



natural

natural
Development Server

Version 2.1.2

For OS/390

This document applies to Natural Development Server Version 2.1.2 for OS/390 and to all subsequent releases.

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

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Natural Development Server

The documentation in the list below applies to the Natural Development Server plug-in (Product code NDV) for OS/390 and the optional Natural Development Server CICS Adapter.

Natural Development Server Documentation

- [What's New?](#)
- [Introducing the Natural Development Server](#)
- [Development Server File](#)
- [Natural Development Server on Mainframes](#)
- [Prerequisites](#)
- [Installing the Natural Development Server under OS/390](#)
- [Configuring the Natural Development Server](#)
- [Operating the Natural Development Server](#)
- [NDV Server Frequently Asked Questions](#)

The following documentation applies in addition if you want to use a Natural Development Server in a CICS environment:

Natural Development Server CICS Adapter Documentation

- [Introducing the Natural Development Server CICS Adapter](#)
- [Installing the Natural Development Server CICS Adapter](#)
- [Configuring the Natural Development Server CICS Adapter](#)
- [NDV CICS Adapter Frequently Asked Questions](#)

Related Documentation:

- [Natural Single Point of Development documentation](#)
- [Natural for Windows documentation](#)

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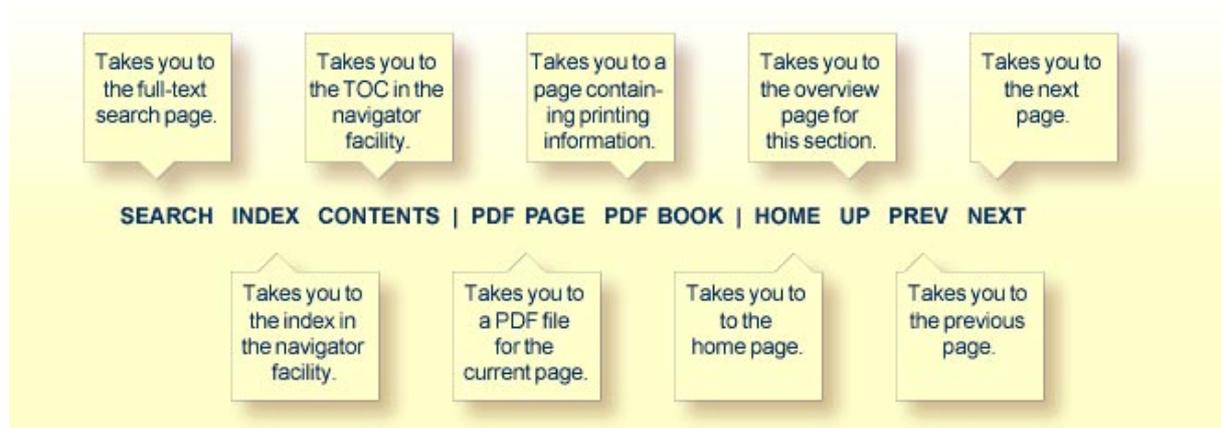
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Navigation Bar

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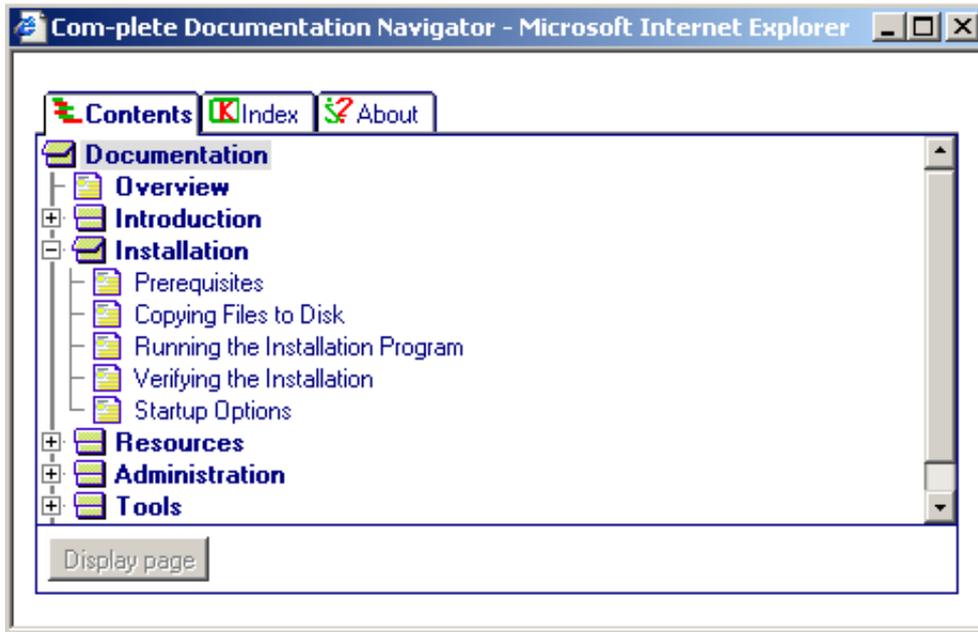
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What's New?

This document describes the enhancements and corrections that apply to the release of Version 2.1.2 of the Natural Development Server (Product code NDV) for OS/390 in batch mode .

The following topics are covered:

- Product Enhancements and Corrections
 - Support of Object Type Function in SPoD Environments
 - Documentation
 - Dropped Functionality
 - End of Maintenance of Natural Development Server Versions
-

Product Enhancements and Corrections

Version 2.1.2 of the Natural Development Server for OS/390 in batch mode contains

- all ZAPs,
- INPL updates,
- early warnings and
- source changes

applied to the previous version as error corrections.

Support of Object Type Function in SPoD Environments

Natural Version 6.1 for Windows and UNIX enables the creation and execution of Natural objects of type Function. The source objects of type Function can be stored in a Natural system file on mainframe computers, but execution of such objects is not possible. Similar to source objects of type Dialog, the following functionality is supported:

- Sources of object type Function can be moved or copied to a remote mainframe environment by using copy-and-paste or drag-and-drop functionality.
- Objects of type Function existing in a remote mainframe environment are displayed in the tree view of the mapped environment.
- Remote editing and saving of objects of type Function is allowed.
- It is not possible to check, catalog and stow objects of type Function in a remote mainframe environment.

With Natural Development Server Version 1.1.5 or below, source objects of type Function existing in a remote mainframe environment are not displayed in the tree view of the mapped environment. Such objects cannot be moved or copied to a remote mainframe environment by using copy-and-paste or drag-and-drop functionality.

Documentation

The Natural Development Server documentation has been revised and updated.

See also the separate Natural Single Point of Development documentation.

Dropped Functionality

The System Management Hub is no longer used.

End of Maintenance of Natural Development Server Versions

Maintenance for Natural Development Server Version 1.1.3 ends on December 31, 2003.

Maintenance for Natural Development Server Version 1.1.4 ends on March 31, 2004.

Maintenance for Natural Development Server Version 1.1.5 ends on November 31, 2004.

Any extensions to the maintenance for Natural Development Server Version 1.1.3 or 1.1.4 will be published via ServLine24 (<http://servline24.softwareag.com>).

Software AG strongly recommends that you migrate to Natural Development Server Version 2.1.2 as soon as possible.

Introducing the Natural Development Server

This document describes the purpose and the functions of the Natural Development Server (Product code NDV).

The following topics are covered:

- Purpose of a Natural Development Server
 - Remote Development Functions
-

Purpose of a Natural Development Server

The Natural Development Server enables you to use the Natural Studio development environment to develop and test Natural applications in a remote Natural environment.

For more information, refer to the current Natural for Windows documentation and the Natural Single Point of Development documentation.

Remote Development Functions

A connection to an active Development Server can be established with the Map Environment function available in the Tools menu of Natural Studio. The Map Environment dialog is displayed for setting up the connection.

The screenshot shows the 'Map Environment' dialog box. It has a blue title bar with the text 'Map Environment' and a close button. The dialog is divided into two sections: 'Server' and 'Startup'. The 'Server' section contains three text input fields: 'Host name' with the value 'IBMNAT1', 'Server port' with the value '4712', and 'Environment name' with the value 'My Mainframe'. The 'Startup' section contains three text input fields: 'Session parameters' with the value 'FDIC=(30,315)', 'User ID' with the value 'NATURAL', and 'Password' which is empty. At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

The host name defines the remote node name where the server is running (or the IP address of the server).

