, see the relevant IBM literature on CICS.

For the impact of transaction isolation, see also *THRDSZE - Thread Size* in the *TP Monitor Interfaces* documentation.

Natural Message Switching Transaction

- Add a definition for the Natural internal message switching transaction:

```
DEFINE TRANSACTION(nmsg) GROUP(natgroup)                               *
        PROGRAM(dep-nuc) TWASIZE(128) DUMP(NO) SPURGE (YES)            *
        PROFILE(natprof) TRANCLASS(natclass)
```

where:

dep-nuc is the environment-dependent nucleus linked in ***Step 6: Link the Environment-Dependent Nucleus***.

nmsg is the name of the Natural CICS Interface message switching transaction ID as defined with the `MSGTRAN` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NMSG`.

We recommend that you set the following parameter values in the CICS transaction definitions:

```
TASKDATALOC(ANY)
```

```
ISOLATE(YES)
```

`TASKDATALOC(ANY)` can have an impact on non-Natural programs called by Natural; for details, see the relevant IBM literature on CICS.

For the impact of transaction isolation, see also *THRDSZE - Thread Size* in the *TP Monitor Interfaces* documentation.

Node Error Program

This definition is optional.

- Add a definition for the node error program (NEP) of the Natural CICS Interface:

```
DEFINE TRANSACTION(neptran) GROUP(natgroup)                                *
         PROGRAM(nciznep) DUMP(NO) PRIORITY(255)                           *
         TASKDATAKEY(CICS) TASKDATALOC(ANY)                                *
         PROFILE(natprof)
```

  where:

  `neptran` is the NEP transaction code defined with the `NEPTRAN` parameter of the `NCIZNEP` module linked in ***Step 9: Link the Natural CICS Interface Node Error Program***.

  `nciznep` is the NEP name of the `NCIZNEP` module linked in ***Step 9: Link the Natural CICS Interface Node Error Program***.

Natural RPC Server Front-End

- Add a definition for the Natural RPC server front-end transaction:

```
DEFINE TRANSACTION(ncisfetransact) GROUP(natgroup)                         *
         PROGRAM(ncirsfe) TWASIZE(128) DUMP(NO) SPURGE (YES)               *
         PROFILE(natprof) TRANCLASS(natclass)
```

  where:

  `ncisfetransact` is the name of the Natural RPC server front-end transaction ID.
  `ncirsfe` is the name of the `NCIRSFE` module specified for the Natural RPC server front-end in ***Step 12: Link the Natural RPC Server Front-End***.

File Definitions

These definitions are only required if VSAM roll files are to be used.

- Add one entry in the FCT for each Natural CICS Interface VSAM roll file:

```
DEFINE FILE(prefixR1) GROUP(natgroup)                                *
         BROWSE(YES) ADD(YES) DELETE(YES) UPDATE(YES) READ(YES)      *
         RECORDFORMAT(F) STRINGS(3) DATABUFFERS(5)
```

  Local shared resources (LSR) should be used whenever possible. If multiple LSR pools are supported, one pool should be dedicated exclusively to Natural CICS Interface roll files.

Transient Data Destinations

- Error Messages
- Natural NATRJE Utility
- Natural CICS Interface Session Statistics
- Natural CICS Interface Profile Parameter File

Error Messages

This definition is optional but highly recommended to log Natural CICS Interface informational messages and Natural abend codes and corresponding error messages.

Add entries in the DCT for the Natural CICS Interface error message logging facility. For Natural error messages, you can use:

- A destination that is already defined in CICS (for example, CSSL); in this case, no extra DCT entry is required.
- An extra partition destination as a synonym for an existing CICS message destination:

```
DEFINE TDQUEUE(message-destination) GROUP(natgroup) TYPE(INDIRECT)     *
         INDIRECTNAME(name)
```

  where:

  message-destination is the name of the Natural CICS Interface error message destination as defined with the `MSGDEST` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NERR`.

  name is the name of the corresponding indirect destination.

- An extra file:

```
DEFINE TDQUEUE(message-destination) GROUP(natgroup) TYPE(EXTRA)          *
         DDNAME(NATMSG) OPEN(INITIAL) TYPEFILE(OUTPUT)                   *
         RECORDFORMAT(VARIABLE) BLOCKFORMAT(UNBLOCKED)                   *
         RECORDSIZE(nnn)
```

where `message-destination` is the name of the Natural CICS Interface error message destination as defined with the `MSGDEST` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NERR`.

You can, for example, change the `BLOCKFORMAT` format from `UNBLOCKED` to `BLOCKED`. Natural and the Natural CICS Interface messages have a length of up to 120 bytes. Therefore, the record size (`RECORDSIZE (nnn)`) should be at least 124 bytes for variable record format or 120 bytes for fixed record format.

When using a disk file:

Sufficient disk space must be reserved for this data set; a DD statement must be added to the CICS startup JCL.

Natural NATRJE Utility

- Add one entry in the DCT for the Natural NATRJE utility (described in the *Utilities* documentation). When submitting a job to JES with the following entry, the internal reader is started on `CLOSE` of the destination:

```
DEFINE TDQUEUE(submit-destination) GROUP(natgroup) TYPE(EXTRA)          *
         DDNAME(NATRJE) OPEN(DEFERRED) TYPEFILE(OUTPUT)                  *
         RECORDFORMAT(FIXED) BLOCKFORMAT(UNBLOCKED) RECORDSIZE(80)
```

where:

`submit-destination` is the name of the Natural CICS Interface submit destination as defined with the `RJEDEST` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NRJE`.

Additionally, add the following DD statement to the CICS startup JCL:

```
//NATRJE DD SYSOUT=(*,INTRDR)
```

When submitting a job to JES with the following *two* entries, the Natural CICS Interface deals with an indirect destination that will not be closed:

```
DEFINE TDQUEUE (submit-destination) GROUP(natgroup) TYPE(INDIRECT)     *
         INDIRECTNAME(name)

DEFINE TDQUEUE(name) GROUP(natgroup) TYPE(EXTRA)                       *
         DDNAME(NATRJE) OPEN(DEFERRED) TYPEFILE(OUTPUT)                *
         RECORDFORMAT(FIXED) BLOCKFORMAT(UNBLOCKED) RECORDSIZE(80)
```

where:

`submit-destination` is the name of the Natural CICS Interface submit destination as defined with the `RJEDEST` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NRJE`.

`name` is the name of the corresponding indirect destination.

You can use either a `/*EOF` card as the very last card in the job stream or the corresponding `NATRJE` exit. When detecting the `/*EOF` card, JES submits the previous job stream.

Natural CICS Interface Session Statistics

This definition is optional.

- Add one entry in the DCT for the Natural CICS Interface session statistics:

```
DEFINE TDQUEUE(log-destination) GROUP(natgroup) TYPE(EXTRA)            *
         DDNAME(NATLOG) OPEN(INITIAL) TYPEFILE(OUTPUT)                 *
         RECORDFORMAT(VARIABLE) BLOCKFORMAT(BLOCKED)                   *
         RECORDSIZE(4624) BLOCKSIZE(4628)
```

where `log-destination` is the name of the Natural CICS Interface logging destination as defined with the parameter `LOGDEST` described in the *Parameter Reference* documentation. The default name is `NLOG`.

Sufficient disk space must be reserved for this data set; a DD statement must be added to the CICS startup JCL.

Natural CICS Interface Profile Parameter File

This definition is optional.

- Add one entry in the DCT for the Natural CICS Interface profile parameter file:

```
DEFINE TDQUEUE(parameter-destination) GROUP(natgroup) TYPE(EXTRA)       *
         DDNAME(CMPRMIN) OPEN(DEFERRED) TYPEFILE(INPUT)                  *
         RECORDFORMAT(FIXED) BLOCKFORMAT(BLOCKED)                        *
         RECORDSIZE(80) BLOCKSIZE(nnn)
```

where:

`parameter-destination` is the name of the Natural CICS Interface profile parameter input destination as defined with the `PRMDEST` parameter in the `NTCICSP` macro described in the *Parameter Reference* documentation. The default name is `NPRM`.

`nnn` is a multiple of 80.

A DD statement must be added to the CICS startup JCL.

Other Definitions

- Add the following system abend codes to a CICS System Recovery Table (SRT):

`0D6`	Protects CICS against failing Natural Roll Server and Natural Authorized Services Manager requests (using PC instructions) by Natural.
`01D`	Protects CICS against failing data space cache requests by Natural.
`DC2`	Protects CICS against failing memory object cache requests by Natural.

Installation Verification

You can verify the successful installation of the Natural CICS Interface by performing the following steps:

1. From a CICS session, type in the Natural transaction ID to start a Natural session.
2. Proceed with the steps described in the section ***Test Online Natural***.

IX Installing Natural Com-plete/SMARTS Interface on z/OS

11 Installing Natural Com-plete/SMARTS Interface Version 8.2.8 on z/OS

This document describes the steps for installing Natural Com-plete/SMARTS Interface Version 8.2.8 which corresponds to the Natural Com-plete Interface (product code NCF) on z/OS.

Note: For support of Natural for Com-plete for zIIP, Natural Com-plete/SMARTS Interface Version 8.3.3 (and above) must be installed.

Related Topics:

For information on how to operate Natural in a Com-plete/SMARTS environment, see the following topics:

- *Using Natural with TP Monitors* in the *TP Monitor Interfaces* documentation.
- *Natural under Com-plete/SMARTS* in the *TP Monitor Interfaces* documentation.
- *Natural under Com-plete/SMARTS User Abend Codes* in the *Messages and Codes* documentation.

For information on installing and using Com-plete, see the *Com-plete* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

A supported version of the following product must be installed before you can install the Natural Com-plete/SMARTS Interface:

- Com-plete

  See the Com-plete *Installation* documentation.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NCF*vrs*.LOAD	Load modules
NCF*vrs*.SRCE	Source modules and macros

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Create the Startup Program

(Job I070, Steps 2320, 2321)

This step is optional.

You can use a Natural Com-plete/SMARTS Interface startup program to pass dynamic parameters to Natural.

1. Adapt the example program NC0001 contained in the source library to your requirements.
2. Assemble and link the startup program into your Com-plete user program library.

Step 2: Build the Natural Parameter Module

(Job I080, Steps 2300, 2310)

The Natural profile parameters and parameter macros mentioned in this section are described in the *Parameter Reference* documentation unless otherwise noted.

1. Modify the Natural parameter module for Com-plete/SMARTS:
   - Configure the Com-plete/SMARTS batch interface: Modify the settings of the parameters supplied with the macro `NTCOMP` to meet your requirements. For descriptions of these parameters, see the corresponding profile parameter `COMP`.
   - Modify the following parameters:

   ```
   FNAT=(database-id,file-number)
   FUSER=(database-id,file-number)
   ```

   where *database-id* and *file-number* are the values you specified when loading the system files during the ***Installation Procedure*** for base Natural.
2. Define a Natural local buffer pool under Com-plete by modifying the values of the keyword parameters supplied with the parameter macro `NTBPI` (see the Natural profile parameter `BPI`) as required.

   A local buffer pool is allocated during initialization of the first Natural session after Com-plete startup.

   The status of the local buffer pools can be displayed on the operator console by issuing the following Com-plete operator command:

   ```
   SERV,server-name,BPSTAT
   ```

   where *server-name* is the name of the server as specified with the Com-plete SERVER startup option.
3. If you want to use a Natural global buffer pool under Com-plete, specify the same values as in the Natural installation procedure for the profile parameter `SUBSID` in the parameter macro `NTPRM` (see the *Operations* documentation) for the keyword subparameter `NAME` in the parameter macro `NTBPI` (see the *Parameter Reference* documentation).
4. Assemble and link the Natural parameter module.

Step 3: Link the Nucleus

(Job I080, Step 2320)

Link the **environment-dependent nucleus** for the Natural Com-plete/SMARTS Interface.

- Link the **environment-dependent nucleus** into your Com-plete user program library.

  The list of the modules to be linked for the environment-dependent nucleus is supplied with Step 2320.

  If you want Natural to run in the IBM Language Environment (LE), set the **System Maintenance Aid (SMA)** `NAT-LE` to `Y` (Yes). The default setting is `N` (No).

- Specify the **environment-dependent nucleus** as a Com-plete startup option by setting the following Com-plete keyword parameter:

  ```
  RESIDENTPAGE=name
  ```

  where *name* is the name of the environment-dependent nucleus for the Natural Com-plete/SMARTS Interface.

Step 4: Link the Natural Com-plete/SMARTS Interface Server

(Job I080, Step 2350)

- Link the Natural Com-plete/SMARTS Interface server.

The Natural Com-plete/SMARTS Interface server is used to maintain common storage and tables across Natural sessions, for example, the local buffer pool.

Step 5: Define the Natural Com-plete/SMARTS Interface Server

- Specify the Natural Com-plete/SMARTS Interface server as a Com-plete startup option by setting the following Com-plete keyword parameter:

  ```
  SERVER=(server-name,module-name)
  ```

  where:

  server-name is the name of the server as specified with the keyword subparameter `SERVER` in the parameter macro `NTCOMP` (see the *Parameter Reference* documentation).

  module-name is the name of the load module linked in ***Step 4: Link the Natural Com-plete/SMARTS Interface Server***.

The Natural Com-plete/SMARTS Interface server module is loaded during Com-plete initialization. The module must therefore be placed in a load library contained in the `COMPINIT` load library concatenation (see also the Com-plete *Installation* documentation).

Step 6: Catalog the Natural Com-plete/SMARTS Interface

This step is required if either of the following is true:

You run Natural under Com-plete/SMARTS and use threads below the line (`THABOVE=NO` setting in the `NTCOMP` macro).

Or:

You want to use Natural work pools below the 16-MB line.

- Catalog the Natural Com-plete/SMARTS Interface by using the Com-plete ULIB utility.
  - For threads below the line:

    The region size to be specified with the ULIB utility parameter `RG` depends on the setting of the keyword subparameter `NTHSIZE` in the parameter macro `NTCOMP` described in the *Parameter Reference* documentation.
  - For work pools below the 16-MB line:

    The region size to be specified with the ULIB utility parameter `RG` depends on the setting of the Natural profile parameter `WPSIZE` (see the *Parameter Reference* documentation) for the parameter macro `NTPRM` (see the *Operations* documentation).

  See also *Storage Usage* in the section *Natural under Com-plete/SMARTS* in the *TP Monitor Interfaces* documentation.

  After installation, you can use the Natural SYSTP utility (see the *Utilities* documentation) to determine the region size actually used.

Installation Verification

You can verify the successful installation of the Natural Com-plete/SMARTS Interface by performing the following steps:

1. Stop and restart Com-plete.
2. Enter the Com-plete user menu and type in the name of the environment-dependent nucleus for the Natural Com-plete/SMARTS Interface.

   The Natural initial screen should appear.
3. Proceed with the steps described in the section ***Test Online Natural***.

12 Installing Natural Com-plete/SMARTS Interface Version 8.3.6 on z/OS

This document describes the steps for installing Natural Com-plete/SMARTS Interface Version 8.3.6 which corresponds to the Natural Com-plete Interface (product code NCF) on z/OS.

Related Topics:

For information on how to operate Natural in a Com-plete/SMARTS environment, see the following topics:

- *Using Natural with TP Monitors* in the *TP Monitor Interfaces* documentation.
- *Natural under Com-plete/SMARTS* in the *TP Monitor Interfaces* documentation.
- *Natural under Com-plete/SMARTS User Abend Codes* in the *Messages and Codes* documentation.

For information on installing and using Com-plete, see the *Com-plete* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

A supported version of the following product must be installed before you can install the Natural Com-plete/SMARTS Interface:

- Com-plete

  See the Com-plete *Installation* documentation.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NCF*vrs*.LOAD	Load modules
NCF*vrs*.SRCE	Source modules and macros
NCF*vrs*.LICS	Product license file for Natural for Com-plete for zIIP For information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NATvrs.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

- Step 1: Prepare, Convert, Assemble and Link the License File for Natural for Com-plete for zIIP
- Step 2: Create the Startup Program
- Step 3: Build the Natural Parameter Module
- Step 4: Link the Nucleus
- Step 5: Link the Natural Com-plete/SMARTS Interface Server
- Step 6: Define the Natural Com-plete/SMARTS Interface Server
- Step 7: Catalog the Natural Com-plete/SMARTS Interface

Step 1: Prepare, Convert, Assemble and Link the License File for Natural for Com-plete for zIIP

(Job I007, Steps 2301, 2302, 2304)

This step is optional and only required if you want to install Natural for Com-plete for zIIP.

You must install a valid Natural license file. An additional license file is required if you want to install Natural for Com-plete for zIIP to enable support of the IBM z/IIP (IBM System z Integrated Information Processor).

For detailed information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

1. Copy the license file from the supplied installation medium to disk or transfer it from the PC as described in *Transferring a License File from PC to a z/OS Host Using FTP* in *Software AG Mainframe Product Licensing*.
2. Check, convert, assemble and link the license file supplied for Natural for Com-plete for zIIP:

Step 2301	Check license file `NCFvrs.LICS`. This job runs the CHECK function of the LICUTIL license utility (see below).
Step 2302	Convert license file into an assembler source. This job runs the MAKE function of the LICUTIL license utility (see below).
Step 2304	Assemble and link the assembler source to generate load module `NCFLIC`. This module is then linked to the nucleus in **Job I080**.

The functions and option settings provided by LICUTIL are described in *Using the License Utility: LICUTIL* in *Software AG Mainframe Product Licensing*.

Step 2: Create the Startup Program

(Job I070, Steps 2320, 2321)

This step is optional.

You can use a Natural Com-plete/SMARTS Interface startup program to pass dynamic parameters to Natural.

1. Adapt the example program `NC0001` contained in the source library to your requirements.
2. Assemble and link the startup program into your Com-plete user program library.

Step 3: Build the Natural Parameter Module

(Job I080, Steps 2300, 2310)

The Natural profile parameters and parameter macros mentioned in this section are described in the *Parameter Reference* documentation unless otherwise noted.

1. Modify the Natural parameter module for Com-plete/SMARTS:
   - Configure the Com-plete/SMARTS batch interface: Modify the settings of the parameters supplied with the macro `NTCOMP` to meet your requirements. For descriptions of these parameters, see the corresponding profile parameter `COMP`.
   - Modify the following parameters:

     ```
     FNAT=(database-id,file-number)
     FUSER=(database-id,file-number)
     ```

     where `database-id` and `file-number` are the values you specified when loading the system files during the ***Installation Procedure*** for base Natural.
2. Define a Natural local buffer pool under Com-plete by modifying the values of the keyword parameters supplied with the parameter macro `NTBPI` (see the Natural profile parameter `BPI`) as required.

A local buffer pool is allocated during initialization of the first Natural session after Com-plete startup.

The status of the local buffer pools can be displayed on the operator console by issuing the following Com-plete operator command:

```
SERV,server-name,BPSTAT
```

where `server-name` is the name of the server as specified with the Com-plete SERVER startup option.

3. If you want to use a Natural global buffer pool under Com-plete, specify the same values as in the Natural installation procedure for the profile parameter `SUBSID` in the parameter macro `NTPRM` (see the *Operations* documentation) for the keyword subparameter `NAME` in the parameter macro `NTBPI` (see the *Parameter Reference* documentation).
4. Assemble and link the Natural parameter module.

Step 4: Link the Nucleus

(Job I080, Step 2320)

Link the **environment-dependent nucleus** for the Natural Com-plete/SMARTS Interface.

- Link the **environment-dependent nucleus** into your Com-plete user program library.

  The list of the modules to be linked for the environment-dependent nucleus is supplied with Step 2320.

  If you want Natural to run in the IBM Language Environment (LE), set the **System Maintenance Aid (SMA)** `NAT-LE` to `Y` (Yes). The default setting is `N` (No).
- Specify the **environment-dependent nucleus** as a Com-plete startup option by setting the following Com-plete keyword parameter:

  ```
  RESIDENTPAGE=name
  ```

  where `name` is the name of the environment-dependent nucleus for the Natural Com-plete/SMARTS Interface.

Step 5: Link the Natural Com-plete/SMARTS Interface Server

(Job I080, Step 2350)

- Link the Natural Com-plete/SMARTS Interface server.

The Natural Com-plete/SMARTS Interface server is used to maintain common storage and tables across Natural sessions, for example, the local buffer pool.

Step 6: Define the Natural Com-plete/SMARTS Interface Server

- Specify the Natural Com-plete/SMARTS Interface server as a Com-plete startup option by setting the following Com-plete keyword parameter:

  ```
  SERVER=(server-name,module-name)
  ```

  where:

  server-name is the name of the server as specified with the keyword subparameter `SERVER` in the parameter macro `NTCOMP` (see the *Parameter Reference* documentation).

  module-name is the name of the load module linked in ***Step 4: Link the Natural Com-plete/SMARTS Interface Server***.

The Natural Com-plete/SMARTS Interface server module is loaded during Com-plete initialization. The module must therefore be placed in a load library contained in the `COMPINIT` load library concatenation (see also the Com-plete *Installation* documentation).

Step 7: Catalog the Natural Com-plete/SMARTS Interface

This step is required if either of the following is true:

> You run Natural under Com-plete/SMARTS and use threads below the line (`THABOVE=NO` setting in the `NTCOMP` macro).
>
> Or:
>
> You want to use Natural work pools below the 16-MB line.

- Catalog the Natural Com-plete/SMARTS Interface by using the Com-plete ULIB utility.
  - For threads below the line:

    The region size to be specified with the ULIB utility parameter `RG` depends on the setting of the keyword subparameter `NTHSIZE` in the parameter macro `NTCOMP` described in the *Parameter Reference* documentation.
  - For work pools below the 16-MB line:

The region size to be specified with the ULIB utility parameter `RG` depends on the setting of the Natural profile parameter `WPSIZE` (see the *Parameter Reference* documentation) for the parameter macro `NTPRM` (see the *Operations* documentation).

See also *Storage Usage* in the section *Natural under Com-plete/SMARTS* in the *TP Monitor Interfaces* documentation.

After installation, you can use the Natural SYSTP utility (see the *Utilities* documentation) to determine the region size actually used.

Installation Verification

You can verify the successful installation of the Natural Com-plete/SMARTS Interface by performing the following steps:

1. Stop and restart Com-plete.
2. Enter the Com-plete user menu and type in the name of the environment-dependent nucleus for the Natural Com-plete/SMARTS Interface.

   The Natural initial screen should appear.
3. Proceed with the steps described in the section ***Test Online Natural***.

X Installing Natural IMS TM Interface on z/OS

13 Installing Natural IMS TM Interface on z/OS

This document describes the steps for installing the Natural IMS TM Interface (product code NII) on z/OS.

Related Topic:

For information on how to operate Natural in an IMS TM environment, see *Using Natural with TP Monitors* and *Natural under IMS TM* in the *TP Monitor Interfaces* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

The following software must be installed before you can install the Natural IMS TM Interface:

- Natural global buffer pool if you are using the MPP environment (strongly recommended).
- Natural Roll Server if the ROLLSRV parameter of the Natural IMS TM Interface is set to YES.
- Natural Authorized Services Manager with the SIP server function if the Non-Conversational MPP Interface, the monitoring or the broadcasting function of the Natural IMS TM Interface is used.
- Natural Authorized Services Manager if the Accounting to SMF function of the Natural IMS TM Interface is used.
- Adabas IMS/TM Interface (product code AII), version as specified under *Software AG Product Versions Supported by Natural* in the current Natural *Release Notes* for Mainframes.

For further information on the functions mentioned above, see the relevant sections in the *TP Monitor Interfaces* and *Operations* documentation.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
`NIIvrs.LOAD`	Load modules
`NIIvrs.SRCE`	Source modules and macros

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NATvrs.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

The installation procedure comprises the following:

- **Prepare, Convert, Assemble and Link the License File for Natural for IMS for zIIP**
- **Common Installation Steps**
- **Installing the Batch Message Processing BMP Environment**
- **Installing the Message-Oriented NTRD Environment**
- **Installing the Dialog-Oriented MPP Environment**
- **Installing the Natural Development/Natural Web I/O Interface**
- **Installing the Server Environment**
- **Customizing the IMS TM Environment**

Prepare, Convert, Assemble and Link the License File for Natural for IMS for zIIP

(Job I007, Steps 2501, 2502, 2504)

Note: This step is optional. It is only required if you want to install Natural for IMS for zIIP, and if Natural IMS TM Interface Version 8.3.4 is installed in your environment.

You must install a valid Natural license file. An additional license file is required if you want to install **Natural for IMS for zIIP** to enable support of the IBM z/IIP (IBM System z Integrated Information Processor).

For detailed information on the license file and product licensing, see *Software AG Mainframe Product Licensing*.

1. Copy the license file from the supplied installation medium to disk or transfer it from the PC as described in *Transferring a License File from PC to a z/OS Host Using FTP* in *Software AG Mainframe Product Licensing*.
2. Check, convert, assemble and link the license file supplied for Natural for IMS for zIIP:

Step 2501	Check license file `NII`*`vrs`*`.LICS`. This job runs the CHECK function of the LICUTIL license utility (see below).
Step 2502	Convert license file into an assembler source. This job runs the MAKE function of the LICUTIL license utility (see below).
Step 2504	Assemble and link the assembler source to generate load module `NIILIC`. This module is then linked to all relevant front-ends in the Jobs I070 and I080.

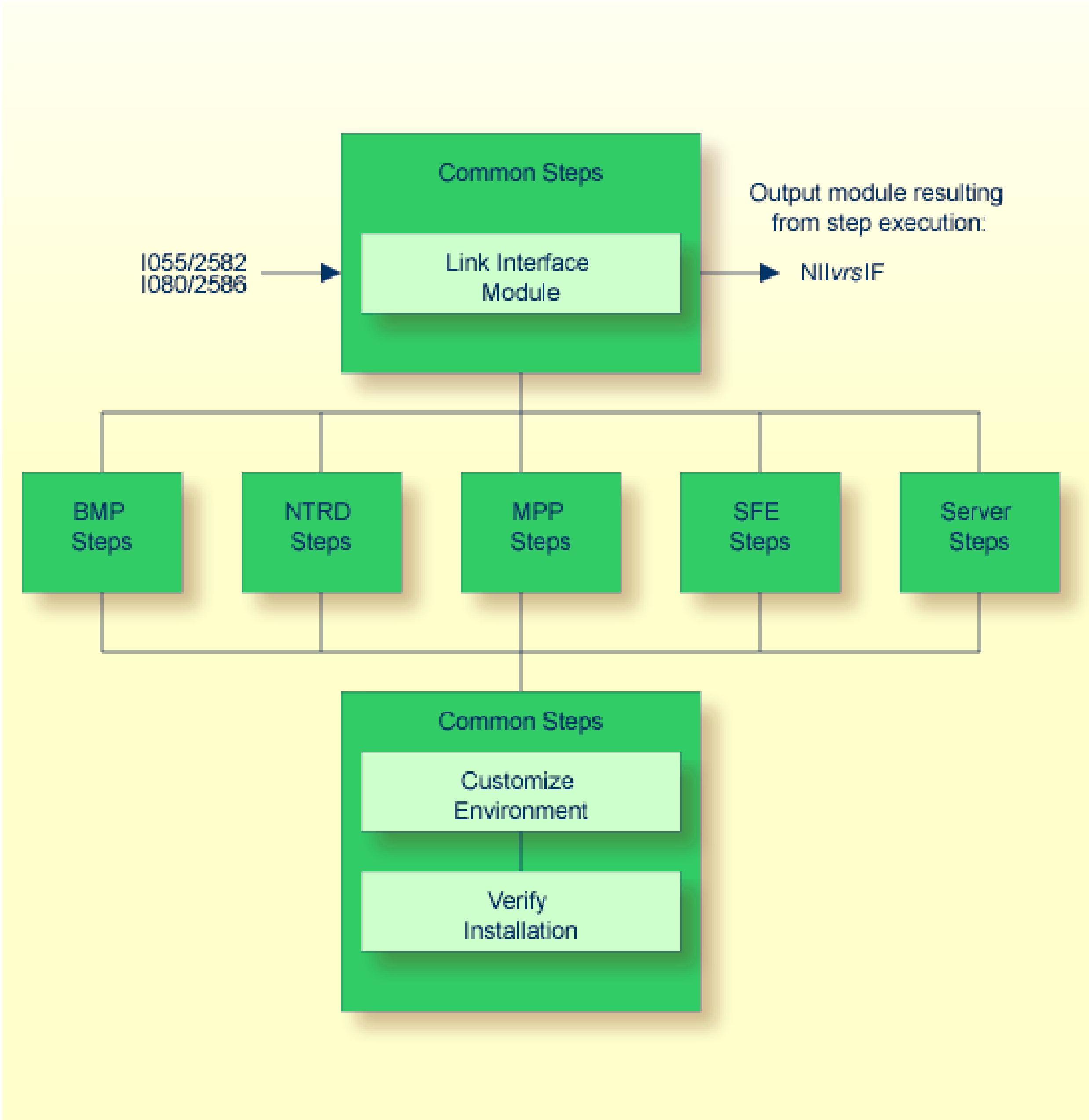
The functions and option settings provided by LICUTIL are described in *Using the License Utility: LICUTIL* in *Software AG Mainframe Product Licensing*.

Common Installation Steps

Note for LE Options:

If you want Natural to run in the IBM Language Environment (LE), set the **System Maintenance Aid (SMA)** parameter `NAT-LE` to `Y` (Yes). The default setting is `N` (No). Additionally, if you want to modify the LE options in the `NATLEOPT` source module or if you use non-Natural programs running in 24-bit mode, set the appropriate SMA parameter as described in ***Build the Natural-Specific IBM Language Environment Options*** in *Installing Natural*.

The following is an overview of the installation jobs/steps required to install the Natural IMS TM Interface in a BMP, an NTRD an MPP and/or a server environment:


Common Steps
I055/2582
I080/2586
Link Interface Module
Output module resulting from step execution:
NIIvrsIF
BMP Steps
NTRD Steps
MPP Steps
SFE Steps
Server Steps
Common Steps
Customize Environment
Verify Installation

Step: Link the Natural IMS TM Interface Module

(Job I055, Step 2582)

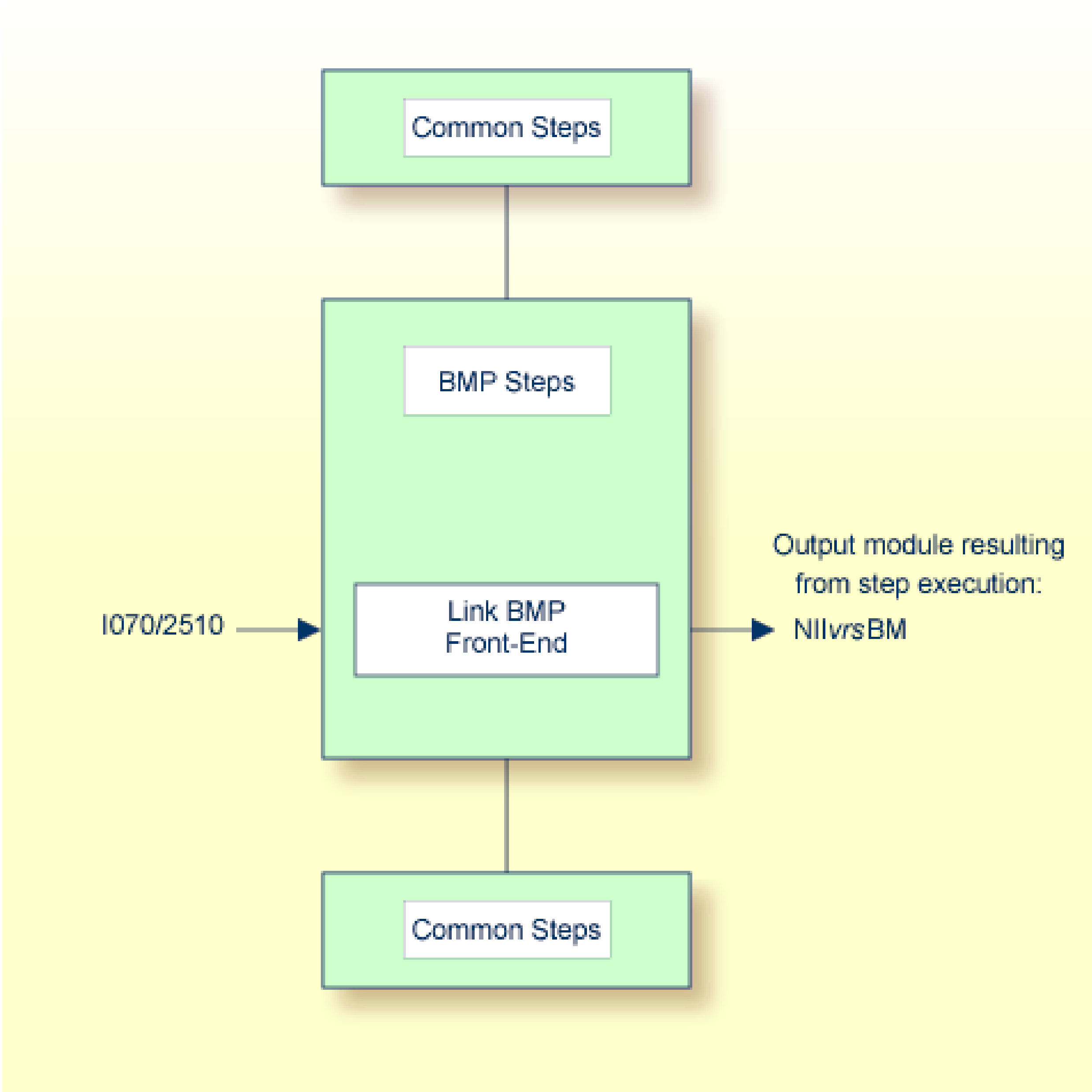
- Link the Natural IMS TM Interface module.

