

# Natural for Mainframes

## Natural Web I/O Interface

Version 1.1.4 (Server)

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# 1 Natural Web I/O Interface

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This documentation is organized under the following headings:

	<b>Introduction</b>	What is the Natural Web I/O Interface?
	<b>Introducing the Natural Web I/O Interface Server CICS Adapter</b>	Special information which applies if you want to use the Natural Web I/O Interface server in a CICS environment under z/OS or z/VSE.
	<b>Installing and Configuring the Natural Web I/O Interface Server</b>	How to install and configure the Natural Web I/O Interface server in a mainframe environment.
	<b>Installing the Natural Web I/O Interface Client</b>	How to install the Natural Web I/O Interface client on a web/application server so that it can be used with the Natural Web I/O Interface server.
	<b>Configuring the Client</b>	How to define the information that is to appear in the logon page.  The information in this part not only applies to the Natural Web I/O Interface client, it also applies to Natural for Ajax which is also a client of the Natural Web I/O Interface server.
	<b>Operating and Monitoring the Natural Web I/O Interface Server</b>	How to operate the the Natural Web I/O Interface server in a mainframe environment, and how to monitor it using the Monitor Client NATMOPI or the HTML Monitor Client.



## Notes:

1. This documentation only explains how to install the Natural Web I/O Interface server in a mainframe environment. For information on how to install it in a UNIX, OpenVMS or Windows environment, see the Natural documentation for the appropriate platform.
2. For information on how to install and use Natural for Ajax, see the *Natural for Ajax* documentation which is provided with the Natural documentation for all supported platforms.



# 2 Introduction

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- What is the Natural Web I/O Interface? ..... 4
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- Differences between the Natural Web I/O Interface Client and Terminal Emulation ..... 9

This chapter describes the purpose and the functions of the Natural Web I/O Interface.



**Note:** This introduction mainly describes how the Natural Web I/O Interface works in a runtime (production) environment. The section *Differences in a SPoD Development Environment* briefly explains the special version that is used in a SPoD development environment.

## What is the Natural Web I/O Interface?

---

The Natural Web I/O Interface is used to execute Natural applications in a web browser. It fully supports the following:

- The display and input of Unicode characters. See *Unicode Input/Output Handling in Natural Applications* in the *Unicode and Code Page Support* documentation.
- Rich internet applications. See the *Natural for Ajax* documentation.

## Components of the Natural Web I/O Interface

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The Natural Web I/O Interface consists of a server and a client.

### Server

The Natural Web I/O Interface server enables you to use a browser as the I/O device for Natural applications. The server does the user authentication, creates the Natural session and handles the I/O between Natural and the client. The Natural Web I/O Interface server is installed on the same machine as the Natural application.

### Client

The client handles the communication between the user's web browser and the Natural Web I/O Interface server. It converts the output from the Natural application to web pages, and returns the user input to Natural.

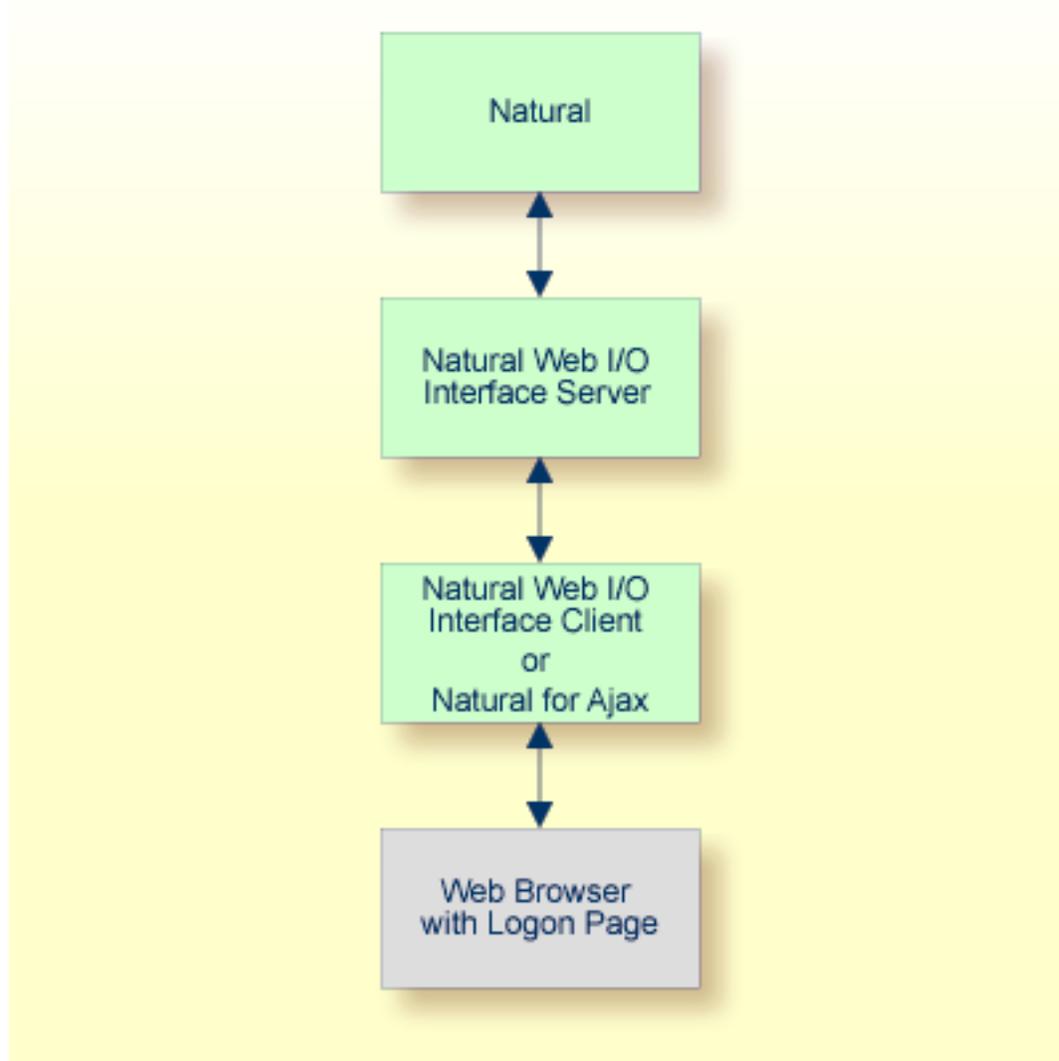
Two types of client are supported:

- Natural Web I/O Interface client for displaying character-based applications in the web browser. Maps with GUI controls are not supported in this case.
- Natural for Ajax for displaying rich internet applications in the web browser.

The client is installed on a web/application server. This can be done on any machine in the network.

## Executing a Natural Application in a Web Browser

The Natural Web I/O Interface receives data from a Natural application and delivers web pages to the user's web browser. This is illustrated in the following graphic:



The communication steps for executing a Natural application in the web browser are:

1. The user enters the address (URL) of a logon page in the web browser. The client then displays the logon page in the web browser.



**Note:** For information on how to invoke and configure the logon page, see [Configuring the Client](#).

2. The user enters all required information for starting a Natural application into the logon page. This information is sent to the client.
3. The client asks the Natural Web I/O Interface server to start the requested Natural application for this user.
4. The Natural Web I/O Interface server checks the supplied user ID and password, creates a Natural session for the user and starts the Natural application.
5. The Natural application returns the first application screen which is then transferred via the Natural Web I/O Interface server to the client and finally as a web page to the web browser.

Different web browsers are supported. Note that cookies and JavaScript must be enabled in the web browser. For a list of the currently supported web browsers, see the documentation for the type of client that you are using:

- **Natural Web I/O Interface Client**

See [Browser Prerequisites](#) in this documentation.

- **Natural for Ajax**

See [Browser Prerequisites](#) in the *Natural for Ajax* documentation.

With Firefox, you can use caret browsing. The following exception applies for Natural applications: you can only use the RIGHT-ARROW and LEFT-ARROW keys to position the cursor (also called “caret”) in an output field. Caret browsing is enabled and disabled by pressing F7. For more information, see the documentation for your web browser.

## Client-Server Compatibility

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The following rules apply:

- The Natural Web I/O Interface server can work with any client that has the same or a higher protocol version.

If the server detects that the client is using a version that is lower than the server version, the server replies that the client is too old and the connection is closed.

- The client can work with any server that has the same or a lower protocol version.

If the client detects that the server is using a version that is lower than the client version, the client switches to the server version. However, new client functionality is not supported in this case.

- The Natural Web I/O Interface server must have the same protocol version as the Natural process that is started by the server. If Natural detects that the server is using a different protocol version, an error message is sent to the user and the connection is closed.

## Terminology

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On the different Natural platforms for which the Natural Web I/O Interface is supported, different techniques are used for implementing the server part of the Natural Web I/O Interface. On Natural for UNIX and Natural for OpenVMS, it is implemented as a daemon. On Natural for Windows, it is implemented as a service. On the mainframe, it is implemented as a server. In this documentation, the general term “server” is therefore used for all different kinds of implementation.

## Differences in a SPoD Development Environment

---

The previous sections of this introduction have described how the Natural Web I/O Interface works in a runtime (production) environment. This section briefly explains the differences in a SPoD development environment.

A special version of the Natural Web I/O Interface is used when working in a remote development environment with Natural for Windows (SPoD). In this case, the Natural Web I/O Interface is an integrated component which does not require a separate installation. The server is part of the Natural Development Server (NDV), and the client is part of Natural Studio. Other than in the runtime environment, the screen is not displayed in a browser but in a normal window. Rich GUI pages created by Natural for Ajax are not supported in the development environment.

It is important that I/O via the Natural Web I/O Interface has been enabled on the Natural host. Otherwise, the Natural Web I/O Interface cannot be invoked. See also *Unicode Input/Output Handling in Natural Applications* in the *Unicode and Code Page Support* documentation.

## Restrictions When Using the Natural Web I/O Interface with Natural Applications

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There are several restrictions when using the Natural Web I/O Interface with Natural applications on UNIX, OpenVMS, mainframe or Windows hosts.



**Note:** The term “application” refers to application software. It does not refer to system software or software for development.

The following restrictions apply:

**■ GUI controls**

GUI controls are not supported: dialogs, buttons, radio buttons, list boxes, list views, check boxes etc. The Natural Web I/O Interface only supports Natural applications developed without GUI controls.

**■ File transfer**

File transfer (for example, with the `DOWNLOAD` statement) is not supported by the Natural Web I/O Interface.

**■ Runtime errors**

This restriction applies to older Natural versions on UNIX and Windows. As of version 6.3.3, this restriction no longer applies.

Runtime errors in Natural applications are not handled by the Natural Web I/O Interface. This leads to a loss of the session. Bypass: use the Natural system variable `*ERROR-TA` to handle the error. Sample Natural error transaction:

```
DEFINE DATA
LOCAL
1 ERR_INFO
  2 ERR_NR(N5)
  2 ERR_LINE(N4)
  2 ERR_STAT(A1)
  2 ERR_PNAM(A8)
  2 ERR_LEVEL(N2)
END-DEFINE
INPUT ERR_INFO
DISPLAY ERR_INFO
TERMINATE
END
```

**■ Return to the Natural main screen**

You must not use Natural applications that return to the Natural main screen as this leads to wrong screen display and a loss of the session.

**■ Natural editors and utilities**

You must not use Natural utilities such as `SYSMAIN` or `SYSDDM` and editors such as the program editor as this leads to wrong screen display and a loss of the session.

**■ Natural system commands**

You must not use any Natural system command such as `CATALL`, `FIND`, `GLOBALS`, `HELP`, `KEY`, `LIST`, `RETURN`, `SCAN`, `SETUP` or `XREF` as this leads to wrong screen display and a loss of the session.

**■ Terminal commands**

Terminal commands are not supported. They do not work when entered in the Natural Web I/O Interface client.

- **Natural system variable** \*INIT-ID

When using the Natural Web I/O Interface client with Natural applications on UNIX, OpenVMS, mainframe or Windows hosts, the Natural system variable \*INIT-ID will not be filled with a value for the terminal type. On UNIX, OpenVMS and Windows, it will contain the value "notty". On mainframes, it will contain a session ID that is unique on that server.

## Differences between the Natural Web I/O Interface Client and Terminal Emulation

---

The Natural Web I/O Interface client runs as an HTML terminal emulator inside a browser control. The look and feel of the Natural Web I/O Interface client display is quite similar to that of the regular terminal (emulation), but there are some differences due to browser functionality:

- A double-click with the mouse pointer on any field simulates the ENTER key.
- Using the mouse pointer, it is possible to position the cursor on an output-only field, however, the returned cursor position (system variable \*CURSOR) is always on the first field character.
- It is not possible to position the cursor outside the range of input and output fields.
- The cursor can be moved with the left and right arrow keys within one input field only. Other cursor movements with the other arrow keys (for example, within output fields or to the next input field or vertical movements) are not possible.
- The insert mode can be switched on and off using the INSERT key.
- For Unicode character sets (type U; for example, Chinese), one character may require more space than an ordinary alphanumeric character, because the Unicode character representation is proportional. The application design must take this into account, because Natural is based on characters with fixed width. For input fields it is possible to scroll within the field, but for output fields there may not be sufficient space to display the Unicode characters. The display length for a field can be controlled by the session parameter DL.
- Type-ahead mode is not supported.
- Paste in overwrite mode is not supported.
- Key schemes are fixed; keys such as the right CTRL key and the ENTER key on the numeric pad are no longer definable.
- Screen update is slower since the complete screen is sent rather than updates.
- The blink attribute is not supported. The reverse attribute is currently only supported in the implementation for Microsoft's Internet Information Services (IIS).
- The keys PF1 through PF12 are simulated by the key combinations F1 through F12.
- The keys PF13 through PF24 are simulated by the key combinations SHIFT+F1 through SHIFT+F12.