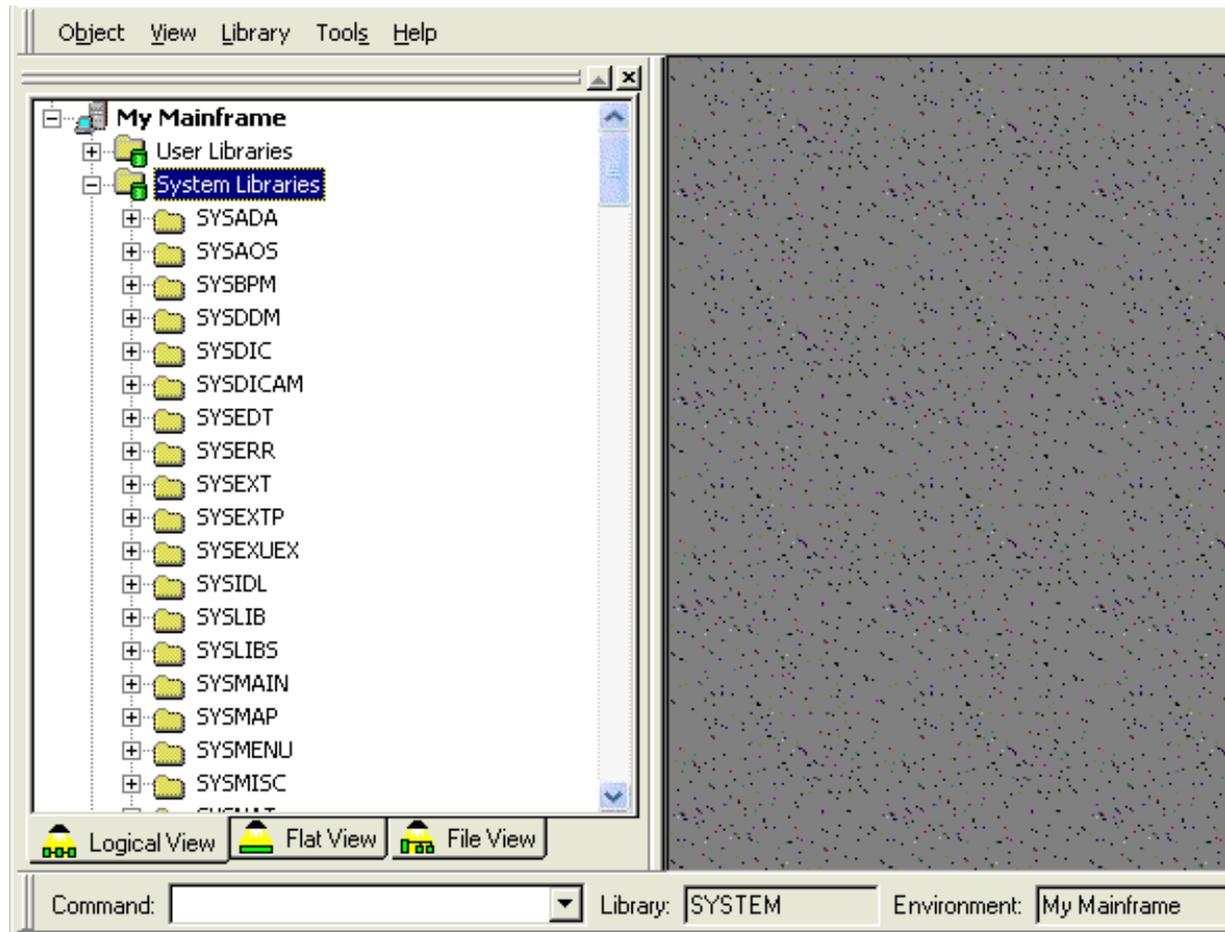
The server port defines the TCP/IP port number for the server.

The environment name can be used to give the addressed server a descriptive name.

You can specify additional Natural session parameters and a Natural Security password.

Both are transferred to the selected Natural Development Server and evaluated to create an exclusive Natural session that is responsible for executing all development requests for that environment.

Once you have executed a Map Environment command, Natural Studio opens a new tree view that represents the Natural objects of the connected Natural development environment, for example:



Note:

The node of a mapped server will reappear in the tree view when a new Natural session is started unless it is deleted with the corresponding context menu function.

You can use the entire functionality of Natural Studio to create, edit, store or execute Natural objects on the remote Natural environment.

You can map to multiple environments from one Natural Studio. Each mapped environment owns a Natural session on the Natural Development Server, even if you map multiple environments on the same server. However, only one mapped environment can be active at a time. The active environment is shown in the status bar. In addition, the corresponding node is highlighted in the tree view. It is this environment in which all remote commands will be executed.

You can change the active environment, by simply clicking on the desired node in the tree view.

Development Server File

This document describes the purpose and use of the Natural Development Server File, a central dictionary file which is used to store applications and the links to objects making up an application. It also holds object locking information in a Single Point of Development environment.

The following topics are covered:

- Purpose of the Development Server File
 - Relations between FDIC and the Development Server File
 - Unique Development Server File
-

Purpose of the Development Server File

As Natural stores its data in system files, the Natural Development Server stores its data in the system file that is assigned to the Natural parameter FDIC, a logical system file which is called the Development Server File.

The Development Server File is used as a central dictionary file for storing Natural applications and the links to objects making up an application. It also holds object locking information. This information is not bound to certain groups of application developers, but has an impact on the entire application development of an enterprise. Therefore, this file should be available only once, to ensure that the application definitions and locking states are kept consistent.

Relations between FDIC and the Development Server File

The Development Server File layout corresponds to the file layout of the Natural system file FDIC used as of Predict Version 4.2 or 4.3. This means that the central dictionary file can be also used to hold Predict data, but Predict is not a prerequisite for using the Development Server File. This enables you to use your existing application documentation in the application definitions of the remote development environment.

Attention: If Predict is used together with Natural Version 4.1.2 or together with NDV 2.1, Predict Version 4.3 is a prerequisite

Unique Development Server File

It is of vital importance that the various development environments use a common and unique Development Server File. Non-compliance with this requirement may give rise to inconsistencies in object locking and in the applications existing in the application workspace.

To prevent the FDIC parameter from being overwritten when a Natural Development Server is mapped, you are strongly recommended to prevent the NTDYNP macro from being used to specify FDIC as a dynamic parameter.

In a Natural Development Server that is protected by Natural Security, however, the use of another FDIC in the application workspace is prevented if the application security profiles are activated. See also Application Protection (in the Natural Security documentation).

Natural Development Server on Mainframes

This document describes the concept and the architecture of the Natural Development Server (Product code NDV) which is designed for use under OS/390 .

In addition, an optional Natural Development Server CICS Adapter is available that enables Natural Development Servers for OS/390 or SMARTS/VSE to be used with a CICS TP monitor.

The following topics are covered:

- Development Server Concept
 - Front-End Stub NATRDEVS
 - Transaction Processors
 - Front-End
 - Gateway Module
 - Server Monitor
 - Product Interaction
-

Development Server Concept

A Natural Development Server is a multi-user, multi-tasking application. It can host Natural sessions for multiple users and execute their requests concurrently.

The concept is based on the "serverized" Natural runtime system. Its architecture comprises a server front-end stub (development server stub NATRDEVS) that uses the Natural front-end to dispatch Natural sessions and to execute functionality within these sessions.

The Natural remote development server architecture basically consists of:

- Front-end stub
The stub NATRDEVS is launched to initialize a Natural Development Server, listens for incoming transactions and dispatches the appropriate Natural session for executing the transaction.
- Front-end
The front-end is called (together with the Natural runtime) by the front-end stub for session initialization/termination, request execution and session rollin/rollout.
- Gateway module
The module NATGWSTG provides for interaction between the Natural runtime and the front-end stub. NATGWSTG is linked to the Natural nucleus and is called by the Natural runtime to exchange the necessary request data.
- Transaction processors
Transaction processors are called by the front-end stub. The application logic of each individual transaction is implemented within a transaction processor.
- Server monitor
A monitor task allows the administrator to control the server activities, to cancel particular user sessions or to terminate the entire server, etc.

Front-End Stub NATRDEVS

The multi-user, multi-tasking, front-end stub NATRDEVS is launched to initialize a Natural Development Server.

- Stub Description
- Natural System Variables Used
- Natural I/O Handling

Stub Description

The task executing the server initialization (TMain) basically is the main listener which waits for incoming requests from the Remote Development Client. It owns a session directory to manage the multiple clients and their corresponding Natural sessions. TMain has the task to accept all incoming requests and to dispatch them to other subtasks (TWork). The process is as follows:

- First, a Map Environment command issued on the client side (in the Tools menu of Natural Studio) connects to TMain to establish a connection.
- Next, TMain inserts the client into its session directory, attaches a new TWork and passes the connection to TWork.
- TWork processes the request (indeed initializes a new Natural session if the client sends a CONNECT request) and replies to the client.
- After the reply, TWork listens on that connection for successive requests of that particular client. TWork remains active until the user on the client side (Natural Studio) switches the focus to a different environment (the local or a different mapped environment).
- If the user activates the environment again, TMain launches a new TWork that resumes the existing Natural session from the previous TWork.

That is, each client owns one subtask TWork on the Natural Development Server and multiple Natural sessions (one for each mapped environment). The subtask remains active as long as the mapped environment on Natural Studio is the currently active environment. Each Natural session remains active until the client disconnects/unmaps the corresponding environment. Consequently, a Natural session can be executed under different subtasks if the client switches among multiple environments.

Natural System Variables Used

Within a Natural Development Server session, the following Natural system variables are used:

- *TPSYS contains 'SERVSTUB',
- *DEVICE contains 'VIDEO' and
- *SERVER-TYPE contains 'DEVELOP'.

Natural I/O Handling

The Natural runtime allows I/O execution in the same way as in an online environment:

- A Natural Development Server intercepts the I/O and sends the 3270 data stream to Natural Studio.
- Natural Studio internally starts a terminal emulation window and passes the 3270 stream to that window.
- After I/O execution, the I/O data is sent back to the server.
- The front-end stub invokes the front-end to continue processing after I/O.

Front-End

OS/390 Batch: The Natural front-end required for a Natural Development Server is a Natural batch driver assembled with the option LE370=YES.

SMARTS: The Natural Version 3.1 front-end required for a Natural Development Server is a Natural Complete driver NCFNUC that is delivered with the Natural Development Server. You must not use the NCFNUC driver delivered with Natural Version 3.1 for Mainframes.

The Natural Version 4.1 front-end required for a Natural Development Server is the Natural Complete driver NCFNUC that is delivered with Natural Version 4.1 for Mainframes.

CICS: The Natural front-end required for executing the Natural sessions under control of CICS is the Natural remote front-end NATCSRFE that is delivered with the Natural Development Server. For more information, refer to the Natural Development Server CICS Adapter documentation.

Transaction Processors

The transaction processors are Natural programs in the library SYSLIB that process transactions (e.g. "save source", "get library list",) requested by the Natural Development Server client. The transaction processors are invoked by the front-end stub.

Gateway Module

The gateway module NATGWSTG must be linked to the Natural nucleus.

For CICS support, the Natural Development Server distribution tape contains a remote gateway module NATRGNVD. This module is responsible for transmitting the NDV-relevant data between a Natural Development Server and the Natural session running in CICS.