  The same interface module can be used in a BMP, an NTRD, an MPP and/or a server environment.

  The name of the interface module must be specified with the `NIINAME` keyword subparameter of the `NTIMSP` macro contained in the Natural parameter module. For details, see the *Parameter Reference* documentation.

Installing the Batch Message Processing BMP Environment

The following is an overview of the installation jobs/steps required to install the Natural IMS TM Interface for the BMP environment:



Step: Link the BMP Front-End

(Job I070, Step 2510)

The front-end consists of the load module `NIIBMP` contained in the `NII`*`vrs`*`.LOAD` data set, the Natural parameter module created in ***Build the Natural Parameter Module*** (see *Installing Natural*) and additional optional modules (see the list of module names supplied with Step 2510).

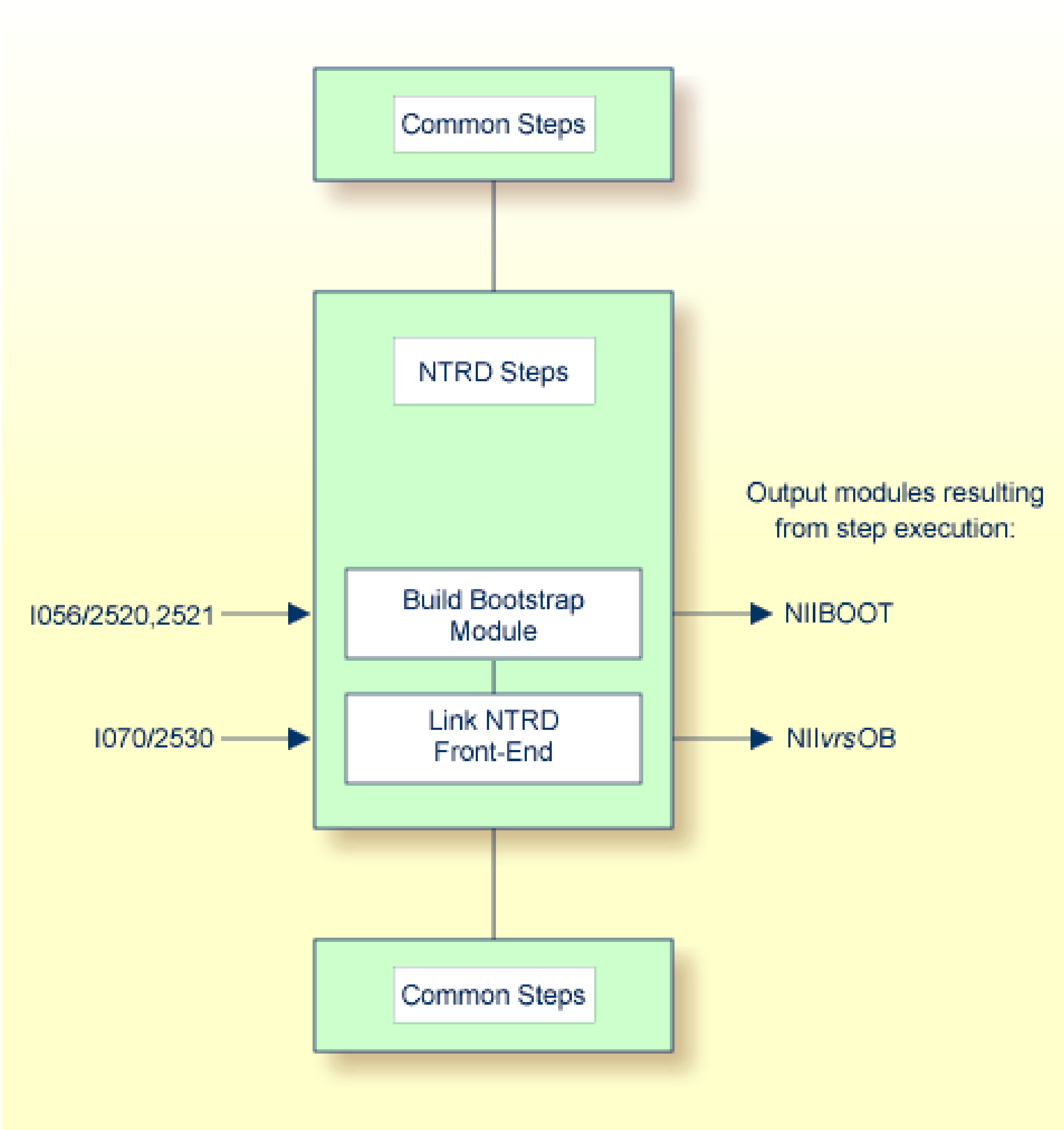
- Link the front-end for the BMP environment.

Important: The name of the linked BMP front-end must also be specified in your BMP region job as the application program name (parameter `MBR` of the `IMSBATCH` procedure invocation).

You can specify the parameter settings for your BMP environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Installing the Message-Oriented NTRD Environment

The following is an overview of the installation jobs/steps required to install the Natural IMS TM Interface for the NTRD environment:



- Step 1: Build the NIIBOOT Bootstrap Module

- Step 2: Link the NTRD Front-End

Step 1: Build the NIIBOOT Bootstrap Module

(Job I056, Steps 2520, 2521)

This step is only required if you want to invoke the NTRD front-end by a bootstrap module and not directly by a transaction code.

1. Create the `NIIBOOT` source module which contains a call to the `NIMBOOT` macro. For the `DRIVERN` parameter, specify the name of the front-end module to be linked in ***Step 2***.
2. Assemble and link the bootstrap module.

Step 2: Link the NTRD Front-End

(Job I070, Step 2530)

The front-end consists of the `NIINTRD` load module contained in the `NII`*`vrs`*`.LOAD` data set, the Natural parameter module created in ***Build the Natural Parameter Module*** (see *Installing Natural*) and additional optional modules (see the list of module names supplied with Step 2530).

- Link the front-end for the NTRD environment.

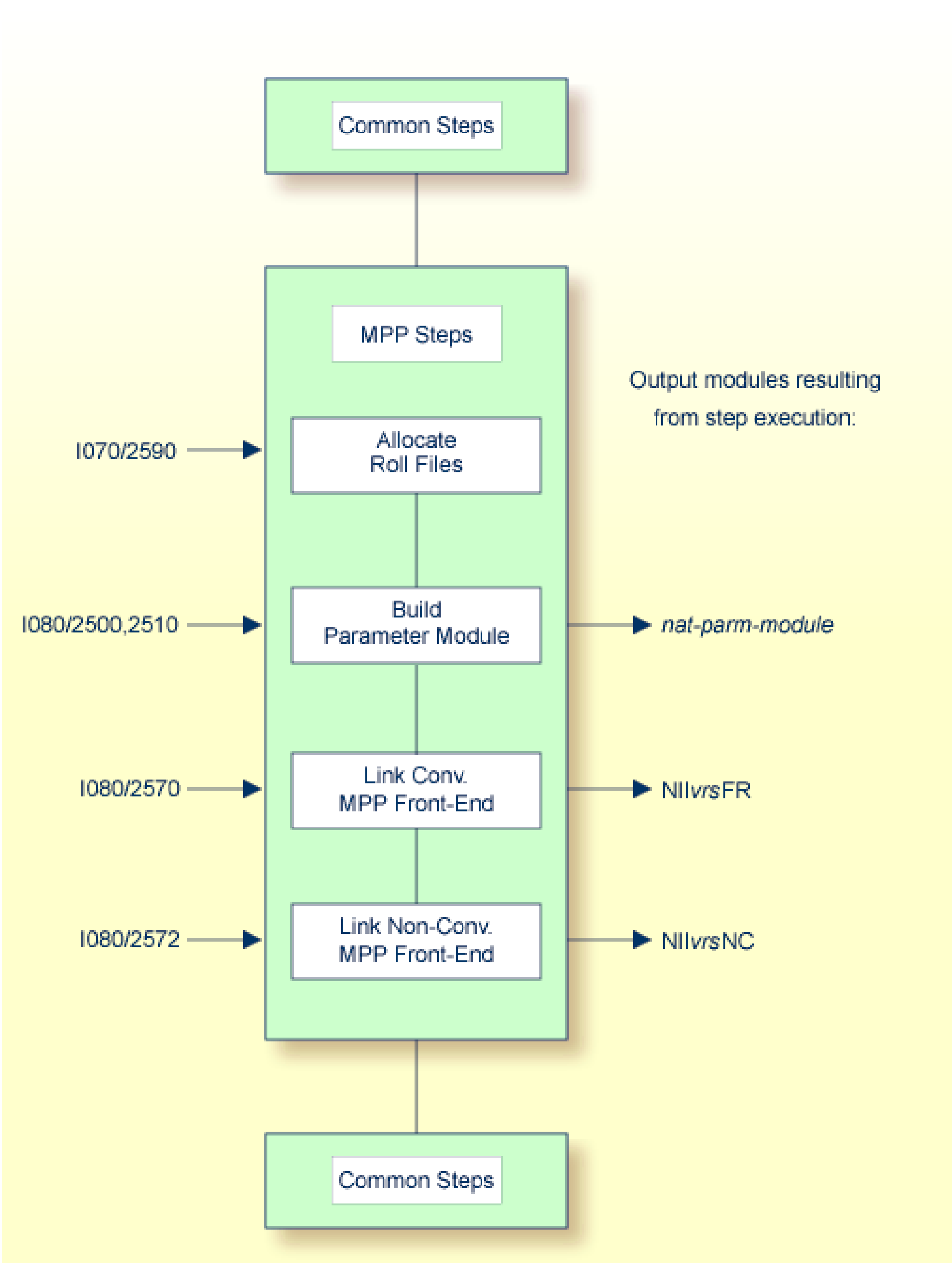
  If you invoke the NTRD front-end by a bootstrap module, you must additionally specify the name of the linked NTRD front-end as the driver name (`DRIVERN` parameter) in the `NIMBOOT` macro. The `NIMBOOT` macro is described in the *TP Monitor Interfaces* documentation.

  If you invoke the NTRD front-end directly by a transaction code, you must additionally specify the name of the linked NTRD front-end as the application program name (parameter `PSB`) in the `APPLCNT` macro.

You can specify the parameter settings for your NTRD environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Installing the Dialog-Oriented MPP Environment

The following is an overview of the installation jobs/steps required to install the Natural IMS TM Interface for the MPP environment:


Common Steps
MPP Steps
Output modules resulting
from step execution:
I070/2590
Allocate
Roll Files
I080/2500,2510
Build
Parameter Module
nat-parm-module
I080/2570
Link Conv.
MPP Front-End
NII*vrs*FR
I080/2572
Link Non-Conv.
MPP Front-End
NII*vrs*NC
Common Steps

Step 1: Allocate and Format the Roll Files

(Job I070, Step 2590)

This step is only required if you do not use the Natural Roll Server.

If you do not want to use the Natural Roll Server, you have to allocate and format the roll files to be used by the Natural IMS TM Interface.

You can allocate up to 5 sequential data sets with a fixed-record format for use as roll files.

1. Allocate the roll files.
2. Format the roll files by using the module `NATRSRFI` described in *Formatting the Roll File* in the *Operations* documentation.

The roll file initialization program produces a WTO message indicating the number of concurrent users which can be serviced by the roll file. For information on the roll file facility, see *Natural Roll Server Functionality* in the *Operations* documentation.

Step 2: Build the Natural Parameter Module

(Job I080, Steps 2500, 2510)

1. Set the profile parameters `FNAT` and `FUSER` (see the *Parameter Reference* documentation) in the Natural parameter module:

   ```
   FNAT=(database-id,file-number)
   FUSER=(database-id,file-number)
   ```

   where *`database-id`* and *`file-number`* are the values you specified when loading the system files during the ***Installation Procedure*** for base Natural.
2. If you want to use a Natural global buffer pool, specify the macro `NTBPI` in the Natural parameter module with the name of the global Natural buffer pool and set the profile parameter `SUBSID` in the parameter module.

   If you want to use any other buffer pool, specify the macro `NTBPI` in the parameter module for each required buffer pool type.

   We strongly recommend that you use a global buffer pool for each buffer pool type.

   If an editor buffer pool is required, you must use a global editor buffer pool.

3. Modify any other parameters in the parameter module whose default values do not meet your requirements. For further information on the parameters contained in the parameter module, see *Building a Natural Parameter Module* in the *Operations* documentation.
4. Assemble and link the Natural parameter module for the dialog-oriented environments.

Step 3: Link the Conversational MPP Front-End

(Job I080, Step 2570)

The front-end consists of the `NIICONV` load module contained in the `NIIvrs.LOAD` data set, the Natural parameter module created in ***Step 2: Build the Natural Parameter Module*** and additional optional modules (see the list of module names supplied with Step 2570).

- Link the front-end for the conversational MPP environment.

> **Important:** The name of the linked MPP front-end must also be specified in the `APPLCNT` macro as the application program name (parameter `PSB`).

You can specify the parameter settings for your conversational MPP environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Step 4: Link the Non-Conversational MPP Front-End

(Job I080, Step 2572)

The front-end consists of the `NIINONC` load module contained in the `NIIvrs.LOAD` data set, the Natural parameter module created in ***Step 2: Build the Natural Parameter Module*** and additional optional modules (see the list of module names supplied with Step 2572).

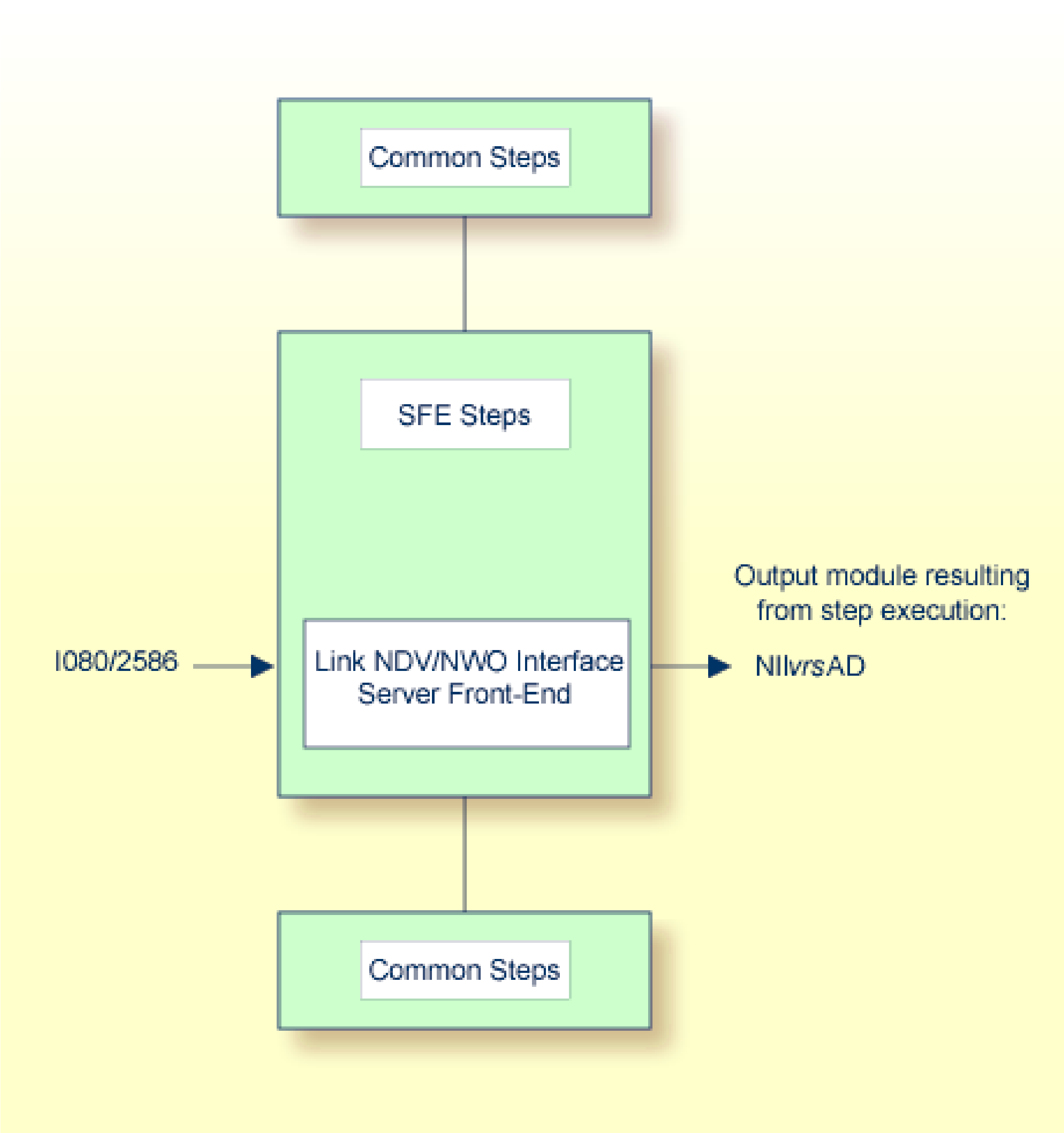
- Link the front-end for the non-conversational MPP environment.

> **Important:** The name of the Non-Conversational MPP front-end must also be specified in the `APPLCNT` macro as the application program name (parameter `PSB`).

You can specify the parameter settings for your non-conversational MPP environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Installing the Natural Development/Natural Web I/O Interface Server

The following steps are required to implement the Natural Development Server (NDV) and the Natural Web I/O Interface (NWO) server in your IMS TM environment.



Note: You are recommended to also read the information contained in the sections *Installing the Natural Development Server IMS Adapter* of the *Natural Development Server for z/OS (Batch)* documentation and *Installing the Natural Web I/O Interface Server IMS Adapter under z/OS* in the *Natural Web I/O Interface* documentation.

Step: Link the Natural Development/Natural Web I/O Interface Server Front-End

(Job I080, Step 2586)

The front-end consists of the `NIISFE` load module contained in the `NII`*`vrs`*`.LOAD` data set, the Natural parameter module created in ***Step 2: Build the Natural Parameter Module*** and additional optional modules (see the list of module names supplied with Step 2586).

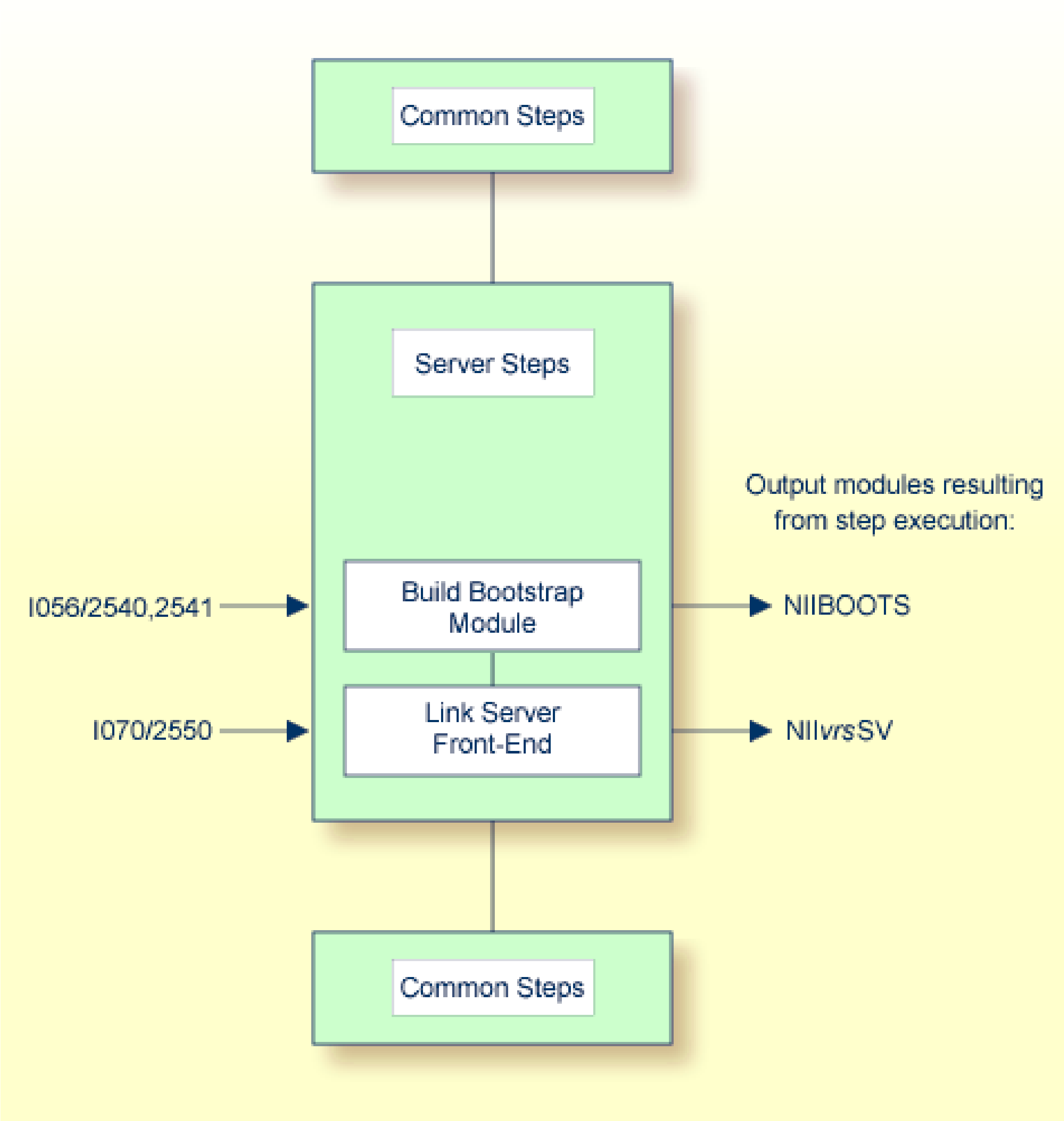
- Link the front-end for the Natural Development Server/Natural Web I/O Interface server.

> **Important:** The name of the linked Natural Development Server/Natural Web I/O Interface server front-end must also be specified in the `APPLCNT` macro as the application program name (parameter `PSB`).

You can specify the parameter settings for your Natural Development Server/Natural Web I/O Interface server environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Installing the Server Environment

The following is an overview of the installation jobs/steps required to install the Natural IMS TM Interface for the sever environment:



- Step 1: Build the NIIBOOTS Bootstrap Module

Step 1: Build the NIIBOOTS Bootstrap Module

(Job I056, Steps 2540, 2541)

1. Create the `NIIBOOTS` source module which contains a call to the `NIMBOOT` macro with the `SERVER` parameter set to `YES`. For the `DRIVERN` parameter, specify the name of the front-end module to be linked in ***Step 2***.
2. Assemble and link the bootstrap module.

Step 2: Link the Server Front-End

(Job I070, Step 2550)

The front-end consists of the `NIISRVD` load module contained in the `NII`*vrs*`.LOAD` data set, the Natural parameter module created in ***Build the Natural Parameter Module*** (see *Installing Natural*) and additional optional modules (see the list of module names supplied with Step 2550).

- Link the front-end for the server environment.

> **Important:** The name of the server front-end must also be specified in the `NIMBOOT` macro as the driver name (parameter `DRIVERN`) described in the *TP Monitor Interfaces* documentation.

You can specify the parameter settings for your server environment by using the parameter macros `NTIMSP` and `NTIMSPE` of the Natural parameter module (see the *Parameter Reference* documentation).

Customizing the IMS TM Environment

The following steps require system modifications to your IMS TM environment.

- Step 4: Create the PRELOAD List

Step 1: Create the APPLCTN Table Definitions for MPP, BMP, NTRD and SFE

Create the APPLCTN table definitions for MPP, BMP and NTRD according to the following examples:

- Example for MPP:

```
APPLCTN PSB=NIIvrsFR,PGMTYPE=TP
      TRANSACT CODE=NATvrs,MODE=SNGL,SPA=512,                          *
          MSGTYPE=(SNLGSEG,RESPONSE,4)
```

> **Important:** The size of the SPA must be set to at least 157 bytes plus the NRAST value specified in the NTIMSPT macro of the Natural parameter module.

- Example for BMP (message-driven or specific for Natural Advanced Facilities):

```
APPLCTN PSB=NIIvrsBM,PGMTYPE=BATCH
      TRANSACT CODE=NATvrsBM,MODE=SNGL,                                *
          MSGTYPE=(SNLGSEG,RESPONSE,4)
```

  This APPLCTN definition is required if you use the CMGETMSG feature.

- Example for BMP (without message queue processing):

```
APPLCTN PSB=NIIvrsBM,PGMTYPE=BATCH
```

- Example for NTRD:

```
APPLCTN PSP=NIIvrsOB,PGMTYPE=TP
        TRANSACT CODE=NATvrsOB,MODE=SNGL,                              *
          MSGTYPE=(MULTSEG,NONRESPONSE,4)
```

- Example for SFE:

```
APPLCTN PSB=NIIvrsAD,PGMTYPE=TP,SCHDTYP=PARALLEL
      TRANSACT CODE=NATvrsAD,MODE=SNGL,                                *
         MSGTYPE=(SNGLSEG,NONRESPONSE,4)
```

Step 2: Create the PSB/ACB for both the MPP and BMP

1. Create the PSB for MPP according to the following example for conversational Natural:

   ```
   PCB TYPE=TP,MODIFY=YES
   PCB TYPE=TP,MODIFY=YES
   PCB TYPE=TP,MODIFY=YES
   PCB TYPE=DB,DBDNAME=NATEXPL,PROCOPT=A,KEYLEN=15
   SENSEG NAME=COURSE
   SENSEG NAME=PREREQ,PARENT=COURSE
   SENSEG NAME=OFFERING,PARENT=COURSE
   SENSEG NAME=TEACHER,PARENT=OFFERING
   SENSEG NAME=STUDENT,PARENT=OFFERING

   PSBGEN PSBNAME=NIIvrsFR,LANG=ASSEM,MAXQ=3,IOASIZE=132
   ```

   The DB-PCB `NATEXPL` refers to the name used for the DBD in a Natural for DL/I installation.

   At least one modifiable TP-PCB must be defined for default use of hardcopy, sending messages and transaction switching. The value of the `WRKPCBS` keyword subparameter (`NTIMSPT` macro in the Natural parameter module) in the current environment table must be less than or equal to the number of PCBs minus 1 to avoid a Natural initialization error.

2. Create the PSB for BMP according to the following example:

   ```
   PCB TYPE=TP,MODIFY=YES
   PCB TYPE=TP,MODIFY=YES
   PCB TYPE=DB,DBDNAME=NATEXPL,PROCOPT=A,KEYLEN=15
   SENSEG NAME=COURSE
   SENSEG NAME=PREREQ,PARENT=COURSE
   SENSEG NAME=OFFERING,PARENT=COURSE
   SENSEG NAME=TEACHER,PARENT=OFFERING
   SENSEG NAME=STUDENT,PARENT=OFFERING

   PSBGEN PSBNAME=NIIvrsBM,LANG=ASSEM,MAXQ=3,IOASIZE=132
   ```

   The DB-PCB `NATEXPL` refers to the name used for the DBD in a Natural for DL/I installation.

   At least one modifiable TP-PCB must be defined for default use of hardcopy and sending messages. The value of the `WRKPCBS` keyword subparameter in the current environment table must be less than or equal to the number of PCBs minus 1 to avoid a Natural initialization error.

3. After creating the required `APPLCTN`s for the BMP and MPP environments, generate the PSB, DBD and ACB.

4. After generating the ACB, activate the new definitions by issuing the following commands :

```
/MODIFY PREP ACBLIB
/MODIFY COMMIT
```

Step 3: Create the BMP and MPP Regions

(Job I200, Steps 2500, 2504)

- Create the BMP region (Step 2500) according to the `BMPJOB` sample member.
- Create the MPP region (Step 2504) according to the `MPPJOB` sample member.

Step 4: Create the PRELOAD List

- Update the `PRELOAD` list by using a `PRELOAD` member `DFSMPL` *xx* with the names of the following modules:

  the nucleus,
  the interface module,
  the front-end, and
  the Adabas link module.

  Example for MPP:

  ```
  NATvrsSH,NIIvrsIF,NIIvrsFR,ADALNI
  ```

  Example for BMP:

  ```
  NATvrsSH,NIIvrsIF,NIIvrsBM,ADALNK
  ```

- If alias names are used for any members in the `PRELOAD` list, these names should be added to the `PRELOAD` list as well. Failure to do so leads to performance degradation.

Special Considerations:

- The region size must be large enough to hold the nucleus, the interface module, the front-end, the Natural thread and about 20 KB of working storage below the line.
- Include the load libraries used by the Natural IMS TM Interface.
- Include the DD statement for the roll file created in *Step 1: Allocate and Format the Roll Files*:

```
//ROLLFn   DD  DSN=....DISP=SHR
```

where *n* is a value from 1 - 5.

- Include the DD statement for `NATRJE`:

```
//NIIRJEDD   DD  SYSOUT=(X,INTRDR)
```

- In the JCL of the MPP region, add the `SYSTPCD` DD statement if the Natural Development Server or Natural Web I/O Interface server is used. See IBM's *z/OS V1Rx.0 Communications Server IP Configuration Guide, Chapter 1.5.2, Configuring TCPIP.DATA*.

Installation Verification

You can verify the successful installation of the Natural IMS TM Interface by following the instructions in this section.

- Start Batch Natural
- Start and Test Online Natural

Start Batch Natural

1. From an IMS TM session, start a BMP with the following IMS TM command:

```
/STA REG BMPJOB
```

2. Check the output. The output results from the Natural system command `TECH` described in the *System Commands* documentation. Verify the output in your environment.

Start and Test Online Natural

1. From an IMS TM session, issue the following IMS TM commands:

```
/STA REG MPPJOB
/STA TRAN NATvrs
/STA PROG NIIvrsFR
```

The Natural IMS TM Interface is available.