### **IBM Mainframes Only**

- The terminal screen size is controlled by the Natural profile parameter `TMODEL`. The default setting `TMODEL=0` means 43 lines and 132 columns.
- The program attention keys (PA1, PA2 and PA3) are simulated by the key combinations `CTRL+F1`, `CTRL+F2`, `CTRL+F3`.
- The clear key is simulated by `CTRL+F4`,
- There is no `ATTN` (attention interrupt) key, no `RESET` key and no `EEOF` (erase end of file) key.

### **VT Only**

- The I/O occurs in block mode. Therefore, the Natural program will only react when a function key is pressed.
- The keys `PF25` through `PF36` are simulated by the key combinations `CTRL+F1` through `CTRL+F12`.
- The keys `PF37` through `PF48` are simulated by the key combinations `ALT+F1` through `ALT+F12`.

# 3 Introducing the Natural Web I/O Interface Server CICS

## Adapter

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- Product Interaction ..... 13

This chapter describes the purpose and the functions of the Natural Web I/O Interface Server CICS Adapter.

## Purpose of the Natural Web I/O Interface Server CICS Adapter

The Natural Web I/O Interface Server CICS Adapter is designed for a mainframe Natural context where it enables the use of a Natural Web I/O Interface server, running under z/OS in batch mode or under SMARTS on z/VSE within a CICS TP monitor environment.

## CICS Support

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

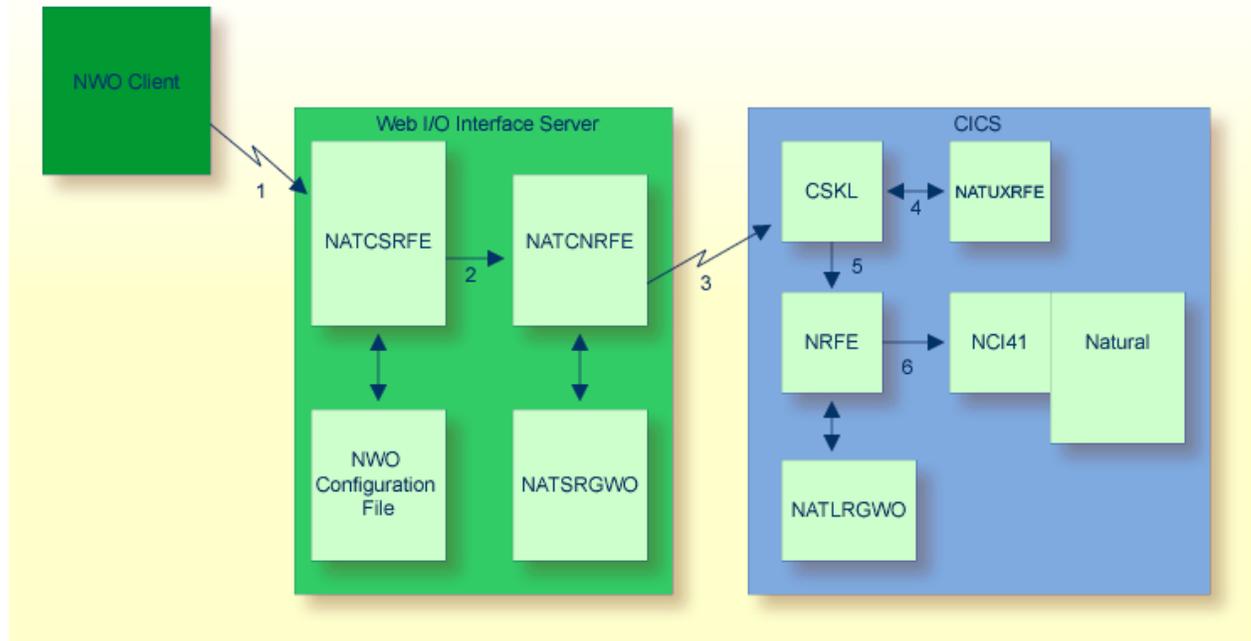
NATCSRFE in turn accepts the Natural request from NATRNWO and transfers it to a configured CICS environment using the CICS Socket Interface. Within the CICS environment, a CICS Natural transaction is launched that processes the Natural request and returns the result. Thus it is not necessary to execute the entire Web I/O Interface server under CICS. Only if Natural is requested to run the Natural application, control is transferred to CICS for execution.

The Natural Web I/O Interface Server CICS Adapter comprises the following components:

NATCSRFE	The remote front-end called by the Natural Web I/O Interface server to dispatch a Natural request. It is loaded into the Web I/O Interface server's 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 z/VSE V1R5 IBM Program Setup and Supplementary Information</i> ).
NATSRGWO/NATLRGWO	Transmits the data relevant for Natural Web I/O Interface server between Natural Web I/O Interface server and the Natural session running in CICS. NATSRGWO must be loaded into the Natural Web I/O Interface server's address space and NATLRGWO into the CICS address space.
NATUXRFE	This user exit obtains the client credentials from the Natural Web I/O Interface server and authenticates then with a CICS VERIFY PASSWORD request. If the request succeeds, the CICS listener launches the NWO transaction under the client account (impersonation).

## Product Interaction

The following figure illustrates the interaction between the Natural Web I/O Interface server and the CICS environment involved.



1. The Web I/O Interface (NWO) client sends a request to the Natural Web I/O Interface server using the port number specified with the Natural Web I/O Interface server configuration variable `PORT_NUMBER`.
2. The Natural Web I/O Interface server dispatches the Natural session using the Natural front-end you have specified with the Natural Web I/O Interface server configuration variable `FRONTEND_NAME`. Specify `NATCSRFE` in order to use the Natural Web I/O Interface Server CICS Adapter.
3. `NATCSRFE` transmits the request to the host/port specified with the Natural Web I/O Interface server configuration variable `RFE_CICS_TA_HOST / RFE_CICS_TA_PORT`. You must configure the CICS-supplied standard listener `CSKL` (z/OS) or `EZAL` (z/VSE) to listen at this port.
4. If the Natural Web I/O Interface server is configured to perform remote impersonation (`SECURITY_MODE=IMPERSONATE/IMPERSONATE_REMOTE`), `NATUXRFE` is called to authenticate the client. If the authentication succeeds, `CSKL` launches the CICS transaction `NRFE` under the account of the client (impersonated).
5. `CSKL` launches the CICS transaction you have specified with the Natural Web I/O Interface server configuration parameter `RFE_CICS_TA_NAME` (`NRFE` in this example). This transaction must be defined to use the program `NATCNRFE`.

6. NATCNRFE finally dispatches the Natural session using the Natural CICS front-end you have specified with the Natural Web I/O Interface server configuration parameter `RFE_CICS_FE_NAME`.

# 4 Installing and Configuring the Natural Web I/O Interface

## Server

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The Natural Web I/O Interface server is available on z/OS and (under SMARTS) on z/VSE, VM/CMS and BS2000/OSD.



**Note:** SMARTS is an acronym for “Software AG Multi-Architecture Runtime System”. It constitutes a runtime layer that allows POSIX-like applications to run on mainframe operating systems. Software AG products communicate with the operating system through the SMARTS layer.

<a href="#">Natural Web I/O Interface Server Concept and Structure</a>
<a href="#">Prerequisites</a>
<a href="#">Installing the Natural Web I/O Interface Server under z/OS</a>
<a href="#">Installing the Natural Web I/O Interface Server under SMARTS on z/VSE</a>
<a href="#">Installing the Natural Web I/O Interface Server under SMARTS on BS2000/OSD</a>
<a href="#">Configuring the Natural Web I/O Interface Server</a>

The following topics apply in addition if you want to use the Natural Web I/O Interface server in a CICS environment under z/OS or z/VSE:

<a href="#">Installing the Natural Web I/O Interface Server CICS Adapter under z/OS</a>
<a href="#">Installing the Natural Web I/O Interface Server CICS Adapter under SMARTS on z/VSE</a>
<a href="#">Configuring the Natural Web I/O Interface Server CICS Adapter</a>



# 5

## Natural Web I/O Interface Server Concept and Structure

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This chapter describes the concept and the structure of the server for the Natural Web I/O Interface which is designed for use on z/OS and (under SMARTS) on z/VSE, VM/CMS or BS2000/OSD.

## Web I/O Interface Server Concept

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A Natural Web I/O Interface server is a multi-user, multi-tasking application. It can host Natural sessions for multiple users and execute their applications concurrently.

The concept is based on the “serverized” Natural runtime system. Its architecture comprises a server front-end stub (Web I/O Interface server stub NATRNWO) that uses the Natural front-end to dispatch Natural sessions and to execute applications within these sessions.

The Natural Web I/O Interface server architecture basically consists of:

- SMARTS runtime environment (only on z/VSE, VM/CMS and BS2000/OSD)

SMARTS is used to implement a server runtime environment for the execution of the Web I/O Interface server.

- **Front-end stub**

The stub NATRNWO is launched to initialize a Natural Web I/O Interface server. It listens for incoming connection requests and launches a Natural session for executing the application.

- **Front-end**

The front-end is called (together with the Natural runtime system) by the front-end stub for session initialization/termination, application execution and session roll-in/roll-out.

- **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.

## Natural Web I/O Interface Server under SMARTS on BS2000/OSD

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SMARTS is an acronym for “Software AG Multi-Architecture Runtime System”. It constitutes a runtime layer that allows POSIX-like applications to run on mainframe operating systems. Software AG products communicate with the operating system through the SMARTS layer.

## SMARTS on BS2000/OSD Basics

SMARTS implements a server runtime environment for the execution of the Web I/O Interface server. Technically, SMARTS represents a C runtime system and implements a nearly full-blown POSIX system. It drives a family of tasks which either process dedicated functionality or process the application payload in parallel-executed worker tasks. The tasks with a dedicated functionality are the main or oc task, the system thread loop task (started as second task), the socket communication task, the pfs task and the sequential file I/O task. The pfs task is optional; it processes all I/O operations on the POSIX file system (PFS). The PFS is used for Web I/O Interface server work/print file access method, thus allowing the testing of programs which execute access to work or print files.

SMARTS offers a configurable set of resources to process the application workload. These resources are mainly threads and (worker-) tasks. The actual workload is scheduled by the SMARTS kernel using these resources. In case of momentary shortages of one or the other resource, SMARTS is able to queue incoming requests and to roll-out inactive threads.

All data, processed by SMARTS or a SMARTS application, is located in one common memory pool, the data pool. All code modules, except for some smaller bootstrap routines, are loaded as shared code into another common memory pool, the code pool.

The worker-tasks are the processes (TSNs) by which the Natural runtime is executed. The amount of storage requested by Natural is located in the SMARTS threads within the data pool during the execution of a transaction. If the number of sessions to be processed exceeds the number of threads defined, an internal facility is invoked for rolling the threads. Threads rolled out are placed in compressed format in a so-called roll buffer pool which resides in the data common memory pool as well.

## Front-End Stub NATRNWO

---

The multi-user, multi-tasking, front-end stub NATRNWO is launched to initialize a Natural Web I/O Interface server.

The following topics are covered below:

- [Stub Description](#)

- **Natural System Variables Used**

### Stub Description

The task executing the server initialization (TMain) basically is the main listener which waits for incoming requests from the Web I/O Interface client. It owns a session directory to manage multiple clients (users) and their corresponding remote 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 server connection issued by the user on the client side (the Login button of the Web I/O Interface client) connects to TMain to establish a connection.
- Next, TMain inserts the client into its session directory, attaches a new TWork subtask and passes the connection to TWork.
- TWork initializes a new Natural session and starts the specified Natural application program.
- While the application performs I/O requests, TWork intercepts the I/O data and passes them to the Web I/O Interface client for processing the I/O. The I/O reply is sent back to the server and the server continues the application.
- If the application terminates (reaches the NEXT mode), TWork terminates the Natural session and drops the connection to the Web I/O Interface client.

That is, each client owns one subtask TWork on the Natural Web I/O Interface server. This subtask runs a Natural session (and within the Natural session, a Natural application) and remains active as long as the application is running.

### Natural System Variables Used

Within a Natural Web I/O Interface server session, the following Natural system variables are used:

- \*TPSYS contains SERVSTUB,
- \*DEVICE contains BROWSER,
- \*SERVER-TYPE contains WEBIO.

## Front-End

---

Under z/OS, the Natural front-end required for a Natural Web I/O Interface server is a Natural batch driver assembled with the option LE370=YES.

Under , the front-end is called (together with the Natural runtime system) by the front-end stub for session initialization/termination, request execution and session roll-in/roll-out.

Under z/VSE, VM/CMS and BS2000/OSD, the Natural front-end required for a Natural Web I/O Interface server is the Natural Com-plete driver NCFNUC that is delivered with the corresponding Natural Version for Mainframes.

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 Web I/O Interface server. For more information, refer to the *Natural Web I/O Interface Server CICS Adapter* documentation.

## Server Monitor

---

To enable the administrator to monitor the status of the Natural Web I/O Interface 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 Web I/O Interface Server](#).



# 6 Prerequisites

---

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- Prerequisites for the Web I/O Interface Server under SMARTS on z/VSE ..... 24
- Prerequisites for the Web I/O Interface Server under SMARTS on VM/CMS ..... 25
- Prerequisites for the Web I/O Interface Server under SMARTS on BS2000/OSD ..... 25

This chapter describes the prerequisites that apply when you install a Natural Web I/O Interface server on a mainframe computer.