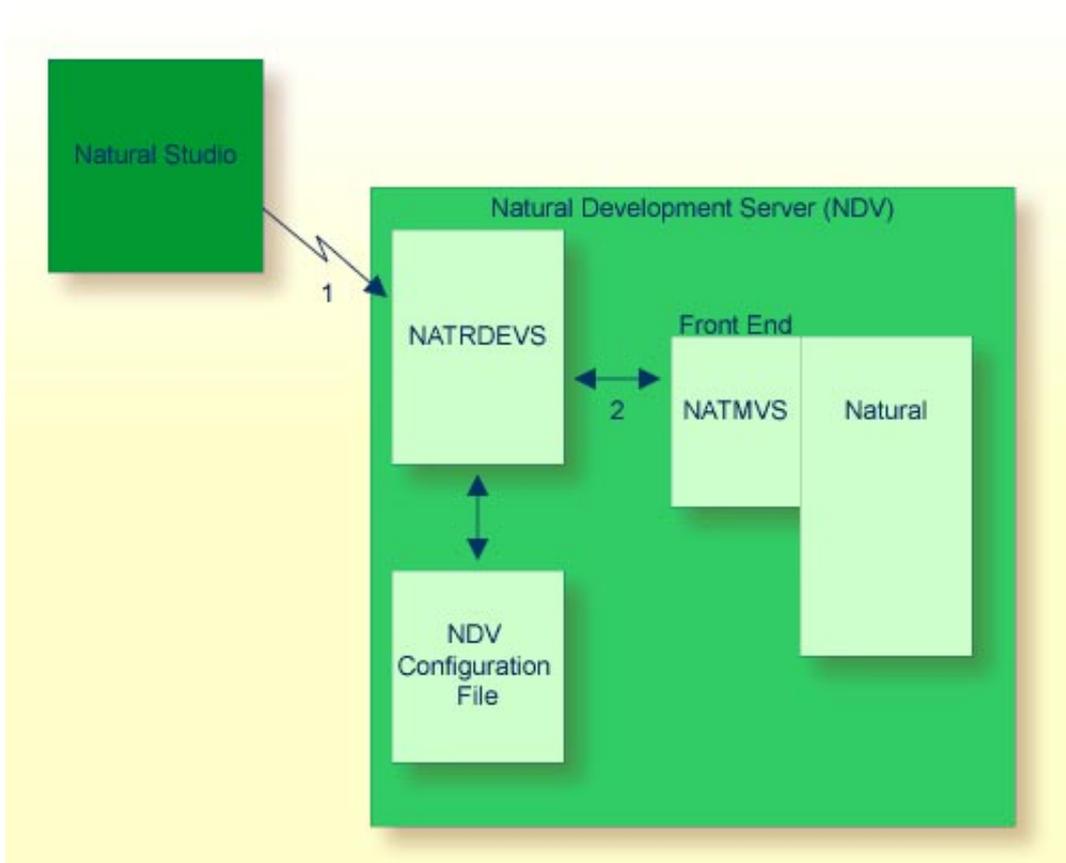
For more information, refer to the Natural Development Server CICS Adapter documentation.

Server Monitor

To enable the administrator to monitor the status of the Natural Development Server, a monitor task is provided which is initialized automatically at server startup. Using the monitor commands, the administrator can control the server activities, cancel particular user sessions, terminate the entire server, etc. See Operating the Development Server.

Product Interaction

The following figure illustrates the interaction of Natural Studio used as a remote development client with a Natural Development Server.



1. Natural Studio sends a remote development request to the Natural Development Server (NDV) using the port number specified with the NDV configuration variable PORT_NUMBER.
2. Natural Development Server dispatches the Natural session using the Natural front-end you have specified with the NDV configuration variable FRONTEND_NAME (NATMVS in this example).

Prerequisites

This document describes the prerequisites that apply when you install a Natural Development Server (Product Code: NDV) on a mainframe computer.

The following topics are covered:

- General Prerequisites for NDV Installation
 - Prerequisites for NDV for OS/390
 - Prerequisites/Restrictions for NDV CICS Adapter
-

General Prerequisites for NDV Installation

- The current Natural Version for Mainframes must be installed.
- If Natural Version 3.1.6 is installed, Natural Version 3.1.6. Service Pack 8 and Zap NA46118 are required.
- If Natural Security Version 3.1.6 is installed, Natural Security Version 3.1.6 Service Pack 8 is required.
- If you are using Predict and you have to migrate to a Predict version specified under Natural and Other Software AG Products in the current Natural Release Notes, you are strongly recommended to migrate to the newer Predict version **before** you install the Natural Development Server. The minimum version of Predict needed for the Natural Development Server Version 2.1 is Predict Version 4.3.1.

-



If you do not migrate to a Predict version specified under Natural and Other Software AG Products in the current Natural Release Notes **before** starting the Natural Development Server installation, you will have to define a new Natural system file (FNAT) and a new Development Server File (FDIC). The current Natural version for Mainframes and the desired additional products must have been loaded on the Natural system file FNAT before you start the installation of the Natural Development Server.

- The Software AG Editor must be installed. You are recommended to set the size of the editor buffer pool to 1024 KB. If you are using SMA, the necessary modules are linked when the SMA parameter SAG-EDITOR is set. If you are installing without SMA, see the Natural Installation Guide for Mainframes, Installing the Software AG Editor.
- The prerequisites required for the operation of a remote development client must be fulfilled in addition. Natural Version 5 (restricted functionality) or Version 6 for Windows is required.
- Optionally:
 - Natural Construct Version 4.5.1 or higher. If you have Natural Construct Version 4.5.1 installed, apply the latest Natural Construct Version 4.5.1 Service Pack to your Natural system file (FNAT).
 - Natural Engineer 4.4.1 or higher.

Prerequisites for NDV for OS/390

In addition to the general prerequisites described above, the following operating-system-specific prerequisites apply:

- OS/390 or z/OS must be installed.
Version as specified under Operating/Teleprocessing Systems Required in the current Natural Release Notes.

Prerequisites/Restrictions for NDV CICS Adapter

The Natural Development Server must have been installed on OS/390 or under SMARTS on VSE/ESA.

In addition, the following prerequisites and restrictions apply to the Natural Development Server CICS Adapter:

- CICS TS 1.3 or above.
- CICS TCP/IP and the CICS listener must be enabled. Refer to *CICS TCP/IP Socket Interface Guide*.
- Natural Version 4.1.2 and Natural CICS Interface Version 4.1.2 for Mainframes must be installed.
- Natural Development Server Version 2.1 must be installed on OS/390 in batch mode or under SMARTS on VSE/ESA.
- Natural must not be used with the Natural profile parameter ADAMODE set to 0, because this would cause an excessive number of Adabas user queue elements (UQE) per Natural session.

Installing the Natural Development Server

This document describes how to install a Natural Development Server (product code NDV) under the operating system OS/390.

The following topics are covered:

- Prerequisites
- Content of the Development Server Distribution Tape
- Installation Procedure

Prerequisites

For details, refer to the section Prerequisites.

Content of the Development Server Distribution Tape

The installation tape contains the datasets listed in the table below. The sequence of the datasets and the number of library blocks needed are shown in the **Report of Tape Creation** which accompanies the installation tape.

dataset Name	Contents
NDV nnn .LOAD	Contains the load modules of the development server. See Natural Development Server on Mainframes.
NDV nnn .EXPL	Contains the sample programs required for using the tutorial. See First Steps with Natural Single Point of Development.
NDV nnn .DE11	Contains instructions for deleting NDV Version 1.1 modules not used in NDV Version 2.1.
NDV nnn .INPL	Contains the transaction processor. See Natural Development Server on Mainframes.
NDV nnn .ERRN	Contains the error messages of the transaction processor.
NDV nnn .SYSF	Contains the FDT of the Development Server File (the layout is identical with PRD nnn .SYSF provided with a Predict version as specified under Natural and Other Software AG Products in the current Natural Release Notes).

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

Installation Procedure

To install the Natural Development Server in the OS/390 environment, perform the following steps:

Copying the Tape Contents to Disk

If you are using System Maintenance Aid (SMA), refer to the SMA documentation (included on the current edition of the Natural documentation CD).

If you are **not** using SMA, follow the instructions below.

This section explains how to:

- Copy data set COPY.JOB from tape to disk.
- Modify this data set to conform with your local naming conventions.

The JCL in this data set is then used to copy all data sets from tape to disk.

If the datasets for more than one product are delivered on the tape, the dataset COPY.JOB contains the JCL to unload the datasets for all delivered products from the tape to your disk.

After that, you will have to perform the individual install procedure for each component.

Step 1 - Copy data set COPY.JOB from tape to disk

The data set COPY.JOB (label 2) contains the JCL to unload all other existing data sets from tape to disk. To unload COPY.JOB, use the following sample JCL:

```
//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=<Tnnnnn>),
// LABEL=(2,SL)
//SYSUT2 DD DSN=<hilev>.COPY.JOB,
// DISP=(NEW,CATLG,DELETE),
// UNIT=3390,VOL=SER=<vvvvvv>,
// SPACE=(TRK,(1,1),RLSE),
// DCB=*.SYSUT1
//SYSPRINT DD SYSOUT=*
//SYSIN DD DUMMY
//
```

Where:

<hilev> is a valid high level qualifier

<Tnnnnn> is the tape number

<vvvvvv> is the desired volser

Step 2 - Modify COPYTAPE.JOB

Modify the COPYTAPE.JOB to conform with your local naming conventions and set the disk space parameters before submitting this job:

- Set HILEV to a valid high level qualifier.
- Set LOCATION to a storage location.
- Set EXPDT to a valid expiration date.

Step 3 - Submit COPY.JOB

Submit COPY.JOB to unload all other data sets from the tape to your disk.

Step 4: Create a development server configuration file and sample Clist

(Job I009 / Step 8410,8420,8430)

See sample member NDVCONFIG on dataset NDV nnn .JOBS.

Step 8430 creates a sample batch job to PING and TERMINATE an NDV server. See sample member NDVBATCH on dataset NDV nnn .JOBS.

Described in the section Development Server Configuration under OS/390.

The following parameters of the configuration file have to be defined. For the other parameters, the default values may be used:

FRONTEND_NAME	Specify the name of the NDV server frontend module you generate in Step 6.
PORT_NUMBER	Specify the TCP/IP port number under which the server can be connected..

Step 8420 creates a sample CLIST to PING and TERMINATE an NDV server. See sample member NDVCLIST on dataset NDV nnn .JOBS.