2. From an IMS TM session, type in the following transaction name:

```
NATvrs
```

A Natural session is started.

3. Proceed with the steps described in the section ***Test Online Natural***.

XI Installing Natural TSO Interface on z/OS

14 Installing Natural TSO Interface on z/OS

This document describes the steps for installing the Natural TSO Interface (product code NTI) on z/OS.

Related Topics:

For information on how to operate Natural in a TSO environment, see *Using Natural with TP Monitors* and *Natural under TSO* in the *TP Monitor Interfaces* documentation and the following topics:

- *General Information about the Natural TSO Interface*
- *Data Sets Used by Natural under TSO*

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data set required for product installation:

Data Set Name	Contents
`NTIvrs.LOAD`	Load modules

Copy the data set into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NATvrs.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Note for LE Options:

If you want Natural to run in the IBM Language Environment (LE), set the **System Maintenance Aid (SMA)** parameter NAT-LE to Y (Yes). The default setting is N (No). Additionally, if you want to modify the LE options in the NATLEOPT source module or if you use non-Natural programs running in 24-bit mode, set the appropriate SMA parameter as described in ***Build the Natural-Specific IBM Language Environment Options*** in *Installing Natural*.

The installation procedure comprises the following:

- Step 1: Create the CLIST for the Natural TSO Interface
- Step 2: Create ADARUN Cards
- Step 3: Build the Natural Parameter Module
- Step 4: Link the Nucleus
- Step 5: Make the Adabas Interface Available

Step 1: Create the CLIST for the Natural TSO Interface

(Job I070, Step 2400)

- Create a TSO CLIST for Natural.

  This CLIST is used later to invoke Natural under TSO. Note that the CLIST supplied with this step is only a basic example which you can adapt to your requirements and to your TSO environment.

Step 2: Create ADARUN Cards

(Job I070, Step 2410)

- Create ADARUN cards in a source library.

  This is required by the CLIST created in ***Step 1: Create the CLIST for the Natural TSO Interface***.

Step 3: Build the Natural Parameter Module

(Job I080, Steps 0010, 0015)

1. Modify the Natural parameter module for TSO.
   - Configure the TSO batch interface:

     Modify the settings of the parameters supplied with the `NTTSOP` macro in the Natural parameter module to meet your requirements. For descriptions of these parameters, see the corresponding dynamic profile parameter `TSOP` in the *Parameter Reference* documentation.
   - Modify the following parameters:

     ```
     FNAT=(database-id,file-number)
     FUSER=(database-id,file-number)
     ```

     where *`database-id`* and *`file-number`* are the values you specified when loading the system files during the ***Installation Procedure*** for base Natural.
   - Global buffer pool:

     If you want to use a global buffer pool, specify the `NTBPI` macro.
   - For all other parameters:

     You can generally use the default values. Modify only the values of those parameters whose default values do not suit your requirements. For descriptions of the individual parameters contained in the parameter module, refer to the *Parameter Reference* documentation.

   For dynamic assignment of profile parameters, see also the `CMPRMIN` data set described in the section *Natural in Batch Mode* in the *Operations* documentation.
2. Assemble and link the Natural parameter module.

Step 4: Link the Nucleus

(Job I080, Step 0020)

- Link the **environment-dependent nucleus**.

Step 5: Make the Adabas Interface Available

Skip this step if the Adabas link module is available in your LPA.

- Perform either of the following steps:
  - Include the Adabas load library in the steplib of your TSO user procedures.
  - Copy the modules listed in the section referring to installation with TSO of the appropriate Adabas installation documentation to a library of your TSO user steplib.

Installation Verification

You can verify the successful installation of the Natural TSO Interface by performing the following steps:

1. Start a TSO session in ISPF mode.
2. Invoke the CLIST you created in *Step 1: Create the CLIST for the Natural TSO Interface*.

   Example:

   ```
   TSO EX 'SAGLIB.SMASRCE(NTICLIST)'
   ```

3. Proceed with the steps described in the section *Test Online Natural*.

XII Installing Natural for DB2 on z/OS

15 Installing Natural for DB2 Version 8.2.8 on z/OS

This document describes the steps for installing Natural for DB2 Version 8.2.8 (product code NDB) on z/OS.

Related Topic:

For information on how to operate Natural in a DB2 environment, see *Natural for DB2* in the *Database Management System Interfaces* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

The following software must be installed before you can install Natural for DB2:

- **Natural** (you cannot install Natural and Natural for DB2 at the same time)
- **Software AG Editor**

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NDB*vrs*.LOAD	Load modules
NDB*vrs*.SRCE	Source modules and macros
NDB*vrs*.JOBS	Sample installation jobs
NDB*vrs*.INPL	Natural objects
NDB*vrs*.ERRN	Natural error messages

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read *Installation Process and Major Natural Features* before you start the installation procedure.

The installation procedure comprises the following:

- Common Installation Steps
- Installation Steps Specific to CICS
- Installation Steps Specific to Com-plete
- Installation Steps Specific to IMS TM
- Installation Steps Specific to TSO

Common Installation Steps

This section described the installation steps that apply to all Natural environments where Natural for DB2 can be installed. The steps additionally required for a particular TP monitor are described in the following sections.

- DB2 Upgrade Considerations
- Step 1: Allocate the DBRM Library for Use with Natural for DB2
- Step 2: Generate the Natural for DB2 I/O Module NDBIOMO
- Step 3: Build NDBIOMO
- Step 4: Bind the DBRM NDBIOMO into a Package
- Step 5: Create the DB2 Plan for Use with Natural for DB2
- Step 6: Link-Edit NATGWDB2
- Step 7: Build the Natural Parameter Module
- Step 8: Link the Nucleus
- Step 9: Load New Objects
- Step 10: Load the Natural Error Messages
- Step 11: Create the Natural for DB2 Server Stub

DB2 Upgrade Considerations

If you upgrade to a newer DB2 version, you need not upgrade your current Natural for DB2 installation.

If you upgrade to a newer DB2 version and also want to upgrade to a newer Natural for DB2 version, consider the following:

- Do not recreate the `NDBIOMO` module with the DB2 version parameter of the new DB2 version, unless the new-function mode is enabled in the new DB2 version. In this case, skip the Steps 2 to 5.
- If the new-function mode is enabled in the new DB2 version, you only need to create a new `NDBIOMO` module if you want to use the new DB2 statements added to the `NDBIOMO` module for the new DB2 version. Otherwise, you can also skip the Steps 2 to 5.

Step 1: Allocate the DBRM Library for Use with Natural for DB2

- Allocate a PDS as DBRM (database request module) library. The size of this data set and the number of directory entries depend on the particular site (5 tracks and 20 directory blocks must be adequate for most environments). The PDS must have a fixed-block record format and a record length of 80.

  Any standard data set name can be used for this DBRM library; however, this installation procedure assumes that the name `SAGLIB.DB2DBRM` is used.

Step 2: Generate the Natural for DB2 I/O Module NDBIOMO

(Job I055, Step 1600)

1. Execute the standard Natural batch job provided with this step to generate the assembly source for the `NDBIOMO` module from the `NDBIOTM` member. This batch job invokes the Natural program `NDBGENI`, which is loaded with the Natural **INPL utility** during the installation of base Natural.

   `NDBIOMO` provides dynamic access to DB2 and contains all necessary `EXEC SQL` statements. In addition, it contains some special SQL statements which cannot be executed in dynamic mode. See also *I/O Module NDBIOMO for Dynamic SQL Statement Execution* in the *Database Management System Interfaces* documentation.

2. Modify the following two positional parameters contained in `NDBGENI` to meet your requirements.
   - The first parameter restricts the use of SQL statements to those supported by a particular DB2 version. Set this parameter to one of the following values:

     `DB2V9` for DB2 Version 9 in new-function mode, or any higher DB2 version,
     `DB2V10` for DB2 Version 10 in new function mode, or any higher DB2 version, or

DB2V11 for DB2 Version 11 in new function mode, or any higher DB2 version.

- The second parameter specifies the maximum number of parallel dynamic prepared DB2 statements.

3. Check the output report created by this job for successful job completion. In addition, a condition code of 0 indicates normal completion.

Step 3: Build NDBIOMO

(Job I055, Step 1610)

- Precompile, assemble and link the Natural for DB2 I/O module NDBIOMO.

  The link-edit step receives a condition code of 4 because of unresolved references for DSNHLI. This is normal and can be ignored.

Step 4: Bind the DBRM NDBIOMO into a Package

(Job I055, Step 1620)

- Bind the DBRM NDBIOMO into a package.

Step 5: Create the DB2 Plan for Use with Natural for DB2

(Job I055, Step 1630)

- Create the DB2 plans to be used by Natural for DB2 in batch mode, TSO and under CICS.

Step 6: Link-Edit NATGWDB2

(Job I055, Step 1680)

- Link-edit the Natural for DB2 load module NATGWDB2.

Step 7: Build the Natural Parameter Module

(Job I060, Steps 0010, 0015)

Build the Natural parameter module for batch mode. The macros and parameters mentioned in this section are described in the *Parameter Reference* documentation.

1. Modify the settings of the parameters supplied with the Natural parameter module as required:
   - Set the parameters supplied with the NTOSP macro to configure the z/OS batch interface. For descriptions of these parameters, see the corresponding dynamic profile parameter OSP.
   - Set the parameters specific to Natural for DB2 supplied with the NTDB2 macro. For descriptions of these parameters, see the corresponding dynamic profile parameter DB2.

See also *Natural Parameter Modifications for Natural for DB2*.

2. Assemble and link the Natural parameter module.

Step 8: Link the Nucleus

(Jobs I060, I080)

1. Link the **environment-dependent nucleus**:

   Add the following `INCLUDE` statements and corresponding DD statements to the link instructions for the linkage editor:

`INCLUDE SMALIB(`*`nat-parm-module`*`)`	Natural parameter module, where *`nat-parm-module`* is the module name used in *Step 7: Build the Natural Parameter Module*
`INCLUDE DSNLIB(DSNTIAR)`	SQL error message module
`INCLUDE NDBLIB(NDBPARM)`	Natural for DB2 load module contained on the `NDB`*`vrs`*`.LOAD` data set.
`INCLUDE SMALIB(NDBIOMO)`	Natural for DB2 I/O module created in *Step 3: Build NDBIOMO*
`INCLUDE `*`xxxxxxxx(yyyyyyyy)`*	Environment-dependent DB2 interface (see below)

   Depending on your environment, specify the appropriate DB2 interface *`yyyyyyyy`* from library *`xxxxxxxx`* in your `INCLUDE` statement as shown in the following table:

Interface	Library	Environment
`DSNALI`	`DSNLIB`	Under TSO and in batch mode without running under the control of the DSN command processor, that is, with CAF (Call Attachment Facility)
`DSNRLI`	`DSNLIB`	WLM (Workload Manager) stored procedure address space and Natural Development Server (recommended) This can also be used in TSO and batch environments.
`DSNELI`	`DSNLIB`	Under TSO and in batch mode when running under the control of the DSN command processor
`DSNCLI`	`DFHLIB`	Under CICS
`DFSLI000`	`IMSLIB`	Under IMS TM (MPP and BMP) and in batch mode using the DB2 DL/I batch support (`DSNMTV01`)
`NDBCOM`	`NDBLIB`	Under Com-plete

2. Link the **environment-independent nucleus**:

Add the following `INCLUDE` statement and corresponding DD statement to the link instructions for the Natural for DB2 load module:

```
INCLUDE SMALIB(NATGWDB2)
```

Alternatives

Instead of linking the nucleus in the way described above, you can use one of the following methods:

1. Create an environment-dependent nucleus without environment-independent nucleus:

   Link all environment-dependent parts to the environment-independent parts, thus creating one environment-dependent nucleus.
2. Separate the `NATGWDB2` module (not linked to the nucleus):

   Remove the Natural for DB2 load module `NATGWDB2` from the environment-independent nucleus and run it as a separate module by using the Natural Resolve STATIC Addresses feature (RCA).

   You can modify the name of the `NATGWDB2` module linked in ***Step 6***. However, if you use a name different from `NATGWDB2`, this name must be specified as an alias name in the `NTALIAS` macro (see the *Parameter Reference* documentation) in the Natural parameter module.
3. Separate the Natural parameter module:

   Move all environment-dependent Natural parts (Natural parameter module) and Natural for DB2 parts (DB2 interface, DB2 error message module, `NDBIOMO` and `NDBPARM`) into a separate Natural parameter module with the mandatory name `CMPRMTB`.

   This Natural parameter module has a separate link and must be loaded by specifying its name in the profile parameter `PARM` (described in the *Parameter Reference* documentation).

The following applies when linking a separate `NATGWDB2` module (Alternative 2 above) or a separate Natural parameter module (Alternative 3 above):

TP Monitor	Requirement
CICS	The resulting module must be defined as PPT entry or RDO. PPT entry:

TP Monitor	Requirement
	`DFHPPT TYPE=ENTRY,PROGRAM=module-name,PGMLANG=ASSEMBLER`
Com-plete	The resulting module must be defined as `RESIDENTPAGE` or reside in the LPA/(E)LPA.

Step 9: Load New Objects

(Job I061, Step 1610)

Before executing this step, change the `CMWKF01` DD statement to point to the `NDBvrs.INPL` data set.

- Load the Natural objects specific to Natural for DB2 from the `NDBvrs.INPL` data set into the Natural system file by using the Natural **INPL utility**. The Natural objects are loaded into the Natural system libraries `SYSDDM`, `SYSTEM` and `SYSDB2` in the `FNAT` system file.

  Important: Ensure that your newly created `SYSDB2` library contains all necessary Predict interface programs which are loaded into `SYSDB2` when installing Predict (see the relevant *Predict* documentation).

Step 10: Load the Natural Error Messages

(Job I061, Step 1620)

Before executing this step, change the `CMWKF02` DD statement to point to the `NDBvrs.ERRN` data set.

- Load the Natural error messages specific to Natural for DB2 from the `NDBvrs.ERRN` data set by executing the Natural batch job that runs the `ERRLODUS` load program of the Natural SYSERR utility (see the *Utilities* documentation).

  `ERRLODUS` loads the error messages into the Natural system library `SYSERR` in the `FNAT` system file.

Step 11: Create the Natural for DB2 Server Stub

(Job I070, Steps 1604, 1606, 1608, 1610)

1. Create server stubs to execute Natural stored procedures and Natural user-defined functions. Natural for DB2 server stubs are interface modules between the DB2 database system and the Natural server. The server stub must be installed in order to execute Natural stored procedures and Natural user-defined functions.

   There are two types of server stub:

   Natural for DB2 server stub (module NDB*vr*SRV, Steps 1604 and 1606)
   The server stub is used to execute Natural stored procedures and Natural user-defined functions.

The IBM Language Environment (LE) runtime modules required must be linked to the Natural for DB2 server stub module. Use the CALL option of the linkage editor and assign the LE runtime library as `SYSLIB`.

Natural for DB2 start server stub (module NDB*vr*STR, Steps 1608 and 1610)

The start server stub is used to start the Natural server environment(s) explicitly.

The IBM LE runtime modules required must be linked to the Natural for DB2 start server stub module. Use the CALL option of the linkage editor and assign the LE runtime library as `SYSLIB`. Additionally, include the modules `NDBSTRP` (delivered with Natural for DB2) and `NATCONFG` (delivered with Natural) from `NDBvrs.LOAD` and `NATvrs.LOAD`.

2. Natural for DB2 server stubs are generated from the `NDBSTUB` macro. You can generally use the default values for all parameters. Modify only the values of the parameters whose default values do not suit your requirements. The individual parameters are described in the section ***Natural for DB2 Server Stub***.
3. Place the resulting load modules into a steplib library of the JCL used to execute the DB2 stored procedure address space.
4. For DB2 UDB, each Natural stored procedure or Natural user-defined function must be defined by a DB2 `CREATE PROCEDURE` or DB2 `CREATE FUNCTION` statement, where the name of the generated Natural for DB2 server stub module `NDBvrSRV` is specified as `EXTERNAL NAME`.

Step 12: Bind the DBRM ROUTINEN into a Package

(Job I070, Step 1615)

- Bind the DBRM `ROUTINEN` into a package.

  The DBRM `ROUTINEN` is contained in the collection `SAGNDBROUTINENPACK` and delivered with Natural for DB2. Natural for DB2 needs this collection to access the DB2 catalog and retrieve the parameter descriptions of Natural stored procedures and Natural user-defined functions.

Installation Steps Specific to CICS

This section describes the additional steps required to install Natural for DB2 in a CICS environment.

Ensure that your Natural/CICS thread size is large enough to contain the `DB2SIZE`; if you use the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation), additional storage of 8 KB is required.

This section covers the following topics:

Using Plan Selection by CICS RCT Entry Threads

(Job I005)

If you want fixed assignment of your transaction code to the DB2 plan, add an additional entry to your CICS RCT, or define a `DB2Entry` with RDO by performing one of the following alternative steps:

- Modify your RCT:

  ```
  DSNRCT TYPE=ENTRY,PLAN=plan-name,TXID=(transaction-id)
  ```

  where *plan-name* must be the same as the name used to create the DB2 plan for Natural for DB2: see ***Common Installation Steps***.

  Assemble and link the RCT.

- Define a DB2Entry with RDO:

  ```
  DEFINE DB2ENTRY
    OVERTYPE TO MODIFY                                            CICS RELEASE = nnnn
    CEDA  DEFine DB2Entry(          )
     DB2Entry        : DB2ENTR
     Group           : NCI
     DEscription     :
    THREAD SELECTION ATTRIBUTES
     TRansid         : transaction-id
    THREAD OPERATION ATTRIBUTES
     ACcountrec      : None                None ! TXid ! TAsk ! Uow
     AUTHId          :
     AUTHType        : Userid              Userid ! Opid ! Group ! Sign ! TErm
                                           ! TX
     DRollback       : Yes                 Yes ! No
     PLAN            : plan-name
     PLANExitname    :
     PRIority        : High               High ! Equal ! Low
     PROtectnum      : 0005                0-2000
     THREADLimit     : 0005                0-2000
     THREADWait      : Pool                Pool ! Yes ! No
  ```

plan-name must be the same as the name used to create the DB2 plan for Natural for DB2: see ***Common Installation Steps***.

For explanations of the parameters, refer to the relevant CICS literature from IBM.

Using Plan Selection by Dynamic Plan Exit

If you want to perform plan selection by using the dynamic plan exit, perform the following steps:

Step 1: Build the CICS Dynamic Plan Selection Exit Module NDBUEXT

(Job I070, Step 1630)

1. If you want to specify a default plan name, modify the source module `NDBUEXT`.

   The sample exit `NDBUEXT` can be modified to use a default plan name if none has been specified prior to the first SQL call. Review the source code in the module `NDBUEXT` for details about specifying a default plan name.
2. Precompile, assemble and link `NDBUEXT` for CICS.

   This step receives a condition code of 4 because of an unresolved external reference for `DFHEAI0` and `DFHEI1`. This is normal and can be ignored.

Step 2: Link the CICS Dynamic Plan Selection Exit Module NDBUEXT

(Job I075, Step 1640)

- Link the module `NDBUEXT` resulting from the previous step to the CICS load library and define it via a corresponding PPT entry or RDO.

  PPT entry:

  ```
  DFHPPT TYPE=ENTRY,PROGRAM=NDBUEXT,PGMLANG=ASSEMBLER
  ```

  For explanations of the parameters, refer to the relevant CICS literature from IBM.

Step 3: Define a DB2Entry

Perform the following step:

- Define a DB2Entry with RDO:

```
DEFINE DB2ENTRY
  OVERTYPE TO MODIFY                                                      CICS RELEASE = nnnn
  CEDA  DEFine DB2Entry(          )
   DB2Entry        : DB2ENTR
   Group           : NCI
   DEscription     :
  THREAD SELECTION ATTRIBUTES
   TRansid         : transaction-id
  THREAD OPERATION ATTRIBUTES
   ACcountrec      : None              None ! TXid ! TAsk ! Uow
   AUTHId          :
   AUTHType        : Userid            Userid ! Opid ! Group ! Sign ! TErm
                                       ! TX
   DRollback       : Yes               Yes ! No
   PLAN            :
   PLANExitname    : NDBUEXT
   PRIority        : High             High ! Equal ! Low
   PROtectnum      : 0005              0-2000
   THREADLimit     : 0005              0-2000
   THREADWait      : Pool              Pool ! Yes ! No
```

The parameter `PLANExitname` must specify the same program as the `NAME` statement of ***Step 2: Link the CICS Dynamic Plan Selection Exit Module NDBUEXT***.

Alternatively or additionally, you can specify the plan exit program `NDBUEXT` with the `PLANExitname` parameter of `POOL THREAD ATTRIBUTES` of the `DB2Conn` resource definition of CICS TS.

Installing the Natural File Server with VSAM

If you want to use the Natural file server with VSAM, perform the following additional installation steps:

- Step 1: Define a VSAM Data Set for the Natural File Server
- Step 2: Format the Natural File Server Data Set
- Step 3: Build the CICS Table
- Step 4: Restart CICS

Step 1: Define a VSAM Data Set for the Natural File Server

(Job I008, Step 1610)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 2: Format the Natural File Server Data Set

(Job I075, Step 1610)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Build the CICS Table

1. Add an additional FCT entry required for the Natural file server and the DB2 components of Natural according to the following example:

```
CMFSERV  DFHFCT TYPE=DATASET,                                                *
                 ACCMETH=VSAM ,                                              *
                 BUFND=5,                                                    *
                 BUFNI=4,                                                    *
                 DATASET=CMFSERV,                                            *
                 DISP=SHR,                                                   *
                 DSNAME=SAGLIB.NCIDB2.SERVER,                                *
                 FILSTAT=(ENABLED,CLOSED),                                   *
                 JID=NO,                                                     *
                 LOG=NO,                                                     *
                 LSRPOOL=NONE,  1-8 ONLY FOR XA; NONE                        *
                 RECFORM=(FIXED,BLOCKED),                                    *
                 RSL=PUBLIC,                                                 *
                 SERVREQ=(ADD,UPDATE,DELETE,BROWSE),                         *
                 STRNO=4
```

2. Assemble and link the CICS table.

Step 4: Restart CICS

- Restarting CICS is required, because of the additional FCT entry specified in the previous step.

Installation Steps Specific to Com-plete

Under Com-plete, the installation procedure of Natural for DB2 continues with the adaptation of your Com-plete environment.

Ensure that the changes required for DB2 have been applied to your Com-plete environment (see the relevant section in the *Com-plete* documentation).

Installation Steps Specific to IMS TM

This section describes the additional steps required to install Natural for DB2 in an IMS TM environment.

Ensure that the thread of your Natural IMS TM Interface is large enough to contain the `DB2SIZE`; if you use the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation), additional storage of 8 KB is required.

Binding DB2 Plans

(Job I055, Steps 1631, 1632, 1633, 1634 for IMS MPP conversational, IMS BMP, IMS MPP non-conversational, OBMP)

- Build the DB2 plan to be used by Natural for DB2 in all IMS TM environments supported by Natural.

Using Plan Selection with IMS TM Resource Translation Table

If the name (or any `ALIAS`) of your **environment-dependent nucleus** does not match the name of your DB2 plan or if you want to use the same DB2 plan for all IMS TM environments, you must use a Resource Translation Table (RTT).

- Modify, assemble and link the IMS TM RTT:

  Add an additional `DSNMAPN` macro to your RTT as follows (for any other parameters, refer to the relevant DB2 literature from IBM):

  `DSNMAPN` macro:

  ```
  DSNMAPN APN=load-module,PLAN=plan-name
  ```

  where *`load-module`* is the environment-dependent nucleus (that is, the IMS TM application program) and *`plan-name`* is the same as the one used in ***Binding DB2 Plans***.

Installing the Natural File Server with VSAM

Be aware that database loops cannot be continued across terminal I/Os without using the Natural file server.

If you want to use the Natural file server with VSAM, perform the following additional installation steps:

Step 1: Define the VSAM Data Set for the Natural File Server

(Job I008, Step 1600)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 2: Format the Natural File Server Data Set

(Job I075, Step 1600)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Update the JCL for the MPP Region

- Include the DD statement `CMFSERV` to define the Natural file server data set.
- Increase the `REGION` parameter if necessary.

Step 4: Restart the MPP Region Used by Your Natural IMS TM Interface

- Restart your MPP region, because of the additional DD statement.

Installation Steps Specific to TSO

This section describes the additional installation steps required in a TSO environment if you want to use the Natural file server with VSAM:

Step 1: Modify NDBFSRV in NTTSOP

- Set the keyword subparameter `NDBFSRV` (see the *Parameter Reference* documentation) in the `NTTSOP` macro to `ON` and reassemble and relink your Natural TSO Interface.

Step 2: Define the VSAM Data Set for the Natural File Server

(Job I008, Step 1620)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Format the Natural File Server Data Set

(Job I075, Step 1620)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Installation Verification

This section provides example batch jobs and online methods for verifying the successful installation of Natural for DB2.

- Online Verification Methods

Test Batch Natural for DB2 under CAF - Job NDBBATCA

NDBBATCA contains sample JCL to test Natural for DB2 in batch mode by using the CAF (Call Attachment Facility) interface.

Modify the sample JCL to meet your requirements.

Before the first SQL call, you must call NATPLAN to explicitly allocate the plan. The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. NATPLAN can be edited to specify the appropriate DB2 subsystem ID.

Test Batch Natural for DB2 under DSN - Job NDBBATTB

NDBBATTB contains sample JCL to test Natural for DB2 in batch mode by using the DSN command processor. Modify the sample JCL to meet your requirements.

The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. For explanations of the DSN and RUN commands, refer to the relevant IBM literature for DB2/TSO and batch users.

Test DSNMTV01 - Job NDBMTV01

NDBMTV01 contains a sample JCL to execute Natural by using the DB2 DL/I batch support.

Modify the sample JCL to meet your requirements.

The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***.

Test TSO Natural for DB2 under CAF - CLIST NDBCAF

You can perform the following steps to test the TSO installation of Natural for DB2 under CAF (Call Attachment Facility):

1. **Adapt CLIST NDBCAF**

   (Job I070, Step 240C)

   Change the library and program names in the CLIST NDBCAF to meet your requirements. If you do not use the Natural file server, remove the ALLOC and FREE statements for CMFSERV.

2. **Invoke Natural**

   Invoke Natural by executing the CLIST adapted in the **previous step**. Ensure that DB2 tables can be accessed and that plan switching can be performed.

Before the first SQL call, you must call `NATPLAN` to explicitly allocate the plan. The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. `NATPLAN` can be edited to specify the appropriate DB2 subsystem ID.

Test TSO Natural for DB2 under DSN - CLIST NDBTSO

You can perform the following steps to test the TSO installation of Natural for DB2 under DSN:

1. **Adapt CLIST NDBTSO**

   (Job I070, Step 240B)

   Change the subsystem ID and the library, plan and program names in the CLIST `NDBTSO` to meet your requirements. If you do not use the Natural file server, remove the `ALLOC` and `FREE` statements for `CMFSERV`.

2. **Invoke Natural**

   Invoke Natural by executing the CLIST created in the previous step. Ensure that DB2 tables can be accessed. The plan name must be the same as the name used in ***Binding DB2 Plans***. For explanations of the `DSN` and `RUN` commands, refer to the relevant IBM literature for DB2/TSO and batch users.

Online Verification Methods

You can verify the successful installation of Natural for DB2 online by using either **SQL Services** or `DEM2` example programs:

- Using SQL Services
- Using DEM2* Example Programs

Using SQL Services

You can verify the successful installation of Natural for DB2 by using the **SQL Services (NDB/NSQ)** function (described in the *Database Management System Interfaces* documentation) of the Natural SYSDDM utility:

1. Invoke Natural.
2. Invoke the SYSDDM utility.
3. In the SYSDDM main menu, enter function code `B` to invoke **SQL Services (NDB/NSQ)**.
4. Enter function code `S` to select all DB2 tables.

   The communication between Natural and DB2 works if all existing DB2 tables are displayed.

   For one of the tables, generate a Natural DDM as described in the section *Generate DDM from an SQL Table* in the *Database Management System Interfaces* documentation.

5. After you have generated a DDM, access the corresponding DB2 table with a simple Natural program as indicated in the following example:

```
DEFINE DATA
01 view-name OF ddm-name
02 field
...
END-DEFINE
FIND view-name WITH field = value
  DISPLAY field
END-FIND
END
```

   where:
   `view-name` is a view of the DDM `ddm-name`,
   `field` is a DDM field,
   `value` is the search value to be used for the field.

If you receive the message NAT3700, enter the Natural system command `SQLERR` to display the corresponding SQL return code. `SQLERR` is described in the *System Commands* documentation.

Using DEM2* Example Programs

You can also use the `DEM2*` example programs in the Natural system library `SYSDB2` provided on the installation medium to verify and test your installation.

You can create a DB2 table with `DEM2CREA`, and then create the corresponding DDM by using the Natural SYSDDM utility. You can store data in the created table with `DEM2STOR`, and retrieve data from the table with `DEM2FIND` or `DEM2SEL`. You can also drop the table with the `DEM2DROP` program.

Natural Parameter Modifications for Natural for DB2

This section covers the following topics:

- Natural Profile Parameter Settings

- Performance Considerations for the DB2SIZE Parameter

Natural Profile Parameter Settings

Adapt the Natural parameter module to meet your requirements. The Natural parameters mentioned in this section are described in the *Parameter Reference* documentation.

DB2SIZE Parameter

Specify the profile parameter `DB2SIZE`:

```
DB2SIZE=nn
```

`DB2SIZE` indicates the size of the work area used for processing SQL requests. It must be set to at least 6 KB.

The setting of `DB2SIZE` also depends on whether you use the Natural file server or not. If the Natural file server is not used, the setting can be calculated according to the following formula:

```
((1064 + n1 * 48 + n2 * 120) + 1023) / 1024 KB
```

If the Natural file server is used, the setting can be calculated according to the following formula:

```
((1160 + n1 * 48 + n2 * 160 + n3 * 8) + 1023) / 1024 KB
```

The variables `n1`, `n2` and `n3` correspond to the following:

`n1`	Number of statements for dynamic access as specified as the second parameter in ***Step 2: Generate the Natural for DB2 I/O Module NDBIOMO***
`n2`	Maximum number of nested database loops as specified with the `MAXLOOP` parameter in the `NTDB2` macro
`n3`	Maximum number of Natural file server blocks to be allocated per user specified as the fifth parameter in **Job I075, Step 1620,** or the `EBPMAX` parameter in the `NTDB2` macro, if you decided to use the Software AG Editor buffer pool as the Natural file server

The `DB2SIZE` parameter can also be specified dynamically at the start of a Natural session.

Important: Ensure that you have also added the Natural parameters required for the Software AG Editor; see the relevant installation description in the section ***Installing Software AG Editor***.

NTDB Macro

Specify database type DB2 and a list of DBIDs (database IDs) in the `NTDB` macro. All Natural DDMs that refer to a DB2 table must be cataloged with a DBID from this list. DBID can be any number from 1 to 65535. For most environments, one DBID (usually 250) is sufficient for database type DB2.

The DB2 DBIDs can also be specified dynamically at the start of a Natural session by using the `DB` profile parameter.

Important: Ensure that all DB2 DDMs used when cataloging a given program have a valid DB2 DBID. Also ensure that the DBIDs selected in the `NTDB` macro for DB2 do not conflict with DBIDs selected for other database systems.

NTDB2 Macro

Set the keyword subparameters in the `NTDB2` macro according to your requirements.

The `NTDB2` keyword subparameters can also be specified dynamically at the start of a Natural session by using the profile parameter `DB2`.

NTLFILE Macro

Set the profile parameter `LFILE` in the macro `NTLFILE` to specify a logical DBID (database ID) that relates to database type DB2:

```
NTLFILE 100,250,1
```

This is necessary for using ISQL or calling `NDBISQL` with Natural for DB2.