## General Prerequisites for Web I/O Interface Server Installation

---

The following general prerequisites apply:

- The currently applicable version of Natural for Mainframes must be installed.
- The Natural ICU Handler (NAT ICU) must be available to the Web I/O Interface server; see *ICU Library* in the *Unicode and Code Page Support* documentation.
- The Natural Web I/O Terminal Converter NATWEB must be linked to the Natural nucleus module.



**Note:** For further information, refer to the products and versions specified under *Natural and Other Software AG Products* in the current *Natural Release Notes*.

## Prerequisites for the Web I/O Interface Server for z/OS

---

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

- z/OS must be installed.
- To prevent the formation of endless loops in user programs running under the Web I/O Interface, specify a reasonable value for Natural profile parameter MT (maximum CPU time).

## Prerequisites for the Web I/O Interface Server under SMARTS on z/VSE

---

In addition to the [general prerequisites](#) described above, the following operating-system-specific prerequisites apply:

- z/VSE must be installed.
- SMARTS must be installed (product code APS).
- The Natural Com-plete/SMARTS Interface must be installed (product code NCF).
- To prevent the formation of endless loops in user programs running under NWO, specify a reasonable value for the CPU time limit in the SMARTS parameter `THREAD-GROUP`.
- As a prerequisite for using the client impersonation feature (parameter `SECURITY_MODE`), Natural Security must be installed.

## Prerequisites for the Web I/O Interface Server under SMARTS on VM/CMS

---

In addition to the [general prerequisites](#) described above, the following operating-system-specific prerequisites apply:

- z/VM must be installed.
- SMARTS must be installed (product code APS).
- The Natural Com-plete/SMARTS Interface must be installed (product code NCF).
- To prevent the formation of endless loops in user programs running under NWO, specify a reasonable value for the CPU time limit in the SMARTS parameter `THREAD-GROUP`.
- As a prerequisite for using the client impersonation feature (parameter `SECURITY_MODE`), Natural Security must be installed.

## Prerequisites for the Web I/O Interface Server under SMARTS on BS2000/OSD

---

In addition to the [general prerequisites](#) described above, the following operating-system-specific prerequisites apply:

- BS2000/OSD must have been installed on the server mainframe.
- SMARTS must be installed (product code APS).
- The Natural Com-plete/SMARTS Interface must be installed (product code NCF)



# 7 Installing the Natural Web I/O Interface Server under z/OS

---

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- Content of the Web I/O Interface Server Distribution Tape ..... 28
- Installation Procedure ..... 28

This chapter describes how to install a server for the Natural Web I/O Interface (product code NWO) under the operating system z/OS.

The installation of the Web I/O Interface server is performed by installation jobs. The sample jobs are contained in the dataset `NW0vrs.JOBS` and are prefixed with `NW0`, or generated by System Maintenance Aid (SMA).

## Prerequisites

---

For details, refer to the section [Prerequisites](#).

## Content of the Web I/O Interface 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
<code>NW0vrs.OBJS</code>	Contains the object modules of the server.
<code>NW0vrs.JOBS</code>	Example installation jobs.

The notation `vrs` in dataset names represents the version, release and system maintenance level of the product.

## Installation Procedure

---

### Step 1: Allocate the Web I/O Interface Server LOAD library

(Job I008, Step 9410)

## Step 2: Create a Web I/O Interface Server configuration file and sample Clist

(Job I009 / Step 9410, 9420, 9430)

Step 9410 creates a sample `NWOCONFIG` for the batch server.

Step 9420 creates a sample `Clist` to ping and terminate a Web I/O Interface server.

Step 9430 creates a sample batch job to ping and terminate a Web I/O Interface server.

The following parameters of the configuration file have to be defined. See [Configuring the Natural Web I/O Interface Server](#). For the other parameters, the default values may be used:

FRONTEND_NAME	Specify the name of the Web I/O Interface server front-end module you will generate in one of the following steps.
PORT_NUMBER	Specify the TCP/IP port number under which the server can be connected.

## Step 3: Link the object modules into the NWO load library

(Job I054, Step 9410)

The NWO object modules must be linked with the necessary runtime extensions of your batch installations into executable load modules.



**Note:** The module `NATCNRFE` applies to two different products, the Natural Web I/O Interface Server (NWO) and the Natural Development Server (NDV). So if you have already installed NDV, the module `NATCNRFE` might already be there. However, it does not matter if you re-install `NATCNRFE` with NWO because the resulting module from either installation is the same.

See sample job `NW0I054` on dataset `NW0vrs.JOBS`.

## Step 4: Assemble NATOS with LE370=YES

(Job I055, Steps 9410, 9420)

- Job I055, Step 9410 starts the batch program `IEBUPDATE` to create the source member `NATOSNWO`.
- Job I055, Step 9420 assembles and links `NATOSNWO`.

## Step 5: Create NATPARM and NWO server front-end module

(Job I060, Steps 9410, 9420, 9430)

- Job I060, Step 9410 starts the batch program IEBUPDATE to store the parameter module NWOPARM.
- Job I060, Step 9420 assembles and links the parameter module NWOPARM.
- Job I060, Step 9430 links the NWO server front-end module.

The reentrant ADALINK module ADALNKR must be used.

## Step 6: Create server startup JCL

(Job I200, Step 9415)

Described in the section [Configuring the Natural Web I/O Interface Server](#). See sample member NWOSTART on dataset NWOvrs.JOBS.

Step 9415 creates a startup procedure for the batch server.

### Sample:

```
//          PROC  SRV=SAGNWO
//NWO       EXEC  PGM=NATRNO ,
// REGION=4000K, TIME=1440, PARM=' POSIX(ON), TRAP(ON, NOSPIE) /&SRV '
//STEPLIB  DD    DISP=SHR, DSN=NWOvrs.LOAD
//          DD    DISP=SHR, DSN=SMA.LOAD
//SYSUDUMP DD    SYSOUT=X
//CEEDUMP  DD    SYSOUT=X
//CMPRINT  DD    SYSOUT=X
//STGCONF  DD    DISP=SHR,
//          DSN=NWO.CONFIG(&SRV)
//STGTRACE DD    SYSOUT=X
//STGSTDO  DD    SYSOUT=X
//STGSTDE  DD    SYSOUT=X
//SYSOUT   DD    SYSOUT=X
```



**Note:** The Web I/O Interface server account must be defined in the z/OS 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 7: Web I/O Interface clients must be defined to Natural Security**

If Natural Security (NSC) is installed:

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

If the Web I/O Interface initial user ID is not defined, the Web I/O Interface server initialization aborts with a NAT0856.

If a Web I/O Interface client is not defined, the server connection returns an NSC error.

If you connect to the server from a Web I/O Interface 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.

**Step 8: Web I/O Interface clients must be defined to the server host**

If you configure the Web I/O Interface server to use an external security system (see Web I/O Interface server configuration parameter `SECURITY_MODE`), the Web I/O Interface clients must be defined to the external security system.



# 8 Installing the Natural Web I/O Interface Server under SMARTS

## on z/VSE

---

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This chapter describes how to install a server for the Natural Web I/O Interface (product code NWO) under the runtime environment SMARTS on z/VSE.

The installation of the Web I/O Interface server is performed by installation jobs. The sample jobs are contained in the dataset `NW0vrs.LIBJ`, or generated by System Maintenance Aid (SMA).

## Prerequisites

---

For details, refer to the section [Prerequisites](#).

## Content of the Web I/O Interface 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* that accompanies the installation tape.

Dataset Name	Contents
<code>APSVrs.LIBR</code>	Contains the load modules of the SMARTS server.
<code>NW0vrs.LIBR</code>	Contains the load modules of the Web I/O Interface server. See <a href="#">Web I/O Interface Server Concept and Structure</a> .
<code>NW0vrs.LIBJ</code>	Contains Installation Job Control for customers who install without using System Maintenance Aid.

The notation `vrs` in the dataset names and in the program samples (below) represents the version, release and system maintenance level of the product.

## Installation Procedure

---

### Step 1: Create a Web I/O Interface server configuration file

(Job I009, Step 9400)

Define sublibrary for NWO environment.

(Job I009, Step 9410)

Catalogs the configuration file of the Web I/O Interface server. For a description of the parameters, refer to [Configuring the Natural Web I/O Interface Server](#).

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

FRONTEND_NAME	Specify the name of the server front-end module you will create in one of the following steps.
PORT_NUMBER	Specify the TCP/IP port number under which the server can be connected.

### Step 2: Create a SMARTS SYSPARM file

(Job I009, Step 9420)

Catalogs the configuration file SYSPARM for SMARTS.

For detailed information on the SMARTS configuration file, see *Configuration of the SMARTS Environment* in the SMARTS documentation.

(Job I009, Step 9430)

Create dummy member for NWO.

### Step 3: Link the object modules into the NWO load library

(Job I054, Step 9410)

The NWO object modules must be linked with the necessary runtime extensions of your batch installations into executable load modules.

### Step 4: Assemble and link reentrant ADALNK

Job I055, Step 9401, assemble and link reentrant ADALNK phase.

The server environment requires a reentrant ADALNK phase.

Link ADALNK using the ADALNKR module.

### Step 5: Assemble and catalog the Web I/O Interface server module

- Job I055, Step 9410, assemble and catalog the NCFNWOPM module.

**Step 6: Create the Web I/O Interface server front-end module**

(Job I060, Steps 9410, 9420)

- Job I060, Step 9410, assemble and catalog the NATPARM module for NWO.
- Job I060, Step 9420, link the NWO front-end.

**Step 7: Catalog the SMARTS startup job**

(Job I200, Step 9415)

Extend your SMARTS startup job by NWO-specific definitions described in the section *Configuring the Natural Web I/O Interface Server*.

**VSE Sample:**

```

* $$ JOB JNM=NWOSRV,CLASS=C,DISP=L,LDEST=(,UID)
* $$ LST CLASS=A,DISP=H
// JOB NWOSRV --- NWO SERVER STARTUP ---
// OPTION PARTDUMP,NOSYSDMP,LOG
/* NWO server datasets -----
// DLBL NWOSRVT,'/SAGLIB/NWOCNFG/NWOSRV.TRC' writes trace to SAGLIB.NWOCNFG
member NWOSRV.TRC
// DLBL NWOSRVC,'/SAGLIB/NWOCNFG/NWOSRV.P' location of NWO configuration file
// DLBL NWOSRVE,'SYSLST' NWO error output directed to job
output
// DLBL NWOSRVO,'SYSLST'
// DLBL SYSPARM,'/SAGLIB/NWOCNFG/MSGQ.DMY' location of NWO Dummy file
// DLBL STDOUT,'CONSOLE' STDOUT directed to VSE console
// DLBL STDERR,'CONSOLE'
/* Libdef's -----
/*
// LIBDEF PHASE,SEARCH=(SAGLIB.NWOCNFG, +
SAGLIB.APSvrs, +
SAGLIB.ADAvrs)
/* *****
// UPSI 00000000
// EXEC TLINSP,SIZE=AUTO
* $$ SLI MEM=RJANPARM.P,S=SAGLIB.APSvrs
* $$ SLI MEM=PXANCONF.P,S=SAGLIB.APSvrs
* $$ SLI MEM=SYSPARM.P,S=SAGLIB.NWOCNFG NWO specific SMARTS configuration
file
/*
// EXEC LISTLOG

```

## Step 8: Web I/O Interface clients must be defined to Natural Security

If Natural Security (NSC) is installed:

- The Web I/O Interface initial user ID (default ID is STARGATE) must be defined in Natural Security with a valid default library. Refer also to Web I/O Interface server configuration parameter `INITIAL_USERID` in the section *Configuring the Natural Web I/O Interface Server*. Alternatively, you can specify the Natural profile parameter `AUTO=OFF` (automatic logon) for the Web I/O Interface.
- Each client user ID must be defined in Natural Security.

If the Web I/O Interface initial user ID is not defined, the Web I/O Interface server initialization aborts with a NAT0856 error message.

If a Web I/O Interface client is not defined, the **Map Environment** dialog returns an NSC error.

If you connect to the server from a Web I/O Interface client, make sure that the user who is defined in Natural Security has a default library or a private library defined. Otherwise, the error message NAT0815 will be displayed.

## Step 9: Web I/O Interface clients must be defined to the server host

If you configure the Web I/O Interface server to use an external security system (see Web I/O Interface server configuration parameter `SECURITY_MODE`), the Web I/O Interface clients must be defined to the external security system.

---

## Allocating and Configuring a SMARTS Portable File System

The Natural server uses the SMARTS portable file system (PFS) as a data container for Natural work files, print files, temporary sort files and the editor work file. The SMARTS PFS is the only storage medium available for those files under SMARTS.

In order to be able to use the PFS for Natural files, you have to configure Natural accordingly:

- For work or print files, specify the access method `AM=SMARTS`, using the Natural profile parameters `WORK` and/or `PRINT`.
- For temporary sort files, specify the type of storage medium `STORAGE=SMARTS`, using the Natural profile parameter `SORT`.
- And to allocate the editor work file in the PFS, specify the work file mode `FMODE=SM`, using the Natural profile parameter `EDBP`.

If you use one of these options, you have to configure your SMARTS to use a PFS.

## Step 1: Allocate a PFS

Allocate a z/VSE file (LRECL=4096) with the estimated size (the file must start at cylinder boundary) to store your PFS, and completely initialize the container to contain x'00's.