Step 5: Load FDIC system file (optional)

(Job I050, Step 8403)

If you do not use Predict at all or if you have not yet migrated to a Predict version as specified under Natural and Other Software AG Products in the current Natural Release Notes, create the development server file, using the dataset NDV nnn .SYSF.

The layout of the Development Server File corresponds to the layout of the Predict Version 4.2 or above dictionary file.

Note: If you have a Predict version installed as specified under Natural and Other Software AG Products in the current Natural Release Notes, you can ignore this step.

Step 6: Assemble and link reentrant ADALNKR

(Job I055, Step 8401)

The server environment requires a reentrant ADALINKR module.

Link ADALNK using the RENT option.

Step 7: Assemble NATOS with LE370=YES

(Job I055, Steps 8410, 8420)

- Job I055, Step 8410 starts the batch program IEBUPDATE to create the source member.
- Job I055, Step 8420 assembles and links NATOS.

Adapt your Natural parameter module with the new parameters and assemble it.

Link the new Natural parameter module and, if Predict is to be used, the PRDXREF module from the load library NAT31 n .LOAD to the environment-independent part of the Natural nucleus.

Step 8: Create NATPARM and NDV server front-end module

(Job I060, Steps 8410, 8420, 8430)

- Job I060, Step 8410 starts the batch program IEBUPDATE.
- Job I060, Step 8420 assembles and links NATPARM.
- Job I060, Step 8430 link the NDV server frontend module.

Step 9: Delete Old Objects

(Job I061, Step 8440)

This step is required if NDV Version 1.1 was installed before. For a first time installation of NDV, skip this step.

Use the INPL command to delete the objects in dataset NDVnnn.DE11 from your Natural system file (FNAT).

These modules are not used by the current NDV version.

Note that the parameter FDIC must have been set to point to your Natural development server file.

Step 10: Load Natural objects, error messages and samples for NDV

(Job I061, Steps 8450,8451,8452)

During NDV INPL the assigned FDIC/FSEC file is initialized with NDV specific information.

- Load objects from dataset NDVnnn.INPL onto your Natural system file (FNAT) using the INPL command. The parameter FDIC must have been set to point to your development server file.
- Load the error messages from dataset NDVnnn.ERRN using ERRLODUS.
- To use the tutorial (see First Steps with Natural Single Point of Development), load the sample programs from dataset NDVnnn.EXPL to your Natural system file.

Step 11: Copy DDMs and processing rules to FDIC (optional)

If you use a Predict system file FDIC as development server file (FDIC), ignore this step.

If a Predict version as specified under Natural and Other Software AG Products in the current Natural Release Notes has not been installed or if you do not use a Predict system file FDIC as development server file (FDIC), you have to copy the existing DDMs and processing rules to the development server file (FDIC), using the copy function of the Natural utility SYSMAIN.

Step 12: Create server startup JCL

(Job I200, Step 8415)

Described in the section Development Server Configuration under OS/390. See sample member NDVSTART on dataset NDVnnn.JOBS.

Sample:

```

//          PROC  SRV=SAGNDV
//NDV       EXEC  PGM=NATRDEVS ,
// REGION=4000K, TIME=1440, PARM= ' POSIX(ON) , TRAP(ON, NOSPIE) /&SRV
//STEPLIB  DD    DISP=SHR, DSN=NDVvr$.LOAD
//          DD    DISP=SHR, DSN=SMA.LOAD
//SYSUDUMP DD    SYSOUT=X
//CEEDUMP  DD    SYSOUT=X
//CMPRINT  DD    SYSOUT=X
//STGCONFIG DD   DISP=SHR,
//          DSN=NDV.CONFIG(&SRV)
//STGTRACE DD    SYSOUT=X
//STGSTDO  DD    SYSOUT=X
//STGSTDE  DD    SYSOUT=X
//SYSOUT   DD    SYSOUT=X

```

Note: The NDV server account must be defined in OS/390 UNIX System Services (OE segment). If the server account is not defined, the server ends with U4093 and system message CEE5101C in the trace file.

Step 13: NDV Clients must be defined to Natural Security

If Natural Security (NSC) is installed:

- The NDV initial user ID (default ID is STARGATE) must be defined in Natural Security with a valid default library. Refer also to NDV configuration parameter INITIAL_USERID. Alternatively, you can define the Natural profile parameter AUTO=OFF (automatic logon) for NDV.
- Each client user ID must be defined in Natural Security.

If the NDV initial user ID is not defined, the NDV server initialization aborts with a NAT0856.

If an NDV client is not defined, the map environment returns an NSC error.

If you logon to the server from an NDV client, make sure that the user who is defined in Natural Security has a default library or a private library defined. Otherwise, error message NAT0815 will occur.

Configuring the Natural Development Server

This document describes how to configure a Natural Development Server for OS/390.

The following topics are covered:

- Configuration Requirements
- Configuration File
- Configuration Parameters
- Server Datasets

Configuration Requirements

A Natural Development Server requires the following OS/390 language environment parameter configuration:

Parameter	Definition
POSIX(ON)	Enables a Natural Development Server to access the POSIX functionality of OS/390. If you start a Natural Development Server server with POSIX(OFF), it terminates immediately with a user abend U4093 and the system message EDC5167. IBM supplies the default OFF.
TRAP(ON,NOSPIE)	Defines the abend handling of the LE/370 environment:
	ON enables the Language Environment condition handler.
	NOSPIE specifies that the Language Environment will handle program interrupts and abends via an ESTAE, that is, the Natural abend handler will receive control to handle program interrupts and abends.
	If you do not specify TRAP(ON,NOSPIE), the Natural abend handling does not work properly. IBM supplies the default (ON,SPIE).
TERMTHDACT(UADUMP)	Defines the the level of information that is produced in case of an abend. The option UADUMP generates a Language Environment CEEDUMP and system dump of the user address space. The CEEDUMP does not contain the Natural relevant storage areas. IBM supplies the default (TRACE).
ENVAR(TZ=)	The ENVAR option enables you to set UNIX environment variables. The only environment variable applicable for the Natural Development Server is TZ (time zone). This variable allows you to adjust the timestamp within the Natural Development Server's trace file to you local time. Example: ENVAR(TZ=CET-1DST) CET - 1 hour daylight saving time

You can set the OS/390 language environment parameters:

- With the PARM parameter specified in the EXEC card of the Natural Development Server startup job. The length of the options is limited by the maximum length of the PARM parameter.
- Assemble an LE/370 runtime option module CEEUOPT and link it to the Natural Development Server load module.

Configuration File

A configuration file is allocated to the DD-name <serverid>C (e.g. NDVS1C) or STGCONFIG alternatively.

The configuration file is a text file located on a dataset or on an HFS file under OS/390 . It contains the server configuration parameters in form of a *keyword=value* syntax.

Configuration Parameters

The following configuration parameters are available:

DBG_CODEPAGE | FRONTEND_OPTIONS | FRONTEND_PARAMETER | INITIAL_USERID |
 THREAD_NUMBER | FRONTEND_NAME | KEEP_TCB | THREAD_SIZE | TRACE_LEVEL |
 SESSION_PARAMETER | DEFAULT_PROFILE | HOST_NAME | PORT_NUMBER

DBG_CODEPAGE

This optional configuration parameter specifies which translation table is used by the remote debugger. By default, the remote debugger uses the code page IBM-1047 contrary to NDV which uses TABA1/2.

Possible values:

USER	Use the Natural translation tables TABA1/2.
------	---------------------------------------------

Default Value none

Example DBG_CODEPAGE=USER

FRONTEND_OPTIONS

This configuration parameter specifies additional options for the Natural front-end.

Possible Options:

01	Do not use the roll server.
02	Clean up roll file at server termination.
04	Write GTF trace.
08	Write ETRACE.
10	Front-end automatic termination.
20	Write console information.

You may combine the above options as desired in that you add their values and set the result as shown in the example below.

Default Value 01

Example FRONTEND_OPTIONS=07 The setting in the example enables the Options 01, 02 and 04.

FRONTEND_PARAMETER

This optional configuration parameter contains additional Natural front-end parameters as specified in the Startup Parameter Area.

You can define multiple parameters. Each parameter specification is a pair of 8-character strings, the first containing the parameter keyword and the second the parameter value.

For further information, see the *Natural Operations for Mainframe documentation*, Natural in Batch Mode.

Default Value none

Example FRONTEND_PARAMETER="MSGCLASSX"

The setting in the example specifies that the default output class for CMPRINT is "X".

INITIAL_USERID

At server initialization, the Natural Development Server creates a temporary Natural session to obtain the properties of the installed Natural environment.

This configuration parameter specifies the user ID to be used for this Natural session.

The specified value must not exceed 8 characters, otherwise it is truncated.

Default Value STARGATE

Example INITIAL_USERID=NDVINITU

THREAD_NUMBER

This configuration parameter specifies the number of physical storage threads to be allocated by the Natural front-end, that is, the number of sessions that can be executed in parallel.

Note:

This number does not limit the number of sessions within the server, but the number of sessions which can be in execution status concurrently. The number of sessions is limited by the size of the Natural swap medium.

Default Value 3

Example THREAD_NUMBER=5

FRONTEND_NAME

This configuration parameter specifies the name of the Natural front-end to be used to start a Natural session. The front-end resides on a PDS member.

Default Value none

Example FRONTEND_NAME=NAT315SV

KEEP_TCB

By default, the remote Natural session of a mapped environment terminates its TCB whenever you switch the focus within Natural Studio to a different mapped environment. If you toggle the focus back, the remote session is dispatched using a different TCB.

The maximum number of active TCBs is equal to the number of connected clients.

The configuration parameter KEEP_TCB specifies whether the remote Natural session should use the same TCB during its entire lifetime. This is required if you want to access DB2. It could also be required if you access 3GL programs which need to be executed under the same TCB for successive calls.

Default Value NO

Example KEEP_TCB=YES

THREAD_SIZE

This configuration parameter specifies the size (in KB) of each physical storage thread which contains the Natural session data at execution time.

Default Value 500

Example THREAD_SIZE=800

TRACE_LEVEL

See Trace Level details in the section Natural Development Server on Mainframe.