The `LFILE` parameter can also be specified dynamically at the start of a Natural session.

Performance Considerations for the DB2SIZE Parameter

During execution of an SQL statement, storage is allocated dynamically to build the SQLDA for passing the host variables to DB2.

In previous Natural for DB2 versions, this storage was always obtained from the TP monitor or operating system. For performance reasons, it is now first attempted to meet the storage requirements by free space in the Natural for DB2 buffer (`DB2SIZE`). If there is not enough space available in this buffer, the TP monitor or operating system is invoked to provide additional storage.

You can avoid `GETMAIN` requests by setting `DB2SIZE` to a size larger than calculated with the **formulas** in the section ***DB2SIZE Parameter***.

Depending on the SQL execution mode and on the usage of the Natural file server, the additional storage requirements (in bytes) can be calculated as follows:

- Considerations for VARCHAR Fields

Dynamic Mode

- With sending fields:

  ```
  80 + n * 56
  ```

  With sending fields including LOB columns:

  ```
  80 + 2 * n * 56
  ```

  where *n* is the number of sending fields in an SQL statement.

  The storage is freed immediately after the execution of the SQL statement.

- With receiving fields (that is, with variables of the `INTO` clause (see *into-clause*) of a `SELECT` statement):

  ```
  80 + n * 56 + 24 + n * 2
  ```

  With receiving fields including LOB columns:

  ```
  80 + 2 * n * 56 + 24 + n * 2
  ```

  where *n* is the number of receiving fields in an SQL statement.

  The storage remains allocated until the loop is terminated.

Static Mode

- With sending fields:

  ```
  80 + n * 24
  ```

  With sending fields including LOB columns:

  ```
  80 + 2 * n * 56
  ```

  where *n* is the number of sending fields in an SQL statement.

  The storage is freed immediately after the execution of the SQL statement.

- With receiving fields (that is, with variables of the `INTO` clause (see *into-clause*) of a `SELECT` statement):

```
80 + n * 24 + 24 + n * 2
```

With receiving fields including LOB columns:

```
80 + 2 * n * 56 + 24 + n * 2
```

where *n* is the number of receiving fields in an SQL statement.

The storage remains allocated until the loop is terminated.

Storage Requirements for the Natural File Server

When using the Natural file server, additional storage is required for each database loop that contains positioned `UPDATE` and/or `DELETE` statements.

For each of such loops, a buffer is allocated to save the contents of all receiving fields contained in the `INTO` clause (see *into-clause*). Therefore, the size of this buffer corresponds to the total length of all receiving fields:

```
20 + 4 + sum (length (v1), ..., length (vn))
```

where *v1 ... vn* refers to the variables contained in the `INTO` clause.

The buffer remains allocated until the loop is terminated.

Example Calculation for Dynamic Mode without Using the Natural File Server

If you use the default value 10 for both variables (*n1* and *n2*), the calculated `DB2SIZE` will be 2208 bytes. However, if you specify a `DB2SIZE` of 20 KB instead, the available space for dynamically allocated storage will be 18272 bytes, which means enough space for up to either 325 sending fields or 313 receiving fields.

Since space for receiving fields remains allocated until a database loop is terminated, the number of fields that can be used inside such a loop is reduced accordingly. For example, if you retrieve 200 fields, you can update about 110 fields inside the loop.

Considerations for VARCHAR Fields

When using `VARCHAR` fields (that is, fields with either an accompanying `L@` field in the Natural view or an explicit `LINDICATOR` clause), additional storage is allocated dynamically if the `L@` or `LINDICATOR` field is not specified directly in front of the corresponding base field. Therefore, always specify these fields in front of their base fields.

Special Requirements for Natural Tools for DB2

Consider the following requirements and recommendations for using the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation).

- Retrieval and Explain Functions
- LISTSQL and Explain Functions

Retrieval and Explain Functions

In order to be independent of DB2 versions, the **Retrieval** and **Explain** functions of the Natural Tools for DB2 have been designed not to access the DB2 catalog tables directly, but to access identical tables qualified by the creator name `SYSSAG`.

Thus, before you can use the **Retrieval** or **Explain** function, you must create these tables. The `SYSSAG` tables must have the same columns as the DB2 catalog tables and they must be created as `ALIAS`, `VIEW` or `TABLE`.

You can use the sample SQLCODE provided in the member `DEMSQL4` in the Natural system library `SYSDB2` to create these tables. By default, it creates an `ALIAS SYSSAG.`*xxx* for the corresponding `SYSIBM` table.

For some catalog tables, no indexes are defined. For performance reasons, consider creating copies of these tables with appropriate indexes.

We recommend that you work with copies of the catalog tables for the following tables:

```
SYSCOLAUTH
SYSDBRM
SYSFOREIGNKEYS
SYSINDEXPART
SYSKEYS
SYSSTMT
SYSSYNONYMS
SYSTABLEPART
SYSVIEWS
```

The required `CREATE TABLE` and `CREATE INDEX` statements are contained as comments in the sample SQL member `DEMSQL4`. In addition, `DEMSQLUP` contains sample SQLCODE to update the data in the copies of the catalog tables.

For any other table, we recommend that you create an `ALIAS` or a `VIEW` that points to the corresponding `SYSIBM` table.

Note: The sample SQL members can be executed with the ISQL part of SYSDB2. ISQL enables you to read SQL members from the Natural system library SYSDB2. You can save an SQL member in any other library by issuing the command LIBRARY MYLIB from the ISQL input screen to switch to another library and then save the SQL member there. You cannot save SQL members in the library SYSDB2.

LISTSQL and Explain Functions

These functions access DB2 PLAN_TABLEs. You can only use these functions if a PLAN_TABLE exists for your SQLID. For the layout of the PLAN_TABLE, refer to IBM's DB2 literature on the EXPLAIN command.

We recommend that you create an index on the following columns of the PLAN_TABLE:

```
APPLNAME
PROGNAME
COLLID
QUERYNO
TIMESTAMP
DESC
QBLOCKNO
PLANNO
MIXOPSEQ
```

Natural for DB2 Server Stub

A Natural for DB2 server stub is an interface module needed to communicate between the DB2 database system and the Natural server. The server stub module determines, sets up and invokes a Natural server environment for executing Natural stored procedures and Natural user-defined functions.

As mentioned in the ***Installation Procedure***, there are two types of server stub: the Natural for DB2 start server stub (STR) and the Natural for DB2 server stub (SRV). Both stubs are generated from the NDBSTUB macro.

- Natural for DB2 Start Server Stub
- Natural for DB2 Server Stub
- JCL Procedure

- NDBSTUB Macro

Natural for DB2 Start Server Stub

The Natural for DB2 start server stub is used for setting up the Natural server environments desired. The start server stub must be the main execution program in the Stored Procedure Address Space (SPAS). After the start server stub has established the Natural server environments, it passes control to the appropriate DB2 program (`DSNX9WLM` for WLM SPAS and `DSNX9STP` for DB2 SPAS). When SPAS terminates, the DB2 program returns control to the start server stub. The start server stub stops the Natural server environments and returns control to the operating system.

The Natural for DB2 start server stub reads the names and parameters of the Natural server to be started from the `CMSRVIN` data set. `CMSRVIN` must be specified with the DD name `CMSRVIN`.

The `CMSRVIN` data set is a sequential file that contains all information required to start the desired Natural servers. For each server to be started, one `START` entry must be provided. The parameters used for the `START` entries are identical to the parameters that apply to the `NDBSTUB` macro. Enclose the contents of each `START` entry in brackets and delimit comments by the following signs: `/*` and `*/`.

Example of START Entries:

```
START=(SERVER=NDBvrSRV,NATURAL=NATBATvr,CMPRMIN=CMPRMIN,
        CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=768,
        THREADNUMBER=2,TRACE=ON)
 START=(SERVER=WDBvrSRV,NATURAL=NATBATvr,CMPRMIN=CMPRMIN,
        CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=768,
        THREADNUMBER=2,TRACE=ON)
/*   START=(SERVER=QEvrsSRV,NATURAL=NATBATvr,CMPRMIN=QAPARM, */
/*         CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=700, */
/*         THREADNUMBER=2,TRACE=OFF) */
```

If the start server data set is missing or has not been assigned, the start server stub will start a Natural server environment with the parameters that derive from the parameters defined for the start server stub itself.

Natural for DB2 Server Stub

The Natural for DB2 server stub is the link between DB2 and Natural stored procedures or Natural user-defined functions (Natural UDFs). Specify the Natural for DB2 server stub as `EXTERNAL NAME` in the `SYSIBM.SYSROUTINES` table row that refers to the Natural stored procedure or Natural UDF. The server stub is started by DB2/WLM when the Natural stored procedures or Natural UDFs are invoked. The Natural for DB2 server stub creates a Natural session in the Natural server environment and invokes the Natural subprogram comprising the Natural stored procedure or the Natural UDF.

A Natural session created for executing a Natural stored procedure terminates when the corresponding Natural subprogram ends and control returns to DB2 and to the calling client.

A Natural session created for executing a Natural UDF stays active for multiple function invocations if the `PARALLEL` attribute is set to `D` and the `FINAL CALL` attribute is set to `Y`. The session invoked for a Natural UDF function is terminated by the server stub if it detects a termination call.

JCL Procedure

The JCL procedure of the Stored Procedure Address Space (SPAS) must specify the Natural for DB2 start server stub as program in the `EXEC` statement.

The Natural for DB2 start server stub and the Natural for DB2 server stub must reside in a library contained in the steplib concatenation of the JCL procedure of the SPAS.

Example of JCL:

```
//***********************************************************
//*    JCL FOR RUNNING THE WLM-ESTABLISHED STORED PROCEDURES
//*    ADDRESS SPACE
//*       RGN     -- MVS REGION SIZE FOR THE ADDRESS SPACE.
//*       DB2SSN  -- DB2 SUBSYSTEM NAME.
//*       NUMTCB  -- NUMBER OF TCBS USED TO
//*                  PROCESS END USER REQUESTS.
//*       APPLENV -- MVS WLM APPLICATION ENVIRONMENT
//*                  SUPPORTED BY THIS JCL PROCEDURE.
//*
//***********************************************************
//DBvrsENV PROC RGN=0K,APPLENV=DBvrsENV,DB2SSN=DBvrs,NUMTCB=8
//IEFPROC EXEC PGM=NDBvrSTR,REGION=&RGN,TIME=NOLIMIT, /* Start server stub
//*IEFPROC EXEC PGM=DSNX9WLM,REGION=&RGN,TIME=NOLIMIT,
//        PARM='&DB2SSN,&NUMTCB,&APPLENV'
//STEPLIB  DD  DISP=SHR,DSN=DSNvrs.RUNLIB.LOAD
//         DD  DISP=SHR,DSN=CEE.SCEERUN
//         DD  DISP=SHR,DSN=DSNvrs.SDSNLOAD
//         DD  DISP=SHR,DSN=NATURAL.LOAD /* Library containing stubs and nucleus
//CMPRMIN  DD  DISP=SHR,DSN=hilev.SOURCE(DYNPARM) /* Dynamic Natural parameters
//CMSRVIN  DD  DISP=SHR,DSN=hilev.SOURCE(CMSRVIN) /* Servers to be started
//CEEDUMP  DD  SYSOUT=X
//SYSOUT   DD  SYSOUT=X /* Traces records of server stub
//RMTRACE  DD  SYSOUT=X
//CMPRINT  DD  SYSOUT=X
//SYSPRINT DD  SYSOUT=X
//SYSERROR DD  SYSOUT=X
//SYSUDUMP DD  SYSOUT=X
```

where *hilev* represents a high-level qualifier.

NDBSTUB Macro

The `NDBSTUB` macro is used to generate the Natural for DB2 server stub and Natural for DB2 start server stub. You can parameterize `NDBSTUB` to create different stubs.

Below are the parameters available with `NDBSTUB`:

CMPRINT | CMPRMIN | CMTRACE | GTRACE | GTRCID | MODE | NATURAL | SERVER | THREADSIZE | TRACE | WLM

CMPRINT - DD Name of CMPRINT Data Set

`CMPRINT` specifies the DD name of the `CMPRINT` data set to which the primary report output is written. If an asterisk (*) is specified, a unique *ddname* `Pnnnnnnn` is built whenever a Natural stored procedure is invoked.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
`CMPRINT`	This is the default name.

CMPRMIN - DD Name of CMPRMIN Data Set

`CMPRMIN` specifies the DD name of the `CMPRMIN` data set during startup to read the input `PROFILE` parameter for this server.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
`CMPRMIN`	This is the default name.

CMTRACE - DD Name of CMTRACE Data Set

`CMTRACE` specifies the DD name of the `CMTRACE` data set to which the primary report output is written. If an asterisk (*) is specified, a unique *ddname* `Pnnnnnnn` is built whenever a Natural stored procedure is invoked, which makes it possible to store each output separately.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
CMTRACE	This is the default name.

GTRACE - Natural for DB2 Server Stub to Execute GTRACE Calls

GTRACE specifies whether or not the server stub executes GTRACE macro calls for tracing purposes.

Possible Values:

Value	Explanation
ON	The generated server stub executes GTRACE macros in order to document its processing.
OFF	The generated server stub does not execute GTRACE macros during its processing cycle. This is the default value.

GTRCID - GTRACE ID to be Used

GTRCID specifies the event ID recorded with the trace data created by the Natural for DB2 server stub.

Possible Values:

Value	Explanation
event-id	Decimal number from 0 to 1023
203	This is the default value.

MODE - Operating Mode of Natural for DB2 Server Stub

MODE determines the operating mode of the Natural for DB2 server stub generated.

Value	Explanation
STR	The generated Natural for DB2 server stub operates as Natural for DB2 start server stub that sets up the Natural server environment.
SRV	The generated Natural for DB2 server stub operates as Natural for DB2 server stub that invokes the associated Natural stored procedure or Natural UDF. This is the default value.

NATURAL - Name of Server Front-End or Natural Server

`NATURAL` denotes the name of the server front-end or Natural server load module loaded by the Natural for DB2 server stub if the external `CMSTART` has not yet been resolved by the linkage editor during the creation of the server stub. The named load module has to be present in any steplib of the stored procedure address space.

Value	Explanation
name	Any valid load module name
NATBAT*vr*	This is the default value.

SERVER - Server Name for Natural Server Environment

Server names suffixed with the three characters `SRV` denote the names of the servers used by the server front-end in order to identify the Natural server. These names must be unique within one address space.

Value	Explanation
server-name	Server name of up to 5 characters
NDB*vr*	This is the default value.

THREADSIZE - Size of Natural Threads for Natural Server

`THREADSIZE` determines the size of the Natural threads to be used by the Natural server. The size is specified in units of kilobytes.

Value	Explanation
threadsize	Decimal number
768	This is the default value.

TRACE - Natural for DB2 Server Stub to Write Trace Records

Determines whether the generated Natural for DB2 server stub writes trace records. The trace records are written to the data set specified with *ddname* `SYSOUT`.

Value	Explanation
YES	Trace records are written.
NO	No trace records are written. This is the default value.

WLM - Natural for DB2 Start Server Stub Mode WLM/DB2 SPAS

WLM (Workload Manager) specifies where control is passed to after the Natural for DB2 start server stub has established the Natural server environments requested.

This parameter is only evaluated if the MODE=STR parameter is set. Specify WLM=YES if the Natural for DB2 start server stub runs in an address space that has been established by WLM.

Value	Explanation
YES	The start server stub generates links to DSNX9WLM, after setting up the Natural server environments.
NO	The start server stub generates links to DSNX9STP, after setting up the Natural server environments. This is default value.

16 Installing Natural for DB2 Version 8.4.3 on z/OS

This document describes the steps for installing Natural for DB2 Version 8.4.3 (product code NDB) on z/OS.

Related Topics:

For information on how to operate Natural in a DB2 environment, see *Natural for DB2* in the *Database Management System Interfaces* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

The following software must be installed before you can install Natural for DB2:

- **Natural** Version 8.2.8 (or higher); you cannot install Natural and Natural for DB2 at the same time.
- **Software AG Editor**

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NDB*vrs*.LOAD	Load modules
NDB*vrs*.SRCE	Source modules and macros
NDB*vrs*.JOBS	Sample installation jobs
NDB*vrs*.INPL	Natural objects including error messages

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read *Installation Process and Major Natural Features* before you start the installation procedure.

The installation procedure comprises the following:

Common Installation Steps

This section described the installation steps that apply to all Natural environments where Natural for DB2 can be installed. The steps additionally required for a particular TP monitor are described in the following sections.

DB2 Upgrade Considerations

If you upgrade to a newer DB2 version, you need not upgrade your current Natural for DB2 installation.

If you upgrade to a newer DB2 version and also want to upgrade to a newer Natural for DB2 version, consider the following:

- Do not recreate the `NDBIOMO` module with the DB2 version parameter of the new DB2 version, unless the new-function mode is enabled in the new DB2 version. In this case, skip the Steps 2 to 5.
- If the new-function mode is enabled in the new DB2 version, you only need to create a new `NDBIOMO` module if you want to use the new DB2 statements added to the `NDBIOMO` module for the new DB2 version. Otherwise, you can also skip the Steps 2 to 5.

Step 1: Allocate the DBRM Library for Use with Natural for DB2

- Allocate a PDS as DBRM (database request module) library. The size of this data set and the number of directory entries depend on the particular site (5 tracks and 20 directory blocks must be adequate for most environments). The PDS must have a fixed-block record format and a record length of 80.

  Any standard data set name can be used for this DBRM library; however, this installation procedure assumes that the name `SAGLIB.DB2DBRM` is used.

Step 2: Generate the Natural for DB2 I/O Module NDBIOMO

(Job I055, Step 1600)

1. Execute the standard Natural batch job provided with this step to generate the assembly source for the `NDBIOMO` module from the `NDBIOTM` member. This batch job invokes the Natural program `NDBGENI`, which is loaded with the Natural **INPL utility** during the installation of base Natural.

   `NDBIOMO` provides dynamic access to DB2 and contains all necessary `EXEC SQL` statements. In addition, it contains some special SQL statements which cannot be executed in dynamic mode. See also *I/O Module NDBIOMO for Dynamic SQL Statement Execution* in the *Database Management System Interfaces* documentation.

2. Modify the following two positional parameters contained in `NDBGENI` to meet your requirements.
   - The first parameter restricts the use of SQL statements to those supported by a particular DB2 version. Set this parameter to one of the following values:

     `DB2V9` for DB2 Version 9 in new-function mode, or any higher DB2 version,
     `DB2V10` for DB2 Version 10 in new function mode, or any higher DB2 version, or

`DB2V11` for DB2 Version 11 in new function mode, or any higher DB2 version.

- The second parameter specifies the maximum number of parallel dynamic prepared DB2 statements.

3. Check the output report created by this job for successful job completion. In addition, a condition code of 0 indicates normal completion.

Step 3: Build NDBIOMO

(Job I055, Step 1610)

- Precompile, assemble and link the Natural for DB2 I/O module `NDBIOMO`.

  The link-edit step receives a condition code of 4 because of unresolved references for `DSNHLI`. This is normal and can be ignored.

Step 4: Bind the DBRM NDBIOMO into a Package

(Job I055, Step 1620)

- Bind the DBRM `NDBIOMO` into a package.

Step 5: Create the DB2 Plan for Use with Natural for DB2

(Job I055, Step 1630)

- Create the DB2 plans to be used by Natural for DB2 in batch mode, TSO and under CICS.

Step 6: Link-Edit NATGWDB2

(Job I055, Step 1680)

- Link-edit the Natural for DB2 load module `NATGWDB2`.

Step 7: Build the Natural Parameter Module

(Job I060, Steps 0010, 0015)

Build the Natural parameter module for batch mode. The macros and parameters mentioned in this section are described in the *Parameter Reference* documentation.

1. Modify the settings of the parameters supplied with the Natural parameter module as required:
   - Set the parameters supplied with the `NTOSP` macro to configure the z/OS batch interface. For descriptions of these parameters, see the corresponding dynamic profile parameter `OSP`.
   - Set the parameters specific to Natural for DB2 supplied with the `NTDB2` macro. For descriptions of these parameters, see the corresponding dynamic profile parameter `DB2`.

See also *Natural Parameter Modifications for Natural for DB2*.

2. Assemble and link the Natural parameter module.

Step 8: Link the Nucleus

(Jobs I060, I080)

1. Link the **environment-dependent nucleus**:

   Add the following `INCLUDE` statements and corresponding DD statements to the link instructions for the linkage editor:

`INCLUDE SMALIB(`*`nat-parm-module`*`)`	Natural parameter module, where *`nat-parm-module`* is the module name used in *Step 7: Build the Natural Parameter Module*
`INCLUDE DSNLIB(DSNTIAR)`	SQL error message module
`INCLUDE NDBLIB(NDBPARM)`	Natural for DB2 load module contained on the `NDB`*`vrs`*`.LOAD` data set.
`INCLUDE SMALIB(NDBIOMO)`	Natural for DB2 I/O module created in *Step 3: Build NDBIOMO*
`INCLUDE `*`xxxxxxxx(yyyyyyyy)`*	Environment-dependent DB2 interface (see below)

   Depending on your environment, specify the appropriate DB2 interface *`yyyyyyyy`* from library *`xxxxxxxx`* in your `INCLUDE` statement as shown in the following table:

Interface	Library	Environment
`DSNALI`	`DSNLIB`	Under TSO and in batch mode without running under the control of the DSN command processor, that is, with CAF (Call Attachment Facility)
`DSNRLI`	`DSNLIB`	WLM (Workload Manager) stored procedure address space and Natural Development Server (recommended) This can also be used in TSO and batch environments.
`DSNELI`	`DSNLIB`	Under TSO and in batch mode when running under the control of the DSN command processor
`DSNCLI`	`DFHLIB`	Under CICS
`DSNULI`	`DSNLIB`	Under all environments except Com-plete
`DFSLI000`	`IMSLIB`	Under IMS TM (MPP and BMP) and in batch mode using the DB2 DL/I batch support (`DSNMTV01`)
`NDBCOM`	`NDBLIB`	Under Com-plete

2. Link the **environment-independent nucleus**:

Add the following `INCLUDE` statement and corresponding DD statement to the link instructions for the Natural for DB2 load module:

```
INCLUDE SMALIB(NATGWDB2)
```

Alternatives

Instead of linking both the environment-dependent nucleus and environment-independent nucleus as described above, you can use one of the following methods:

1. Create a single environment-dependent nucleus:

   Link all the environment-dependent modules together with all environment-independent modules, thus creating one single, environment-dependent nucleus.
2. Separate the `NATGWDB2` module (not linked to the environment-independent nucleus):

   Run the `NATGWDB2` module as a separate module by using the Natural Resolve STATIC Addresses feature (RCA).

   You can modify the name of the `NATGWDB2` module linked in ***Step 6***. However, if you use a name different from `NATGWDB2`, this name must be specified as an alias name in the `NTALIAS` macro (see the *Parameter Reference* documentation) in the Natural parameter module.
3. Create an alternative Natural parameter module containing all the environment-dependent and environment-independent Natural for DB2 and DB2 for z/OS modules:

   Link the alternative Natural parameter module together with all Natural for DB2 modules (`NATGWDB2`, `NDBIOMO`, `NDBPARM`) and all DB2 for z/OS modules (`DSNTIAR` and a DB2 interface module) as Natural for DB2 nucleus `NDBNUC`*xx* with `ENTRY NATPARM`.

   You can deploy the Natural for DB2 nucleus `NDBNUC`*xx* by specifying `PARM=NDBNUC`*xx* as a dynamic parameter.

   This method provides the option to execute a new Natural for DB2 Version *xx* in an existing Natural environment with an older Natural for DB2 version.

   A Natural for DB2 nucleus with a linked DB2 interface module `DSNULI` supported by DB2 for z/OS Version 12 can operate in all environments except Com-plete.

The following applies when linking a separate `NATGWDB2` module (Alternative 2 above) or a separate Natural parameter module (Alternative 3 above):

TP Monitor	Requirement
CICS	The resulting module must be defined as PPT entry or RDO. PPT entry: `DFHPPT TYPE=ENTRY,PROGRAM=module-name,PGMLANG=ASSEMBLER`
Com-plete	The resulting module must be defined as `RESIDENTPAGE` or reside in the LPA/(E)LPA.

Step 9: Load New Objects

(Job I061, Step 1610)

Before executing this step, change the `CMWKF01` DD statement to point to the `NDBvrs.INPL` data set.

- Load the Natural objects specific to Natural for DB2 from the `NDBvrs.INPL` data set into the Natural system file by using the Natural **INPL utility**. The Natural objects are loaded into the Natural system libraries `SYSDDM`, `SYSTEM` and `SYSDB2` in the `FNAT` system file.

> **Important:** Ensure that your newly created `SYSDB2` library contains all necessary Predict interface programs which are loaded into `SYSDB2` when installing Predict (see the relevant *Predict* documentation).

Step 10: Create the Natural for DB2 Server Stub

(Job I070, Steps 1604, 1606, 1608, 1610)

1. Create server stubs to execute Natural stored procedures and Natural user-defined functions. Natural for DB2 server stubs are interface modules between the DB2 database system and the Natural server. The server stub must be installed in order to execute Natural stored procedures and Natural user-defined functions.

   There are two types of server stub:

   Natural for DB2 server stub (module NDB*vr*SRV, Steps 1604 and 1606)
   The server stub is used to execute Natural stored procedures and Natural user-defined functions.

   The IBM Language Environment (LE) runtime modules required must be linked to the Natural for DB2 server stub module. Use the CALL option of the linkage editor and assign the LE runtime library as `SYSLIB`.

   Natural for DB2 start server stub (module NDB*vr*STR, Steps 1608 and 1610)
   The start server stub is used to start the Natural server environment(s) explicitly.

   The IBM LE runtime modules required must be linked to the Natural for DB2 start server stub module. Use the CALL option of the linkage editor and assign the LE runtime library as `SYSLIB`. Additionally, include the modules `NDBSTRP` (delivered with Natural for DB2) and `NATCONFG` (delivered with Natural) from `NDBvrs.LOAD` and `NATvrs.LOAD`.

2. Natural for DB2 server stubs are generated from the `NDBSTUB` macro. You can generally use the default values for all parameters. Modify only the values of the parameters whose default values do not suit your requirements. The individual parameters are described in the section ***Natural for DB2 Server Stub***.
3. Place the resulting load modules into a steplib library of the JCL used to execute the DB2 stored procedure address space.
4. For DB2 UDB, each Natural stored procedure or Natural user-defined function must be defined by a DB2 `CREATE PROCEDURE` or DB2 `CREATE FUNCTION` statement, where the name of the generated Natural for DB2 server stub module `NDBvrSRV` is specified as `EXTERNAL NAME`.

Step 11: Bind the DBRM ROUTINEN into a Package

(Job I070, Step 1615)

- Bind the DBRM `ROUTINEN` into a package.

  The DBRM `ROUTINEN` is contained in the collection `SAGNDBROUTINENPACK` and delivered with Natural for DB2. Natural for DB2 needs this collection to access the DB2 catalog and retrieve the parameter descriptions of Natural stored procedures and Natural user-defined functions.

Installation Steps Specific to CICS

This section describes the additional steps required to install Natural for DB2 in a CICS environment.

Ensure that your Natural/CICS thread size is large enough to contain the `DB2SIZE`; if you use the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation), additional storage of 8 KB is required.

This section covers the following topics:

- Installing the Natural File Server with VSAM

Using Plan Selection by CICS RCT Entry Threads

(Job I005)

If you want fixed assignment of your transaction code to the DB2 plan, add an additional entry to your CICS RCT, or define a `DB2Entry` with RDO by performing one of the following alternative steps:

- Modify your RCT:

  ```
  DSNRCT TYPE=ENTRY,PLAN=plan-name,TXID=(transaction-id)
  ```

  where *plan-name* must be the same as the name used to create the DB2 plan for Natural for DB2: see ***Common Installation Steps***.

  Assemble and link the RCT.

- Define a DB2Entry with RDO:

  ```
  DEFINE DB2ENTRY
    OVERTYPE TO MODIFY                                         CICS RELEASE = nnnn
    CEDA  DEFine DB2Entry(          )
     DB2Entry        : DB2ENTR
     Group           : NCI
     DEscription     :
    THREAD SELECTION ATTRIBUTES
     TRansid         : transaction-id
    THREAD OPERATION ATTRIBUTES
     ACcountrec      : None                  None ! TXid ! TAsk ! Uow
     AUTHId          :
     AUTHType        : Userid                Userid ! Opid ! Group ! Sign ! TErm
                                             ! TX
     DRollback       : Yes                   Yes ! No
     PLAN            : plan-name
     PLANExitname    :
     PRIority        : High                 High ! Equal ! Low
     PROtectnum      : 0005                  0-2000
     THREADLimit     : 0005                  0-2000
     THREADWait      : Pool                  Pool ! Yes ! No
  ```

plan-name must be the same as the name used to create the DB2 plan for Natural for DB2: see ***Common Installation Steps***.

For explanations of the parameters, refer to the relevant CICS literature from IBM.

Using Plan Selection by Dynamic Plan Exit

If you want to perform plan selection by using the dynamic plan exit, perform the following steps:

Step 1: Build the CICS Dynamic Plan Selection Exit Module NDBUEXT

(Job I070, Step 1630)

1. If you want to specify a default plan name, modify the source module `NDBUEXT`.

   The sample exit routine `NDBUEXT` can be modified to use a default plan name if none has been specified prior to the first SQL call. Review the source code in the `NDBUEXT` module for details about specifying a default plan name.

   Ensure that all `NDBUEXT` modules used in Natural for DB2 versions prior to Version 8.3 are replaced by the new `NDBUEXT` module built in this step. The new `NDBUEXT` module still supports CICS TS queue names used in previous versions of Natural for DB2.
2. Precompile, assemble and link `NDBUEXT` for CICS.

   This step receives a condition code of 4 because of an unresolved external reference for `DFHEAI0` and `DFHEI1`. This is normal and can be ignored.

Step 2: Link the CICS Dynamic Plan Selection Exit Module NDBUEXT

(Job I075, Step 1640)

- Link the module `NDBUEXT` resulting from the previous step to the CICS load library and define it via a corresponding PPT entry or RDO.

  PPT entry:

  ```
  DFHPPT TYPE=ENTRY,PROGRAM=NDBUEXT,PGMLANG=ASSEMBLER
  ```

  For explanations of the parameters, refer to the relevant CICS literature from IBM.

Step 3: Define a DB2Entry

Perform the following step:

- Define a DB2Entry with RDO:

```
DEFINE DB2ENTRY
  OVERTYPE TO MODIFY                                               CICS RELEASE = nnnn
  CEDA  DEFine DB2Entry(          )
   DB2Entry        : DB2ENTR
   Group           : NCI
   DEscription     :
  THREAD SELECTION ATTRIBUTES
   TRansid         : transaction-id
  THREAD OPERATION ATTRIBUTES
   ACcountrec      : None                None ! TXid ! TAsk ! Uow
   AUTHId          :
   AUTHType        : Userid              Userid ! Opid ! Group ! Sign ! TErm
                                         ! TX
   DRollback       : Yes                 Yes ! No
   PLAN            :
   PLANExitname    : NDBUEXT
   PRIority        : High               High ! Equal ! Low
   PROtectnum      : 0005                0-2000
   THREADLimit     : 0005                0-2000
   THREADWait      : Pool                Pool ! Yes ! No
```

The parameter `PLANExitname` must specify the same program as the `NAME` statement of ***Step 2: Link the CICS Dynamic Plan Selection Exit Module NDBUEXT***.

Alternatively or additionally, you can specify the plan exit program `NDBUEXT` with the `PLANExitname` parameter of `POOL THREAD ATTRIBUTES` of the `DB2Conn` resource definition of CICS TS.