The initialization can be done using the following job (runs until no more extents are available in the file and requires extra operator intervention to continue the job after the WTOR message for the extent overflow):

```
// JOB PFSFMT
// OPTION NODUMP
// DLBL CMWKF01,'your.pfs.file.name',0,SD
// EXTENT SYS001,volume,...
// ASSGN SYS001,DISK,VOL=volume,SHR
// ASSGN SYS000,READER
// UPSI 00000011
// LIBDEF PHASE,SEARCH=(SAGLIB.NATvrs)
// EXEC NATBATvr,SIZE=AUTO,PARM='SYSRDR'
IM=D,MADIO=0,MT=0,OBJIN=R,ID=',',INTENS=1,
WORK=((1),AM=STD,RECFM=FB,BLKSIZE=4096,LRECL=4096)
EDT
DEFINE DATA LOCAL
1 B(B1) INIT<H'00'>
END-DEFINE
DEFINE WORK FILE 1 'CMWKF01'
REPEAT
WRITE WORK 1 B
WHILE 1=1
END
.E
RUN
FIN
/*
```

## Step 2: Configure SMARTS

In the SMARTS startup JCL, add the following statements:

```
// DLBL APSPFS1,'your.pfs.file.name',0,DA
// EXTENT SYSvrs,volume,...
// ASSGN SYSvrs,DISK,VOL=volume,SHR
```

In the SMARTS SYSPARM file, add the following statements (where *vrs* stands for the current Natural version, release number and system maintenance level):

```
RESIDENTPAGE=NCFvrAPS
CDI_DRIVER=('CIO,PAANCIO')
CDI=('PFS1,PAANPFS,CACHESIZE=2000,LRECL=4096,CONTAINER=CIO://DD:APSPFS1')
MOUNT_FS=('PFS1://','/usr/')
ENVIRONMENT_VARIABLES=/SAGLIB/APSvrs/ENVARS.P
```

Create a member ENVARS.P under SAGLIB.APSvrs containing the following lines:

```
NAT_WORK_ROOT=/usr/natural/etc/work_file
NAT_PRINT_ROOT=/usr/natural/etc/print_file
NCFWFAPS_TRACE_LEVEL=0
```

NCFWFAPS\_TRACE\_LEVEL=31 may be used for diagnostic purposes. It causes all PFS accesses to be traced by Natural and to be written to the Web I/O Interface server dataset STDOUT. It is recommended to set the NCFWFAPS\_TRACE\_LEVEL parameter value to zero.

### Step 3: Verify PFS Configuration

SMARTS now should protocol the following line in SYSLSL during startup:

```
APSPSX0050-SYSNAME CDI PFS1 PROTOCOL INITIALIZED
```

Once your Natural Web I/O Interface server installation has been completed, issue a **Map Environment** command to the Natural Web I/O Interface server, using the following session parameter:

```
WORK=((1),AM=SMARTS)
```

The following Natural program should run and display Record 01:

```
0010 DEFINE DATA LOCAL
0020 1 A(A20)
0030 END-DEFINE
0040 A := 'Record 01'
0050 WRITE WORK 1 A
0060 CLOSE WORK 1
0070 READ WORK 1 A
0080 WRITE A
0090 END-WORK
0100 END
```



# 9 Installing the Natural Web I/O Interface Server under SMARTS on BS2000/OSD

---

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This chapter describes how to install a server for the Natural Web I/O Interface (product code NWO) in the runtime environment SMARTS on BS2000/OSD.

## Prerequisites

---

For details, refer to the section [Prerequisites](#).

## Installation Tape

---

### Content of the Web I/O Interface 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
APSVrs.LIB	Contains the load modules and the procedures of the SMARTS server.
APSVrs.LOpp	Patch-level of SMARTS (product code APS). The content of this library must be copied into the library APSVrs.LIB.
NW0vrs.MOD	Contains the load modules of the Natural Web I/O Interface server.
NW0vrs.JOBS	Contains the Installation Job Control for those customers who want to install without using System Maintenance Aid (SMA).
NCFvrs.MOD	Contains the load modules of the Natural Complete Interface (required for SMARTS).
NCFvrs.MAC	Contains the macros of the Natural Complete Interface (required for SMARTS).

- where

*vrs* in a dataset name represents the version, release and system maintenance level of the product.

*pp* in a dataset name represents the patch level of the product.

## Content of the Web I/O Interface Server JOBLIB

### Naming Conventions

In the following text, the library name JOBLIB stands for

- the example job library (NWO *vs.* JOBS), if you are not using SMA, or
- the SMA job library (see SMA parameter JOBLIB in SMA Parameter Group BASIC), if you are using SMA.

Software AG uses the following naming conventions for source elements in the library JOBLIB:

A<product-code><function> = Assembler sources

L<product-code><function> = Instruction for TSOSLNK/BINDER

### Important Elements of the Job Library

Element	Description
NWO-SYSPARM	SMARTS parameters for NWO.
NWO-CONFIG	NWO configuration parameters.
NWO-ADAPARM	ADALNK parameter for NWO.
ANCFPRMW	Assembler source - Natural Com-plete interface.
ANWOPARM	Assembler source - Natural parameter module for NWO.
LNATSHAR	Link instructions to link the Natural nucleus.
LNWOFRNT	Link instructions to link the NWO front-end module.
START-NWO	Procedure to start the NWO server.
STOP-NWO	Procedure to stop the NWO server.
SHOW-SYSOUT	Show SYSOUT file.

## Installation Procedure

To install the Natural Web I/O Interface server in a SMARTS environment on BS2000/OSD, perform the following steps:

### Step 1: Assemble the Natural Complete interface

(Job I055, Step 9410)

Assemble the source ANCFPRMW which is contained in the library JOBLIB.

### Step 2: Assemble the Natural parameter module

(Job I055, Step 9420)

Assemble the source ANWOPARM which is contained in the library JOBLIB.

### Step 3: Relink the Natural nucleus module

(Job I060, Step 3802)

This step is optional.

The Natural nucleus module must be relinked with the modules NATWEB if this has not been included yet. This is accomplished by using the source LNATSHAR which is contained in the library JOBLIB.

If you are using SMA, please refer to the SMA Readme file of NWO vrs (skeleton `##NWO vrs-README`).

### Step 4: Link the NWO front-end module

(Job I060, Steps 9410)

Link the NWO front-end module by using the source LNWOFRNT which is contained in the library JOBLIB.

### Step 5: NWO clients must be defined to Natural Security

If Natural Security (NSC) is installed:

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

If the Web I/O Interface initial user ID is not defined, the Web I/O Interface server initialization aborts with a NAT0856.

If a Web I/O Interface client is not defined, the server connection returns an NSC error.

If you connect to the server from a Web I/O Interface 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.

## Installation Verification

---

### Check Messages

#### BS2000/OSD Operator Console

```
APSSVR0026-* Server NCFNAT42 started
APSOPC0000-* SMARTServer is initialized
```

#### SYSOUT of FSIO-Task

The following messages are displayed when parameter `TRACE_LEVEL=31` was set:

```
Template session initialized
Template runtime connected
Template runtime terminated
Template ready for clone
Listener thread launched 01625028
*****
***** Server is up *****
*****
Waiting for terminate event...
```

## SMARTS Portable File System on BS2000/OSD

---

The following topics are covered below:

- [PFS Description](#)

- [Allocating and Configuring a SMARTS Portable File System](#)

## PFS Description

SMARTS PFS (Portable or POSIX File System) implements a file system, known from UNIX systems, in a mainframe environment. Basically, it consists of a container file, which comprises all (UNIX) files and a corresponding (logical) access method, which processes all requested I/O operations.

The container file has to be allocated and preformatted using the BS2000/OSD procedure `CREATE-PFS` described below.

The PFS maps all file names to a node of a directory tree within the physical container file. In the case of BS2000/OSD, this container file is a PAM file with a block size of 4 KB (STD, 2).

Within Natural, the actual path is specified by a corresponding `DEFINE WORK FILE` statement in the program which executes work file or print file access.

Each node (subdirectory) is separated by a slash (/) from its parent. The highest level qualifies the file name.

### Example 1:

```
DEFINE WORK FILE 1 '/MISC/USER1/TESTFILE/'
```

Specifies: ROOT' => MISC => 'USER1 => 'TESTFILE

```
://MISC/USER1/TESTFILE
```

### Example 2:

```
DEFINE WORK FILE 1 'TESTFILE2.W01'
```

Specifies: ROOT' => TESTFILE2.W01

## Allocating and Configuring a SMARTS Portable File System

The Natural server uses the SMARTS portable file system (PFS) as a data container for Natural work files, print files, temporary sort files and the editor work file. The SMARTS PFS is the only storage medium available for these files under SMARTS.

In order to be able to use the PFS for Natural files you have to configure Natural accordingly:

- For work files or print files, specify the access method `AM=SMARTS`, using the Natural profile parameters `WORK` (Work-File Assignments) and/or `PRINT` (Print File Assignments).
- For temporary sort files, specify the type of storage medium `STORAGE=SMARTS`, using the Natural profile parameter `SORT` (Control of Sort Program).

- And to allocate the editor work file in the PFS, specify the work file mode `FMODE=SM`, using the Natural profile parameter `EDBP` (Software AG editor buffer pool definitions).

If you use one of these options, you have to configure your SMARTS to use a PFS.

### Step 1: Allocate a PFS

The file `PFS.TST` should not exist before the allocation procedure is executed, otherwise DMS error `DMS0683` will occur.

The initialization can be done by using the following procedure:

```
/CLP FROM-FILE=*LIBRARY-ELEMENT(LIBRARY=APSVrs.LIB,ELEMENT=CREATE-PFS, -  
/   TYPE=SYSJ),PROCEDURE-PARAMETERS=(FILE-NAME=PFS.TEST,SIZE=4096K, -  
/   APS-LIB=APSVrs.LIB)
```

### Step 2: Configure SMARTS

In the SMARTS `SYSPARM` configuration file, add the following lines:

```
CDI_DRIVER=('CIO,PAAQBIO,PFSTSK=PFSTASK,TRACE=N')  
CDI_DRIVER=('TESTPFS,PAANPFS,LRECL=4096,CONTAINER=CIO:PFS/TEST/')  
MOUNT_FS=('TESTPFS://','/')
```



# 10

## Configuring the Natural Web I/O Interface Server

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This chapter describes how to configure a Natural Web I/O Interface server.

Where applicable, specific information for z/OS, z/VSE, VM/CMS or BS2000/OSD is provided.

## Configuration Requirements for z/OS

The following topics are covered:

- [Language Environment Parameter Settings](#)
- [External Security Configuration](#)
- [SSL Support](#)

### Language Environment Parameter Settings

A Natural Web I/O Interface server requires the following z/OS language environment parameter configuration:

Parameter	Definition				
POSIX(ON)	Enables a Natural Web I/O Interface server to access the POSIX functionality of z/OS. If you start a Natural Web I/O Interface 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)	<p>Defines the abend handling of the LE/370 environment:</p> <table border="1"> <tr> <td>ON</td> <td>Enables the Language Environment condition handler.</td> </tr> <tr> <td>NOSPIE</td> <td>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.</td> </tr> </table> <p>If you do not specify TRAP(ON,NOSPIE), the Natural abend handling does not work properly. IBM supplies the default (ON,SPIE).</p>	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.
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.				
TERMTHDACT(UADUMP)	Defines 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 Web I/O Interface server is TZ (time zone). This variable allows you to adjust the timestamp within the Natural Web I/O Interface server's trace file to your local time.				

Parameter	Definition
	Example: <pre>ENVAR(TZ=CET-1DST) CET</pre> - 1 hour daylight saving time

You can set the z/OS language environment parameters:

- With the `PARM` parameter specified in the `EXEC` card of the Natural Web I/O Interface 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 Web I/O Interface server load module.

### External Security Configuration

If you configure the Web I/O Interface server to impersonate the Web I/O Interface clients in the server (Web I/O Interface server configuration parameter `SECURITY_MODE=IMPERSONATE` or `IMPERSONATE_LOCAL`), the Web I/O Interface server must run “program-controlled”. Under RACF, the following definitions are required for the Web I/O Interface server:

- The resource `BPX.SERVER` must be defined and the Web I/O Interface server account must have `READ` access to this resource.
- The `LOAD` datasets defined in the Web I/O Interface server startup job definition must be defined to the program class “\*\*”.

```
ralt program ** addmem('natural load library') uacc(read)
ralt program ** addmem('NWO load library'//NOPADCHK) uacc(read)
ralt program ** addmem('user load library'//NOPADCHK) uacc(read)
```

- `SETR WHEN(PROGRAM) REFRESH`

Additionally, each client connecting to the server must be defined in RACF and must be granted to use the z/OS Unix System Services.

## SSL Support

- [SSL over AT-TLS](#)
- [Maintenance of Certificates under z/OS](#)
- [Using RACF Key Rings](#)
- [Using Key Databases](#)
- [How to configure TCP/IP for AT-TLS?](#)
- [How to Verify AT-TLS Configuration?](#)
- [Frequently Asked Questions](#)
- [Generation of a Natural Web I/O Interface Server Certificate](#)

### SSL over AT-TLS

SSL support for the Natural Web I/O Interface server is based on the z/OS Communication Server component AT-TLS (Application Transparent-Transport Layer Security).

AT-TLS provides TLS/SSL encryption as a configurable service for sockets applications. It is realized as an additional layer on top of the TCP/IP protocol stack, which exploits the SSL functionality in nearly or even fully transparent mode to sockets applications. AT-TLS offers three modes of operation. See *z/OS Communications Server, IP Programmer's Guide and Reference*. Version 1, Release 9, Chapter 15, IBM manual SC31-8787-09.

These modes are:

#### ■ **Basic**

The sockets application runs without modification in transparent mode, unaware of performing encrypted communication via AT-TLS. Thus legacy applications can run in secured mode without source code modification.