Default Value 0

Example TRACE_LEVEL=0x00000011

The setting in the example switches on Bits 31 and 27.

DEFAULT_PROFILE

This optional configuration parameter defines a default profile.

Specifying a parameter string in the Map Environment window of Natural Studio overwrites this default profile.

Default Value none

Example DEFAULT_PROFILE=RDEVS,10,930

The setting in the example defines that, if no parameters are defined in the Map Environment window, the session is started with the parameter PROFILE=(RDEVS10,930).

SESSION_PARAMETER

This optional configuration parameter defines session parameters that precede the parameter string either specified in the Map Environment window or defined by default by the configuration parameter DEFAULT_PROFILE.

Default Value none

Example SESSION_PARAMETER=FNAT=(10 , 930)

The setting in the example defines that every session on this Natural Development Server is started with the session parameter FNAT=(10 , 930) appended to the user-specified parameters or the definitions in DEFAULT_PROFILE.

HOST_NAME

This optional configuration parameter is necessary only if the server host supports multiple TCP/IP stacks.

If HOST_NAME is specified, the server listens on the particular stack specified by HOST_NAME, otherwise the server listens on all stacks.

Default Value none

Example HOST_NAME=node1

or

HOST_NAME=157.189.160.55

PORT_NUMBER

This configuration parameter defines the TCP/IP port number under which the server can be connected.

Default Value none

Example PORT_NUMBER=3140

Configuration File Example:

```
# This is a comment
SESSION_PARAMETER=profile=(stgqa,10,930) fuser=(10,32)
DEFAULT_PROFILE=DEFPROF
THREAD_NUMBER=2
THREAD_SIZE=700
FRONTEND_NAME=NATOS31L            # and another comment
PORT_NUMBER=4711
```

Server Datasets

The Natural Development Server requires the following datasets:

STGCONFIG	Defines the server configuration file.
STGTRACE	The server trace output.
STGSTDO	The stdo dataset.
STGSTDE	The stde error output.

Alternately, you can qualify each dataset name by the server ID.

NDVS1C	Defines the server configuration file for the server NDVS1.
NDVS1T	The server trace output for the server NDVS1.
NDVS1O	The stdo dataset for the server NDVS1.
NDVS1E	The stde error output for the server NDVS1.

Operating the Natural Development Server

This document describes how to operate a Natural Development Server in an OS/390-based batch environment .

The following topics are covered:

- Starting the Natural Development Server
- Terminating the Natural Development Server
- Monitoring the Natural Development Server
- Runtime Trace Facility
- Trace Filter

Starting the Natural Development Server

The development server can be started as a **started task**:

```
//NDVSRV  PROC
//KSPSRV  EXEC PGM=NATRDEVS,REGION=4000K,TIME=1440,
// PARM=( ' POSIX(ON)/NDVSRV1 ' )
//STEPLIB DD DISP=SHR,DSN=NDVvrn.LOAD
//        DD DISP=SHR,DSN=NATvrn.LOAD
//CMPRINT DD SYSOUT=X
//STGCONFIG DD DISP=SHR,DSN=NDV111.CONFIG(SRV1)
//STGTRACE DD SYSOUT=X
//STGSTDO  DD SYSOUT=X
//STGSTDE  DD SYSOUT=X
```

where *vrn* is the version, release, system maintenance level number of NDV (starting with NDV111) or Natural (starting with NAT315).

Note: PARM=(' POSIX(ON)/NDVSRV1 ')

POSIX(ON) is required for a proper LE370 initialization and NDVSRV1 is the name of the server for the communication with the monitor client.

The name of the started task must be defined under RACF and the OS/390 UNIX System Services.

Start the NDV server with the SMARTS console command /F <SMARTS-region>, NATRDEVS <server-id>, where *SMARTS-region* is the name of your SMARTS started task.

Example: /F SMARTS62,NATRDEVS NDVS1.

Note: If you qualify the NDV datasets by *server-id*, the server-id is restricted to a maximum length of 7 characters.

Terminating the Natural Development Server

The Development Server can be terminated from within the Monitor Client NATMOPI (described in the Natural Operations for Mainframes documentation).

Monitoring the Natural Development Server

To enable the administrator to monitor the status of the Natural Development Server, a monitor task is provided which is initialized automatically at server startup. Using the monitor commands described below, the administrator can control the server activities, cancel particular user sessions, terminate the entire server, etc.

Monitor Communication

To communicate with the monitor, you can use the monitor client NATMOPI (described in the Natural for Mainframes Operations documentation).

Monitor Commands

The Natural Development Server supports the following monitor commands:

Monitor Command	Action
ping	Verifies whether the server is active. The server responds and sends the string "I'm still up".
terminate	Terminates the server.
abort	Terminates the server immediately without releasing any resources.
set configvariable value	With the set command, you can modify server configuration settings. For example, to modify TRACE_LEVEL: <code>set TRACE_LEVEL 0x00000012</code>
list sessions	Returns a list of active Natural sessions within the server. For each session, the server returns information about the user who owns the session, the session initialization time, the last activity time and an internal session identifier (session-id).
cancel session session-id	Cancels a particular Natural session within the Natural Development Server. To obtain the session-id, use the monitor command list sessions .
help	Returns help information about the monitor commands supported.

Runtime Trace Facility

For debugging purposes, the server code has a built-in trace which can be switched on, if desired.

The following topics are covered:

- Trace Medium
- Trace Configuration
- Trace Level

Trace Medium

A remote development server writes its runtime trace to a dataset allocated to the DD name STGTRACE or, alternatively, to <server-id>T.

The trace file is allocated (overwritten) at server initialization.

Trace Configuration

The trace is configured by a trace level which defines the detail of the trace. Once a trace is switched on, it can be restricted to particular clients or client requests by specifying a trace filter.

Every Natural session is equipped with a 32-bit trace status word (TSW) which defines the trace level for that session. The value of the TSW is set by a server configuration parameter. A value of zero means that the trace is switched off.

Trace Level

Each bit of the TSW is responsible for certain trace information. Starting with the rightmost bit:

Bit 31	Trace main events (server initialization/termination, client request/result).
Bit 30	Detailed functions (session allocation, rollin/rollout calls, detailed request processing).
Bit 29	Dump internal storage areas.
Bit 28	Session directory access.
Bit 27	Dump request/reply buffer EBCDIC.
Bit 26	Dump request/reply buffer ASCII.
Bit 25-24	Free.
Bit 23	Request processing main events.
Bit 22	Request processing detailed functions.
Bit 21	Remote debugger main events.
Bit 20	Remote debugger detailed functions.
Bit 19-16	Free.
Bit 15	Trace error situations only.
Bit 14	Apply trace filter definitions.
Bit 13-08	Free.
Bit 07-01	Free.
Bit 00	Reserved for trace-level extension.

Trace Filter

In order to reduce the volume of the server trace output, it is possible to restrict the trace by a logical filter.

- The filter can be set with the configuration parameter TRACE_FILTER.
- The filter may consist of multiple keyword=*filtervalue* assignments separated by spaces.

The filter keyword is:

Client	Filters the trace output by specific clients.
--------	-----------------------------------------------

The following rules apply:

- If a keyword is defined multiple times, the values are cumulated.
- The value must be enclosed in braces and can be a list of filter values separated by spaces.
- The values are not case sensitive and asterisk notation is possible.

Example:

```
TRACE_FILTER="Client=(KSP P*)"
```

Each request of the userid KSP and each request of the userids prefixed by a P are traced.

Natural Development Server Frequently Asked Questions

This document contains frequently asked questions concerning the Natural Development Server (NDV) under OS/390.

The following topics are covered:

- Natural Development Server starts and terminates immediately
- Which dataset should I analyze to get error information?
- Trace output shows "Cannot load Natural front-end "
- Trace output shows "Transport initialization failed" "EDC8115I address already in use"
- How do I get information about which process occupies a port number?
- The task that occupies a port number is not active but the port is still occupied. How do I drop the stuck connections?
- Trace output shows "Error at: Template runtime connect"
- NDV task abends with User Code 4093 and SYSOUT Message CEE5101C
- Required LE runtime options
- Useful LE runtime options
- How do I pass LE runtime options?
- Definitions required in Natural Security
- I do not get a NAT0954 even if I specify DU=OFF
- Map Environment fails with a NAT3048
- Map Environment fails with Stub RC nn
- Special characters are not translated correctly
- How do I find out which hexadecimal value must be specified for TABA1/TABA2?
- The modifications of TABA1/TABA2 do not apply to sources listed in the remote debugger?
- Accessing work files
- I have problems when accessing DB2
- Are there any Natural profile parameter settings required for NDV?

Natural Development Server starts and terminates immediately

At server initialization, the Natural Development Server

- allocates central control blocks,
- opens the datasets STGTRACE, STGSTDO, STGSTDE, STGCONFIG,
- obtains the configuration file,
- loads the Natural front-end,
- initializes the first Natural session and
- launches the TCP/IP listener task

If one of these steps fails, the server cannot continue and terminates immediately.

Analyze the trace output (STGTRACE) or the error output (STGSTDE) to find out the problem.

Which dataset should I analyze to get error information?

STGSTTE	<p>Contains only error output. Each record consists of 2-4 lines depending on whether it is a Natural error, a system error or an NDV stub error.</p> <p>Natural Error</p> <ol style="list-style-type: none"> 1. DayOfMonth Time TaskId UserId 2. TaskId NDV Error: error classification 3. Natural FrontEnd error or NATURAL runtime error 4. Natural error text <p>System Error</p> <ol style="list-style-type: none"> 1. DayOfMonth Time TaskId UserId 2. TaskId NDV Error: error classification 3. TaskId Sys Error: System error text <p>NDV stub error</p> <ol style="list-style-type: none"> 1. DayOfMonth Time TaskId UserId 2. TaskId NDV Error: error classification
STGTRACE	<p>Contains NDV trace information and error information. Each trace record contains</p> <p>DayOfMonth Time TaskId Trace information text</p> <p>The string PrintError in the Trace information text prefixes errors.</p>
STGSTO	Content of the configuration file allocated to STGCONFIG.
SYSOUT	Messages from LE runtime system.