Installing the Natural File Server with VSAM

If you want to use the Natural file server with VSAM, perform the following additional installation steps:

- Step 4: Restart CICS

Step 1: Define a VSAM Data Set for the Natural File Server

(Job I008, Step 1610)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 2: Format the Natural File Server Data Set

(Job I075, Step 1610)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Build the CICS Table

1. Add an additional FCT entry required for the Natural file server and the DB2 components of Natural according to the following example:

```
CMFSERV  DFHFCT TYPE=DATASET,                                         *
                ACCMETH=VSAM ,                                        *
                BUFND=5,                                              *
                BUFNI=4,                                              *
                DATASET=CMFSERV,                                      *
                DISP=SHR,                                             *
                DSNAME=SAGLIB.NCIDB2.SERVER,                          *
                FILSTAT=(ENABLED,CLOSED),                             *
                JID=NO,                                               *
                LOG=NO,                                               *
                LSRPOOL=NONE,  1-8 ONLY FOR XA; NONE                  *
                RECFORM=(FIXED,BLOCKED),                              *
                RSL=PUBLIC,                                           *
                SERVREQ=(ADD,UPDATE,DELETE,BROWSE),                   *
                STRNO=4
```

2. Assemble and link the CICS table.

Step 4: Restart CICS

- Restarting CICS is required, because of the additional FCT entry specified in the previous step.

Installation Steps Specific to Com-plete

Under Com-plete, the installation procedure of Natural for DB2 continues with the adaptation of your Com-plete environment.

Ensure that the changes required for DB2 have been applied to your Com-plete environment (see the relevant section in the *Com-plete* documentation).

Installation Steps Specific to IMS TM

This section describes the additional steps required to install Natural for DB2 in an IMS TM environment.

Ensure that the thread of your Natural IMS TM Interface is large enough to contain the `DB2SIZE`; if you use the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation), additional storage of 8 KB is required.

Binding DB2 Plans

(Job I055, Steps 1631, 1632, 1633, 1634 for IMS MPP conversational, IMS BMP, IMS MPP non-conversational, OBMP)

- Build the DB2 plan to be used by Natural for DB2 in all IMS TM environments supported by Natural.

Using Plan Selection with IMS TM Resource Translation Table

If the name (or any `ALIAS`) of your **environment-dependent nucleus** does not match the name of your DB2 plan or if you want to use the same DB2 plan for all IMS TM environments, you must use a Resource Translation Table (RTT).

- Modify, assemble and link the IMS TM RTT:

  Add an additional `DSNMAPN` macro to your RTT as follows (for any other parameters, refer to the relevant DB2 literature from IBM):

  `DSNMAPN` macro:

  ```
  DSNMAPN APN=load-module,PLAN=plan-name
  ```

  where *`load-module`* is the environment-dependent nucleus (that is, the IMS TM application program) and *`plan-name`* is the same as the one used in ***Binding DB2 Plans***.

Installing the Natural File Server with VSAM

Be aware that database loops cannot be continued across terminal I/Os without using the Natural file server.

If you want to use the Natural file server with VSAM, perform the following additional installation steps:

Step 1: Define the VSAM Data Set for the Natural File Server

(Job I008, Step 1600)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 2: Format the Natural File Server Data Set

(Job I075, Step 1600)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Update the JCL for the MPP Region

- Include the DD statement `CMFSERV` to define the Natural file server data set.
- Increase the `REGION` parameter if necessary.

Step 4: Restart the MPP Region Used by Your Natural IMS TM Interface

- Restart your MPP region, because of the additional DD statement.

Installation Steps Specific to TSO

This section describes the additional installation steps required in a TSO environment if you want to use the Natural file server with VSAM:

Step 1: Modify NDBFSRV in NTTSOP

- Set the keyword subparameter `NDBFSRV` (see the *Parameter Reference* documentation) in the `NTTSOP` macro to `ON` and reassemble and relink your Natural TSO Interface.

Step 2: Define the VSAM Data Set for the Natural File Server

(Job I008, Step 1620)

- Specify the size and the name of the VSAM RRDS that is to be used as the Natural file server (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Step 3: Format the Natural File Server Data Set

(Job I075, Step 1620)

- Specify the five input parameters required to format the Natural file server data set (see also *Preparations for Using the File Server* in the *Database Management System Interfaces* documentation).

Installation Verification

This section provides example batch jobs and online methods for verifying the successful installation of Natural for DB2.

Test Batch Natural for DB2 under CAF - Job NDBBATCA

`NDBBATCA` contains sample JCL to test Natural for DB2 in batch mode by using the CAF (Call Attachment Facility) interface.

Modify the sample JCL to meet your requirements.

Before the first SQL call, you must call `NATPLAN` to explicitly allocate the plan. The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. `NATPLAN` can be edited to specify the appropriate DB2 subsystem ID.

Test Batch Natural for DB2 under DSN - Job NDBBATTB

`NDBBATTB` contains sample JCL to test Natural for DB2 in batch mode by using the DSN command processor. Modify the sample JCL to meet your requirements.

The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. For explanations of the `DSN` and `RUN` commands, refer to the relevant IBM literature for DB2/TSO and batch users.

Test DSNMTV01 - Job NDBMTV01

`NDBMTV01` contains a sample JCL to execute Natural by using the DB2 DL/I batch support.

Modify the sample JCL to meet your requirements.

The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***.

Test TSO Natural for DB2 under CAF - CLIST NDBCAF

You can perform the following steps to test the TSO installation of Natural for DB2 under CAF (Call Attachment Facility):

1. **Adapt CLIST NDBCAF**

   (Job I070, Step 240C)

   Change the library and program names in the CLIST `NDBCAF` to meet your requirements. If you do not use the Natural file server, remove the `ALLOC` and `FREE` statements for `CMFSERV`.

2. **Invoke Natural**

   Invoke Natural by executing the CLIST adapted in the **previous step**. Ensure that DB2 tables can be accessed and that plan switching can be performed.

   Before the first SQL call, you must call `NATPLAN` to explicitly allocate the plan. The plan name must be the same as the name used in ***Step 5: Create the DB2 Plan for Use with Natural for DB2***. `NATPLAN` can be edited to specify the appropriate DB2 subsystem ID.

Test TSO Natural for DB2 under DSN - CLIST NDBTSO

You can perform the following steps to test the TSO installation of Natural for DB2 under DSN:

1. **Adapt CLIST NDBTSO**

   (Job I070, Step 240B)

   Change the subsystem ID and the library, plan and program names in the CLIST `NDBTSO` to meet your requirements. If you do not use the Natural file server, remove the `ALLOC` and `FREE` statements for `CMFSERV`.

2. **Invoke Natural**

   Invoke Natural by executing the CLIST created in the previous step. Ensure that DB2 tables can be accessed. The plan name must be the same as the name used in ***Binding DB2 Plans***. For explanations of the `DSN` and `RUN` commands, refer to the relevant IBM literature for DB2/TSO and batch users.

Online Verification Methods

You can verify the successful installation of Natural for DB2 online by using either **SQL Services** or `DEM2` example programs:

- Using SQL Services
- Using DEM2* Example Programs

Using SQL Services

You can verify the successful installation of Natural for DB2 by using the **SQL Services (NDB/NSQ)** function (described in the *Database Management System Interfaces* documentation) of the Natural SYSDDM utility:

1. Invoke Natural.
2. Invoke the SYSDDM utility.
3. In the SYSDDM main menu, enter function code `B` to invoke **SQL Services (NDB/NSQ)**.
4. Enter function code `S` to select all DB2 tables.

   The communication between Natural and DB2 works if all existing DB2 tables are displayed.

   For one of the tables, generate a Natural DDM as described in the section *Generate DDM from an SQL Table* in the the *Database Management System Interfaces* documentation.
5. After you have generated a DDM, access the corresponding DB2 table with a simple Natural program as indicated in the following example:

```
DEFINE DATA
01 view-name OF ddm-name
02 field
...
END-DEFINE
FIND view-name WITH field = value
  DISPLAY field
END-FIND
END
```

   where:
   `view-name` is a view of the DDM *`ddm-name`*,
   `field` is a DDM field,
   `value` is the search value to be used for the field.

If you receive the message NAT3700, enter the Natural system command `SQLERR` to display the corresponding SQL return code. `SQLERR` is described in the *System Commands* documentation.

Using DEM2* Example Programs

You can also use the `DEM2*` example programs in the Natural system library `SYSDB2` provided on the installation medium to verify and test your installation.

You can create a DB2 table with `DEM2CREA`, and then create the corresponding DDM by using the Natural SYSDDM utility. You can store data in the created table with `DEM2STOR`, and retrieve data from the table with `DEM2FIND` or `DEM2SEL`. You can also drop the table with the `DEM2DROP` program.

Natural Parameter Modifications for Natural for DB2

This section covers the following topics:

- Natural Profile Parameter Settings
- Performance Considerations for the DB2SIZE Parameter

Natural Profile Parameter Settings

Adapt the Natural parameter module to meet your requirements. The Natural parameters mentioned in this section are described in the *Parameter Reference* documentation.

DB2SIZE Parameter

Specify the profile parameter `DB2SIZE`:

```
DB2SIZE=nn
```

`DB2SIZE` indicates the size of the work area used for processing SQL requests. It must be set to at least 6 KB.

The setting of `DB2SIZE` also depends on whether you use the Natural file server or not. If the Natural file server is not used, the setting can be calculated according to the following formula:

```
((1064 + n1 * 48 + n2 * 120) + 1023) / 1024 KB
```

If the Natural file server is used, the setting can be calculated according to the following formula:

```
((1160 + n1 * 48 + n2 * 160 + n3 * 8) + 1023) / 1024 KB
```

The variables *n1*, *n2* and *n3* correspond to the following:

n1	Number of statements for dynamic access as specified as the second parameter in ***Step 2: Generate the Natural for DB2 I/O Module NDBIOMO***
n2	Maximum number of nested database loops as specified with the `MAXLOOP` parameter in the `NTDB2` macro
n3	Maximum number of Natural file server blocks to be allocated per user specified as the fifth parameter in **Job I075, Step 1620,** or the `EBPMAX` parameter in the `NTDB2` macro, if you decided to use the Software AG Editor buffer pool as the Natural file server

The `DB2SIZE` parameter can also be specified dynamically at the start of a Natural session.

Important: Ensure that you have also added the Natural parameters required for the Software AG Editor; see the relevant installation description in the section ***Installing Software AG Editor***.

NTDB Macro

Specify database type DB2 and a list of DBIDs (database IDs) in the `NTDB` macro. All Natural DDMs that refer to a DB2 table must be cataloged with a DBID from this list. DBID can be any number from 1 to 65535. For most environments, one DBID (usually 250) is sufficient for database type DB2.

The DB2 DBIDs can also be specified dynamically at the start of a Natural session by using the `DB` profile parameter.

Important: Ensure that all DB2 DDMs used when cataloging a given program have a valid DB2 DBID. Also ensure that the DBIDs selected in the `NTDB` macro for DB2 do not conflict with DBIDs selected for other database systems.

The DBID for SQL/DS used when cataloging a Natural program does not have to be in the `NTDB` list of DBIDs used when executing this program. Therefore, when executing existing Natural programs, DBID 250 is not mandatory. Two sample `NTDB` macros follow:

```
NTDB  DB2,250
```

```
NTDB  DB2,(200,250,251)
```

NTDB2 Macro

Set the keyword subparameters in the `NTDB2` macro according to your requirements.

The `NTDB2` keyword subparameters can also be specified dynamically at the start of a Natural session by using the profile parameter `DB2`.

NTLFILE Macro

Set the profile parameter `LFILE` in the macro `NTLFILE` to specify a logical DBID (database ID) that relates to database type DB2:

```
NTLFILE 100,250,1
```

This is necessary for using ISQL or calling `NDBISQL` with Natural for DB2.

The `LFILE` parameter can also be specified dynamically at the start of a Natural session.

Performance Considerations for the DB2SIZE Parameter

During execution of an SQL statement, storage is allocated dynamically to build the SQLDA for passing the host variables to DB2.

In previous Natural for DB2 versions, this storage was always obtained from the TP monitor or operating system. For performance reasons, it is now first attempted to meet the storage requirements by free space in the Natural for DB2 buffer (`DB2SIZE`). If there is not enough space available in this buffer, the TP monitor or operating system is invoked to provide additional storage.

You can avoid `GETMAIN` requests by setting `DB2SIZE` to a size larger than calculated with the **formulas** in the section ***DB2SIZE Parameter***.

Depending on the SQL execution mode and on the usage of the Natural file server, the additional storage requirements (in bytes) can be calculated as follows:

- Dynamic Mode
- Static Mode
- Storage Requirements for the Natural File Server
- Example Calculation for Dynamic Mode without Using the Natural File Server
- Considerations for VARCHAR Fields

Dynamic Mode

- With sending fields:

  ```
  80 + n * 56
  ```

  With sending fields including LOB columns:

  ```
  80 + 2 * n * 56
  ```

  where *n* is the number of sending fields in an SQL statement.

  The storage is freed immediately after the execution of the SQL statement.

- With receiving fields (that is, with variables of the `INTO` clause (see *into-clause*) of a `SELECT` statement):

```
80 + n * 56 + 24 + n * 2
```

With receiving fields including LOB columns:

```
80 + 2 * n * 56 + 24 + n * 2
```

where *n* is the number of receiving fields in an SQL statement.

The storage remains allocated until the loop is terminated.

Static Mode

- With sending fields:

  ```
  80 + n * 24
  ```

  With sending fields including LOB columns:

  ```
  80 + 2 * n * 56
  ```

  where *n* is the number of sending fields in an SQL statement.

  The storage is freed immediately after the execution of the SQL statement.

- With receiving fields (that is, with variables of the `INTO` clause (see *`into-clause`*) of a `SELECT` statement):

  ```
  80 + n * 24 + 24 + n * 2
  ```

  With receiving fields including LOB columns:

  ```
  80 + 2 * n * 56 + 24 + n * 2
  ```

  where *n* is the number of receiving fields in an SQL statement.

  The storage remains allocated until the loop is terminated.

Storage Requirements for the Natural File Server

When using the Natural file server, additional storage is required for each database loop that contains positioned `UPDATE` and/or `DELETE` statements.

For each of such loops, a buffer is allocated to save the contents of all receiving fields contained in the `INTO` clause (see *`into-clause`*). Therefore, the size of this buffer corresponds to the total length of all receiving fields:

```
20 + 4 + sum (length (v1), ..., length (vn))
```

where `v1 ... vn` refers to the variables contained in the `INTO` clause.

The buffer remains allocated until the loop is terminated.

Example Calculation for Dynamic Mode without Using the Natural File Server

If you use the default value 10 for both variables (*n1* and *n2*), the calculated `DB2SIZE` will be 2208 bytes. However, if you specify a `DB2SIZE` of 20 KB instead, the available space for dynamically allocated storage will be 18272 bytes, which means enough space for up to either 325 sending fields or 313 receiving fields.

Since space for receiving fields remains allocated until a database loop is terminated, the number of fields that can be used inside such a loop is reduced accordingly. For example, if you retrieve 200 fields, you can update about 110 fields inside the loop.

Considerations for VARCHAR Fields

When using `VARCHAR` fields (that is, fields with either an accompanying `L@` field in the Natural view or an explicit `LINDICATOR` clause), additional storage is allocated dynamically if the `L@` or `LINDICATOR` field is not specified directly in front of the corresponding base field. Therefore, always specify these fields in front of their base fields.

Special Requirements for Natural Tools for DB2

Consider the following requirements and recommendations for using the Natural Tools for DB2 (described in the *Database Management System Interfaces* documentation).

- Retrieval and Explain Functions
- LISTSQL and Explain Functions

Retrieval and Explain Functions

In order to be independent of DB2 versions, the **Retrieval** and **Explain** functions of the Natural Tools for DB2 have been designed not to access the DB2 catalog tables directly, but to access identical tables qualified by the creator name `SYSSAG`.

Thus, before you can use the **Retrieval** or **Explain** function, you must create these tables. The `SYSSAG` tables must have the same columns as the DB2 catalog tables and they must be created as `ALIAS`, `VIEW` or `TABLE`.

You can use the sample SQLCODE provided in the member `DEMSQL4` in the Natural system library `SYSDB2` to create these tables. By default, it creates an `ALIAS SYSSAG.xxx` for the corresponding `SYSIBM` table.

For some catalog tables, no indexes are defined. For performance reasons, consider creating copies of these tables with appropriate indexes.

We recommend that you work with copies of the catalog tables for the following tables:

SYSCOLAUTH
SYSDBRM
SYSFOREIGNKEYS
SYSINDEXPART
SYSKEYS
SYSSTMT
SYSSYNONYMS
SYSTABLEPART
SYSVIEWS

The required CREATE TABLE and CREATE INDEX statements are contained as comments in the sample SQL member DEMSQL4. In addition, DEMSQLUP contains sample SQLCODE to update the data in the copies of the catalog tables.

For any other table, we recommend that you create an ALIAS or a VIEW that points to the corresponding SYSIBM table.

Note: The sample SQL members can be executed with the ISQL part of SYSDB2. ISQL enables you to read SQL members from the Natural system library SYSDB2. You can save an SQL member in any other library by issuing the command LIBRARY MYLIB from the ISQL input screen to switch to another library and then save the SQL member there. You cannot save SQL members in the library SYSDB2.

LISTSQL and Explain Functions

These functions access DB2 PLAN_TABLEs. You can only use these functions if a PLAN_TABLE exists for your SQLID. For the layout of the PLAN_TABLE, refer to IBM's DB2 literature on the EXPLAIN command.

We recommend that you create an index on the following columns of the PLAN_TABLE:

APPLNAME
PROGNAME
COLLID
QUERYNO
TIMESTAMP
DESC
QBLOCKNO
PLANNO
MIXOPSEQ

Natural for DB2 Server Stub

A Natural for DB2 server stub is an interface module needed to communicate between the DB2 database system and the Natural server. The server stub module determines, sets up and invokes a Natural server environment for executing Natural stored procedures and Natural user-defined functions.

As mentioned in the ***Installation Procedure***, there are two types of server stub: the Natural for DB2 start server stub (STR) and the Natural for DB2 server stub (SRV). Both stubs are generated from the `NDBSTUB` macro.

Natural for DB2 Start Server Stub

The Natural for DB2 start server stub is used for setting up the Natural server environments desired. The start server stub must be the main execution program in the Stored Procedure Address Space (SPAS). After the start server stub has established the Natural server environments, it passes control to the appropriate DB2 program (`DSNX9WLM` for WLM SPAS and `DSNX9STP` for DB2 SPAS). When SPAS terminates, the DB2 program returns control to the start server stub. The start server stub stops the Natural server environments and returns control to the operating system.

The Natural for DB2 start server stub reads the names and parameters of the Natural server to be started from the `CMSRVIN` data set. `CMSRVIN` must be specified with the DD name `CMSRVIN`.

The `CMSRVIN` data set is a sequential file that contains all information required to start the desired Natural servers. For each server to be started, one `START` entry must be provided. The parameters used for the `START` entries are identical to the parameters that apply to the `NDBSTUB` macro. Enclose the contents of each `START` entry in brackets and delimit comments by the following signs: `/*` and `*/`.

Example of START Entries:

```
START=(SERVER=NDBvrSRV,NATURAL=NATBATvr,CMPRMIN=CMPRMIN,
        CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=768,
        THREADNUMBER=2,TRACE=ON)
 START=(SERVER=WDBvrSRV,NATURAL=NATBATvr,CMPRMIN=CMPRMIN,
        CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=768,
        THREADNUMBER=2,TRACE=ON)
/*  START=(SERVER=QEvrsSRV,NATURAL=NATBATvr,CMPRMIN=QAPARM, */
/*         CMPRINT=CMPRINT,CMTRACE=CMTRACE,THREADSIZE=700, */
/*         THREADNUMBER=2,TRACE=OFF) */
```

If the start server data set is missing or has not been assigned, the start server stub will start a Natural server environment with the parameters that derive from the parameters defined for the start server stub itself.

Natural for DB2 Server Stub

The Natural for DB2 server stub is the link between DB2 and Natural stored procedures or Natural user-defined functions (Natural UDFs). Specify the Natural for DB2 server stub as `EXTERNAL NAME` in the `SYSIBM.SYSROUTINES` table row that refers to the Natural stored procedure or Natural UDF. The server stub is started by DB2/WLM when the Natural stored procedures or Natural UDFs are invoked. The Natural for DB2 server stub creates a Natural session in the Natural server environment and invokes the Natural subprogram comprising the Natural stored procedure or the Natural UDF.

A Natural session created for executing a Natural stored procedure terminates when the corresponding Natural subprogram ends and control returns to DB2 and to the calling client.

A Natural session created for executing a Natural UDF stays active for multiple function invocations if the `PARALLEL` attribute is set to `D` and the `FINAL CALL` attribute is set to `Y`. The session invoked for a Natural UDF function is terminated by the server stub if it detects a termination call.

JCL Procedure

The JCL procedure of the Stored Procedure Address Space (SPAS) must specify the Natural for DB2 start server stub as program in the `EXEC` statement.

The Natural for DB2 start server stub and the Natural for DB2 server stub must reside in a library contained in the steplib concatenation of the JCL procedure of the SPAS.

Example of JCL:

```
//***********************************************************
//*    JCL FOR RUNNING THE WLM-ESTABLISHED STORED PROCEDURES
//*    ADDRESS SPACE
//*       RGN     -- MVS REGION SIZE FOR THE ADDRESS SPACE.
//*       DB2SSN  -- DB2 SUBSYSTEM NAME.
//*       NUMTCB  -- NUMBER OF TCBS USED TO
//*                  PROCESS END USER REQUESTS.
//*       APPLENV -- MVS WLM APPLICATION ENVIRONMENT
//*                  SUPPORTED BY THIS JCL PROCEDURE.
//*
//***********************************************************
//DBvrsENV PROC RGN=0K,APPLENV=DBvrsENV,DB2SSN=DBvrs,NUMTCB=8
//IEFPROC EXEC PGM=NDBvrSTR,REGION=&RGN,TIME=NOLIMIT, /* Start server stub
//*IEFPROC EXEC PGM=DSNX9WLM,REGION=&RGN,TIME=NOLIMIT,
//       PARM='&DB2SSN,&NUMTCB,&APPLENV'
//STEPLIB  DD  DISP=SHR,DSN=DSNvrs.RUNLIB.LOAD
//         DD  DISP=SHR,DSN=CEE.SCEERUN
```

```
//          DD  DISP=SHR,DSN=DSNvrs.SDSNLOAD
//          DD  DISP=SHR,DSN=NATURAL.LOAD /* Library containing stubs and nucleus
//CMPRMIN   DD  DISP=SHR,DSN=hilev.SOURCE(DYNPARM) /* Dynamic Natural parameters
//CMSRVIN   DD  DISP=SHR,DSN=hilev.SOURCE(CMSRVIN) /* Servers to be started
//CEEDUMP   DD  SYSOUT=X
//SYSOUT    DD  SYSOUT=X /* Traces records of server stub
//RMTRACE   DD  SYSOUT=X
//CMPRINT   DD  SYSOUT=X
//SYSPRINT  DD  SYSOUT=X
//SYSERROR  DD  SYSOUT=X
//SYSUDUMP  DD  SYSOUT=X
```

where *hilev* represents a high-level qualifier.

NDBSTUB Macro

The NDBSTUB macro is used to generate the Natural for DB2 server stub and Natural for DB2 start server stub. You can parameterize NDBSTUB to create different stubs.

Below are the parameters available with NDBSTUB:

CMPRINT | CMPRMIN | CMTRACE | GTRACE | GTRCID | MODE | NATURAL | SERVER | THREADSIZE | TRACE | WLM

CMPRINT - DD Name of CMPRINT Data Set

CMPRINT specifies the DD name of the CMPRINT data set to which the primary report output is written. If an asterisk (*) is specified, a unique *ddname* P*nnnnnnn* is built whenever a Natural stored procedure is invoked.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
CMPRINT	This is the default name.

CMPRMIN - DD Name of CMPRMIN Data Set

CMPRMIN specifies the DD name of the CMPRMIN data set during startup to read the input PROFILE parameter for this server.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
CMPRMIN	This is the default name.

CMTRACE - DD Name of CMTRACE Data Set

CMTRACE specifies the DD name of the CMTRACE data set to which the primary report output is written. If an asterisk (*) is specified, a unique *ddname* P*nnnnnnn* is built whenever a Natural stored procedure is invoked, which makes it possible to store each output separately.

Possible Values:

Value	Explanation
ddname	Any valid 8-character DD name
CMTRACE	This is the default name.

GTRACE - Natural for DB2 Server Stub to Execute GTRACE Calls

GTRACE specifies whether or not the server stub executes GTRACE macro calls for tracing purposes.

Possible Values:

Value	Explanation
ON	The generated server stub executes GTRACE macros in order to document its processing.
OFF	The generated server stub does not execute GTRACE macros during its processing cycle. This is the default value.

GTRCID - GTRACE ID to be Used

GTRCID specifies the event ID recorded with the trace data created by the Natural for DB2 server stub.

Possible Values:

Value	Explanation
event-id	Decimal number from 0 to 1023
203	This is the default value.

MODE - Operating Mode of Natural for DB2 Server Stub

`MODE` determines the operating mode of the Natural for DB2 server stub generated.

Value	Explanation
`STR`	The generated Natural for DB2 server stub operates as Natural for DB2 start server stub that sets up the Natural server environment.
`SRV`	The generated Natural for DB2 server stub operates as Natural for DB2 server stub that invokes the associated Natural stored procedure or Natural UDF. This is the default value.

NATURAL - Name of Server Front-End or Natural Server

`NATURAL` denotes the name of the server front-end or Natural server load module loaded by the Natural for DB2 server stub if the external `CMSTART` has not yet been resolved by the linkage editor during the creation of the server stub. The named load module has to be present in any steplib of the stored procedure address space.

Value	Explanation
name	Any valid load module name
`NATBAT`*vr*	This is the default value.

SERVER - Server Name for Natural Server Environment

Server names suffixed with the three characters `SRV` denote the names of the servers used by the server front-end in order to identify the Natural server. These names must be unique within one address space.

Value	Explanation
server-name	Server name of up to 5 characters
`NDB`*vr*	This is the default value.

THREADSIZE - Size of Natural Threads for Natural Server

`THREADSIZE` determines the size of the Natural threads to be used by the Natural server. The size is specified in units of kilobytes.

Value	Explanation
threadsize	Decimal number
768	This is the default value.

TRACE - Natural for DB2 Server Stub to Write Trace Records

Determines whether the generated Natural for DB2 server stub writes trace records. The trace records are written to the data set specified with *ddname* SYSOUT.

Value	Explanation
YES	Trace records are written.
NO	No trace records are written. This is the default value.

WLM - Natural for DB2 Start Server Stub Mode WLM/DB2 SPAS

WLM (Workload Manager) specifies where control is passed to after the Natural for DB2 start server stub has established the Natural server environments requested.

This parameter is only evaluated if the MODE=STR parameter is set. Specify WLM=YES if the Natural for DB2 start server stub runs in an address space that has been established by WLM.

Value	Explanation
YES	The start server stub generates links to DSNX9WLM, after setting up the Natural server environments.
NO	The start server stub generates links to DSNX9STP, after setting up the Natural server environments. This is default value.

XIII Installing Natural for Db2 for zIIP Version 1.1.1 on z/OS

17 Installing Natural for Db2 for zIIP Version 1.1.1 on z/OS

This document describes the additional steps for installing Natural for Db2 for zIIP Version 1.1.1 (product code NDZ) on z/OS.

Related Topics:

For information on how to use Natural for Db2 for zIIP, see *Natural for Db2 for zIIP* in the *Database Management System Interfaces* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

Before you can install Natural for Db2 for zIIP, you must meet all the prerequisites for Natural for Db2 and have the following software installed:

- **Natural (NAT)**Version 8.2.8 or higher
- **Natural for Db2 (NDB)**Version 8.4.3 or higher
- Mainframe License Check (MLC) 1.3.7 or higher
- IBM Java 8 64 bits
- Db2 JDBC driver
- z/OS Unix System Services
- APF authorized load library
- RACF user (referred as `ndz user` in the next steps) with:
  - Started RACF profile defined for NDZ started task(s).
  - Permit to `ERBSDS.MON3DATA` RACF facility profile.
  - Permit to `BPX.WLMSERVER` RACF facility profile.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NDZ*vrs*.LOAD	Load modules
NDZ*vrs*.SRCE	Source modules and macros
NDZ*vrs*.JOBS	Example jobs
NDZ*vrs*.TAR	USS files (tar format for extraction to unix system services)

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

The installation procedure comprises the following:

- **NDZ Server Installation Steps**
- **Installation Steps Specific to Batch**

NDZ Server Installation Steps

This section describes the installation steps that apply to all Natural environments where Natural for Db2 for zIIP can be installed.

- Step 7: Create NDZ started task procedure(s)

Step 1: Prepare the Unix System Services directory

1. Create the Unix System Services directory where the .jar and configuration files will be located. The directory is referred to as `NDZ home directory` in the next steps.
2. Grant access to `ndz user` (RACF user with the permissions listed in the prerequisites).

Step 2: Copy and Extract the TAR file

(Job I020 Step 9610 + 9615)

Extract the TAR file into the Unix System Services directory (`NDZ home directory`)

Step 3: Create the Db2 properties file

1. Create the `NDZ home directory`**/etc/db2.properties** file from the sample `NDZ home directory`**/etc/db2.properties.sample** file.
2. Set the variables according to the instructions located in the sample file.

Step 4: Create the NDZ properties file

1. Create the `NDZ home directory`**/etc/ndz.properties** file from the sample `NDZ home directory`**/etc/ndz.properties.sample** file.
2. Set the variables according to the instructions located in the sample file.

Step 5: Update Static Preparation Shell Script

Update the Db2, Java, and NDZ home path variables located in `NDZ directory path`**/bin/setnenv.sh** according to the instructions located in the file.

Step 6: Link the NDZ Nucleus

(Job I060 Step 9620)

Link the NDZ nucleus with `NDZvrs.LOAD`(`NDZNUC`), `MLCvrs.LOAD`(`LICMAIN`) and `MLCvrs.LOAD`(`LICCHECK`).

Step 7: Create NDZ started task procedure(s)

(Job I200 Step 9610)

Create procedure(s) for NDZ started task(s) (or daemons) using the following template:

```
//NAME   PROC
//*
//NDZ11    EXEC  PGM=NDZNUC11,REGION=0M,TIME=NOLIMIT,
// PARM=('PATH=NDZ INSTALLATION PATH','PORT=PORT NUMBER TO CONNECT')        ↩

//*---------------------------------------------------------------------*
//LICNDZ   DD DISP=SHR,DSN=LICENSE DATASET(ndzlic)
//STEPLIB  DD DISP=SHR,DSN=LOAD DATASET
//SYSPRINT DD SYSOUT=X
//SYSOUT   DD SYSOUT=X
//SYSUDUMP DD SYSOUT=X
//STDOUT   DD SYSOUT=X
//STDERR   DD SYSOUT=X
```

Substitute the highlighted parts using the following instructions:

- `NAME` – The name of the started task.
- `NDZ INSTALLATION PATH` – The path to the NDZ home directory.
- `PORT NUMBER TO CONNECT` – The port number.
- `LICENSE DATASET` – The dataset which contains the license file.
- `LOAD DATASET` – The APF authorized dataset in which the NDZ nucleus is located.

Installatiosn Steps Specific to Batch

(Job I060 Step 0020)

1. Link the batch nucleus with the NDZ Support.
2. Add the following `INCLUDE` statements and corresponding `DD` statements to the link instructions for the linkage editor:

`INCLUDE NDBLIB(NDBNDZ)`	NDB support for NDZ
`CHANGE DSNHLI(DB2HLI)` `INCLUDE DB2LIB(DSNALI)`	Db2 Interface module

XIV Installing Natural for DL/I on z/OS

18 Installing Natural for DL/I on z/OS

This document describes the steps for installing Natural for DL/I (product code NDL) on z/OS.