#### ■ **Aware**

The application is aware of running in secured mode and is able to query TLS status information.

#### ■ **Controlling**

The sockets application is aware of AT-TLS and controls the use of AT-TLS encryption services itself. This means, the application is able to switch between secured and non secured communication.

Natural Web I/O Interface server uses the Basic mode for its SSL implementation. That is, a server configured as SSL server rejects requests from non-secured clients.

## Maintenance of Certificates under z/OS

Certificates, which are to be used with AT-TLS, can be maintained in two ways under z/OS. They are stored either in RACF key rings or in key databases, which are located in the z/OS UNIX file system. Which of these proceedings actually applies is defined in the AT-TLS Policy Agent Configuration file for the z/OS TCP/IP stack, which is used by the Natural HTTPS client.

IBM delivers a set of commonly used CA root certificates with each z/OS system delivery. If key rings are going to be used to hold server certificates, those root certificates must be manually imported into the key rings by the system administrator. If IBM delivers newer replacements for expired root certificates, all affected key rings have to be updated accordingly.

Unlike key rings, key databases contain the current set of root certificates automatically after they have been newly created. However, the need for maintaining always the latest set of root certificates applies to the key database alternative as well.

### Using RACF Key Rings

In RACF, digital certificates are stored in so called key rings. The RACF command `RACDCERT` is used to create and maintain key rings and certificates, which are contained in those key rings.

See *z/OS Security Server RACF Security Administrator's Guide*, IBM manual SA22-7683-11, and *z/OS Security Server RACF Command Language Reference*, IBM manual SA22-7687-11.

### Using Key Databases

Alternatively to RACF, certificates can be kept in key databases, which reside in the z/OS UNIX services file system. For the creation and maintenance of key databases, the `GSKKYMANT` utility has to be used.

See *z/OS Cryptographic Services PKI Services Guide and Reference*, IBM manual SA22-7693-10.

## How to configure TCP/IP for AT-TLS?

Proceed as follows:

1. In the TCP/IP configuration file, set the option `TTLS` in the `TCPCONFIG` statement.
2. Configure and start the AT-TLS Policy Agent. This agent is called by TCP/IP on each new TCP connection to check if the connection is SSL.
3. Create the Policy Agent file containing the AT-TLS rules. The Policy Agent file contains the rules to stipulate which connection is SSL.

See also *z/OS Communications Server: IP Configuration Guide*, Chapter 18 *Application Transparent Transport Layer Security (AT-TLS) data protection*.

The Sample Policy Agent file defines the server with the job name starting with NWODEV and listening at port 4843 to use SSL.

The sample expects the certificate database on the HFS file `/u/admin/CERT.kdb`.

```

TTLRule ConnRule01~1
{
  LocalAddrSetRef      addr1
  RemoteAddrSetRef     addr1
  LocalPortRangeRef   portR1
  RemotePortRangeRef  portR2
  Jobname              NWODEV*
  Direction            Inbound
  Priority              255
  TLSGroupActionRef   gAct1~NWO_Server
  TLSEnvironmentActionRef eAct1~NWO_Server
  TLSConnectionActionRef cAct1~NWO_Server
}
TLSGroupAction gAct1~NWO_Server
{
  TTLEnabled          On
}
TLSEnvironmentAction eAct1~NWO_Server
{
  HandshakeRole      Server
  EnvironmentUserInstance 0
  TLSKeyringParmsRef keyR1
}
TLSConnectionAction cAct1~NWO_Server
{
  HandshakeRole      Server
  TLSCipherParmsRef  cipher1~AT-TLS__Silver
  TLSConnectionAdvancedParmsRef cAdv1~NWO_Server
}
TLSConnectionAdvancedParms cAdv1~NWO_Server
{
  CertificateLabel    NDV_TEST_CERT
}
TLSKeyringParms keyR1
{
  Keyring             /u/admin/CERT.kdb
  KeyringStashFile    /u/admin/CERT.sth
}
TLSCipherParms cipher1~AT-TLS__Silver
{
  V3CipherSuites     TLS_RSA_WITH_DES_CBC_SHA
  V3CipherSuites     TLS_RSA_WITH_3DES_EDE_CBC_SHA
  V3CipherSuites     TLS_RSA_WITH_AES_128_CBC_SHA
}
IpAddrSet addr1
{

```

```

Prefix          0.0.0.0/0
}
PortRange      portR1
{
  Port         4843
}
PortRange      portR2
{
  Port         1024-65535
}

```

### How to Verify AT-TLS Configuration?

Check Policy-Agent job output JESMSG LG for:

```
EZZ8771I PAGENT CONFIG POLICY PROCESSING COMPLETE FOR <your TCP/IP address space>:
TTLS
```

This message indicates a successful initialization.

Check Policy-Agent job output JESMSG LG for:

```
EZZ8438I PAGENT POLICY DEFINITIONS CONTAIN ERRORS FOR <your TCP/IP address space>:
TTLS
```

This message indicates errors in the configuration file. Check the *syslog.log* file for further information.

Does the configuration rule cover the server?

Try to connect the server and check *syslog.log* for:

```
EZD1281I TTLS Map  CONNID: 00018BED LOCAL: 10.20.91.61..4843 REMOTE:
10.20.160.47..4889 JOBNAME: NWODEV42 USERID: NWOSRV TYPE: InBound STATUS: Enabled
RULE: ConnRule01~1 ACTIONS: gAct1 eAct1~NWO_Server cAct1~NWO_Server
```

The above entry indicates that the connection to Port 4843 is SSL enabled.

### Frequently Asked Questions

#### Is there more information about problem determination?

See also *z/OS V1R8.0 Comm Svr: IP Diagnosis Guide: 3.23, Chapter 29 Diagnosing Application Transparent Transport Layer Security (AT-TLS)*

#### How to switch on P-agent trace?

See *Comm Svr: IP Configuration Reference, Chapter 20 Syslog daemon and Comm Svr: IP Configuration Guide, Chapter 1.5.1 Configuring the syslog daemon (syslogd)*

## Error at connection establishment

Find return code RC and corresponding GSK\_ function name in P-agent trace.

See *System SSL Programming* and locate the RC in Chapter 12.1 *SSL Function Return Codes*.

Sample trace with trace=255:

```
EZD1281I TTLS Map CONNID: 00002909 LOCAL: 10.20.91.61..1751 REMOTE:
10.20.91.117..443 JOBNAME: KSP USERID: KSP TYPE: OutBound STATUS: A
EZD1283I TTLS Event GRPID: 00000003 ENVID: 00000000 CONNID: 00002909 RC: 0
Connection Init
EZD1282I TTLS Start GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 Initial
Handshake ACTIONS: gAct1 eAct1 AllUsersAsClient HS-Client
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0 Call
GSK_SECURE_SOCKET_OPEN - 7EE4F718
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0 Set
GSK_SESSION_TYPE - CLIENT
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0 Set
GSK_V3_CIPHER_SPECS - 090A2F
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0 Set
GSK_FD - 00002909
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0 Set
GSK_USER_DATA - 7EEE9B50
EZD1284I TTLS Flow GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 435 Call
GSK_SECURE_SOCKET_INIT - 7EE4F718
EZD1283I TTLS Event GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 435
Initial Handshake 00000000 7EEE8118
EZD1286I TTLS Error GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 JOBNAME: KSP
USERID: KSP RULE: ConnRule01 RC: 435 Initial Handshake
EZD1283I TTLS Event GRPID: 00000003 ENVID: 00000002 CONNID: 00002909 RC: 0
Connection Close 00000000 7EEE8118
```

## Generation of a Natural Web I/O Interface Server Certificate

Under z/OS, SSL certificates can be produced with the UNIX System Services utility GSKKYMANT. The following steps have to be executed for the production of a new certificate, which is to be used for the SSL secured communication between Natural Web I/O Interface client and server:

1. Start a shell session out of TSO or connect via telnet to the z/OS UNIX shell.
2. Start GSKKYMANT.
3. Create a new – or open an existing key database.
4. Create a self-signed certificate, for example, of type “User or server certificate with 2048-bit RSA key”.
5. Export the certificate to a (HFS) file. Choose Base64 ASN.1 DER as export format.

This generated file can now be copied to the Natural Web I/O Interface client(s) using FTP with ASCII transfer format. On the client side, the received file should be stored with the file name suffix `.CER`. The certificate can now be used by the Natural Web I/O Interface client.

If certificates are kept in a RACF key ring, the generated certificate has to be imported into the appropriate key ring using the `RADCERT` command.

Certificates, which are produced on a different platform, for example, on a Windows PC, can be imported into a RACF key ring or into a key database as well.

Detailed information about the use of the `GSKKMAN` utility can be found in the IBM Communications server documentation, e.g in the following manuals:

*z/OS Communications Server IP Configuration Guide Version 1 Release 2* (IBM manual SC31-8775-01

or

*z/OS Communications Server Cryptographic Services System Secure Sockets Layer Programming* (IBM manual SC24-5901-04).

For the generation of certificates under Windows, a free downloadable utility named Ikeyman is available on several websites. Ikeyman is an IBM product as well and maps the functionality of `GSKKMAN` to the Windows platform.

## Configuration Requirements for z/VSE and VM/CMS

The following topics are covered below:

- [SMARTS SYSPARM Parameters](#)
- [SYSPARM Example for the Natural Web I/O Interface Server](#)

### SMARTS SYSPARM Parameters

The Natural Web I/O Interface server requires the following SMARTS SYSPARM parameters:

Parameter	Definition
RESIDENTPAGE	The following members must be defined in the SMARTS resident area:  NATRNWO, NATMONI, NATDSSEC, Natural front-end (NCFNUC) and Natural nucleus (if you run using a split nucleus).
SECSYS	The installed external security system (RACF   ACF2   TOPSECRET).
SERVER	The following SERVER definitions are required for the Natural Web I/O Interface server:  SERVER=(OPERATOR, TLINOPER, TLSPOPER)      The Operator Communications Server.

Parameter	Definition	
	SERVER=(POSIX, PAENKERN)	The POSIX Server.
	The Natural local buffer pool definition.	For details, refer to the Natural Complete interface documentation.
CDI_DRIVER	CDI_DRIVER=('TCPIP, PAACSOCK, MINQ=10, MAXQ=20')	The SMARTS TCP/IP Socket Driver for Connectivity Systems TCP/IP stack on z/VSE and VM/CMS. MINQ/MAXQ define the number of TcpIP listener tasks.
THSIZEABOVE	THSIZEABOVE=1024	The storage above 16 MB that is available for each Natural Web I/O Interface server subtask. This size must be large enough to keep the Natural tread, heap and stack of the Natural Web I/O Interface server subtasks. A certain headroom (20% or more, depending on your environment) is recommended. If the Natural Web I/O Interface server initialization fails with NAT9915 GETMAIN for thread storage failed, this parameter must be increased.
ADASVC	ADASVC= <i>nnn</i>	The Adabas SVC number of your Adabas installation.

You can set the SMARTS SYSPARM parameters in the file SMARTS.CONFIG which must reside on one of your accessed disk.

**SYSPARM Example for the Natural Web I/O Interface Server**

For z/VSE:

```

* ----- ADABAS PARS -----*
ADACALLS=20 CALLS BEFORE ROLL
ADASVC=47 ADABAS SVC NUMBER
* ----- BUFFERPOOL PARS -----*
BUFFERPOOL=(064,030,20,ANY)
BUFFERPOOL=(128,064,64,ANY)
BUFFERPOOL=(256,010,10,ANY)
BUFFERPOOL=(512,032,10,ANY)
BUFFERPOOL=(1K,032,32,ANY)
BUFFERPOOL=(6K,005,02,ANY)
BUFFERPOOL=(8K,016,16,ANY)
* ----- ROLLING PARS -----*
ROLL-BUFFERPOOL=(048K,04,04,DS) ESA DATA SPACE
ROLL-BUFFERPOOL=(064K,04,04,DS) ESA DATA SPACE
ROLL-BUFFERPOOL=(128K,04,04,DS) ESA DATA SPACE
ROLL-BUFFERPOOL=(256K,04,04,DS) ESA DATA SPACE
ROLL-BUFFERPOOL=(800K,02,02,DS) ESA DATA SPACE
*
* ----- NWO Server to launch at startup -----*
* STARTUPPGM='NATRNO NWOS1'
*
*
TASK-GROUP=(DEFAULT,6)
THREAD-GROUP=(DEFAULT,(DEFAULT,252,06,15,28,N))
*
THSIZEABOVE=1024
*
SERVER=(NCFNAT42,NCFNAT42) NAT42 BUFFER POOL
*
CDI_DRIVER=('TCP,PAACSOCK,MINQ=10,MAXQ=20')
*
RESIDENTPAGE=NATRNO
RESIDENTPAGE=NWONCF42
RESIDENTPAGE=NATNUC42
RESIDENTPAGE=NATMONI

```

For VM/CMS:

```

*
*          SMARTS/SSE System Parameters
*
WORKLOAD-AVERAGE=10
*
WORKLOAD-MAXIMUM=50
*
TIBTAB=DYN00040
*
* TASK-GROUP=(DEFAULT,2)
*THREAD-GROUP=(DEFAULT,(DEFAULT,252,02,15,28,N))
*
*
* Recovery
*ABEND_RECOVERY=NO                MAIN TASK RECOVERY YES/NO
*THREAD_ABEND_RECOVERY=NO        THREAD RECOVERY YES/NO
CDI_DRIVER=(TCPIP,PAASSOCK)
ADASVC=247
*----- SERVERS -----*
CDI_DRIVER=(PIPE,PAANPIO)
CDI_DRIVER=(CONSOLE,PAANCNIO)
*
SERVER=(OPERATOR,TLINOPER)        OPERATOR COMMAND READER
*
SERVER=(POSIX,PAENKERN)           POSIX SERVER DEFINITION
SERVER=(NCFNAT41,NCFNAT41)
STARTUPPGM='NATRNO NWO21'
RESIDENTPAGE=NATRNO
RESIDENTPAGE=NATMONI
RESIDENTPAGE=NATMOPI

RESIDENTPAGE=NATHTMON
RESIDENTPAGE=NCF422
RESIDENTPAGE=NAT422RE
RESIDENTPAGE=NCFNAT42
RESIDENTPAGE=NCFBTIO
RESIDENTPAGE=NCFWFAPS
*
THSIZEABOVE=2048                 THREAD AREA > 16 M ADDRESS
* ENVIRONMENT_VARIABLES=DD:CONFIG
CDI_DRIVER=(FILE,PAASFSIO)
SYSTEM_TRACE_LEVEL=5
* * * End of File * * *

```

## SMARTS Configuration File for BS2000/OSD

The Natural Web I/O Interface server reads its configuration parameters from a file which resides as an S-type member in the NWO-JOBS library.