Trace output shows "Cannot load Natural front-end "

The Natural front-end specified by the NDV configuration parameter FRONTEND_NAME was not found in the load library concatenation.

Trace output shows "Transport initialization failed" "EDC8115I address already in use"

The TCP/IP port number specified by the NDV configuration parameter PORT_NUMBER is already in use by another process.

How do I get information about which process occupies a port number?

TSO command **NETSTAT (PO 4712)** displays connections of Port 4712. The first column of the list refers to the task that owns the port.

Or enter the OS/390 Unix System Services command **netstat -P4712**.

Trace output shows "Error at: Template runtime connect"

When a Natural Development Server initializes, it starts a Natural session using the session parameter defined by the NDV configuration parameter SESSION_PARAMETER. The profile definition of the NDV configuration parameter DEFAULT_PROFILE is appended.

If the initialization of the template session fails, the server terminates immediately. The original error can be found below the message "Error at:Template runtime connect".

Typical error situations could be:

- No Natural buffer pool defined
- Natural system file not accessible
- Profile parameter ITERM=ON
- NDV initial user ID not defined

NDV task abends with User Code 4093 and SYSOUT Message CEE5101C

The account of the Natural Development Server is not defined in OS/390 Unix System Services. If you start the Natural Development Server as a started task, the member name of the started task must be defined under OS/390 Unix System Services. If you start the Natural Development Server as a batch job, the user that submits the job must be defined under OS/390 Unix System Services.

Required LE runtime options

IBM Language Environment (LE) runtime options that must be specified to operate a Natural Development Server.

POSIX(ON)	Enables the Natural Development Server to access the POSIX functionality of OS/390. If you start a Natural Development Server with POSIX(OFF), it terminates immediately with a user abend U4093 and the system message EDC5167. IBM supplies the default OFF.
TRAP(ON,NOSPIE)	Defines the abend handling of the IBM Language Environment. ON enables the Language Environment condition handler. NOSPIE specifies that Language Environment will handle program interrupts and abends via an ESTAE, that is the Natural abend handler will receive control to handle program interrupts and abends. If you do not specify TRAP(ON,NOSPIE) the Natural abend handling does not work properly. IBM supplies the default (ON,SPIE).
TERMTHDACT(UADUMP)	Defines the the level of information that is produced in case of an abend. The option UADUMP generates a Language Environment CEEDUMP and system dump of the user address space. The CEEDUMP does not contain the storage areas relevant to Natural. IBM supplies the default (TRACE).

Useful LE runtime option?

IBM Language Environment (LE) runtime options to monitor and tune Natural Development Servers.

RPTOPTS(ON)	Prints LE runtime option settings to SYSOUT after server termination.
HEAPPOOLS	The HEAPPOOLS run-time option is used to control an optional heap storage management algorithm, known as heap pools. Refer also to Language Environment for OS/390 & VM Programming Reference. The setting of this parameter depends on NDV functionality mostly used by NDV clients. A good value to start with is: HEAPP=(ON,40,3,80,7,224,7,528,3,1344,8,2048,8).
ALL31(ON)	Specify ALL31(ON) if your entire Natural environment runs in 31-bit mode to prevent LE switching addressing mode.
STACK(64K,16K,ANY,FREE)	Specify the ANY option if your entire Natural environment runs in 31-bit mode. This enables LE to allocate the storage for the STACK segment above the 16 MB line. The STACK segment above 16 MB increases the number of subtasks you can create within the NDV region. The initial and extend size (64 KB and 16 KB in the example) should be determined for your own environment by using the LE storage report generated when you specify RPTSTG(ON).
HEAP(800K,64K,ANY,FREE,,)	Initial heap storage (see STACK option).
ANYHEAP(1300K,200K,ANY,FREE)	Library heap storage (see STACK option).
RPTSTG(ON)	Generates, after server termination, a report of the storage the server used. At the end of the report, it suggests cell sizes for the HEAPPOOLS option. This option decreases performance of the server. Use it only as an aid to find best settings for HEAPPOOLS definition.
ENVAR(TZ=)	The ENVAR option enables you to set UNIX environment variables. The only environment variable applicable for the Natural Development Server is TZ (time zone). Example: ENVAR(TZ=CET-1DST) CET - 1 hour daylight saving time

How do I pass LE runtime options?

1. With the PARM parameter specified in the EXEC card of the NDV startup job.
The length of the options is limited by the maximum length of the PARM parameter.

```
//NDV EXEC PGM=NATRDEVS,
// PARM='RPTOPTS(ON)/server-id'
```

2. Assemble an LE runtime option module CEEUOPT and link it to the NDV load module.

```
//KSPLNDV JOB KSP,CLASS=K,MSGCLASS=X
//*
/* RELINK NDV SERVER WITH LE RUNTIME OPTIONS
/*
/*****
/* STEP1: ASSEMBLE LE RUNTIME OPTION MODULE
/*
//STEP1 EXEC PGM=ASMA90,PARM='DECK,NOOBJECT'
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSUT2 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSUT3 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSPUNCH DD DSN=&&TEMPOBJ(CEEUOPT),DISP=(,PASS),UNIT=SYSDA,
```

```

// SPACE=(TRK,(1,1,1)),DCB=(BLKSIZE=3120,LRECL=80,DSORG=PO)
//SYSLIB DD DSN=CEE.SCEEMAC,DISP=SHR <<<<<<
// DD DSN=SYS1.MACLIB,DISP=SHR <<<<<<
//SYSIN DD *
CEEUOPT CSECT
CEEUOPT AMODE ANY
CEEUOPT RMODE ANY
CEEEXOPT ENVAR=(TZ=CET-1DST), X
HEAPOOLS=(ON,40,50,80,90,224,80,528,50,1344,90,2048, X
90), X
POSIX=(ON), X
RPTOPTS=(ON)
END
/*
/*****
/* STEP1: LINK RUNTIME OPTION MODULE
/*
//STEP2 EXEC PGM=IEWL,
// PARM='NCAL,RENT,LIST,XREF,LET,MAP,SIZE=(9999K,96K)'
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD UNIT=SYSDA,SPACE=(TRK,(5,5))
//SYSLMOD DD DSN=&&CEEOBJ(CEEUOPT),DISP=(,PASS),UNIT=SYSDA,
// SPACE=(TRK,(1,1,1))
//SYSLIB DD DSN=&&TEMPOBJ,DISP=(OLD,PASS)
//SYSLIN DD *
INCLUDE SYSLIB(CEEUOPT)
ENTRY CEEUOPT
ORDER CEEUOPT
NAME CEEUOPT(R)
/*
/*****
/* STEP3: RELINK NDV SERVER WITH RUNTIME OPTION MODULE
/*
//STEP3 EXEC PGM=IEWL,
// PARM='RENT,XREF,LIST,LET,REUS,SIZE=(300K,64K),CASE=MIXED,
// AMODE=31,RMODE=ANY'
//SYSUT1 DD UNIT=(SYSDA),SPACE=(TRK,(10,4))
//SYSLMOD DD DISP=SHR,DSN=NATURAL.NDV.LOAD <<<<<<
//SYSPRINT DD SYSOUT=X
//NDVLOAD DD DISP=SHR,DSN=NATURAL.NDV.LOAD <<<<<<
//CEELOAD DD DISP=SHR,DSN=&&CEEOBJ
//SYSLIN DD *
REPLACE CEEUOPT
INCLUDE NDVLOAD(NATRDEVS)
INCLUDE CEELOAD(CEEUOPT)
NAME NATRDEVS(R)
/*

```

The lines marked with <<<<<< must be adapted to your environment.

Definitions required in Natural Security

- Each client must be defined in Natural Security if the Transition Period Logon flag in NSC is set to NO. Otherwise, your Map Environment fails with a NAT0873.
- You must define an NDV initial user ID (default ID is STARGATE) unless you run with profile parameter AUTO=OFF.
- Each user must have either a default library or a private library. Otherwise your Map Environment fails with a NAT1699.
- You must not specify a startup program that executes an I/O statement or stacks a LOGON, LOGOFF or RETURN command, because the program is executed whenever you change the focus to that library within

the tree view.

- If you add a new user, you must specify a password for this user. Otherwise, the Map Environment fails with a NAT0838.

I do not get a NAT0954 even if I specify DU=OFF

The IBM Language Environment (LE) runtime option TRAP must be set to TRAP(ON,NOSPIE).

Map Environment fails with a NAT3048

Specify session parameter ETID=' '. If you have Natural Security, clear the ETID definition for that user.

Map Environment fails with Stub RC *nn*

Stub return codes are raised by the NDV front-end stub if it detects a logical processing error when dispatching the NDV request. The NDV trace output contains detailed information about the reason for the error.