Related Topic:

For information on how to operate Natural in a DL/I environment, see *Natural for DL/I* in the *Database Management System Interfaces* documentation.

Notation *vrs* **or** *vr***:**

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NDL*vrs*.LOAD	Load modules
NDL*vrs*.SRCE	Source modules and macros
NDL*vrs*.JOBS	Sample installation jobs

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

The installation procedure comprises the following:

- **Common Installation Steps**
- **Installation Steps Specific to CICS**
- **Installation Steps Specific to IMS TM**

Common Installation Steps

This section described the installation steps that apply to all Natural environments where Natural for DL/I can be installed. The steps additionally required for a particular TP monitor are described in the following sections.

Step 1: Build the DL/I Bootstrap Module

(Job I054, Step 1500)

- Link the Natural for DL/I bootstrap module `NDLSINIB`.

Step 2: Build the Natural for DL/I Parameter Module

(Job I055, Steps 1500, 1501)

1. Modify the Natural for DL/I parameter module `NDLPARM` as described in the section *Natural Parameter Modifications for DL/I* in the *Database Management System Interfaces* documentation.
2. Assemble and link/catalog `NDLPARM`.

Step 3: Build the Natural Parameter Module

(Job I060, Steps 0010, 0015)

Build the Natural parameter module for batch mode:

1. Add the Natural profile parameter `DLISIZE` and specify `DLISIZE=27`. This value applies if the default values of the parameters contained in the `NDLPARM` module are used. `DLISIZE` is described in the *Parameter Reference* documentation.
2. Add an `NTDB` macro (see the *Parameter Reference* documentation) to the Natural parameter module specifying the database IDs (DBIDs) that relate to DL/I segment types. The numbers specified in this DBID list must be in the range from 1 to 254. They indicate which DBIDs are reserved for DL/I segment types. Up to 254 entries can be specified. All Natural DDMs that refer to a DL/I segment type are cataloged with a DBID from this list. The number with the lowest value in this list is the default DBID for DL/I segment types.

Examples:

```
NTDB DLI,(250,253,252)
NTDB DLI,250
```

Note: Values for DL/I DBIDs above 255 are not possible.

3. Assemble and link the parameter module.

Step 4: Link the Nucleus

(Job I060, Steps 0020, 0105)

1. Link the **environment-dependent nucleus** (Step 0020) for batch Natural.

   Add the following `INCLUDE` statements and the corresponding DD statements to the link step for Natural:

   ```
    INCLUDE NDLLIB(NDLSIOBA)
    INCLUDE SMALIB(NDLPARM)
    INCLUDE RESLIB(ASMTDLI)
   ```

2. Link the **environment-independent nucleus** (Step 0105).

   Add the following `INCLUDE` statement and the corresponding DD statement to the link step for Natural:

   ```
    INCLUDE NDLLIB(NDLNUC)
   ```

Step 5: Build the Natural for DL/I Sample Database

(Jobs I008, I053, I075)

Build a Natural for DL/I environment with a sample database:

1. Allocate VSAM spaces for the sample database (Job I008, Steps 1500 and 1501).
2. Create the DBDs and PSBs, and perform the initial load (Job I053, Steps 1500, 1521, 1531, 1541, 1542, 1543, 1550 and 1560).
3. Execute the procedures `NATPSB` and `NATDBD` for the sample database (Job I075, Steps 1500, 1510, 1520, 1521 and 1522).

   Additional data must be added to the `FDIC` system file to enable Natural to access DL/I databases. To do so, the procedures `NATPSB` and `NATDBD` (see the relevant sections in the *Database Management System Interfaces* documentation) must be executed for each PSB/DBD to be used.

Installation Steps Specific to CICS

This section describes the additional steps required to install Natural for DL/I in a CICS environment.

Step 1: Build the Natural Parameter Module for the Natural CICS Interface

(Job I080, Steps 2210, 2220)

Build the Natural Parameter Module for the Natural CICS Interface:

1. Add the Natural profile parameter `DLISIZE` and specify `DLISIZE=27`. This value applies if the default values of the parameters contained in the `NDLPARM` module are used. `DLISIZE` is described in the *Parameter Reference* documentation.
2. Add an `NTDB` macro (see the *Parameter Reference* documentation) to the Natural parameter module specifying the database IDs (DBIDs) that relate to DL/I segment types. The numbers specified in this DBID list must be in the range from 1 to 254. They indicate which DBIDs are reserved for DL/I segment types. Up to 254 entries can be specified. All Natural DDMs that refer to a DL/I segment type are cataloged with a DBID from this list. The number with the lowest value in this list is the default DBID for DL/I segment types.

   Examples:

   ```
   NTDB DLI,(250,253,252)
   NTDB DLI,250
   ```

   Note: Values for DL/I DBIDs above 255 are not possible.

3. Assemble and link the parameter module.

Step 2: Link the Nucleus for the Natural CICS Interface

(Job I080, Step 2230)

- Link the **environment-dependent nucleus** for the Natural CICS Interface.

  Add the following `INCLUDE` statements and the corresponding DD statements to the link step for Natural:

```
INCLUDE NDLLIB(NDLSIOCX)
INCLUDE SMALIB(NDLPARM)
INCLUDE TPSLIB(ASMTDLI)
```

Alternative Link-Edit Options

Instead of the standard link-edit options, you can also use one of the following link-edit methods:

- Link-edit all Natural for DL/I modules (`NDLNUC`, `NDLPARM` and `NDLSIOCX`), the DL/I module `ASMTDLI` and an alternate Natural parameter module as a separate module with the mandatory entry name `CMPRMTB`. The name of the resulting module is optional. This way of link-editing only applies if an alternate parameter module (`PARM=`) is used. If so, under CICS, an additional CICS PPT entry with `PROGRAM=`*`name`* is required.
- Link-edit all Natural for DL/I modules (`NDLNUC`, `NDLPARM` and `NDLSIOCX`) and the DL/I module `ASMTDLI` as a separate module with the mandatory entry name `NATGWDLI`. The name of the resulting module is optional. However, if it is different from `NATGWDLI`, it must be specified as an alias name in an `NTALIAS` macro entry of the Natural parameter module. This way of link-editing only applies if the Natural Resolve CSTATIC Addresses feature (RCA) is used. If so, under CICS, an additional CICS PPT entry with `PROGRAM=`*`name`* is required.

Installation Steps Specific to IMS TM

This section describes the additional steps required to install Natural for DL/I in an IMS TM environment.

Step 1: Build the Natural Parameter Module for the Natural IMS TM Interface

(Job I080, Steps 2500, 2510)

Build the Natural Parameter Module for the Natural IMS TM Interface:

1. Add the Natural profile parameter `DLISIZE` and specify `DLISIZE=27`. This value applies if the default values of the parameters contained in the `NDLPARM` module are used. `DLISIZE` is described in the *Parameter Reference* documentation.
2. Add an `NTDB` macro (see the *Parameter Reference* documentation) to the Natural parameter module specifying the database IDs (DBIDs) that relate to DL/I segment types. The numbers specified in this DBID list must be in the range from 1 to 254. They indicate which DBIDs are reserved for DL/I segment types. Up to 254 entries can be specified. All Natural DDMs that refer to a DL/I segment type are cataloged with a DBID from this list. The number with the lowest value in this list is the default DBID for DL/I segment types.

Examples:

```
NTDB DLI,(250,253,252)
NTDB DLI,250
```

Note: Values for DL/I DBIDs above 255 are not possible.

3. Assemble and link the parameter module.

Step 2: Link the Nucleus for the Natural IMS TM Interface

(Job I080, Steps 2570, 2572)

- Link the **environment-dependent nucleus** for the Natural IMS TM Interface.

  Add the following `INCLUDE` statements and the corresponding DD statements to the link step for Natural:

```
INCLUDE NDLLIB(NDLSIOBA)
INCLUDE SMALIB(NDLPARM)
INCLUDE RESLIB(ASMTDLI)
```

Alternative Link-Edit Options

Instead of the standard link-edit options, you can also use one of the following link-edit methods:

- Link-edit all Natural for DL/I modules (`NDLNUC`, `NDLPARM` and `NDLSIOBA`), the DL/I module `ASMTDLI` and an alternate Natural parameter module as a separate module with the mandatory entry name `CMPRMTB`. The name of the resulting module is optional. This way of link-editing only applies if an alternate parameter module (`PARM=`) is used.
- Link-edit all Natural for DL/I modules (`NDLNUC`, `NDLPARM` and `NDLSIOBA`) and the DL/I module `ASMTDLI` as a separate module with the mandatory entry name `NATGWDLI`. The name of the resulting module is optional. However, if it is different from `NATGWDLI`, it must be specified as an alias name in an `NTALIAS` macro entry of the Natural parameter module. This way of link-editing only applies if the Natural Resolve CSTATIC Addresses feature (RCA) is used.

Customizing the IMS TM Environment

The following steps are required if you want to run the Natural for DL/I NATEXPL example program in an IMS TM environment.

Step 1: Run PSBGENs for Sample PSBs

- Run IMS TM PSBGEN procedures to create the sample PSBs NATSYSF, NATSYSFL, NII*vrs*FR, NII*vrs*NC and NIIBOOT.

Step 2: Run DBDGEN for NATEXPL

- Run an IMS TM DBDGEN procedure to generate the NATEXPL example program.

Step 3: Perform GEN and Create the APPLCTN Table Definitions

- Perform an IMS TM GEN with the new DATABASE, APPLCTN and TRANSACT definitions as shown in the following examples:

```
         DATABASE DBD=NATEXPL,ACCESS=UP NATURAL DL/I
         DATABASE DBD=NATEXPLO,ACCESS=UP NATURAL DL/I
```

```
APPLCTN PSB=NATSYSF,PGMTYPE=BATCH
        TRANSACT CODE=NATTRNSF,MODE=SNGL,                                *
          MSGTYPE=(SNGLSEG,RESPONSE,4)


APPLCTN PSB=NATSYSFL,PGMTYPE=BATCH
        TRANSACT CODE=NATTRNFL,MODE=SNGL,                                *
          MSGTYPE=(SNGLSEG,RESPONSE,4)


APPLCTN PSB=NIIvrsFR,PGMTYPE=TP
        TRANSACT CODE=NATvrs,MODE=SNGL,SPA=512,                          *
          MSGTYPE=(SNGLSEG,RESPONSE,4)


APPLCTN PSB=NIIvrsNC,PGMTYPE=TP
        TRANSACT CODE=NATvrsNC,MODE=SNGL,                                *
          MSGTYPE=(SNGLSEG,NONRESPONSE,4)
```

```
APPLCTN PSB=NIIBOOT,PGMTYPE=TP
        TRANSACT CODE=NATTRNBT,MODE=SNGL,                              *
          MSGTYPE=(SNGLSEG,RESPONSE,4)
```

Step 4: Modify the Allocation Table

- Update the IMS TM dynamic allocation table with information on the new databases:

```
DFSMDA TYPE=DATABASE,DBNAME=NATEXPL


DFSMDA TYPE=DATASET,DDNAME=NATEXPL,                                    *
             DSNAME=RD.IBM.EXPLDBD.DATA,                               *
             DISP=SHR


DFSMDA TYPE=DATASET,DDNAME=NATEXPLO,                                   *
             DSNAME=RD.IBM.EXPLDBDX.OVFL,                              *
             DISP=SHR
```

Step 5: Modify the RECON Data Set

- Update the RECON data set with information on the new databases:

```
INIT.DB DBD(NATEXPL) SHARELVL(3) TYPEIMS
  INIT.DBDS DBD(NATEXPL) DDN(NATEXPL) -
             DSN(RD.IBM.EXPLDBD.DATA) -
             ICJCL(ICJCL) OICJCL(OICJCL) RECOVJCL(RECOVJCL) -
             NOREUSE RECOVPD(0) GENMAX(3)
  INIT.DBDS DBD(NATEXPL) DDN(NATEXPLO) -
             DSN(RD.IBM.EXPLDBDX.OVFL) -
             ICJCL(ICJCL) OICJCL(OICJCL) RECOVJCL(RECOVJCL) -
             NOREUSE RECOVPD(0) GENMAX(3)
```

Installation Verification

You can verify the successful installation of Natural for DL/I online by using the **DL/I Services** function (described in the *Database Management System Interfaces* documentation) of the Natural SYSDDM utility:

1. Invoke online Natural.
2. Invoke the SYSDDM utility.

3. In the SYSDDM main menu, enter function code `D` to invoke the **DL/I Services** function.
4. On the resulting screen, enter function code `D` to invoke the **NDB Maintenance** function.
5. On the resulting screen, enter function code `S` to select the NDB which was created in ***Step 4: Build the Natural for DL/I Sample Database*** .

   On the resulting screen, enter function code `L` to list the NDB segments.

   On the resulting screen, enter function code `A` to assign DBID and FNR to the segments.
6. On the same screen, enter function code `G` to generate a DDM from the segment description.
7. Catalog the generated DDM.
8. Only if running under CICS:

   Enter `NATPSB ON NATSYSF` in the command line where `NATSYSF` refers to the name used for DBD and PSB in ***Step 4: Build the Natural for DL/I Sample Database*** .
9. Edit and run the following program:

```
DEFINE DATA LOCAL
01 COURSE VIEW OF NATEXPL-COURSE
  02 COURSEN
  02 TITLE
  02 DESCRIPN
END-DEFINE
READ (100) COURSE BY COURSEN
  DISPLAY COURSEN TITLE DESCRIPN
END
```

   where `NATEXPL-COURSE` refers to the name used for DBD and PSB in ***Step 4: Build the Natural for DL/I Sample Database***.

XV Installing Natural for VSAM on z/OS

This document describes the installation of Natural for VSAM (product code NVS) on an Adabas database or in a VSAM (Virtual Storage Access Method) file system on z/OS.

Related Topic:

For information on how to operate Natural in a VSAM environment, see *Natural for VSAM* in the *Database Management System Interfaces* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

19 Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

For the installation of Natural ISPF in a VSAM file system, see the Natural ISPF *Installation* documentation. Be sure that you use the relevant module (`NVSISPV`) provided on the Natural for VSAM installation medium.

20 Installing Natural for VSAM on Adabas System Files on z/OS

This document describes the steps for installing Natural for VSAM on an Adabas database on z/OS.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NVS*vrs*.LOAD	Load modules
NVS*vrs*.SRCE	Source modules and macros
NVS*vrs*.JOBS	Sample installation jobs
NVS*vrs*.EMPL	EMPLOYEES example data
NVS*vrs*.EXPL	Natural example objects

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Define the CICS RDO Definitions

(Job I005)

- Define the CICS RDO definitions for the sample VSAM files.

Step 2: Load the Employees Example Data

(Job I008, Steps 1403 - 1407)

1. Define the VSAM cluster and files to contain the Employees example file.
2. Load the `NVS`*`vrs`*`.EMPL` data set into the first of these files (suffix `.EMPL`).
3. Build a secondary index of this into the second file (suffix `.EMPLX`) and define the path for this.

Step 3: Build the Natural for VSAM I/O Module

- Assemble and link the Natural for VSAM I/O module:
  - Under Com-plete:

    (Job I055, Steps 1410, 1411, 1415, 1416)

    Assemble the I/O module `NVSMISC` by using the parameter `SMARTS=YES` (Steps 1415 and 1416). For detailed information, see *NVSMISC Module* and `SMARTS` described in the *Database Management System Interfaces* documentation.
  - Under CICS:

    (Job I070, Step 1400)

    Use the I/O module `NVSCICS`. See *NVSCICS Module* described in the *Database Management System Interfaces* documentation.

    Note: If you are not using the most recent CICS version, the precompile step may result in a non-zero return code (4 - 16, depending on your CICS version) because of CICS commands being used that are unknown to your CICS translator. This return code can be ignored as long as the subsequent assembly step ends with a return code of 0.

  - In any other environment:

    Use the I/O module `NVSMISC`. See *NVSMISC Module* described in the *Database Management System Interfaces* documentation.

Step 4: Build the Natural Parameter Module for VSAM

(Jobs I060, I080)

Build the Natural parameter module:

1. Modify the appropriate jobs according to the batch modules or TP monitor you are relinking: Job I060 for batch, Job I080 for Com-plete and Job I080 for CICS. This applies also to *Step 5: Link the Nucleus*.

   Add the following parameter and macro calls to your Natural parameter module:

   ```
   VSIZE=72 NTDB VSAM, vsam-dbid NTVSAM
   ```

   The values for `VSIZE` depend on the values specified in `NTVSAM` (see also the *VSIZE Parameter* in the *Database Management System Interfaces* documentation).

2. Assemble and link the Natural parameter module.

Step 5: Link the Nucleus

(Jobs I060, I080)

- Modify the JCL used to link your **environment-independent nucleus** by adding the following `INCLUDE` statement:

  ```
  INCLUDE NVSLIB(NVSNUC)
  ```

- Modify the JCL used to link your **environment-dependent nucleus** for the Natural CICS Interface by adding the following `INCLUDE` statement:

  ```
  INCLUDE SMALIB(NVSCICS)
  ```

- Modify the JCL used to link your **environment-dependent nucleus** for Natural TP monitor interfaces other than the Natural CICS Interface by adding the following `INCLUDE` statement:

  ```
  INCLUDE SMALIB(NVSMISC)
  ```

- Modify the JCL used to link your **environment-dependent nucleus** for Natural TP monitor interfaces other than the Natural CICS Interface if `RLS=CHECK` is specified in the `NTVSAM` macro of the VSAM-specific Natural parameter module by adding the following `INCLUDE` statement:

```
INCLUDE CSSLIB(IGWARLS)
```

The routine `IGWARLS` is a callable service to support RLS processing. It resides in the system library `SYS1.CSSLIB`. Add the corresponding DD statements to the link step for Natural.

For information on the components and structure of Natural for VSAM, see also *Components of Natural for VSAM* and *Structure of the Natural Interface to VSAM* in the *Database Management System Interfaces* documentation.

Step 6: Load the Natural Example Objects

(Job I061, Step 1400)

- Load the Natural example objects specific to Natural for VSAM from the `NVSvrs.EXPL` data set into the Natural system file by using the Natural **INPL utility**.

Step 7: Customize your TP Monitor

- Customize your TP monitor environment:

<table>
<tr><th>TP Monitor</th><th>Instruction</th></tr>
<tr><td>Com-plete</td><td>Catalog all VSAM files to Com-plete using the CA function of the Com-plete UFILE utility (described in the Com-plete documentation).

If you have specified <code>PATH=CHECK</code> in <code>NTVSAM</code>:
1. Catalog your front program to Com-plete using the CA function of the Com-plete ULIB utility with a region size of 40 KB if you have not changed the first default value of the <code>WPSIZE</code> parameter in the Natural parameter module.
2. Load the IBM routine <code>IGGOCLAO</code> either in the LPA or as a resident program using the Com-plete UCTRL utility.</td></tr>
<tr><td>CICS</td><td>Add the entries for the VSAM-specific example files <code>EMPLVS</code> and <code>EMPLVX</code> to your RDO definition as described in Step 1: Define the CICS RDO Definitions; you can find the CICS tables on the <code>NVSvrs.JOBS</code> data set as <code>NVSI005</code>.</td></tr>
<tr><td>TSO</td><td>Add the following statements to the CLIST used to start Natural:

<code>ALLOCATE F(EMPLVS) DATASET('SAGLIB.VSAM.EMPL')   SHR</code>
<code>ALLOCATE F(EMPLVX) DATASET('SAGLIB.VSAM.EMPLX.PATH') SHR</code></td></tr>
</table>

Installation Verification

You can verify the successful installation of Natural for VSAM by performing the following:

- Log on to the Natural system library `SYSEXNVS` and run the following programs:
  - `NVSINST1`
  - `NVSINST2`
  - `NVSINST3`
  - `NVSINST4`
  - `NVSINST5`
  - `NVSINST6`

  If all these programs can be executed successfully, the installation of Natural for VSAM is completed and verified.

Note for Batch Mode:

For verification in batch mode, you can run Job I200 which executes the above programs.

21 Installing Natural for VSAM on VSAM System Files on z/OS

This document describes the steps for installing Natural for VSAM in a VSAM file system on z/OS.

The Natural system files `FNAT`, `FUSER`, `FDIC`, `FSEC` and `FSPOOL` can also be located on VSAM files.

The installation of Natural for VSAM in a VSAM file system is basically a combination of the installation descriptions for both base Natural and Natural for VSAM, plus some points specific to VSAM.

For support of source object locking, a separate `FLOCK` file and related paths are required.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

If you want to install Natural in a VSAM file system, you need the data sets for both base Natural and Natural for VSAM. The required data sets are listed in the table below:

Data Set Name	Contents
NAT*vrs*.LOAD	Load modules
NAT*vrs*.SRCE	Source modules and macros
NAT*vrs*.JOBS	Sample installation jobs
NAT*vrs*.INPL	Natural objects
NAT*vrs*.EXPL	Natural example objects
NVS*vrs*.LOAD	Load modules
NVS*vrs*.SRCE	Source modules and macros
NVS*vrs*.JOBS	Sample installation jobs
NVS*vrs*.VINI	`FDIC` initialization file for Natural for VSAM
NVS*vrs*.LINI	`FLOCK` initialization file for Natural for VSAM
NVS*vrs*.EMPL	EMPLOYEES example data
NVS*vrs*.EXPL	Natural example objects

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk***.

Installation Procedure

Be sure to read *Installation Process and Major Natural Features* before you start the installation procedure.

The VSAM jobs (for example, VSAMI008) indicated in this section are identical to the jobs generated by **System Maintenance Aid** (for example, I008).

Step 1: Define the CICS RDO Definitions

(Job VSAMI005)

- Define the CICS RDO definitions for the sample VSAM files.

Step 2: Load the Employees Example Data

(Job VSAMI008, Steps 1403 - 1407)

1. Define the VSAM cluster and files to contain the Employees example file.
2. Load the `NVS`*`vrs`*`.EMPL` data set into the first of these files (suffix `.EMPL`).
3. Build a secondary index of this into the second file (suffix `.EMPLX`) and define the path for this.

Step 3: Prepare the VSAM Clusters for the Natural System Files

(Job VSAMI008, Steps 1420 - 1446)

- Define three VSAM clusters to be used as system files for Natural (`FNAT`, `FUSER` and `FDIC`), an alternate index and a path for the alternate index for `FDIC`.

  We strongly recommend that you keep these three system files on separate VSAM clusters.

Step 4: Prepare a VSAM Cluster for the Spool File

(Job VSAMI008, Steps 0300 - 0309)

This step must be performed only if you have Natural Advanced Facilities installed and want your spool file to be a VSAM file, too.

- Define an additional VSAM cluster to be used as the spool file (`FSPOOL`) and five alternate indices.

  Note: Path processing is *not* supported for `FSPOOL`.

Step 5: Prepare a VSAM Cluster for the Security File

(Job VSAMI008, Steps 9900 - 9907)

This step must be performed only if you have Natural Security installed and want your security file to be a VSAM file, too.

- Define an additional VSAM cluster to be used as the security file (`FSEC`) and three alternate indices.

  Note: Path processing is *not* supported for `FSEC`.

Step 6: Prepare a VSAM Cluster for the Scratch-Pad File

(Job VSAMI008, Steps 1450, 1451)

This step must be performed only if you want to use a scratch-pad file; that is, if you want to use read-only Natural system files (`ROSY=ON`); see also the Natural profile parameter `ROSY` and the macro `NTLFILE` described in the *Parameter Reference* documentation.

- Define an additional VSAM cluster to be used as the scratch-pad file (Step 1450).
- Initialize the VSAM scratch-pad file (Step 1451).
- Set the following parameters in the Natural parameter module according to your requirements:

```
NTLFILE 212,dbid,nt-file-number,dd-name-scratch-pad-file
ROSY=ON
```

- If you want your Natural system file(s) to be opened for input, adapt your Natural parameter module as follows:

```
FNAT=(dbid,fnr,filename,,RO),
FUSER=(dbid,fnr,filename,,RO),
FSEC=(dbid,fnr,filename,,RO),
```

Step 7: Prepare a VSAM Cluster for the Source Locking File FLOCK

(Job VSAMI008, Steps 1460, 1461)

This step must be performed only if you want to lock source objects in a VSAM file system (`SLOCK=PRE`); see also the parameter `SLOCK` and the macro `NTLFILE` (described in the *Parameter Reference* documentation).

- Define an additional VSAM cluster to be used as the source locking file (Step 1460).
- Load and print the example data record contained in the VSAM source locking file (Step 1461).
- Set the following parameters in the Natural parameter module according to your requirements:

```
NTLFILE 002,dbid,nt-file-number,dd-name-source-locking-file,,PATH
SLOCK=PRE
```

The default DD name (*dd-name*) is `FLOCK`, the related default paths are `FLOCKA`, `FLOCKB` and `FLOCKC`.

Step 8: Build the Natural for VSAM I/O Module

(Job VSAMI055, Steps 1410, 1411, 1415, 1416)

- Edit, assemble and link the Natural for VSAM I/O module `NVSMISC` with the LSR options:

```
DEFER=YES
COMMIT=NO
READINT=NO
```

For the parameters that can be specified in the `NVSMISC` module, see the relevant section in the *Database Management System Interfaces* documentation.

Step 9: Build the Natural Parameter Module for Batch Mode for VSAM

(Job I060, Step 0010)

1. Modify the settings of the supplied Natural profile parameters as required for batch mode. The parameters and corresponding macros (if applicable) are described in the *Parameter Reference* documentation. The most important parameter/macro settings are described below.

   - Configure the z/OS batch interface:
     Modify the settings of the parameters supplied with the `NTOSP` macro to meet your requirements. For descriptions of these parameters, see the corresponding profile parameter `OSP`.
   - In addition to the `VSIZE` and `NTDB` specifications, modify the parameters `FNAT`, `FUSER` and `FDIC` as follows:

     ```
     VSIZE=126,
     FNAT=(vsam-dbid,fnr-fnat,dd-name-fnat),
     FUSER=(vsam-dbid,fnr-fuser,dd-name-fuser),
     FDIC=(vsam-dbid,fnr-fdic,dd-name-fdic),
     NTDB VSAM,vsam-dbid
     NTVSAM
     ```

     The *`vsam-dbid`* must have the same value in all four entries.

     We recommend that you use different files and different file numbers for `FNAT` and `FUSER`. The `FDIC` file must be a file different from `FNAT` and `FUSER`. Therefore, you may *not* omit the `FDIC` parameter.

     The DD names (*`dd-name`*) are the logical names of the Natural system files; each DD name can be up to seven characters long. The DD name for the `FDIC` path is created by appending an `X` to the DD name of the `FDIC` file.
   - If you have Natural Advanced Facilities installed and want your spool file to be a VSAM file, modify the `FSPOOL` parameter accordingly:

     ```
     FSPOOL=(vsam-dbid,fnr-fspool,dd-name-fspool)
     ```

   - If you have Natural Security installed and want your security file to be a VSAM file, modify the `FSEC` parameter accordingly:

     ```
     FSEC=(vsam-dbid,fnr-fsec,dd-name-fsec)
     ```

     The `FSEC` file must be a file different from `FNAT`.
   - For a quick installation, use the Natural for VSAM LSR feature and specify the following `NTVLSR` definitions in the Natural parameter module (see also *NTVLSR Macro* in the *Parameter Reference* documentation):

```
NTVLSR fnat-dd-name,1
NTVLSR fuser-dd-name,2
NTVLSR fdic-dd-name,3
NTVLSR fdicx-dd-name,3
```

If you want to use `FSEC` system files:

```
NTVLSR fsec-dd-name,4
NTVLSR fseca-dd-name,4
NTVLSR fsecb-dd-name,4
NTVLSR fsecc-dd-name,4
```

2. Assemble and link the batch parameter module.

Step 10: Link the Nucleus for Batch Natural

(Job I060, Step 0020)

1. Modify the JCL used to link your **environment-dependent nucleus** for batch Natural by adding the following `INCLUDE` statements:

   ```
   INCLUDE NVSLIB(NVSNUC)
   INCLUDE NVSLIB(NVSFNAT)
   INCLUDE NVSLIB(NVSFSPO)
   INCLUDE NVSLIB(NVSFSEC)
   INCLUDE SMALIB(NVSFLOCK)
   INCLUDE SMALIB(NVSMISC)
   ```

   The module `NVSFSPO` is only required if you have Natural Advanced Facilities installed and want your spool file to be installed in a VSAM file system.

   The module `NVSFSEC` is only required if you have Natural Security installed and want your security file to be installed in a VSAM file system.

   The module `NVSFLOCK` is only required if you want to lock source objects contained in an `FUSER` or `FNAT` system file in a VSAM file system.

   If your **environment-dependent nucleus** is not linked to your **environment-independent nucleus**, `NVSMISC` must be linked to the Natural parameter module instead.

2. Add the corresponding DD statements to the link step for Natural.

For information on the components and structure of the Natural interface to VSAM, see also *Components of Natural for VSAM* and *Structure of the Natural Interface to VSAM* in the *Database Management System Interfaces* documentation.

Step 11: Load the Natural Objects

(Job I061, Step 0100)

- Load the Natural objects from the `NATvrs.INPL` data set into the Natural system file by using the Natural **INPL utility**.

  Ensure that the DD names specified in the Natural parameter module (see ***Step 9: Build the Natural Parameter Module for Batch Mode for VSAM***) are also specified for the load function performed with the Natural INPL utility. In addition, an alternate index DD name (`dd-name-fdicX`) must be specified for `FDIC`.

Note: If you want to install any other Software AG products that require Natural objects to be loaded with the Natural **INPL utility**, ensure that the corresponding installation steps are adapted according to **Job VSAMI061**.

Step 12: Load the Natural Example Objects

(Job I061, Step 0103, and Job VSAMI061, Step 1400)

- Load the Natural example objects from the `NATvrs.EXPL` data set into the Natural system file by using the Natural INPL utility (Job I061, Step 0103).
- Load the Natural example objects specific to Natural for VSAM from the `NVSvrs.EXPL` data set into the Natural system file by using the Natural INPL utility (Job VSAMI061, Step 1400).

Ensure that the DD names specified in the Natural parameter module (see ***Step 9: Build the Natural Parameter Module for Batch Mode for VSAM***) are also specified for the load function performed with the Natural INPL utility. In addition, a path DD name (`dd-name-fdicX`) must be specified for `FDIC`.

Step 13: Reorganize the FNAT System File

- Reorganize the `FNAT` system file by using the VSAM facility AMS REPRO to unload and reload the file.

Step 14: Build the Natural for VSAM I/O Module for CICS

(Job VSAMI070, Step 1400)

This step must be performed only if you want to install Natural for VSAM under CICS.

- Assemble and link the module `NVSCICS`.

Step 15: Link the Nucleus for Natural Under a TP Monitor

(Job VSAMI080)

Proceed with the TP monitor-specific installation steps for base Natural described in the relevant sections in *Installation for z/OS*, taking into account the following additions:

- Modify your VSAM-specific Natural parameter module according to ***Step 9: Build the Natural Parameter Module for Batch Mode for VSAM***.
- Add the following `INCLUDE` statements to all links of the online nucleus:

  ```
  INCLUDE NVSLIB(NVSNUC)
  INCLUDE NVSLIB(NVSFNAT)
  INCLUDE NVSLIB(NVSFSPO)
  INCLUDE NVSLIB(NVSFSEC)
  INCLUDE NVSLIB(NVSFLOCK)
  ```

  The module `NVSFSPO` is only required if you have Natural Advanced Facilities installed and want your spool file to be installed in a VSAM file system. The online environment for Natural Advanced Facilities must be a CICS environment, and the spool files installed in a VSAM file system must be defined in the CICS FCT.