### Notes:

1. Translation tables are used to convert characters when sending or receiving data to or from a host while working with a terminal emulation, see *Adapting Translation Tables for Natural Web I/O Interface Server under BS2000/OSD* in the Natural for Windows (Natural Studio) documentation.
2. The SMARTS configuration is contained as an S-type member which resides in the NWO-JOBLIB. It has to be passed to the system in the startup procedure parameter NWO-SYSPARM.

The following topics are covered below:

- [SMARTS SYSPARM Parameters](#)
- [SMARTS Server Environment Configuration Parameters](#)
- [SMARTS Sample Configuration](#)

### SMARTS SYSPARM Parameters

The Natural Web I/O Interface server requires the following SMARTS SYSPARM parameters:

Parameter	Definition						
<a href="#">RESIDENTPAGE</a>	This parameter specifies one or more programs which are loaded into the SMARTS load-pool during system startup. The following members must be defined in the SMARTS resident area: NATRNWO, NATMONI, Natural front-end (NCFNUC) and Natural nucleus.						
<a href="#">SERVER</a>	The following SERVER definitions are required for the Natural Web I/O Interface server: <table border="1"> <tbody> <tr> <td>SERVER=( POSIX , PAENKERN , CONF=PAANCONF )</td> <td>The POSIX server.</td> </tr> <tr> <td>SERVER=( NCFNAT <i>nn</i> , NCFNAT <i>nn</i> )</td> <td>The Natural buffer pool server. The size of the various Natural buffer pools is configured in the parameter string of the NWO configuration parameter <a href="#">SESSION_PARAMETER</a>.</td> </tr> <tr> <td>SERVER=( NWOSEV , PAENAPPS , NATRNWO , ' <i>SERVERID</i> ' )</td> <td>The NWO server <i>SERVERID</i>.</td> </tr> </tbody> </table>	SERVER=( POSIX , PAENKERN , CONF=PAANCONF )	The POSIX server.	SERVER=( NCFNAT <i>nn</i> , NCFNAT <i>nn</i> )	The Natural buffer pool server. The size of the various Natural buffer pools is configured in the parameter string of the NWO configuration parameter <a href="#">SESSION_PARAMETER</a> .	SERVER=( NWOSEV , PAENAPPS , NATRNWO , ' <i>SERVERID</i> ' )	The NWO server <i>SERVERID</i> .
SERVER=( POSIX , PAENKERN , CONF=PAANCONF )	The POSIX server.						
SERVER=( NCFNAT <i>nn</i> , NCFNAT <i>nn</i> )	The Natural buffer pool server. The size of the various Natural buffer pools is configured in the parameter string of the NWO configuration parameter <a href="#">SESSION_PARAMETER</a> .						
SERVER=( NWOSEV , PAENAPPS , NATRNWO , ' <i>SERVERID</i> ' )	The NWO server <i>SERVERID</i> .						
<a href="#">CDI_DRIVER</a>	The CDI (Communication Driver Interface) drivers specify the various I/O routines and/or tasks of SMARTS as well as the physical access paths for sequential files and PFS-container files. If necessary for technical reasons, these routines are implemented						

Parameter	Definition
	as separate tasks (socket communication, physical file I/O, etc.). The others are executed in the oc-task (main task) or in one of the worker-tasks (e.g. console I/O).
	CDI_DRIVER=( 'console, PAANCNIO' ) The console server.
	CDI_DRIVER=( 'file, PA2SFIO, SIOTSK=JOBNAME' ) The file I/O task <i>JOBNAME</i> (SYSOUT, traces, etc.).
	CDI_DRIVER=( 'tcPIP, PAAZSOCK, SOCKTSK=JOBNAME' ) The socket task <i>JOBNAME</i> .
	CDI_DRIVER=( 'CIO, PAAQBIO, PFSTSK=' ) The PFS task <i>JOBNAME</i> running the CDI driver CIO.
	CDI_DRIVER=( 'PFS, PAANPFS, LRECL=4096, CONTAINER=CIO:AAA/BBB/CC' ) Defines the container file \$USERID.AAA.BBB.CC for the Portable File System (PFS); see also <i>Using SMARTS PFS under BS2000/OSD</i> .
MOUNT_FS	MOUNT_FS=( 'PFS://', '/' ) Mapping of (PFS) file names to the appropriate physical BS2000/OSD container file; see also <i>Using SMARTS PFS under BS2000/OSD</i> . This parameter maps (POSIX) filenames to a physical BS2000/OSD container file for the specified PFS.
DATA-MAXIMUM	DATA-MAXIMUM= <i>nnnn</i> Maximum possible CMP size for DATA in MB (over all sessions). This parameter limits the maximum size of the data common memory pool. At SMARTS startup, the data CMP is enabled with the specified size, however, real storage allocations within the pool are done on demand only in the actually requested size (For more information, please refer to the BS2000/OSD executive macros manual: <i>ENAMP / REQMP macros</i> ).
CODE-MAXIMUM	CODE-MAXIMUM= <i>nn</i> Maximum possible CMP size for (shared) Code in MB. This parameter limits the total size of all routines loaded, such as the SMARTS kernel itself, NWO and the Natural nucleus.
THREAD-GROUP	THREAD-GROUP=( DEFAULT, ( DEFAULT, 0, <i>n</i> ) Establishes the default thread-group with <i>n</i> threads. Only the num subparameter is of importance. This value defines the number of sessions that can be active and kept

Parameter	Definition	
		in storage in parallel; see also the WORKLOAD and TASK-GROUP parameters.
TASK-GROUP	TASK-GROUP=(DEFAULT , <i>n</i> )	Specifies the number of active worker-tasks. The value <i>n</i> should correspond to the specified number of threads. Only the num subparameter is of importance. This value defines the number of worker-tasks (BS2000/OSD tasks) that can execute NWO Natural sessions in parallel. Evidently, this parameter value should correspond to the number of available threads as defined by the THREAD-GROUP definition!
THSIZEABOVE	THSIZEABOVE= <i>nnnn</i>	Specifies the SMARTS thread size (in KB) which has to contain all buffers of one Natural session. This parameter specifies the size of the SMARTS threads which have to contain the Natural thread (NTHSIZE parameter, defined in the parameter module NCFPARM). A certain headroom (20% or more, depending on your environment) is recommended. If the Natural Web I/O Interface server initialization fails with NAT9915 GETMAIN for thread storage failed, this parameter must be increased.
WORKLOAD-AVERAGE	WORKLOAD-AVERAGE= <i>n</i>	The average number of sessions active in parallel. This parameter defines the expected average number of Natural sessions (not users, since one user can start more than one session!) which are to be executed by the server. This parameter must not be confused with the THREAD-GROUP parameter, because it represents the sum of all active and inactive sessions.
WORKLOAD-MAXIMUM	WORKLOAD-MAXIMUM= <i>nn</i>	The maximum possible number of sessions active in parallel. This parameter defines the maximum

Parameter	Definition	
		possible number of Natural sessions.
ADASVC	ADASVC=249	The Adabas SVC number must not be changed.

 **Note:** The parameter values printed in italics (*SERVERID*, *JOBNAME*, *PFS*, *nnn*, etc.) are to be specified by the user.

### SMARTS Server Environment Configuration Parameters

The following general parameter descriptions are adapted excerpts from the original SMARTS documentation. The text is provided for background information only. Therefore, not all of the information contained therein applies to the Natural Web I/O Interface server under SMARTS on BS2000/OSD.

- ADASVC
- RESIDENTPAGE
- SERVER
- TASK-GROUP
- THREAD-GROUP
- THSIZEABOVE
- WORKLOAD-AVERAGE, WORKLOAD-MAXIMUM

#### ADASVC

This parameter is for internal use only. Do not change the Adabas SVC number.

#### RESIDENTPAGE

Sysparm	Use	Possible Values	Default
RESIDENTPAGE	The name of a program to be loaded and made resident when SMARTS is initialized.	<i>program-name</i>	none

All modules are assumed to be reentrant, and are loaded into the address space automatically at first reference.

The program must be fully reentrant. If it is not marked reentrant, a warning message is issued on the operator's console at SMARTS initialization time.

The program must reside in the APS-LIB or in the NWO-MOD library of the SMARTS initialization procedure.

**SERVER**

Sysparm	Use	Possible Values	Default
SERVER	Information that identifies a server to SMARTS.	<i>server-information</i>	none

The *server-information* has the format

*(serv-id, init-mod, p1, p2, pn)*

- where

<i>serv-id</i>	is the ID for this server (1-8 characters).
<i>init-mod</i>	is the name of the initialization/termination routine.
<i>p1, p2, pn</i>	are parameters to be passed to the initialization routines.

Specifying the **SERVER** parameter causes SMARTS to build a server directory entry (SDE) for the specified server and pass control to the initialization routine specified to initialize the server.

**TASK-GROUP**

Sysparm	Use	Possible Values	Default
TASK-GROUP	A group comprising one or more tasks, available when SMARTS is started.	<i>(grp, num, priority, maxq)</i>	(DEFAULT, <i>num</i> )

- where

<i>grp</i>	Required. The name of the task group being defined. The default task group is DEFAULT.
<i>num</i>	Required. The number of tasks to be allocated in the task group. The default number of tasks is calculated dynamically based on the size of the installation.
<i>priority</i>	Not supported under BS2000/OSD.
<i>maxq</i>	The maximum number of TIBs (default 16) expected on this task group's work queue at the same time. Under normal circumstances, the default should be adequate. When there are problems and it is not, a secondary Last In First Out (LIFO) queue is used so that no work is lost. The normal queue is First In First Out (FIFO), which ensures that work is done in the order in which it is received. This is why the LIFO queue is only used as a secondary backup.



**Important:** For SMARTS, only the **TASK-GROUP** DEFAULT is available. Software AG strongly recommends that you use the default definition. If other products running on SMARTS require changes to the defaults or allow the definition of their own **TASK-GROUPS**, that will be indicated in the relevant documentation.



**Notes:**

1. A maximum of 8 task groups may be defined.
2. Task-group names are converted to uppercase prior to being processed; therefore, a parameter entered in lowercase is treated as, and appears in, uppercase letters.
3. If more than one specification appears for a task group, the last valid specification is used.
4. The task group `DEFAULT` must always exist in the system. If it is not explicitly defined by the installation, the task group is built by the system with the default values.
5. Note that the total number of tasks to be attached must not exceed the `MAXTASKS` specification. This is not checked until the task groups are being built; however, exceeding the value leads to task-group allocation errors as against parameter errors.

### THREAD-GROUP

Sysparm	Use	Possible Values	Default
THREAD-GROUP	A thread group containing one or more thread subgroups and threads, to be available when SMARTS is started.	see below	see below

The format for the value is

```
(grp,(sub,size,num,cpu,real,key),...,(sub,size,num,cpu,real,key))
```

- where

<i>grp</i>	Required. The name of the task group being defined.
<i>sub</i>	The name of the subgroup being defined. If a subgroup name is specified more than once for the same group, the last valid specification is used when parameter processing has been completed.
<i>size</i>	Required. The amount of storage in kilobytes to be allocated for each thread below the line. A valid value is between 8 kilobytes and 1 megabyte.
<i>num</i>	The number of threads to be allocated in the thread subgroup. The value must be greater than 1 and less than 4096. Generally, this subparameter is required. It can be omitted for one (and only one) thread subgroup in the address space; in this case, the number of threads to be allocated for the subgroup is calculated dynamically by SMARTS, based on the size of the installation.
<i>cpu</i>	The CPU time in seconds (default 0.00) that a user program can use in the thread subgroup for one SMARTS transaction. This value may be entered as an integer or to a level of hundredths of seconds using the <i>n.nn</i> format. If a 0 is provided as the CPU TIME for a thread subgroup, no CPU limit is placed on programs running in the associated threads.
<i>real</i>	The wait time in seconds (default 0.00) for the thread subgroup, after which a message is issued to the console if the user program has not given up control of its thread. This value may be entered as an integer or to a level of hundredths of seconds using the <i>n.nn</i> format. If 0 is specified, elapsed time is not checked for the thread subgroup.
<i>key</i>	The key (default M) in which the threads within the subgroups are allocated:  M - The thread keys are a mixture of user keys excluding the key in which SMARTS is running. N - No storage protection is implemented and all threads run in the same key as SMARTS.