The following stub return codes are possible:

1	Error during session reconnect (for future use).
2	<p>Cannot create new session directory entry or subtask. If Natural Studio executes a Map Environment, the Natural Development Server allocates an entry in its session directory and creates a new subtask. If one of these actions fails, the Stub RC 2 is raised.</p> <p>Reason:</p> <ul style="list-style-type: none"> ● Region size (virtual storage below 16 MB) for the Natural Development Server is too small, ● Number of subtasks exceeds the limit specified by the OS/390 Unix System Services parameter MAXTHREADS. <p>Action: Increase region size or MAXTHREADS, or distribute the clients to several Natural Development Server. To save memory below 16 MB, you can also specify the ANY option of the LE parameter STACK (refer to Useful_LE_runtime options).</p> <p>The number of active tasks can be displayed using the OS/390 system command D OMVS ,PID=<i>process-id</i> (where <i>process-id</i> is the process id of the Natural Development Server).</p> <p>The value of MAXTHREADS can be displayed with D OMVS ,OPTIONS.</p>
3	<p>Cannot initialize new session. This error occurs if a storage allocation for internal NDV control buffers fails due to a lack of virtual memory above 16 MB.</p> <p>Reason: Virtual memory above 16 MB too small.</p> <p>Action: Increase the virtual memory above 16 MB, decrease the number of physical storage threads, configure NDV to use the Natural roll server, or distribute the clients to several Natural Development Servers.</p>

4	<p>Session execution failed. Internal error. The Natural Studio uses an invalid session identifier to process a request.</p> <p>Reason:</p> <ul style="list-style-type: none"> ● On Map Environment, the session ID already exists. ● The Natural session with specified ID is not initialized. <p>Action: Locate the defective session ID in the server trace file and cancel it using the monitor, or restart your Natural Studio.</p>
5	<p>I/O execution not allowed. In some situations, a Natural I/O is prohibited at the Natural Development Server.</p> <p>Reason:</p> <ul style="list-style-type: none"> ● I/O execution during LOGON request, ● I/O execution during execution of a transaction processor. <p>Action: Locate the I/O buffer in the server trace file to find out which I/O should be processed. Check for any startup program specified for the library you want to logon.</p>
6	Not applicable.
7	<p>Error during I/O execution. The Natural Development Server cannot finish a terminal I/O.</p> <p>Reason:</p> <ul style="list-style-type: none"> ● Virtual memory above 16 MB too small, ● I/O reply buffer send by Natural Studio is invalid. <p>Action: Increase the virtual memory above 16 MB. If the I/O reply buffer is invalid, contact Software AG support.</p>
8	Protocol element missing. Internal error, contact Software AG support.
9	<p>NDV not installed on Natural systemfile. Natural Development Server cannot execute the Natural module TRPRO located on library SYSLIB.</p> <p>Reason: The NDV modules are not loaded on the FNAT.</p> <p>Action: INPL the NDV modules.</p>
10	<p>LOGON command required. If you execute a program on the Natural Development Server that executes a LOGOFF (or a RETURN when no SETUP record is available), the logon library is undefined. In an online environment the Natural Security logon screen is displayed in this situation. Under NDV, the Natural session rejects all requests except a LOGON command. This applies only if Natural Security is installed. You can execute a LOGON command either by using the command line or by clicking on any library in your tree view.</p>

Special characters are not translated correctly

The ASCII-EBCDIC translation for NDV uses the Natural translate tables TABA1/TABA2. These tables can be maintained at customer site. The translate tables can be modified as follows:

1. Modify source member NTTABA1/NTTABA2 on the Natural distribution library. Reassemble NATCONFIG and relink the Natural nucleus.
2. Specify the Natural session parameter TABA1/TABA2.

How do I find out which hexadecimal value must be specified for TABA1/TABA2?

Run the following program on your Natural for Windows locally.

```
#A(A1) = '{'  
  WRITE A(EM=H)  
  END
```

Output is **7B**.

Run the program on a mainframe (edit the program with the Natural mainframe editor).

Output is **75**, assuming that you use a German EBCDIC table. If you use a US EBCDIC table, the output will be C0.

Start your Natural Development Server session with TABA1=(75,7B) and TABA2=(7B,75).

The modifications of TABA1/TABA2 do not apply to sources listed in the remote debugger?

Specify the NDV configuration parameter DBG_CODEPAGE=USER.

Accessing work files

This topic is discussed in the Natural Operations for Mainframes documentation. Refer to Natural as a Server under OS/390, Print and Work File Handling with External Datasets in a Server Environment.

I have problems when accessing DB2

Ensure that your Natural Development Server is started with the configuration parameter KEEP_TCB=YES.

Are there any Natural profile parameter settings required for NDV?

The following Natural profile parameter values are required for NDV:

- ETID=OFF is required to allow multiple Natural sessions for each client.
- DBCLOSE=ON is required to remove database resources immediately after session termination rather than to keep them until they are removed due to a timeout.
- ITERM=OFF is required to continue with the Natural Development Server initialization even if session initialization errors occur.
- AUTO=ON/OFF has a different behavior under Natural Single Point of Development. In an online Natural environment, this parameter controls whether you are prompted for your user ID and password or if your user ID is treated to be a trusted user ID from the TP environment. With Natural Single Point of Development, you must always specify your user ID and password in the Map Environment dialog.

Introducing the Natural Development Server CICS Adapter

This document describes the purpose and the functions of the Natural Development Server (NDV) CICS Adapter.

The following topics are covered:

- Purpose of the Natural Development Server CICS Adapter
 - Remote Development Functions
 - CICS Support
 - Product Interaction
-

Purpose of the Natural Development Server CICS Adapter

The Natural Development Server CICS Adapter is designed for a Natural Single Point of Development context where it enables the use of a Natural Development Server (NDV, running under OS/390 in batch mode or under SMARTS on VSE/ESA) within a CICS TP monitor environment.

See also

- Natural Single Point of Development
- Natural Development Server for OS/390
- Natural Development Server under SMARTS on VSE/ESA

Remote Development Functions

The Natural Development Server CICS Adapter enables you to execute a Natural Single Point of Development session within CICS.

In the Tools menu, Natural Studio offers you a function named "Map Environment". This function enables you to open a Natural session on a remote development server.

If you configure the remote development server for use in conjunction with the Natural Development Server CICS Adapter, this Natural session is not hosted by the remote development server, but it is dispatched remotely within a specified CICS region.

CICS Support

The CICS support is not implemented within the front-end stub NATRDEVS. For dispatching the Natural sessions in CICS, the development server continues to run in batch or under SMARTS. But it uses the remote front-end NATCSRFE that is delivered with the Natural Development Server to dispatch the Natural sessions in CICS. That is, depending on the installed front-end, a development server dispatches the sessions locally (NCFNUC for SMARTS or NATMVS for batch) or remote (NATCSRFE for CICS).

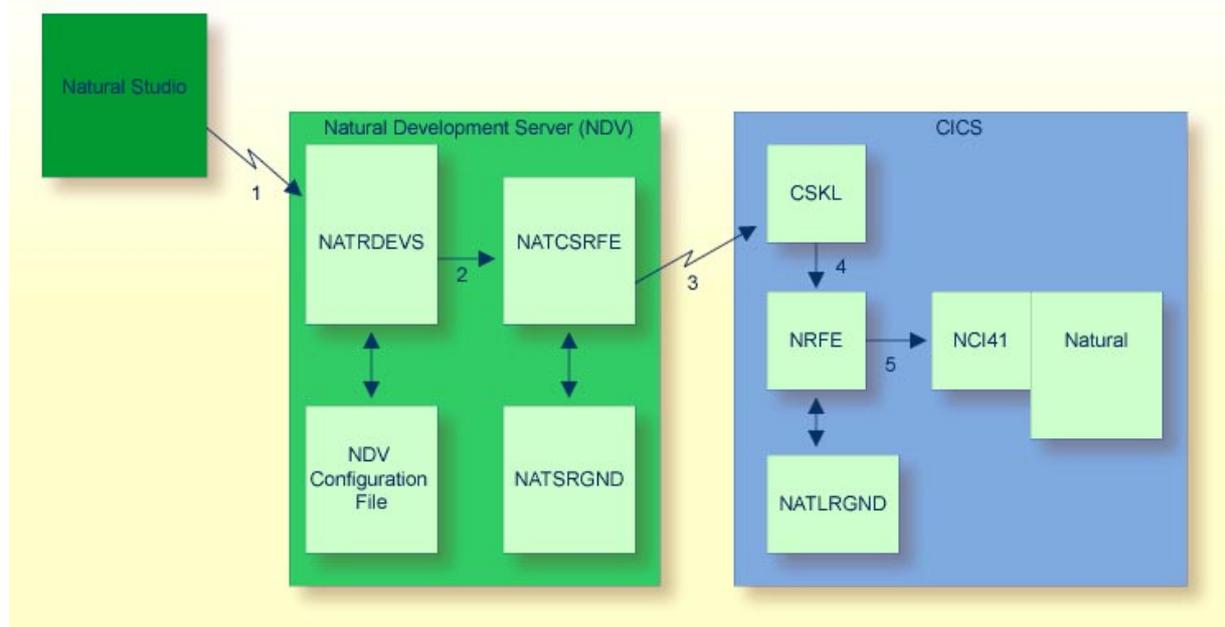
NATCSRFE in turn accepts the Natural request from NATRDEVS and transfers it to a configured CICS environment using the CICS Socket Interface. Within the CICS environment, a CICS Natural transaction is launched that processes the Natural request and returns the result. Thus it is not necessary to execute the entire development server under CICS. Only small working units (Natural requests such as "save source" or "get library list") are transferred to CICS for execution.

The Natural Development Server CICS Adapter comprises the following components:

NATCSRFE	The remote front-end called by the Natural Development Server to dispatch a Natural request. It is loaded into the development server address space.
NATCNRFE	The counterpart of NATCSRFE. NATCNRFE runs in the CICS address space. It is started by the IBM-provided standard listener of the CICS Socket Interface (refer also to <i>TCP/IP V3R1 for MVS: CICS TCP/IP Socket Interface Guide</i> and <i>TCP/IP for VSE/ESA VIR5 IBM Program Setup and Supplementary Information</i>).
NATSRGND/ NATLRGND	Transmits the NDV-relevant data between Natural Development Server and the Natural session running in CICS. NATSRGND must be loaded into the Natural Development Server address space and NATLRGND into the CICS address space.

Product Interaction

The following figure illustrates the interaction between Natural Studio as a remote development client, the Natural Development Server and the CICS environment involved.



1. Natural Studio sends the remote development request to the Natural Development Server using the port number specified with the Natural Development Server configuration variable `PORT_NUMBER`.
2. The Natural Development Server dispatches the Natural session using the Natural front-end you have specified with the Natural Development Server configuration variable `FRONTEND_NAME`. Specify `NATCSRFE` in order to use the Natural Development Server CICS Adapter. For details, see the configuration parameter descriptions in the platform-specific document *Configuring the Natural Development Server*.
3. `NATCSRFE` transmits the request to the host/port specified with the Natural Development Server configuration variable `RFE_CICS_TA_HOST / RFE_CICS_TA_PORT`. You must configure the CICS-supplied standard listener `CSKL` to listen at this port.
4. `CSKL` launches the CICS transaction you have specified with the Natural Development Server configuration variable `RFE_CICS_TA_NAME` (`NRFE` in this example). This transaction must be defined to use the program `NATCNRFE`.