  The module `NVSFSEC` is only required if you have Natural Security installed and want your Natural security system file to be installed in a VSAM file system. The VSAM Natural security system files installed in a VSAM file system must be defined in the CICS FCT.

  The module `NVSFLOCK` is only required if you want to lock source objects contained in an FUSER or FNAT system file in a VSAM file system. The locking files installed in a VSAM file system must be defined in the CICS FCT.
- Modify the JCL used to link your **environment-dependent nucleus** for the Natural CICS Interface by adding the following `INCLUDE` statement:

  ```
  INCLUDE SMALIB(NVSCICS)
  ```

- Modify the JCL used to link your **environment-dependent nucleus** for Natural TP monitor interfaces other than the Natural CICS Interface by adding the following `INCLUDE` statement:

  ```
  INCLUDE SMALIB(NVSMISC)
  ```

- Before starting Natural, ensure that the DD and DSN names of the Natural system files in the VSAM file system are known in your batch and online environments.

Step 16: Customize your TP Monitor

Customize your TP monitor environment:

<table>
<tr><th>TP Monitor</th><th>Instruction</th></tr>
<tr><td>Com-plete</td><td> Catalog the FNAT, FUSER and FDIC system files in the VSAM file system under Com-plete using the CA function of the Com-plete UFILE utility (described in the Com-plete documentation).
If Natural Security is installed, catalog the FSEC, FSECA, FSECB and FSECC system files in the VSAM file system under Com-plete using the CA function of the Com-plete UFILE utility.
If you want to lock source objects contained in the FUSER or FNAT system file, catalog the VSAM files FLOCK, FLOCKA, FLOCKB and FLOCKC under Com-plete using the CA function of the Com-plete UFILE utility.
If you have specified PATH=CHECK in NTVSAM, catalog your front program to Com-plete using the CA function of the Com-plete ULIB utility (described in the Com-plete documentation) with a region size of 36 KB if you have not changed the first default value for the WPSIZE (described in the Parameter Reference documentation) in the Natural parameter module. </td></tr>
<tr><td>CICS</td><td> Add the following entries to your FCT:

the Natural system files FNAT, FUSER, FDIC and FDICX required for VSAM;
the Natural example files EMPLVS and EMPLVX provided for VSAM;
the Natural Security files FSEC, FSECA, FSECB and FSECC if you have Natural Security installed;
the VSAM files FLOCK, FLOCKA, FLOCKB and FLOCKC if you want to lock source objects contained in the FUSER or FNAT system file in the VSAM file system.

Refer to Job VSAMI005 for examples. You can add DD statements for these data sets to your CICS startup job, too. </td></tr>
<tr><td>TSO</td><td> Add the following statements to the CLIST used to start Natural:
<pre>
ALLOCATE F(FNAT)   DATASET('SAGLIB.VSAM.FNAT')   SHR
ALLOCATE F(FUSER) DATASET('SAGLIB.VSAM.FUSER')   SHR
ALLOCATE F(FDIC)   DATASET('SAGLIB.VSAM.FDIC')   SHR
ALLOCATE F(FDICX) DATASET('SAGLIB.VSAM.FDIC.PATH')   SHR
ALLOCATE F(FSEC)   DATASET('SAGLIB.VSAM.FSEC')   SHR
ALLOCATE F(FSECA) DATASET('SAGLIB.VSAM.FSEC.AIXA')   SHR
ALLOCATE F(FSECB) DATASET('SAGLIB.VSAM.FSEC.AIXB')   SHR
ALLOCATE F(FSECC) DATASET('SAGLIB.VSAM.FSEC.AIXC')   SHR
ALLOCATE F(FLOCK) DATASET('SAGLIB.VSAM.FLOCK')   SHR
ALLOCATE F(FLOCKA) DATASET('SAGLIB.VSAM.FLOCK.PATHA') SHR
ALLOCATE F(FLOCKB) DATASET('SAGLIB.VSAM.FLOCK.PATHB') SHR
ALLOCATE F(FLOCKC) DATASET('SAGLIB.VSAM.FLOCK.PATHC') SHR
ALLOCATE F(EMPLVS) DATASET('SAGLIB.VSAM.EMPLVS')   SHR
ALLOCATE F(EMPLVX) DATASET('SAGLIB.VSAM.EMPLVX.PATH') SHR
</pre></td></tr>
</table>

Installation Verification

You can verify the successful installation of Natural for VSAM by performing the following:

- Log on to the Natural system library `SYSEXNVS` and run the following programs:
  - `NVSINST1`
  - `NVSINST2`
  - `NVSINST3`
  - `NVSINST4`
  - `NVSINST5`
  - `NVSINST6`

  If all these programs can be executed successfully, the installation of Natural in a VSAM file system is completed and verified.

Note for Batch Mode:

For verification in batch mode, you can run Job VSAMI200 which executes the above programs.

Restrictions

The Natural `FSEC` and `FSPOOL` system files provided for VSAM file systems cannot be used for record-level sharing (RLS), as the related AIX files cannot be accessed using a path definition. The reason is that null values are not suppressed during VSAM upgrade handling for AIX keys. The record length of AIX files related to `FSEC` and `FSPOOL` would be exceeded for AIX keys filled with blanks or binary zeros. This would cause problems under CICS, as the record length supported is limited to 32 K only. Natural for VSAM supports null-value suppression for AIX keys and the upgrade handling for AIX files.

XVI Installing Natural Security on z/OS

22 Installing Natural Security on z/OS

This document describes the steps for installing Natural Security (product code NSC) on z/OS.

Related Topic:

For information on the features and functions provided by Natural Security, see the *Natural Security* documentation.

Notation `vrs` **or** `vr`**:**

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Additional Prerequisites for Natural Security in a Heterogeneous Environment

In addition to the prerequisites referred to above, the following software must be installed to use Natural Security in a heterogeneous environment:

- Entire Net-Work
- Natural Security for Mainframes

The following software must be installed as required:

- Natural Security for UNIX
- Natural Security for Windows
- Natural Security for OpenVMS

For further information, see *Using Natural Security on Multiple Platforms* in the *Natural Security* documentation.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NSC*vrs*.SYSL	Natural Security log file
NSC*vrs*.INPL	Natural objects
NSC*vrs*.VINI	Natural Security FDIC initialization file for VSAM system files

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Note for the Reinstallation:

- When you repeat a Natural Security installation, only the Natural objects are replaced; the Natural Security data defined for SYSSEC and DBA is *not* reset to the values defined after the initial installation. You can use the **Natural Security Recover** function of the Natural **INPL utility** to reset the data.

This section describes the actual installation steps:

Step 1: Load the FSEC System File Definition

(Job I050, Step 9900)

Skip this step if you want to use an existing Natural FSEC system file.

Skip this step if you want to load the FSEC system file into a VSAM file system. In this case, refer to ***Installing Natural for VSAM***. See also *Natural for VSAM with Natural Security* in the *Database Management System Interfaces* documentation for restrictions on the use of the FSEC system file in a VSAM environment.

- Load the new Natural `FSEC` system file definition:
  1. Set the System Maintenance Aid (SMA) parameter `NSC-FIRST-INSTALL` to `Y` (Yes). This is the default setting.
  2. Specify the database ID and file number of the Adabas file where to load the `FSEC` system file by using the Adabas ADALOD utility.

     In addition, you must specify this database ID and file number in the Natural parameter module as described in ***Step 4: Build the Natural Parameter Module***.
  3. Load the `FSEC` system file definition contained in the `NAT`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

     The following ADALOD utility parameter must *not* be changed:

     ```
     ISNREUSE=YES
     ```

Step 2: Load the Log File

(Job I050, Step 9901)

This step only applies if Adabas is installed and if the Natural Security function **Logging of maintenance functions** (see the *Natural Security* documentation) is to be used. It creates the log file to be used by the function.

- Load the log file by using the Adabas ADALOD utility. Input for ADALOD is the `NSC`*`vrs`*`.SYSL` data set.

Step 3: Load the Logon and Error Log File

(Job I050, Step 9902)

This step only applies if Adabas is installed and if the Natural Security function **Store Logon and Error Data on Separate System Files** (see the *Natural Security* documentation) is to be used. It creates the logon and error log file to be used by the function.

- Load the logon and error log file by using the Adabas ADALOD utility. Input for ADALOD is the `NAT`*`vrs`*`.SYSF` data set.

Step 4: Build the Natural Parameter Module

(Jobs I060, I080)

1. Specify the following profile parameter in your Natural parameter module:

   ```
   FSEC=(database-id,file-number)
   ```

   where *database-id* and *file-number* are the database ID and file number of either the new FSEC system file loaded in **Step 1** or your existing FSEC system file.

   The FSEC profile parameter is described in the *Parameter Reference* documentation.

   Repeat Job I080 for all your TP monitors.
2. Assemble and link your Natural parameter module.

Step 5: Load New Natural Objects

(Job I061, Step 0102 or Step 9905)

For the migration installation (Step 0102):

1. Set the System Maintenance Aid (SMA) parameter NSC-FIRST-INSTALL to N (No). The default setting is Y (Yes).
2. Load the Natural objects specific to Natural Security from the NSC*vrs*.INPL data set into the appropriate Natural libraries in your FNAT system file by using the Natural **INPL utility**.

   Once this step has been performed, it is not possible to remove Natural Security from the Natural system file; to remove Natural Security from the system file, you would have to delete the entire contents of the system file and reinstall all Natural components again.

For the initial installation (Step 9905):

1. Set the System Maintenance Aid (SMA) parameter NSC-FIRST-INSTALL to Y (Yes).
2. Load the Natural objects specific to Natural Security from the NSC*vrs*.INPL data set into the appropriate Natural libraries in your FNAT system file by using the Natural **INPL utility**.

   When you load the contents of the NSC*vrs*.INPL data set for the first time, this step creates the following security profiles and relationships:

   - A library security profile with the library ID SYSSEC. The library is people-protected (**People-protected** set to Y and **Terminal-protected** set to N).
   - A user security profile with the user ID DBA, the user type Administrator, and the password set to DBA.

     The user DBA is linked to the library SYSSEC (ordinary link, no special link).

Installation Verification

Natural Security is operational after ***Step 5: Load New Natural Objects*** of the *Installation Procedure* has been completed successfully.

For the initial installation, proceed as described in the section *First Steps After the Installation* in the *Natural Security* documentation. If you upgrade from a previous Natural Security version, you can skip the steps described in this section.

XVII Installing Natural SAF Security on z/OS

23 Installing Natural SAF Security on z/OS

This document describes the steps for installing Natural SAF Security (product code NSF) on z/OS.

Related Topic:

For information on the features and functions provided by Natural SAF Security, see the *Natural SAF Security* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

Supported versions of the following products must be installed before you can install Natural SAF Security:

- **Natural Security**
- Adabas
- Adabas Limited Libraries
- SAF-compliant security system

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set	Contents
NSF*vrs*.LOAD	Load modules
NSF*vrs*.INPL	Natural objects

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Load the Natural Objects

(Job I005)

- Load the Natural objects specific to Natural SAF Security from the `NSF`*`vrs`*`.INPL` data set into the appropriate Natural libraries in your `FNAT` system file by using the Natural INPL utility.

Step 2: Build the Natural Parameter Module

(Job I060, Step 0010)

Build the Natural parameter module. The parameters and macros mentioned in this section are described in the *Parameter Reference* documentation.

1. Specify the following with the `NTDS` macro:

   ```
   NTDS NSFSIZE,8
   ```

   8 KB is the minimum `NSFSIZE` value. Depending on your usage of Natural SAF Security, a higher value may be required, which can be calculated as follows:

   `4 KB + (`*`e`*` * 17 bytes) + ((`*`p`*` + `*`r`*`) * 8 bytes)`, rounded up to the next KB

   where:
   `e` is the number of protected environments,
   `p` is the number of protected Natural objects,
   `r` is the number of protected RPC services.

   You can also use the dynamic profile parameter `DS` to specify `NSFSIZE` at the start of a Natural session:

```
DS=(NSFSIZE,8)
```

2. If you want to use Natural SAF Security to control the execution of Natural objects, specify the following in the `NTRDC` macro of the Natural parameter module:

   ```
   NTRDC SIZE=2,EXIT=(RDCEX3,2000)
   ```

   You can also use the corresponding dynamic profile parameter `RDC` to specify the parameter at the start of a Natural session:

   ```
   RDC=(SIZE=2,EXIT=(RDCEX3,2000))
   ```

   Note: If this feature is used, you have to either link the Natural SAF Security module `NSFNUC` to the Natural parameter module or to the nucleus (in the case of an environment-independent nucleus, to the environment-independent part).

3. Assemble and link the Natural parameter module.

Step 3: Relink the Nucleus

(Job I060, I080)

Adapt the link steps for Natural:

1. Add the following `INCLUDE` statement to the link of the nucleus to include Natural SAF Security modules:

   ```
   INCLUDE NSFLIB(NSFNUC)
   ```

   If you are using a shared nucleus, include this statement in the link of the shared part.
2. Add the corresponding DD statement:

   ```
   //NSFLIB DD DSN=NSFvrs.LOAD,DISP=SHR
   ```

3. Relink your nucleus as described in ***Link the Nucleus*** in *Installing Natural*.

Step 4: Install the SAF Server

The SAF server (SAF Security Kernel) is delivered with Adabas Limited Libraries.

- Install and configure the SAF server and its associated Daemon as described in the *SAF Security Kernel* documentation.

You may have to set the following Natural SAF Security options in the configuration module of the SAF server:

Number of Cached Resource Checks

Natural SAF Security allows you to have resource checks cached. If you want resource checks to be cached, you have to specify the number of successful resource checks to be cached for each resource class using the following parameters of the configuration module:

Parameter	Default Value	Function
NANUSF	0	Number of cached environment checks
NANUTC	0	Number of cached library checks
NANURP	0	Number of cached RPC service checks

Alternate Resource Names

If you want to change the default names for the resource classes, you have to change the following parameters of the configuration module:

Parameter	Default Value	Function
NACLSF	SAGNSF	Resource-class name for environments
NACLTC	SAGNTC	Resource-class name for libraries
NACLPG	SAGNPG	Resource-class name for Natural objects
NACLRP	SAGNRP	Resource-class name for RPC services
NACLAP	SAGNRP	Resource-class name for user-defined resources

Installation Verification

Natural SAF Security is operational after ***Step 4: Install the SAF Server*** of the *Installation Procedure* has been completed successfully.

After the installation, proceed as described in *Activating Natural SAF Security* in the *Natural SAF Security* documentation.

XVIII Installing Natural Advanced Facilities on z/OS

This document describes the installation of Natural Advanced Facilities (product code NAF) on z/OS.

Related Topic:

For information on the features and functions provided by Natural Advanced Facilities, see the *Natural Advanced Facilities* documentation.

Notation `vrs` or `vr`:

When used in this document, the notation `vrs` or `vr` represents the relevant product version (see also Version in the *Glossary*).

24 Installing Natural Advanced Facilities under CICS on z/OS

This document describes the steps for installing Natural Advanced Facilities under CICS on z/OS.

Prerequisites

Supported versions of the following products must be installed before you can install Natural Advanced Facilities:

- **Natural CICS Interface**
- **Natural for VSAM** if a VSAM file is to be used as a spool file

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
`NAF`*`vrs`*`.LOAD`	Load modules
`NAF`*`vrs`*`.SRCE`	Source modules and macros
`NAF`*`vrs`*`.SYSF`	Natural `FSPOOL` system file definition
`NAF`*`vrs`*`.INPL`	Natural objects
`NAF`*`vrs`*`.ERRN`	Natural error messages

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NAT`*`vrs`*`.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Define the CICS RDO Definitions

(Job I005)

This step only applies when using VSAM system files.

- Define the CICS RDO definitions for the sample VSAM files:

  Add the Natural Advanced Facilities spool files (`SPOOL`, `SPOOLA`, `SPOOLB`, `SPOOLC`, `SPOOLD` and `SPOOLE`) to your FCT.

For performance reasons, we strongly recommend you to specify a transaction ID for the spool server, which is different from that of the terminal task. It is then possible to dedicate special threads to the spool server.

If you want to convert an existing VSAM spool file, the FCT must contain the entries for this spool file. The cluster names of the new and the old versions must be different. The VSAM database ID and file number as well as the VSAM DD names must be unique.

Step 2: Prepare a VSAM Cluster for the Spool File

(Job I008, Steps 0300 - 0311)

This step only applies when using VSAM system files.

- Define and initialize a VSAM cluster to be used as the spool file (`FSPOOL`) and five alternate indices.

Step 3: Load the FSPOOL System File Definition for Adabas

(Job I050, Step 0300)

This step only applies when using Adabas system files.

Skip this step if you want to use an existing spool file of Natural Advanced Facilities.

Load the new Natural `FSPOOL` system file definition contained in the `NAF`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

Step 4: Build the NAFPARMC Parameter Module

(Job I055, Step 0305)

The use of the `NAFPARMC` parameter module is optional. Alternatively, you can set the server options with Function 30 (see the *Natural Advanced Facilities* documentation) of the `SYSPOOL` application.

- Modify, assemble and link the `NAFPARMC` module.

Step 5: Build the Natural Parameter Module

(Jobs I060, I080)

1. Modify the parameters `FSPOOL`, `NTPRINT`, `NAFUPF` and `NAFSIZE` in the Natural parameter module according to your site requirements. For more information on these parameters, see *NATSPOOL Initialization* in the *Natural Advanced Facilities* documentation.
2. Assemble and link the Natural parameter module.

VSAM System Files

The following additional step applies when using VSAM system files:

- Set the `FSPOOL` parameter as follows:

```
FSPOOL=(vsam-dbid,fnr-fspool,dd-name-fspool)
```

where:
`vsam-dbid` is the database ID of the VSAM file to be used as the spool file,
`fnr-fspool` is the file number of the VSAM file to be used as the spool file,
`dd-name-fspool` is limited to seven characters.

Step 6: Link the Nucleus

(Jobs I060, I080)

- Add the following `INCLUDE` statements to the link steps for Natural and link-edit the executable module:

`INCLUDE NAFLIB(NAFAF)`
`INCLUDE NAFLIB(NAFNUC)`
`INCLUDE SMALIB(NAFPARMC)` (optional)

The link-edit of the load module containing Natural Advanced Facilities can be done in any of the following ways:

- Include all modules of Natural Advanced Facilities, that is, `NAFNUC`, `NAFAF` and, optionally, `NAFPARMC` in the link-edit of Natural.

  Note: If a shared nucleus is created, the modules can be included in the shared nucleus.

- Link-edit `NAFNUC`, `NAFAF` and, optionally, `NAFPARMC` and an alternative Natural parameter module as a separate module with the mandatory name `CMPRMTB` specified in the `ENTRY` statement. The name of the resulting module is optional.

  Note: This way of link-editing only applies if an alternate parameter module (`PARM=`*`parameter`*) is used. If so, an additional CICS PPT entry with `PROGRAM=`*`name`* is required.

- Link-edit `NAFNUC`, `NAFAF` and, optionally, `NAFPARMC` as a separate module with the mandatory name `NATAM08` specified in the `ENTRY` statement. The name of the resulting module is optional. If it is different from `NATAM08`, however, it must be specified as an alias name in the `NTALIAS` macro of the Natural parameter module.

Note: This way of link-editing only applies if the `CSTATIC` and `RCA` profile parameters (see the *Parameter Reference* documentation) are used. If so, an additional CICS PPT entry with `PROGRAM=`*name* is required.

The following additional step applies when using VSAM system files.

- Add the following `INCLUDE` statement to all links of the nucleus:

```
INCLUDE NVSLIB(NVSFSPO)
```

Step 7: Load the Natural Objects

(Job I061, Step 0300)

- Load the Natural objects specific to Natural Advanced Facilities from the `NAF`*vrs*`.INPL` data set into the Natural system files `SYSPOOL` and `SYSPRINT` by using the Natural **INPL utility**.

  Ensure that the INPL load function finishes with the message:

  ```
  Natural Advanced Facilities initialized by INPL
  ```

  If this initialization fails, various problems will be encountered at execution time.

The maps contained on the data set are provided in source form so that you can modify them according to your requirements (for example, translate the maps from English into another language). If you modify these maps, ensure that all fields have the same format/length/relative position in the map. Failure to abide by this restriction will result in an invalid system.

Step 8: Load the Natural Error Messages

(Job I061, Step 0304)

- Load the Natural error messages specific to Natural Advanced Facilities from the `NAF`*vrs*`.ERRN` data set into the Natural `FDIC` system file by using the `ERRLODUS` program of the Natural SYSERR utility (described in the *Utilities* documentation).

Step 9: Create a Separate Thread Group for Printer Transaction

(Job I070, Steps 2245, 2250, and Job I080)

We recommend that you establish a separate thread group for the Natural Advanced Facilities printer transaction. To do so, perform these steps:

1. Modify the Natural CICS Interface system directory (Step 2245):

   Include a definition of the Natural Advanced Facilities printer thread group into the Natural CICS Interface system directory.
2. Relink the modified Natural CICS Interface system directory (Step 2250).

   Repeat linking of the Natural CICS Interface system directory.

See also *Build the Natural CICS Interface System Directory Module* in *Installing Natural CICS Interface on z/OS* or *Installing Natural CICS Interface on z/VSE* in the Natural *Installation* documentation.

Step 10: Define Natural Advanced Facilities for Natural Security

This step must be performed only if Natural Advanced Facilities is being installed in a Natural Security environment.

- Define `SYSPOOL` to Natural Security with the startup program `MENU`.

  Note: The physical CICS printers and the application `SYSPRINT` need not be defined to Natural Security. The Natural Security logon processing will identify the `NATSPOOL` spool server and perform a simplified logon to `SYSPRINT`, that is, without any further security checks. In this way, maintenance efforts and the number of Adabas calls at the start of the spool server are considerably reduced. Any logon to `SYSPRINT` attempted by users other than the `NATSPOOL` spool server will be rejected by Natural Security, regardless of whether `SYSPRINT` is defined to it or not.

Step 11: Start Natural

- Start Natural and add the user profile, as defined in the `NAFUPF` parameter of the Natural parameter module, to the `SYSPOOL` file by using Function 31.1 (described in the *Natural Advanced Facilities* documentation).

  Note: A NAT7201 message is issued at the start of the session indicating that the profile has not yet been added to the `SYSPOOL` file.

Step 12: Create the NATSPOOL Environment

- Initialize a new NATSPOOL environment as described in *NATSPOOL Initialization* in the *Natural Advanced Facilities* documentation.

Step 13: Define Natural Advanced Facilities for VTAM/SNA

This step must be performed only if Natural Advanced Facilities is to be used in conjunction with VTAM/SNA printers.

- Define devices in the TCT with a RELREQ=YES. This will ensure that VTAM printers are released at the end of printout time when devices are shared with other CICS, TSO or BATCH regions, or with JES.
- Define TRMSTAT=INTLOG or CREATESESS=YES for the printer to allow EXEC CICS START requests to create a session.
- Ensure that the devices have the SHARE option generated into the controller VTAM specifications.

Step 14: Define Natural Advanced Facilities for VTAM/non-SNA

This step must be performed only if Natural Advanced Facilities is to be used in conjunction with VTAM/non-SNA printers.

1. Include TRMSTAT=TRANSCEIVE in the TCT definition for the device.
2. Set the VTAM definition for the device parameter ISTATUS to ACTIVE.

25 Installation Verification for Natural Advanced Facilities under CICS on z/OS

You can verify the successful installation of Natural Advanced Facilities by following the instructions provided in this section.

System Testing

You can perform the following steps to determine whether Natural Advanced Facilities functions correctly.

To print a test report

- In the appropriate logical printer, set the `Disposition` to `K` for testing.

  Log on to the Natural system library `SYSPOOL` and execute the programs `NTEST` and `SPPTEST`. These programs contain `WRITE (1)` statements.

  Or:

  Create test reports with Function 42 described in the *Natural Advanced Facilities* documentation.

To proceed if a test report cannot be printed

1. Check that the CICS printer status is `IN SERVICE`.
2. Use the CICS message switching transaction `CMSG` to route a message to the specified printer:

   ```
   CMSG 'message',ROUTE=term-id,SEND
   ```

   where *term-id* is the terminal identification of the CICS printer as specified in the TCT.
3. If Natural Security is installed, check whether logon error records (of the `NATSPOOL` spool server `NATP`) have been written to the Natural Security system file. The maintenance system for these error records can be invoked by entering `ERROR` in the command line of Natural Security.
4. Check that the standard Natural `LOGON` object has *not* been replaced. The `NATSPOOL` spool server `NATP` must be able to execute the `SVPCIC01` module in the `SYSPRINT` library.

   Also check whether the `LOGON` user exit causes the `LOGON` of the spool server to `SYSPRINT` to terminate.
5. Check that the catalog dates of the objects in `SYSPRINT` and `SYSPOOL` are identical to one another.
6. Check that the parameters for the spool server match the Natural Advanced Facilities environment. To do so, invoke `MENU` in the `SYSPOOL` library and check the **CICS Options** defined with Function 30.5 (see the *Natural Advanced Facilities* documentation).

7 Check that neither the external security (`EXTSEC` operand of CICS PCT) nor the security levels (`TRANSEC` operand of CICS PCT) are defined for the spool server `NATP`. This ensures that `NATP` can be initiated without security violations.

8 Check the TCT and VTAM definitions (see ***Step 10: Define Natural Advanced Facilities for Natural Security***, ***Step 13: Define Natural Advanced Facilities for VTAM/SNA*** and ***Step 14: Define Natural Advanced Facilities for VTAM/non-SNA*** in the section *Installing Natural Advanced Facilities under CICS*).

9 Allocate a screen device instead of a printer device to the `Destination/Form` pairing of the first logical printer, execute `NTEST` in the `SYSPOOL` library, and check for error messages on the screen.

On certain devices, the CICS abend ATNI may occur.

Since the Natural Security logon processing checks whether the device is a printer, this test is only possible if Natural Security is *not* installed.

10 Start the transaction `CEDF` for your terminal device and check whether the command `EXEC CICS START` (to start the spool server) is executed.

11 Start the transaction `CEDF` for your printer device (`CEDF` terminal ID of printer) and check which commands are executed.

12 Check the Natural Advanced Facilities messages on the system operator console and/or in the log file (the destination of messages is defined with Function 30.5 (see the *Natural Advanced Facilities* documentation).

Console messages sent by the spool server start with:

```
NAF SP-SERV:
```

Console messages sent by the terminal task start with:

```
NAF-
```

13 Obtain a `NATSPOOL` trace and check which Natural Advanced Facilities modules are called, which Adabas commands are executed, and which return codes are encountered.

NATSPOOL Trace using SYSRDC

To obtain an online `NATSPOOL` trace by using the Natural SYSRDC utility

1 Start a Natural session with the following dynamic parameters:

```
RDCSIZE=100, TRACE=(NATAM08), ITRACE=ON
```

2 Log on to the `SYSRDC` library.

3 Execute the following command to select the internal trace type:

```
RDCSET N
```

4 Execute the following command to start the trace:

```
RDCSTART
```

5 Execute a program which creates a report, for example, `NTEST` in the `SYSPOOL` library.

6 Log on to the `SYSRDC` library.

7 Execute the following command to display the trace entries:

```
RDCDISP
```

You will now see when a `NATSPOOL` module begins (marked as `BEG`) and ends (marked as `END`) as well as its return code in decimal representation.

After the execution of an Adabas call (marked as `ADA`), you will see the command code, the first byte of the command ID and the return code in decimal representation.

For detailed information on the SYSRDC utility, see the *Utilities* documentation.

NATSPOOL Reason Codes

Errors that may occur during the check for printer availability:

Error	Description
`INV REQU`	Invalid request
`INV ID`	Invalid ID
`INV ADDR`	Invalid address
`INV DEVC`	Invalid logical device code for page status
`ATI REQU`	ATI required on NON-ATI terminal
`RESO PRO`	Resource problem for inter-partition session
`INV PROG`	Invalid program name
`UNAB PER`	Unable to perform request
`INV TYPE`	Type is not LUC
`RESO QUI`	Resource quiesced by TMP
`LOCATERR`	Any error different from those listed above

Errors that may occur during the start of the spool server:

Error	Description
TERMIDER	Terminal ID error
TRANIDER	Transaction ID error
SYSIDERR	SYSID error
INVREQ	Invalid request
IOERR	I/O error
LENGERR	Length error
ISCINVRE	ISC invalid request
NOTAUTH	Not authorized
STARTERR	Any error different from those listed above

NATSPOOL Initialization Console Messages

Messages that may occur during the initialization of NATSPOOL:

Message	Text
NAF-01C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT OPEN
NAF-02C	Not used
NAF-03C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT READ REPORT
NAF-04C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT READ PRINTER
NAF-05C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT CLOSE
NAF-06C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT UPDATE REPORT
NAF-07C	ADABAS RC*xxx*, DBID*xxx*, FNR*xxx*, AT UPDATE PRINTER
NAF-08I	REPORT *xxxxxxxxx*, JOB*xx.xxx*, SET -TO BE PRINTED-
NAF-09I	PRINTER *xxxx* SET -FREE-
NAF-10I	PRINTER *xxxx* RESTARTS IN 20 SECONDS, DEST=*xxxxxxxx*, FORM=*x*
NAF-11C	RESTART ERROR NAT *xxxx* ON PRINTER *xxxx*

NATSPOOL Print Server Messages

See the online help for descriptions of the NATSPOOL print server messages.

To invoke online help for print server messages

1. In the **Natural Spool Administration Menu**, press PF1.
2. Enter function code 99 (miscellaneous information).
3. Enter function code 4 (Natural Advanced Facilities SP-SERV messages from spool server).

NATSPOOL Abend Codes

Abend Code	Reason	Action
NAF1 - INVALID LENGTH	The length of the data to be printed is not positive.	Obtain the dump and contact Software AG technical support.
NAF2 - INVALID LENGTH	The length of the data to be printed is greater than the maximum length of the terminal I/O buffer (TIOBM).	Obtain the dump and contact Software AG technical support.
NAF3 - INVALID RETURN CODE	The return code of the task-end routine CMTSKND is not zero.	Obtain the dump and contact Software AG technical support.
NAF4 - INVALID RETURN CODE	The return code of the print routine CMWTERM is not zero.	Obtain the dump and contact Software AG technical support.

26 Installing Natural Advanced Facilities under IMS TM on z/OS

This document describes the steps for installing Natural Advanced Facilities under IMS TM on z/OS.

Prerequisites

A supported version of the following product must be installed before you can install Natural Advanced Facilities:

- **Natural IMS TM Interface**

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
NAF*vrs*.LOAD	Load modules
NAF*vrs*.SRCE	Source modules and macros
NAF*vrs*.SYSF	Natural FSPOOL system file definition
NAF*vrs*.INPL	Natural objects
NAF*vrs*.ERRN	Natural error messages

Copy the data sets into your environment as described in ***Copying Files to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the NAT*vrs*.JOBS data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Load the FSPOOL System File Definition

(Job I050, Step 0300)

Skip this step if you want to use an existing spool file of Natural Advanced Facilities.

Load the new Natural `FSPOOL` system file definition contained in the `NAF`*`vrs`*`.SYSF` data set by using the Adabas ADALOD utility.

Step 2: Build the NAFPARMI Parameter Module

(Job I055, Step 0305)

The use of the `NAFPARMI` parameter module is optional. Alternatively, to set the server options, you can use Function 30 (see the *Natural Advanced Facilities* documentation) of the `SYSPOOL` application:

- Modify, assemble and link the `NAFPARMI` module.

Step 3: Build the Natural Parameter Module for the BMP Environment

(Job I060)

1. Modify the parameters `FSPOOL`, `NTPRINT`, `NAFUPF` and `NAFSIZE` in the Natural parameter module according to your site requirements. For more information on these parameters, see *Natural Profile Parameters for NATSPOOL* in the *Natural Advanced Facilities* documentation.