**Note:** The user may also specify a value in the range 1 to 15 inclusive to allocate a thread to that key explicitly.

The default value is

```
THREAD-GROUP=(DEFAULT,($DEFAULT,8,num))
```

- where *num* is calculated dynamically based on the size of the installation.



**Important:** For SMARTS, only `THREAD-GROUP DEFAULT` is available. Software AG strongly recommends that you use the default definition. If other products running on SMARTS require changes to the defaults or allow the definition of their own `THREAD-GROUPs`, that will be indicated in the relevant documentation.



**Notes:**

1. A maximum of 8 thread groups may be defined.
2. A maximum of 8 subgroups can be allocated per thread group. The subgroups may be defined on one line or on different lines. When a second `THREAD-GROUP` statement is used, the same group name must be specified to relate the subgroup entries.
3. Thread group and subgroup names are converted to uppercase prior to being processed; therefore, a parameter entered in lowercase is treated as, and appears in, uppercase letters.
4. If more than one specification appears for a thread subgroup of a thread group, the last valid specification is used.
5. The amount of storage specified on the `THSIZEABOVE` parameter is allocated above the line for each thread defined as a result of the `THREAD-GROUP` parameter.
6. The thread group `DEFAULT` must always exist in the system. If it is not explicitly defined by the installation, the thread group is built by the system with the default values. If it is defined, the system ensures that a thread subgroup with a thread size at least as large as that required by `DEFAULT` is allocated. If not, the system allocates an additional subgroup for the group. If too many subgroups have been defined, the last one defined is overwritten to allow for the default specification.
7. The keyword `data` is processed from left to right. If more than one thread subgroup is defined on one line and the line contains an error, even if an error message is issued for the line, any subgroups processed up to the error are still accepted. That is to say, if the first subgroup is correct and the second is not, an error message is issued but the first thread subgroup is defined while the second and subsequent specifications in the same statement are ignored.

**THSIZEABOVE**

Sysparm	Use	Possible Values	Default
THSIZEABOVE	The amount of storage above the 16 MB line, in multiples of 1024 bytes, to be allocated to each thread.	<i>n</i>	1024

**WORKLOAD-AVERAGE, WORKLOAD-MAXIMUM**

The `WORKLOAD-AVERAGE` parameter specifies a normal workload value, and the `WORKLOAD-MAXIMUM` parameter specifies a maximum workload value. SMARTS uses these values together with the region sizes above and below the 16 MB line to configure itself.

These parameters are not required, but tuning them may improve performance.

Sysparm	Use	Possible Values	Default
WORKLOAD-AVERAGE	The average number of parallel processes expected to run in SMARTS.	1 - 32767	WORKLOAD-MAXIMUM divided by 4.
WORKLOAD-MAXIMUM	The maximum number of parallel processes expected to run in SMARTS.	1 - 32767	50 if WORKLOAD-AVERAGE is not specified, otherwise WORKLOAD-AVERAGE times 4.

**SMARTS Sample Configuration**

```

ADASVC=249
DATA-MAXIMUM=160
CODE-MAXIMUM=34
THSIZEABOVE=4096
THREAD-GROUP=(DEFAULT,(DEFAULT,0,4))
TASK-GROUP=(DEFAULT,2)
WORKLOAD-AVERAGE=8
WORKLOAD-MAXIMUM=40
RESIDENTPAGE=NATSOCK
RESIDENTPAGE=NATMONI
RESIDENTPAGE=NATRNWO
RESIDENTPAGE=NCFSERV
RESIDENTPAGE=NvrLPRRB
*****SERVERS *****
SERVER=(POSIX,PAENKERN,CONF=PAANCONF)
SERVER=(NCFNATvr,NCFNATvr,1,2048,2,100,4,2048)
SERVER=(NWONATv,PAENAPPS,NATRNWO,'NWOS01')
*****CDI-DRIVERS*****
CDI_DRIVER=('file,PA2SFIO,SLOTSK=HSFSIO')
CDI_DRIVER=('console,PAANCNIO')
CDI_DRIVER=('tcpip,PAAZSOCK,SOCKETSK=HSSOCTA2,TRACE=1')
CDI_DRIVER=('CIO,PAAQBIO,PFSTSK=HSPFS,TRACE=N')
    
```

```
CDI_DRIVER=( 'PFS,PAANPFS,LRECL=4096,CONTAINER=CIO:NWO/ROOT/SERVER1/' )
MOUNT_FS=( 'PFS://', '/' )
```

where *vr* is the current version and release number.

## Web I/O Interface Server Configuration File for z/OS and z/VSE and VM/CMS

A configuration file is allocated to the name `<serverid>C` (for example, `NW0S1C`) or `STGCONFG` alternatively.

The configuration file is a text file located on a dataset or on an HFS file under z/OS and a librarian member under z/VSE and a librarian member under VM/CMS.



**Note:** Under VM/CMS, the configuration file is a text file of type RTS located on one of your accessed disks.

The configuration file contains the server configuration parameters in the form of a `keyword=value` syntax. In addition, it may contain comments whose beginning is marked with a hash symbol (#).

See also the [Web I/O Interface Server Configuration File Example](#) shown below.

## Web I/O Interface Server Configuration Parameters

The following Web I/O Interface server configuration parameters are available:

- COMPATIBILITY\_MODE
- FRONTEND\_NAME
- FRONTEND\_OPTIONS
- FRONTEND\_PARAMETER
- HANDLE\_ABEND
- HOST\_NAME
- HTPMON\_ADMIN\_PSW
- HTPMON\_PORT
- HOST\_NAME
- IGNORE\_PRESENT\_SERVER
- INITIAL\_USERID
- KEEP\_TCB
- PASSWORD\_MIXEDCASE
- PORT\_NUMBER
- SECURITY\_MODE
- SESSION\_PARAMETER
- THREAD\_NUMBER
- THREAD\_SIZE

- TRACE\_FILTER
- TRACE\_LEVEL
- UPPERCASE\_SYSTEMMESSAGES

## COMPATIBILITY\_MODE

The current version of NWO presumes to run with the most recent version of Natural. An error NAT7729 NWO and Natural version do not agree is issued when running with older Natural versions. This is because NWO must negotiate a subset of functionality with the client at a time when the involved Natural version is not already known.

If you want to run NWO with a previous version of Natural, you can set this parameter to YES. It is recommended that you leave this parameter at its default value if you intend to run your NWO with the most recent version of Natural, because in this case COMPATIBILITY\_MODE=YES would unnecessarily limit the functionality.

Value	Explanation
YES	Accept also older versions of Natural. Results in a limitation of the functionality documented with the most recent version.
NO	Presume to run with the most recent version of Natural. This is the default value.

Example:

```
COMPATIBILITY_MODE=YES
```

## 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.

Value	Explanation
<i>frontend-name</i>	Natural front-end to be used. Maximum length: 8 characters.

No default value is provided.

Example:

```
FRONTEND_NAME=NATvrssv
```

## FRONTEND\_OPTIONS

This configuration parameter applies to z/OS only.

The values of this configuration parameter may be used to specify additional options for the Natural front-end.

Value	Explanation
01	Do not use the Roll Server. This is the default value.
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.

Example:

```
FRONTEND_OPTIONS=07
```

The setting in this example enables the Options 01, 02 and 04.

## FRONTEND\_PARAMETER

This configuration parameter applies to z/OS only.

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

Value	Explanation
<i>parameter-name</i>	<p>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 example:</p> <pre>FRONTEND_PARAMETER = 'MSGCLASSX      '</pre>

No default value is provided.

For further information, refer to the section *Natural in Batch Mode* in the *Natural Operations for Mainframe* documentation.

Example:

```
FRONTEND_PARAMETER='MSGCLASSX      '
```

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

### HANDLE\_ABEND

If an abend occurs in the server processing outside the Natural processing the abend is not trapped by the Natural abend handling. For this reason the NWO server has its own abend recovery.

It is recommended that you leave this parameter on its default value in order to limit the impact of an abend to a single user. If you set the value of this parameter to `NO`, any abend in the server processing terminates the complete server processing. That is, it affects all users running on that server.

Value	Explanation
YES	Trap abends in the server processing, write a snap dump and abort the affected user. This is the default value.
NO	Suspend the server abend handling.

Example:

```
HANDLE_ABEND=NO
```

**HOST\_NAME**

This configuration parameter applies to z/OS and z/VSE and VM/CMS.

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

Value	Explanation
<i>host-name</i>	If HOST_NAME is specified, the server listens on the particular stack specified by HOST_NAME, otherwise the server listens on all stacks.

No default value is provided.

Example:

```
HOST_NAME=node1
```

or

```
HOST_NAME=157.189.160.55
```

**HTPMON\_ADMIN\_PSW**

This configuration parameter applies to z/OS, z/VSE and BS2000/OSD.

This configuration parameter defines the password required for some monitor activities (e.g. Terminate Server) performed by the HTML Monitor Client.

Value	Explanation
any character string	The password to be entered at the HTML Monitor Client for some monitor activities.

No default value is provided.

Example:

```
HTPMON_ADMIN_PSW=GHAU129B
```

## HTPMON\_PORT

This configuration parameter applies to z/OS, z/VSE and BS2000/OSD.

A Web I/O Interface server can be configured to host an HTTP monitor task which serves the HTML Monitor Client running in a web browser. It is not required to run this monitor task on each server. A single task allows you to monitor all servers running at one node.

This configuration parameter defines the TCP/IP port number under which the server monitor task can be connected from a web browser.

Value	Explanation
1 - 65535	TCP/IP port number.

No default value is provided.

Example:

```
HTPMON_PORT=3141
```

## HOST\_NAME

This configuration parameter applies to z/VSE, VM/CMS and BS2000/OSD.

This configuration parameter defines the host name of the Web I/O Interface server.

## IGNORE\_PRESENT\_SERVER

This configuration parameter applies to z/OS and z/VSE in conjunction with the Web I/O Interface server CICS Adapter.

A Web I/O Interface (NWO) server allocates a so-called "server environment" which contains the server dependent common resources.

This environment is unique for each NWO server and relates to the server name. If an NWO server with Web I/O Interface Server CICS Adapter ends abnormally, it might leave a stuck NWO server environment within the CICS region. This causes that a restart of the server fails with error message NAT9913.

If you start an NWO server with `IGNORE_PRESENT_SERVER=YES`, it might damage an already running server which is using the same server name and the same CICS region.

Value	Explanation
YES	Terminate existing CICS server environment.
NO	Abort server initialization if a CICS server environment already exist. This is the default value.

Example:

```
IGNORE_PRESENT_SERVER=YES
```

## INITIAL\_USERID

At server initialization, the Natural Web I/O Interface 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.

Value	Explanation
<i>userid</i>	The specified value must not exceed 8 characters, otherwise it is truncated.
STARGATE	This is the default value.

Example:

```
INITIAL_USERID=NWOINITU
```

See also *Web I/O Interface clients must be defined to Natural Security* in the operating-system-specific Natural Web I/O Interface server *Installation* section.

## KEEP\_TCB

This configuration parameter applies to z/OS only.

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.

Value	Explanation
YES	The remote Natural session uses the same TCB during its entire lifetime.
NO	This is the default value.

Example:

```
KEEP_TCB=YES
```

### **PASSWORD\_MIXEDCASE**

This configuration parameter applies to z/OS and z/VSE.

This parameter allows you to define whether passwords specified in the connection dialog are translated into upper case or not.

This parameter does only apply with SECURITY\_MODE=IMPERSONATE, IMPERSONATE\_LOCAL or IMPERSONATE\_REMOTE.

Value	Explanation
YES	Passwords remain in mixed case.
NO	Passwords are translated into upper case. This is the default.

Example:

```
PASSWORD_MIXEDCASE=YES
```

### **PORT\_NUMBER**

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

Value	Explanation
1 - 65535	TCP/IP port number.

No default value is provided.

Example:

```
PORT_NUMBER=3140
```



**Note:** Under BS2000/OSD, some port numbers are privileged and reserved for certain system services. Ask your BS2000/OSD system administrator for the port number range available to you.

## SECURITY\_MODE

This configuration parameter applies to z/OS and z/VSE.

The Natural Web I/O Interface server offers a security concept that also covers the operating system resources. The client credentials are validated at the operating-system-depending security system and the client request is executed under the client's account data.

Using the `SECURITY_MODE` parameter, you can specify at which rank (in batch mode or under CICS) you want to impersonate the activities of a Web I/O Interface client.

Value	Explanation
IMPERSONATE_LOCAL	Impersonation is done within the Natural Web I/O Interface server environment. If the session is dispatched in a remote TP environment (e.g. in CICS using the NWO CICS Adapter), it is still executed anonymous. The client must be defined in the security system of the Web I/O Interface server. It is not required to define the client in a remote TP environment. For z/OS, see also <a href="#">External Security Configuration</a> . For z/VSE and VM/CMS, see also <a href="#">SYSPARM Parameter SECSYS</a> .
IMPERSONATE_REMOTE	No impersonation is done within the Natural Web I/O Interface server environment. If the session is dispatched in a remote TP environment, the client is impersonated. The client must be defined in the security system of the remote TP environment. See also Web I/O Interface server security exit <a href="#">NATUXRFE</a> and the section <a href="#">Product Interaction</a> in the <i>Web I/O Interface Server CICS Adapter</i> documentation.  <b>Note:</b> Please verify the correct installation of NATUXRFE. A <b>Map Environment</b> attempt with a valid user ID and an invalid password should fail with a NAT0873 error.
IMPERSONATE	Impersonation is done within the Natural Web I/O Interface server environment and in a remote TP environment. The client must be defined in the security system of the Natural Web I/O Interface server and in the remote TP environment.

No default value is provided.