5. NATCNRFE finally dispatches the Natural session using the Natural CICS Front-End you have specified with the Natural Development Server configuration variable RFE_CICS_FE_NAME.

Installing the Natural Development Server CICS Adapter

This document describes how to install the CICS connection for a Natural Development Server (NDV) running under OS/390 in batch mode or under SMARTS on VSE/ESA.

The following topics are covered:

- Prerequisites
 - Installation Procedure
-

Prerequisites

For details, refer to the section Prerequisites.

Installation Procedure

To install the Natural Development Server CICS Adapter, perform the following steps:

Step 1: Customize CICS

(Job I005, Steps 8405, 8406, 8410, 8411)

The Natural Development Server load library must be defined in the CICS DFHRPL concatenation.

Customize the standard listener of the CICS socket interface using the CICS transaction EZAC.

Start the standard listener using the CICS transaction EZAO.

The following CICS resource definitions are required:

1. Define the CICS transaction for the remote front-end. This transaction name is an arbitrary name which must be defined in the NDV configuration parameter RFE_CICS_TA_NAME. This document uses the transaction name NRFE.
2. Define the programs NATCNRFE and NATRGNDV.

The sample JCL containing the following members defines all necessary CICS entries:

- NDV I005C
- NDV I009C
- NDV CONFC

Step 2: Customize the Development Server

In order to dispatch the NDV Natural sessions in CICS, you must adapt the configuration file of your development server running under OS/390 in batch mode or under SMARTS on VSE/ESA. For this purpose, two sample JCL members (NDV I009C and NDV CONFC) are available.

Refer to Configuring the Natural Development Server CICS Adapter and to Configuring the Natural Development Server.

Configuring the Natural Development Server CICS Adapter

This document describes how to configure the CICS connection for a Natural Development Server (NDV) running on OS/390 or under SMARTS on VSE/ESA.

The following topics are covered:

- Configuration File
 - Configuration of the NDV CICS Adapter
-

Configuration File

After the installation of the NDV CICS Adapter is complete, the configuration of the NDV CICS Adapter has to be done in the Natural Development Server configuration file of the corresponding Natural Development Server.

To enable the CICS Adapter, you have to specify the remote front-end module in the NDV configuration parameter `FRONTEND_NAME` (`FRONTEND_NAME=NATCSRFE`).

Configuration Parameters

The following CICS-relevant configuration parameters exist:

`RFE_CICS_TA_NAME` | `RFE_CICS_FE_NAME` | `RFE_CICS_TA_HOST` | `RFE_CICS_TA_PORT` |
`RFE_CICS_TA_INIT_TOUT` | `RFE_CICS_KEEP_TA` | `RFE_CICS_TRACE`

RFE_CICS_TA_NAME

This configuration parameter specifies the CICS transaction to be used for starting the remote front-end in CICS. This transaction must be defined in CICS and must refer to the program `NATCNRFE`. See also *Installing the NDV CICS Adapter*.

Default Value none

Example `RFE_CICS_TA_NAME = NRFE`

RFE_CICS_FE_NAME

This configuration parameter specifies the Natural CICS nucleus you have installed with the Natural Version 4.1 installation under CICS. This program must be defined in CICS.

Default Value none

Example `RFE_CICS_FE_NAME = NCI41NUC`

See also the *Natural Installation Guide for Mainframes*, *Installing the Natural CICS Interface*, *Customize CICS*.

RFE_CICS_TA_HOST

This configuration parameter specifies the TCP/IP address of the host the desired CICS is running. This parameter can be omitted if the development server and CICS are running on the same TCP/IP node.

Default Value The host address of the development server.

Example RFE_CICS_TA_HOST = node1 or RFE_CICS_TA_HOST = 157.189.160.55

RFE_CICS_TA_PORT

This configuration parameter specifies the TCP/IP port of the CICS supplied listener.

You can acquire this port number using the CICS supplied transaction EZAC. The CICS command EZAC DISPLAY LISTENER shows the definitions of the CICS standard listener.

Note:

This port number is not used in Natural Studio to map to a remote development server. This port number (and the RFE_CICS_TA_HOST definition) is used internally by the development server to communicate with the CICS region.

Default Value none

Example RFE_CICS_TA_PORT = 3010

RFE_CICS_TA_INIT_TOUT

If Natural Studio sends a request to a Natural Development Server that is configured to use the CICS remote front-end, the remote front-end launches a CICS transaction (NRFE) for processing the request. The CICS transaction in turn listens to the TCP/IP to receive the data from the development server required processing the request.

This configuration parameter specifies the timeout value (in seconds) a launched transaction waits until the expected request data arrives from the development server. If this timeout expires, the request aborts with a NAT9940 error.

Default Value 5

Example RFE_CICS_TA_INIT_TOUT = 20

Note: Do not define a value below 5.

RFE_CICS_KEEP_TA

For each request sent by the Natural Studio, NDV opens a TCP/IP connection to the CICS region and launches a CICS transaction (NRFE) for processing the request. With RFE_CICS_KEEP_TA=YES, the CICS transaction remains active for processing further requests of the same client. This saves the overhead for creating the TCP/IP connection and transaction initialization for successive requests, but consumes more resources within the CICS region due to waiting transactions.

The transaction wait time (for successive requests) is limited by RFE_CICS_TA_INIT_TOUT. That is, if the time slice between two successive requests exceeds the time specified by RFE_CICS_TA_INIT_TOUT, the CICS transaction and the TCP/IP connection is terminated independent of the RFE_CICS_KEEP_TA definition.

RFE_CICS_TA_INIT_TOUT=5 is a reasonable value to reuse transactions for multiple requests initiated by a single action in Natural Studio and to save CICS resources if Natural Studio waits for the next action of the user.

Default Value None

Example RFE_CICS_KEEP_TA = YES

RFE_CICS_TRACE

This configuration parameter specifies the trace level for the remote front-end.

The trace level is similar to the trace implemented for the development server. It is a bit string where each bit is responsible for a certain trace information:

Bit 31	Trace main events (transaction initialization/termination, request processing).
Bit 30	Detailed functions.
Bit 29	Dump internal storage areas.
Bit 27	Dump buffer header exchanged between development server and CICS.
Bit 26	Dump entire buffer exchanged between development server and CICS.
Bit 25	Dump the NDV relevant buffer only (Remote Gateway buffer).
Bit 23	Trace error situations only.
Bit 07	Activate trace in the development server region.
Bit 06	Activate trace in the CICS region.
Bit 00	Reserved for trace-level extension.

The trace destination is the data set defined for STDOUT.

Default Value 0

Example RFE_CICS_TRACE = Dump main events and buffer header in the CICS region
0x02000011 (Bits 31 + 27 + 07)..

The following is a sample development server configuration file using the NDV CICS Adapter:

```
# the development server parameter
SESSION_PARAMETER= PROFILE=(NDV,10,930)
FRONTEND_NAME = NATCSRFE      # use the CICS Adapter front-end
PORT_NUMBER=4711             # the port number used by Natural Studio

# the CICS Adapter parameter
RFE_CICS_TA_NAME = NRFE      # the CICS transaction for remote front-end
RFE_CICS_TA_PORT = 3010     # the port of the CICS listener
                             # no RFE_CICS_TA_HOST is defined. This requires
                             # that CICS runs on the same node as the
                             # development server
RFE_CICS_FE_NAME = NCI41NUC  # the name of the installed Natural CICS nucleus
RFE_CICS_TA_INIT_TOUT = 20  # transaction timeout is 20 seconds
```

Note:

The development server parameters `THREAD_NUMBER` and `THREAD_SIZE` are obsolete when the NDV CICS Adapter is used.

NDV CICS Adapter Frequently Asked Questions

This document contains frequently asked questions concerning the Natural Development Server CICS Adapter under OS/390.

The following topics are covered:

- Under which CICS userid does the NDV transaction run within the CICS region?
 - I receive a NAT9940 (NAT9939) starting my NDV server.
-

Under which CICS userid does the NDV transaction run within the CICS region?

The NDV transaction (the NDV Natural session) runs under the CICS region userid .

This is the same userid as your CICS standard listener (CSKL) uses.

I receive a NAT9940 (NAT9939) starting my NDV server.

The NAT9940 message in fact should be a NAT9939. This will be corrected with Patch Level 01 (NDV212PL01). The NAT9939 message indicates an error in the communication between the NDV server environment and the CICS environment. The general layout of the message is a text describing the error which may be followed by a condition code (CC), if applicable.

The most important NAT9939 errors are listed below. Many errors not listed here are internal errors.

- **ConfigError: missing or invalid.**
A mandatory configuration variable for the Natural Development Server CICS Adapter is not defined in the NDV configuration file.
- **Cannot bind Socket.**
The port specified with RFE_CICS_TA_PORT is not in a listen state on the node specified with RFE_CICS_TA_HOST. Probably the CICS TCP/IP standard listener is configured to use a different port or the listener is not running.
- **Timeout at connection establishment.**
The CICS transaction launched by the NDV server did not respond within the time specified in RFE_CICS_TA_INIT_TOUT. Examine CICS message log for potential messages regarding this transaction.
- **Partner closed connection.**
Unexpected abort of the connection by either of the partners (NDV server or CICS transaction). Examine CICS message log and NDV server trace for preceding error messages regarding this request.
- **Invalid reply on connection establishment.**
The CICS transaction launched by the NDV server did not initialize correctly. Examine CICS message log for potential messages regarding this transaction. Possible reason: The transaction defined with RFE_CICS_TA_NAME is not defined correctly within CICS.
- **Cannot load NDV Remote Gateway DLL.**
The remote gateway DLL NATSRGND/NATLRGND cannot be loaded within the NDV server/CICS region. Possible reason: Module cannot be found on load library concatenation or CICS PPT entry missing.
- **Cannot load NCI front-end.**
The Natural CICS front-end specified with RFE_CICS_FE_NAME cannot be loaded. Examine CICS message log error messages regarding this program. Possible reason: Module cannot be found on load library concatenation or CICS PPT entry missing.