   The Natural parameter module for Natural in a BMP environment must contain a valid `FSPOOL=(`*`dbid`*`,`*`fnr`*`)` entry where *`dbid`* is a valid database ID and *`fnr`* a valid file number. The specified values must be identical to those of Natural in an MPP environment (see ***Step 5: Build the Natural Parameter Module for the MPP Environment***).
2. Assemble and link the Natural parameter module.

Step 4: Link the Environment-Dependent Nucleus for the BMP Environment

(Job I060)

- Link your BMP front-end with the Natural parameter module created in the previous step.

Step 5: Build the Natural Parameter Module for the MPP Environment

(Job I060)

1. Modify the parameters `FSPOOL`, `NTPRINT`, `NAFUPF` and `NAFSIZE` in the Natural parameter module according to your site requirements. For more information on these parameters, see *Natural Profile Parameters for NATSPOOL* in the *Natural Advanced Facilities* documentation.

   The Natural parameter module for Natural in an MPP environment must contain a valid `FSPOOL=(dbid,fnr)` entry and the values specified must be identical to those of Natural in a BMP environment (see also ***Step 3: Build the Natural Parameter Module for the BMP Environment***).
2. Assemble and link the Natural parameter module.

Step 6: Load the Natural Objects

(Job I061, Step 0300)

- Load the Natural objects specific to Natural Advanced Facilities from the `NAFvrs.INPL` data set into the Natural system files `SYSPOOL` and `SYSPRINT` by using the Natural **INPL utility**.

  Ensure that the INPL load function finishes with the message:

  ```
  Natural Advanced Facilities initialized by INPL
  ```

  If this initialization fails, various problems will be encountered at execution time.

The maps contained on the data set are provided in source form so that you can modify them according to your requirements (for example, translate the maps from English into another language). If you modify these maps, ensure that all fields have the same format/length/relative position in the map. Failure to abide by this restriction will result in an invalid system.

Step 7: Load the Natural Error Messages

(Job I061, Step 0304)

- Load the Natural error messages specific to Natural Advanced Facilities from the `NAFvrs.ERRN` data set into the Natural `FDIC` system file by using the `ERRLODUS` program of the Natural SYSERR utility (described in the *Utilities* documentation).

Step 8: Link the Environment-Dependent Nucleus for the MPP Environment

(Job I080)

- Include all modules of Natural Advanced Facilities by adding the following `INCLUDE` statements to the link steps for Natural and link-edit the executable module:

```
INCLUDE NAFLIB(NAFAF)
INCLUDE NAFLIB(NAFNUC)
INCLUDE SMALIB(NAFPARMI)  (optional)
```

Note: If an environment-independent nucleus is created, the modules can be included in the environment-independent nucleus.

Step 9: Define Natural Advanced Facilities for Natural Security

This step must be performed only if Natural Advanced Facilities is being installed in a Natural Security environment.

- Define `SYSPOOL` to Natural Security with the startup program `MENU`.

Step 10: Start Natural

- Start Natural and add the user profile, as defined in the `NAFUPF` parameter of the Natural parameter module, to the `SYSPOOL` file by using Function 31.1 (see the *Natural Advanced Facilities* documentation).

Note: A NAT7201 message is issued at the start of the session indicating that the profile has not yet been added to the `SYSPOOL` file.

Step 11: Create the MPP Region

(Job I200, Steps 2502)

- Create the MPP region according to the `NAFJOB` sample member contained on the `NAT`*`vrs`*`.JOBS` data set.

Step 12: Adapt the IMS TM Environment

Adapt the IMS TM environment considering the following requirements:

- The JCL for the BMP printer job must be stored in the appropriate IMS library with the member name specified in the **BMP JCL Member** field of the **IMS TM Options** of Function 30.5 (see the *Natural Advanced Facilities* documentation).
- The BMP must use the input transaction code specified in the **BMP Transaction ID** field of the **IMS TM Options**.
- The BMP must use a PSB with at least two modifiable TP PCBs.
- The input transaction code for the BMP must be defined in the `NTIMSPT` macro of the Natural parameter module with at least one additional TP PCB specified with the `WRKPCBS` keyword subparameter. The keyword subparameters contained in `NTIMSPT` are described in the *Parameter Reference* documentation.
- If the input transaction code for the BMP is generated as WFI, the **Wait for input** field of the **IMS TM Options** must be set to `Y` (Yes). If the input transaction code for the BMP is *not* generated as WFI, the **Wait for input** field must be set to `N` (No). For further information, see also *Wait for Input WFI* in the *Natural Advanced Facilities* documentation.

  If the input transaction code for the BMP is *not* generated as WFI, the MPP transaction code must be authorized to issue the `/STA REG` command. Otherwise, IMS TM will issue the status code CD when trying to start the BMP.

XIX Installing Natural Optimizer Compiler on z/OS

27 Installing Natural Optimizer Compiler on z/OS

This document describes the steps for installing the Natural Optimizer Compiler (product code NOC) on z/OS.

Related Topic:

For information on the features and functions provided by the Natural Optimizer Compiler, see the *Natural Optimizer Compiler* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data set required for product installation:

Data Set Name	Contents
`NOCvrs.LOAD`	Load modules

Copy the data set into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NATvrs.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

- Step 2: Relink the Nucleus

Step 1: Build the Natural Parameter Module

(Jobs I060 and I080)

1. Activate the Natural Optimizer Compiler by adding the following macro to your Natural parameter module:

   ```
   NTOPT 'INDX,OVFLW,ZD=OFF'
   ```

   See also *Macro NTOPT* in the *Natural Optimizer Compiler* documentation.
2. Assemble and link the Natural parameter module.

Step 2: Relink the Nucleus

(Jobs I060, I080)

Adapt the link steps for Natural:

1. Add the following `INCLUDE` statement to the link of the nucleus to include the Natural Optimizer Compiler modules:

   ```
    INCLUDE NOCLIB(NOCNUC)
   ```

   Add the corresponding DD statement:

   ```
   //NOCLIB DD DSN=NOCvrs.LOAD,DISP=SHR
   ```

2. Relink your nucleus as described in ***Link the Nucleus*** in *Installing Natural*.

Installation Verification

You can verify the successful installation of the Natural Optimizer Compiler by performing the following steps:

1. Recatalog an existing program or write a new program and then catalog it.
2. Check the directory information for the program you have just cataloged, by using the following `LIST` system command:

   ```
   LIST DIR object-name
   ```

   The directory information for the specified object will be displayed, showing the size of the machine code at the bottom of the screen.

XX Installing Natural Connection on z/OS

28 Installing Natural Connection on z/OS

This document describes the steps for installing Natural Connection (product code NTC) on z/OS.

Related Topic:

For information on the features and functions provided by Natural Connection, see the *Natural Connection* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

A supported version of the following product must be installed before you can install Natural Connection:

- Entire Connection

  See the *Installation* section in the *Entire Connection* documentation.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Medium

The **installation medium** contains the following data set required for product installation:

Data Set Name	Contents
`NTCvrs.LOAD`	Load modules

Copy the data set into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Sample Jobs

Sample installation jobs are contained in the `NATvrs.JOBS` data set and are prefixed with the product code. The data set is provided on the installation medium supplied for base Natural.

Installation Procedure

Be sure to read *Installation Process and Major Natural Features* before you start the installation procedure.

Step 1: Build the Natural Parameter Module

(Jobs I060, I080)

1. Adapt the Natural parameter module:
   - Specify the keyword subparameter `AM=PC` in the `NTPRINT` macro for all printer files and work files to be used for data transfer between the host and the PC. For example:

     ```
     NTPRINT (7),AM=PC
     NTWORK  (7),AM=PC
     ```

   - Specify the profile parameter `PC=ON`.

   The parameters and the macro are described in the *Parameter Reference* documentation.
2. Assemble and link the Natural parameter module.

Step 2: Adapt the Link Steps

(Job I080)

Adapt the link steps for online Natural:

1. Add the following `INCLUDE` statement and the corresponding DD statement to the link instructions for the linkage editor:

   ```
   INCLUDE NTCLIB(NTCPCAM3)
   ```

2. Relink your nucleus as described in *Link the Nucleus* in *Installing Natural*.

Installation Verification

You can verify the successful installation of Natural Connection by following the instructions below:

1. Invoke Entire Connection on the PC and start the terminal emulation.
2. Use the terminal emulation to invoke Natural on the mainframe.
3. Enter the terminal command `%+` to activate the PC connection.
4. Use the Natural Object Handler (described in the *Utilities* documentation) to download Natural objects to the PC. For information on transferring Natural objects, see also *Data Transfer* in the section *Terminal Emulation* in the *Entire Connection* documentation.
5. Verify that the downloaded objects are now on your PC.

XXI Installing Natural Review on z/OS

29 Installing Natural Review on z/OS

This document describes the steps for installing Natural Review (product code RNM) on z/OS.

Related Topic:

For information on the features and functions provided by Natural Review, see the *Natural Review* documentation.

Notation *vrs* or *vr*:

When used in this document, the notation *vrs* or *vr* represents the relevant product version (see also Version in the *Glossary*).

Prerequisites

See ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Storage Requirements

The Natural Review monitoring system requires CICS shared storage for collecting its monitoring data. For each Natural session, a user account area of 656 bytes is allocated plus space for a Natural call table (NCT). This table is used to track the Natural programs and database calls issued within a transaction. The number of NCT entries is determined by the `NCTSIZE` parameter in the source member `RNMSCB3.A` (see ***Step 7: Build the Natural Review System Control Block***). Each table entry is 48 bytes long and the table contains 32 entries (default). This yields a total amount of 656+32*48=2192 bytes per running session. The storage is reused when the session terminates.

Each active response time report requires a basic control block that is 400 bytes long. Each detail record is 128 bytes long. The maximum number of detail records per report is controlled by the `Number of Records` in the report definition. If the `Transaction Summary` option is set in the report definition, a 64 bytes transaction summary area is allocated for each transaction ID.

After a report has been written to the Natural Review repository file by the history session, all report-depending storage is released.

Installation Medium

The **installation medium** contains the following data sets required for product installation:

Data Set Name	Contents
`RNMvrs.LOAD`	Load modules
`RNMvrs.SRCE`	Source modules and macros
`RNMvrs.SYSF`	Natural system file definition
`RNMvrs.JOBS`	Sample installation jobs
`RNMvrs.INPL`	Natural objects

Copy the data sets into your environment as described in ***Copying Data Sets to a z/OS Disk*** in the section *Installing Natural*.

Installation Procedure

Be sure to read ***Installation Process and Major Natural Features*** before you start the installation procedure.

Step 1: Add CICS Control Table Entries for Natural Review

(Job I005, Step 2211)

Define the following CICS table entries with RDO. You may have to include additional parameters according to your requirements. Natural Review supports transaction isolation (that is, it can run in user key).

- Program List Tables CICS Startup and Shutdown (PLTPI and PLTSD)

Program Control Table (PCT)

1. Define the Natural Review history session start/stop transaction:

```
CEDA DEFINE TRANSACTION(RVH1) PROGRAM(RNMHIST3)
     GROUP(RNMvr)
```

2. Define the Natural Review asynchronous Natural history session transaction:

```
CEDA COPY TRANSACTION(xxxx) GROUP(yyyy) AS(RVH2)
     TO(RNMvr)
```

   This copies your existing Natural transaction ID *xxxx* from your Natural definition group *yyyy* as an alias transaction for Natural Review. This definition is optional and you may use the online Natural transaction code *xxxx* as well, but it helps the administrator identify the Natural Review asynchronous history session.

   The transaction codes `RVH1` and `RVH2` can be chosen freely (that is, you may change them if required). The Natural session transaction code must be the same as defined with the parameter `NATTRAN` (in this example, `NATTRAN=RVH2`). See ***Step 7: Build the Natural Review System Control Block*** and *Installation Verification* (**Step 3**).

Processing Program Table (PPT)

1. Define the Natural Review history session start/stop program:

```
CEDA DEFINE PROGRAM(RNMHIST3) LANGUAGE(ASSEMBLER)
     GROUP(RNMvr)
```

2. Define the Natural Review system control block:

```
CEDA DEFINE PROGRAM(RNMSCB3) LANGUAGE(ASSEMBLER)
     RESIDENT(YES) GROUP(RNMvr)
```

3. After entering the online definitions, activate them by using `CEDA INSTALL GROUP(RNMvr)`. The new `GROUP` should be added to the `GRPLIST` defined for CICS cold start.

Program List Tables CICS Startup and Shutdown (PLTPI and PLTSD)

This table entry is optional. You can use it for automatic start and termination of the Natural Review history session during CICS startup and shutdown.

1. Define the Natural Review history session start/stop program:

   ```
   DFHPLT TYPE=ENTRY,PROGRAM=RNMHIST3
   ```

2. Insert the table entry in your assembled PLTPI and/or PLTSD CICS table. This avoids manual starting and stopping of the Natural Review history session (see ***Step 7: Build the Natural Review System Control Block***).

Step 2: Load the Natural Review Repository File

(Job I050, Step 2620)

You can skip this step if you have already installed a Natural Review repository file and want to continue using it. The format of the repository file is compatible with previous versions.

The repository file is an Adabas file used for storing response time reports and history data. It is possible to share the repository file across several CICS regions. Any Adabas file can be used to contain the Natural Review repository file. The corresponding file number must be defined to Natural as a logical system file (see ***Step 3: Build the Natural Parameter Module***). The repository file has to be initialized via Natural (see ***Step 10: Initialize the Natural Review Repository File***).

- Modify the job as follows before submitting it:
  - Change the data set definitions according to your requirements.
  - Change `DB=`*`dbid`* in the Adabas `ADARUN` statements to the correct database ID.
  - Change `SVC=`*`nnn`* to the correct Adabas SVC number.
  - Change the Adabas `ADALOD` statement to the file number *`fnr`* of the Adabas file that will contain the Natural Review repository file, and the Natural Review version *`vrs`* you are running:

    ```
    ADALOD LOAD FILE=fnr,NAME='REPOS-RNMvrs'
    ```

Step 3: Build the Natural Parameter Module

(Job I060, Steps 0010, 0015)

1. Modify the settings of the parameters supplied with the Natural parameter module as follows:

```
RDCSIZE=2
MADIO=5000
MAXCL=0
RCA=NATGWREV
NTLFILE 180,dbid,fnr
```

   where:

   `RDCSIZE` is the Natural profile parameter that determines whether a session is monitored by Natural Review. If you set `RDCSIZE=0` (this is the default) for a session, it is *not* monitored by Natural Review.

   `RCA` is the Natural profile parameter required if you want to link the Natural Review monitor interface module separate from the nucleus (see ***Step 7: Build the Natural Review System Control Block***) by means of the RCA technique.

   `NTLFILE` (or dynamic `LFILE` parameter) is the macro that determines the Natural Review repository file used by the `SYSRNM` application for retrieving and maintaining report definitions and storing history report data for the history session. The currently accessed repository file can be changed using the `LFILE` command within Natural Review (see the *Natural Review* documentation).

   `dbid` is the database ID and *`fnr`* the file number specified in ***Step 2: Load the Natural Review Repository File***.

   For details about the parameters mentioned above, see the *Parameter Reference* documentation.

2. Assemble and link the Natural parameter module.

Step 4: Link the Nucleus

(Job I060, Step 0020)

- Link the nucleus for Natural Review by including the following module from the Natural Review load library `RNMLIB`:

```
INCLUDE RNMLIB(RNMNUC3)
```

Natural Review uses the Natural Data Collector exit interface to get data from Natural. For more information on the SYSRDC Data Collector, see the Natural SYSRDC utility described in the *Utilities* documentation.

The Natural Review module RNMNUC3 supports all different ways of statically linked Natural subprograms. For more information about linking the nucleus, see *Linking Natural Objects to the Natural Nucleus* in the Natural *Operations* documentation.

If you run an **environment-independent nucleus** for multiple environments (for example, CICS and batch), link RNMNUC3 to the environment-dependent nucleus, because Natural Review monitoring runs under CICS only. This prevents unnecessary overload in your non-CICS systems.

- If RNMNUC3 is not linked to the **environment-dependent nucleus**, the following CICS assembler command level stub from the CICS load library must be linked to RNMNUC3:

```
INCLUDE CICSLIB(DFHEAI)
```

- Instead of linking RNMNUC3 to the nucleus, you can link it as a separate module defined with the Natural profile parameter RCA (described in the *Parameter Reference* documentation). The following linkage editor statements are then required:

```
MODE RMODE(ANY)
INCLUDE CICSLIB(DFHEAI)
INCLUDE RNMLIB(RNMNUC3)
ENTRY NATGWREV
NAME NATGWREV
```

The MODE statement is optional. A CICS PPT entry is required for the module NATGWREV. It must be specified with the profile parameter RCA (see ***Step 3: Build the Natural Parameter Module***). The module can be shared between multiple Natural nuclei.

Step 5: Load New Natural Objects

(Job I061, Step 2661)

1. If you want to continue using a profile text object DEFAULT you modified according to your requirements, rename your DEFAULT object in the SYSRNM library before you start loading the new Natural objects.
2. Load the Natural objects specific to Natural Review from the RNM*vrs*.INPL data set into your FNAT system file by using the Natural INPL utility.

   It is sufficient to load the Natural objects only into one FNAT system file even if you want to monitor other FNAT system files as well.

The Natural Review User Profile Subsystem is initialized when the profile text object `DEFAULT` is copied to the `SYSRNM` library.

3. If you renamed the profile text object `DEFAULT` in the first step, replace the newly loaded `DEFAULT` by this object.

Step 6: Define the SYSRNM Library in Natural Security

This step only applies if Natural Security is installed.

- Define the Natural Review library `SYSRNM` in Natural Security.

  You can define a startup menu for the `SYSRNM` library. If the library is `People-protected`, each user of this library must be linked to it.

- Define `REVHIST` as a user of type `PERSON` with a default application of `SYSRNM`. `REVHIST` is used as the user ID by the Natural Review history session.

Step 7: Build the Natural Review System Control Block

(Job I070, Steps 2622, 2623)

The Natural Review System Control Block `RNMSCB3` is defined as a program in CICS. `RNMSCB3` is not an executable program. Its storage is used by Natural Review as the common anchor and control point for all monitored Natural sessions and reports within one CICS address space. There are some installation-specific generation parameters you can specify in object `RNMSCB3` in the Natural Review source library.

- Set the following parameters in `RNMSCB3` according to your requirements:

<table>
<tr><th>Parameter</th><th>Explanation</th></tr>
<tr><td><code>NATTRAN=</code></td><td>This is the Natural/CICS transaction code for the Natural Review history session. You must specify this parameter to set the correct Natural transaction code (see Step 1: Add CICS Control Table Entries for Natural Review).</td></tr>
<tr><td><code>NPARMS=</code></td><td>Additional dynamic Natural parameters for the Natural Review history session. This parameter is optional.</td></tr>
<tr><td><code>CLOSE=</code></td><td>This parameter determines whether any started Natural Review reports are closed automatically during the termination of the Natural Review history session. There are two possible values:<table><tr><td><code>CLOSE=YES</code></td><td>All started reports are closed. This is the default setting.</td></tr><tr><td><code>CLOSE=NO</code></td><td>Started reports are not closed.</td></tr></table></td></tr>
<tr><td><code>DATE=</code></td><td>The date format used in the records stored in the Natural Review repository file. There are two possible values:</td></tr>
</table>

Parameter	Explanation	
	DATE=OLD	The date format is *YY/MM/DD*. This is the default setting.
	DATE=NEW	The date format is *YYYYMMDD*.
EMPTY=	This parameter determines whether empty history records are stored in the Natural Review repository file. A record is considered empty if no transactions occurred within the report time interval. There are two possible values:	
	EMPTY=YES	Empty history records are stored.
	EMPTY=NO	Empty history records are not stored. This is the default setting.
NCTSIZE=	This parameter determines the number of entries in the Natural Call Table (NCT) of Natural Review. The NCT is allocated in CICS shared storage and is used to track the usage of the Natural programs per session. Possible values: 0 - 128. The default setting is NCTSIZE=32.	

- Modify and run the job RNMI070 to generate the Natural Review System Control Block. The module must be linked with the NORENT option. The target link library can be any library defined to CICS.

Step 8: Link the Natural Review History Session Startup Module

(Job I070, Step 2625)

Natural Review history data is written to the Natural Review repository file by an asynchronous (that is, not terminal-bound) Natural session.

- Modify and run job RNMLINK in the Natural Review source library.

  It links the CICS-dependant history session startup module RNMHIST3. The target link library can be any library defined to CICS.

  There can be only one history session within one CICS address space. The Natural objects specific to Natural Review (see ***Step 5: Load New Natural Objects***) must be loaded to the FNAT system file running with the history session.

Step 9: Activate the Natural Review Modules

- Use the following `CEMT` transaction to activate the nucleus module to which `RNMNUC3` and the modified the Natural parameter module are linked:

  ```
  CEMT SET PROGRAM(. . . .) NEWCOPY
  ```

- Restart CICS if you cannot activate the nucleus module.

Step 10: Initialize the Natural Review Repository File

Skip this step if your Natural Review repository file is already initialized.

- Initialize the repository file after loading it in ***Step 2: Load the Natural Review Repository File***:

  Logon to the `SYSRNM` library and enter the following at the `NEXT` prompt:

  ```
  INSTALL NM
  ```

  The following messages will then appear:

  ```
  Now creating sample report system response time
  Now creating sample report highest response
  Natural Review repository initialization complete.
  Press <ENTER> to continue
  ```

  During the initialization process, two default (`sample`) response time reports are added as shown above.

Installation Verification

You can verify the successful installation of Natural Review by performing the following steps:

1. At any Natural command prompt, enter the following:

   ```
   SYSRNM
   ```

   Natural Review is started and a Natural Review logo screen similar to the example below appears:

```
17:30:01                 ***** REVIEW NM UTILITY *****               date



           RRRRRRRR    EEEEEEE   VVV    VVV   III   EEEEEEE  WWW        WWW
          RRRRRRRRR   EEEEEEE   VVV    VVV   III   EEEEEEE  WWW        WWW
         RRR   RRR   EEE       VVV    VVV   III   EEE      WWW        WWW
        RRR   RRR   EEE       VVV    VVV   III   EEE      WWW        WWW
       RRRRRRRR    EEEEEE    VVV    VVV   III   EEEEEE   WWW    W    WWW
      RRRRRRRR    EEEEEE    VVV    VVV   III   EEEEEE   WWW    WW   WWW
     RRR   RRR   EEE       VVV    VVV   III   EEE      WWW   WWWW  WWW
    RRR   RRR   EEE        VVV  VVV    III   EEE       WWW WWWWWW WWW
   RRR   RRR   EEEEEEE     VVVVVV     III   EEEEEEE    WWWWW   WWWWW
  RRR   RRR   EEEEEEE      VVVV      III   EEEEEEE     WWW     WWW


                   N A T U R A L    M O N I T O R




              A    P R O D U C T    O F    S O F T W A R E    A G
```

(You can suppress this screen by specifying `BANNER=N` in the text object `CONFIG` in the library `SYSRNM`.)

2. Press ENTER to invoke the Natural Review **Main Menu** screen:

```
17:30:17                 ***** REVIEW NM UTILITY *****               date
                                  - Main Menu -



                      Code  Function

                       NM   Natural Monitor System
                       UP   User Profile System












 Command ===>

 REV00001 - Welcome to Review NM running under CICS

 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
       Help        Exit                                                Fin
```

Alternatively, you can invoke this menu by logging on to the Natural library `SYSRNM` and then entering the following command:

```
MENU
```

3. In the command line of the Natural Review **Main Menu** screen, enter either of the following commands:

   ```
   NM
   ```

   (for **Natural Monitor System**)

   or

   ```
   UP
   ```

   (for **User Profile System**)

   Depending on the command entered, the main screen of the requested subsystem appears. You can then check your installation parameters and the status of the history session. For detailed information on the functions provided by the subsystems, see the *Natural Review* documentation.

4. If you want to run history reports, start the history session. It runs as an asynchronous (non-terminal) Natural session and writes the collected report data to the repository file each time a report time interval has expired.

You can start and stop the history session either automatically by using the CICS PLTPI/PLTSD (see ***Step 1: Add CICS Control Table Entries for Natural Review***), or manually outside Natural by using the RVH1 transaction (see ***Step 1: Add CICS Control Table Entries for Natural Review***) in the following ways:

RVH1	Start the Natural Review history session with the transaction code RVH2 as defined with NATTRAN in ***Step 8: Build the Natural Review System Control Block***. The history session can also be started with the START command of Natural Review (see the *Natural Review* documentation).
RVH1 STOP	Terminate the Natural Review history session. The history session can also be terminated with the STOP command of Natural Review (*Natural Review* documentation).
RVH1 TEST	Start the Natural Review history session on the current terminal. This option can be used for debugging purposes, for example, to debug the history session with CEDF (the CICS debugging facility). Note that no Natural terminal I/Os are supported during the normal processing of the history session. Therefore, you have to terminate the history session from another terminal.

5. Check the Natural Review initialization messages on the console log of your CICS system to find out whether the history session has started successfully. The following message should appear: REV20200 - REVIEW NM HISTORY SESSION STARTED.

   For more detailed explanations of the messages in Natural Review, enter MSG followed by the message number (for example, MSG 1) in the command line of Natural Review.

XXII Installing Natural for zIIP on z/OS

30 Installing Natural for zIIP on z/OS

This document provides information on installing the following Natural for zIIP products on z/OS: Natural Batch for zIIP (product code NAZBT), Natural for CICS for zIIP (product code NAZCI) and Natural for Com-plete for zIIP (product code NAZCO).

Related Topics:

For information on zIIP usage with Natural, see the *Natural for zIIP* documentation.

Prerequisites

- The z/OS operating system hosting the Natural environment executes on an IBM System z Integrated Information Processor (zIIP).
- The Natural session runs in a z/OS batch, batch server or TSO environment in which Natural Batch for zIIP is installed.

  The Natural session runs in a CICS environment in which Natural CICS Interface and Natural for CICS for zIIP are installed.

  The Natural session runs in a Com-plete environment in which Natural Com-plete/SMARTS Interface and Natural for Com-plete for zIIP are installed.

  The Natural session runs in an IMS TM environment in which Natural IMS TM Interface and Natural for IMS for zIIP are installed.
- In addition to the Natural product license file, a license file is required for each environment in which Natural for zIIP runs.

See also ***General Prerequisites and System Support*** in the section *Overview of the Installation Process*.

Installation Procedure

The steps required to install Natural for zIIP are performed during the installation for base Natural described in ***Installing Natural on z/OS***. These steps are summarized in the following section.

- Step 4: Link the Environment-Dependent Nucleus

Step 1: Install Natural for ZIIP License Files

In addition to the Natural product license file, a license file is required and must be installed for each environment in which Natural for zIIP runs:

- For Natural Batch for zIIP: `NAZ`*vrs*`.LICS`; see ***Prepare, Convert, Assemble and Link the License File*** in *Installing Natural*.
- For Natural for CICS for zIIP: `NCI`*vrs*`.LICS`; see ***Prepare, Convert, Assemble and Link the License File for Natural for CICS for zIIP*** in *Installing Natural CICS Interface Version 8.3.4*.
- Natural for Com-plete for zIIP: `NCF`*vrs*`.LICS`; see ***Prepare, Convert, Assemble and Link the License File for Natural for Com-plete for zIIP*** in *Installing Natural Com-plete/SMARTS Interface Version 8.3.5*.
- Natural for IMS for zIIP: `NII`*vrs*`.LICS`; see ***Prepare, Convert, Assemble and Link the License File for Natural for Com-plete for zIIP*** in *Installing Natural IMS TM Interface*.

zIIP support will not be enabled if a Natural for zIIP license file check fails. Appropriate warning messages will then be displayed on the operator console and in the job log.

Step 2: Link and Start ASM

If you have already installed and activated a Natural Authorized Services Manager (ASM) in your environment, you can skip the following and go to ***Set the ZIIP Profile Parameter***.

1. Link the ASM module: see ***Link Natural Modules to an APF Library*** in *Installing Natural*.

   The ASM must be of the same Natural version that provides zIIP support.

2. Start the ASM: ***Create and Start the Natural Authorized Services Manager***.

   The subsystem ID is the only parameter the ASM requires for Natural for zIIP. Each Natural session must run with the same subsystem ID as the ASM. Otherwise, Natural will issue an appropriate error message. The subsystem ID is defined with the Natural profile parameter `SUBSID` (see the *Natural Parameter* documentation).

Step 3: Set the ZIIP Profile Parameter

- Set the Natural profile parameter `ZIIP` to `AUTO` (default) or `ON` or use the corresponding macro `NTZIIP`:

  For `NAZvrs.LICS`, see **Build the Natural Parameter Module** in *Installing Natural*;

  For `NCIvrs.LICS`, see *Build the Natural Parameter Module* in ***Installing Natural CICS Interface Version 8.2.8*** or ***Installing Natural CICS Interface Version 8.3.4***;

  For `NCFvrs.LICS`, see *Build the Natural Parameter Module* in ***Installing Natural Com-plete/SMARTS Interface Version 8.2.8*** or ***Installing Natural Com-plete/SMARTS Interface Version 8.3.5***.

  For `NIIvrs.LICS`, see ***Build the Natural Parameter Module*** in *Installing Natural IMS TM Interface*;

`ZIIP` and `NTZIIP` are described in the *Parameter Reference* documentation.

Step 4: Link the Environment-Dependent Nucleus

The license files must be linked to the environment-dependent nucleus. It is not possible to link two or more license files together to the environment-independent nucleus, for example, one CICS license together with one for batch, because they have the same CSECT name `NAZLIC`.

- Link the **environment-dependent nucleus** with the appropriate license file generated in ***Install Natural for ZIIP License Files***:

  For `NAZvrs.LICS`, see ***Link the Nucleus*** in *Installing Natural*;

  For `NCIvrs.LICS`, see *Link the Environment-Dependent Nucleus* in ***Installing Natural CICS Interface Version 8.2.8*** or ***Installing Natural CICS Interface Version 8.3.4***;

  Under CICS, the Natural environment-dependent nucleus must be defined to run in the CICS open transaction environment (OTE) as described in *Environment-Dependent Nucleus* in *Installing Natural CICS Interface*.

  For `NCFvrs.LICS`, see *Link the Nucleus* in ***Installing Natural Com-plete/SMARTS Interface Version 8.2.8*** or ***Installing Natural Com-plete/SMARTS Interface Version 8.3.5***.

  For `NIIvrs.LICS`, see the link steps for different front-ends described in ***Installing Natural IMS TM Interface***.

Installation Verification

After the last step of the installation procedure has been completed, you can run a Natural session and check whether zIIP support is active.

To find out whether zIIP support has been enabled

- Check whether the following message is shown on the operator console or in the job log:

  ```
  NAT7070 Advanced zIIP support enabled successfully.
  ```

  No zIIP-specific message is displayed if your Natural session runs without zIIP enablement.

  Or:

  Issue the Natural system command `ZIIP` in batch or online mode.

  If zIIP support is active, a **zIIP Processing Information** report is displayed indicating that zIIP support has been enabled. See the *System Commands* documentation for details.

  If zIIP support is *not* active, a corresponding message appears.

  Or:

  For batch processing, set the Natural profile parameter `ZIIP=(PRINT=INFO)` or use the corresponding macro `NTZIIP` macro. See the *Parameter Reference* documentation for details.

  If zIIP support is active, the **zIIP Processing Information** report (see above) is shown.

  If zIIP support is *not* active, a corresponding message appears.

To check whether the correct license file is installed

- Issue the Natural system command `ZIIP LIC`.

  A **zIIP License Information** screen appears listing details about the Natural for zIIP product license installed in your current environment.