Example:

```
SECURITY_MODE=IMPERSONATE
```

## SESSION\_PARAMETER

This optional configuration parameter defines session parameters that precede the parameter string specified in the connection dialog of the Natural Web I/O Interface client.

Value	Explanation
<i>parameter-string</i>	This string may extend across several lines. A + sign at the end of a string line denotes that another line follows.

No default value is provided.

Example 1:

```
SESSION_PARAMETER='NUCNAME=NATNUCvr' +
'PROFILE=(NWOPARM,18006,48),ADAMODE=0,' +
'BPI=(TYPE=NAT,SIZE=6044),BPI=(TYPE=EDIT,SIZE=2048)', +
'BPI=(TYPE=SORT,SIZE=1024)'
```

- where *vr* stands for the version and release number.

Example 2:

```
SESSION_PARAMETER=FNAT=(10,930)
```

The setting in the second example defines that every session on this Natural Web I/O Interface server is started with the session parameter `FNAT=(10,930)` appended to the user-specified parameters or the definitions in the configuration parameter `DEFAULT_PROFILE`.

## THREAD\_NUMBER

This configuration parameter applies to z/OS only.

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 parameter is obsolete when the Natural Web I/O Interface Server CICS Adapter is used.

Value	Explanation
<i>thread-number</i>	Number of physical storage threads to be allocated.  <b>Note:</b> 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.
3	This is the default value.

Example:

```
THREAD_NUMBER=5
```

## THREAD\_SIZE

This configuration parameter applies to z/OS only.

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



**Note:** This parameter is obsolete when the Natural Web I/O Interface Server CICS Adapter is used.

Value	Explanation
<i>thread-size</i>	Size (in KB) of each physical storage thread.
500	This is the default value.

Example:

```
THREAD_SIZE=800
```

## TRACE\_FILTER

This optional configuration parameter enables you to restrict the trace by a logical filter in order to reduce the volume of the server trace output, for example:

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

Each request of the user ID "KSP" and each request of the user IDs starting with a "P" are traced.

See [Trace Filter](#) in the section *Operating the Natural Web I/O Interface Server*.

## TRACE\_LEVEL

Value	Explanation
<i>trace-level</i>	See <a href="#">Trace Level</a> in the section <i>Operating the Natural Web I/O Interface Server</i> .
0	This is the default value.

Example:

```
TRACE_LEVEL=0x00000011
```

or alternatively

```
TRACE_LEVEL=31+27
```

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

## UPPERCASE\_SYSTEMMESSAGES

This configuration parameter is used to enable or disable the translation of all NWO error messages and trace outputs to uppercase. This feature is for customers who are using character sets with no lowercase characters defined.

Value	Explanation
YES	Enable uppercase translation.
NO	Disable uppercase translation. This is the default value.

## Web I/O Interface Server Configuration File Example

---

For z/OS:

```
# This is a comment
SESSION_PARAMETER=profile=(stgqa,10,930) fuser=(10,32) CFICU=ON
THREAD_NUMBER=2
THREAD_SIZE=700
FRONTEND_NAME=NATOS42L          # and another comment
PORT_NUMBER=4811
```

For z/VSE:

```
# This is a comment
SESSION_PARAMETER=profile=(stgqa,10,930) fuser=(10,32) CFICU=ON
DEFAULT_PROFILE=DEFPROF
FRONTEND_NAME=NATNCF      # and another comment
PORT_NUMBER=4711
```

For VM/CMS:

```
# This is a comment
SESSION_PARAMETER=profile=(stgqa,10,930) fuser=(10,32) CFICU=ON
DEFAULT_PROFILE=DEFPROF
FRONTEND_NAME=NATNCF      # and another comment
PORT_NUMBER=4711
```

For BS2000/OSD:

```
SESSION_PARAMETER = 'NUCNAME=N42LPRRB' +
  ' PROFILE=(NWOPARM,18006,58),ADAMODE=0,' +
  ' FNAT=(18006,58),FUSER=(18006,19),FDIC=(18006,11),' +
  ' FSPPOOL=(18006,58),FSEC=(18006,58),CFICU=ON,MENU=OFF,CP=EDF03IRV '
THREAD_NUMBER = 3
THREAD_SIZE = 900
FRONTEND_OPTIONS = 0X01
FRONTEND_NAME = NCFSERV
PORT_NUMBER = 4811
MONITOR=Y
```

## Web I/O Interface Server Datasets for z/OS, z/VSE and VM/CMS

The Natural Web I/O Interface server requires the following datasets:

STGCONFG	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. Under z/VSE and VM/CMS, this is necessary if you want to start different Natural Web I/O Interface servers under a single SMARTS address space.

NWOS1C	Defines the server configuration file for the server NWOS1.
NWOS1T	The server trace output for the server NWOS1.
NWOS1O	The stdo dataset for the server NWOS1.
NWOS1E	The stde error output for the server NWOS1.

## Web I/O Interface Server User Exits

---

The Natural Web I/O Interface server offers the following user exit:

### User Exit NSECUX01

This user exit is applicable only when the parameter `SECURITY_MODE` is set to `IMPERSONATE_LOCAL` or `IMPERSONATE`.

This user exit allows you to adapt the user ID used for the RACF login. It is useful if the RACF user IDs and the user IDs used in Natural differ according to a standardized rule. For example, each RACF user ID is the corresponding Natural user ID preceded by two dollar signs (\$\$).

If the exit (the loadmodule `NSECUX01`) is found in the NWO load library concatenation, it is called before the user is validated against RACF.

The following parameters are passed to the exit:

Name	Format	In/Out	Description
sUId	CL64	I/O	User ID to be modified for RACF login.

The exit is called using standard linkage conventions.

Sample user exit implemented in C:

```
#include <string.h>
#include <stdio.h>

# pragma linkage (NSECUX01, FETCHABLE)

void NSECUX01(char sUId[64])
{
    char sUIdTemp[64];
```

```
printf("Uex got usid:%s\n", sUId);
strcpy(sUIdTemp, sUId);
sprintf(sUId, "$$%s", sUIdTemp);
printf("Uex ret usid:%s\n", sUId);
return;
}
```

The exit above extends each user ID by two preceding dollar signs (\$\$) when it is used for RACF login.



# 11 Installing the Natural Web I/O Interface Server CICS Adapter under z/OS

---

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This chapter describes how to install the CICS connection for a Natural Web I/O Interface server (product code NWO) running under z/OS in batch mode.

## Prerequisites

---

For details, refer to the section *Prerequisites*.

## Installation Procedure

---

To install the Natural Web I/O Interface Server CICS Adapter, perform the following steps:

### Step 1: Customize CICS

(Job I005, Steps 9405, 9406, 9410, 9411)

The Natural Web I/O Interface server load library must be defined in the CICS `DFHRPL` concatenation.

Customize the standard listener `CSKL` of the CICS socket interface using the CICS transaction `EZAC` and define `NATUXRFE` in the `SECEXIT` field of `EZAL`.

Start the standard listener using the CICS transaction `EZA0`.

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 NWO configuration parameter `RFE_CICS_TA_NAME`. This document uses the transaction name `NRFE`.

```
DEFINE TRANSACTION(NRFE) GROUP(NW0group)
PROGRAM(NATNRFE)
TWSIZE(128)
RESART(NO)
TASKDATAKEY(USER)
TASKDATALOC(ANY)
```

## 2. Define the programs NATCNRFE and NATLRGWO.

```
DEFINE PROGRAM(NATCNRFE) GROUP(NW0group)
LANGUAGE(C) DATALOCATION(ANY) EXECCKEY(USER)
*
DEFINE PROGRAM(NATLRGWO) GROUP(NW0group)
LANGUAGE(C) DATALOCATION(ANY) EXECCKEY(USER)
```

### Define the program NATUXRFE.

```
DEFINE PROGRAM(NATUXRFE) GROUP(NW0group)
LANGUAGE(Le370) DATALOCATION(ANY) EXECCKEY(CICS)
```

- For DB2 access, a DB2 plan name must be defined. If you have not specified a DB2 plan name for pool threads in the DB2CONN resource definition, the transaction specified in RFE\_CICS\_TA\_NAME and its associated DB2 plan name must be defined to CICS with a DB2TRAN and/or DB2ENTRY resource definition.



**Note:** The dynamic plan selection provided by the Natural for DB2 interface must not be used.

- For DB2 access, the authorization ID under which the NWO CICS transaction is accessing DB2 must have the necessary privileges for DB2 access. The authorization ID to be used is specified in the DB2ENTRY resource definition. If you choose the USERID option, the user ID of the CICS system will be used because the NWO CICS transactions are running under the user ID of the CICS system.

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

- NWOCNF

### Step 2: Create member for CICS server

- Job I009, Step 9411, create member NWOCNFC for CICS server

### Step 3: Link the object modules into the NWO load library

(Job I054, Step 8420)

The NWO object modules must be linked with the necessary runtime extensions of your CICS installations into executable load modules.

See sample job NW0I054 on dataset NW0vrs.JOBS.

#### **Step 4: Create startup procedure**

- Job I200, Step 9416, create startup procedure for CICS server

#### **Step 5: Customize the Natural Web I/O Interface Server**

In order to dispatch the NWO Natural sessions in CICS, you must adapt the configuration file of your Natural Web I/O Interface server running under z/OS in batch mode. For this purpose, two sample JCL members (NW0I009C and NW0CONF0) are available.

Refer to *Configuring the Natural Web I/O Interface Server CICS Adapter* and to *Configuring the Natural Web I/O Interface Server*.

# 12      Installing the Natural Web I/O Interface Server CICS

## Adapter under SMARTS on z/VSE

---

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This chapter describes how to install the CICS connection for a Natural Web I/O Interface server (product code NWO) running under SMARTS on z/VSE.

## Prerequisites

---

For details, refer to the section [Prerequisites](#).

## Installation Procedure

---

To install the Natural Web I/O Interface Server CICS Adapter, perform the following steps:

### Step 1: Customize CICS

(Job I005, Step 9405)

The Natural Web I/O Interface server sublibrary must be defined in the CICS Libdef search chain.

Customize the standard listener EZAL of the CICS socket interface using the CICS transaction EZAC and define NATUXRFE in the SECEXIT field of EZAL.

As of z/VSE Version 4.1, the CICS *task related user exit* must be active (transaction EZAT).

Start the standard listener using the CICS transaction EZA0.

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 NWO configuration parameter RFE\_CICS\_TA\_NAME. This document uses the transaction name NRFE.

```
DEFINE TRANSACTION(NRFE) GROUP(NW0group)
    PROGRAM(NATCNRFE)
    TWASIZE(128)
    RESART(NO)
    TASKDATAKEY(USER)
    TASKDATALOC(ANY)
```

## 2. Define the programs NATCNRFE and NATLRGWO.

```
DEFINE PROGRAM(NATCNRFE) GROUP(NW0group)
    LANGUAGE(C) DATALOCATION(ANY) EXECKEY(USER)
*
DEFINE PROGRAM(NATLRGWO) GROUP(NW0group)
    LANGUAGE(C) DATALOCATION(ANY) EXECKEY(USER)
```



**Note:** If CICS runs with storage protection, NATCNRFE must be defined with EXECKEY=(CICS).

### Step 2 : Customize the Natural Web I/O Interface Server

In order to dispatch the NWO Natural sessions in CICS, you must adapt the configuration file of your Natural Web I/O Interface server running under SMARTS on z/VSE. For this purpose, one sample JCL member (SMAI009 Step 9410) is available.

Refer to [Configuring the Natural Web I/O Interface Server CICS Adapter](#) and to [Configuring the Natural Web I/O Interface Server](#).

### Step 3: Link the object modules into the NWO load library

(Job I054, Step 9420)

The NWO object modules must be linked with the necessary runtime extensions of your CICS installations into executable load modules.



# 13      Configuring the Natural Web I/O Interface Server CICS

## Adapter

---

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This chapter describes how to configure the CICS connection for a Natural Web I/O Interface server (product code NWO) running on z/OS or under SMARTS on z/VSE.

## Configuration File

---

After the installation of the Natural Web I/O Interface Server CICS Adapter is complete, the configuration of the Natural Web I/O Interface Server CICS Adapter has to be done in the configuration file of the corresponding Natural Web I/O Interface server.

To enable the CICS Adapter, specify the remote front-end module in the NWO 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 `NATNRFE`. See also [Installing the Natural Web I/O Interface Server CICS Adapter under z/OS](#) or [Installing the Natural Web I/O Interface Server CICS Adapter under SMARTS on z/VSE](#).

<b>Default Value</b>	none
<b>Example</b>	<code>RFE_CICS_TA_NAME=NRFE</code>

## RFE\_CICS\_FE\_NAME

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

<b>Default Value</b>	none
<b>Example</b>	RFE_CICS_FE_NAME=NCIvrNUC

where *vr* stands for the relevant version and release numbers.

See also the Natural *Installation for Mainframes* documentation, *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 Web I/O Interface server and CICS are running on the same TCP/IP node.

<b>Default Value</b>	The host address of the server.
<b>Example</b>	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 the Web I/O Interface client to connect to a Web I/O Interface server. This port number (and the `RFE_CICS_TA_HOST` definition) is used internally by the Web I/O Interface server to communicate with the CICS region.

<b>Possible Values</b>	1 - 65535
<b>Default Value</b>	none
<b>Example</b>	RFE_CICS_TA_PORT=3010

## RFE\_CICS\_TA\_INIT\_TOUT

If the Web I/O Interface client sends a request to a Natural Web I/O Interface 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 Web I/O Interface server required for processing the request.

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

<b>Default Value</b>	5
<b>Example</b>	RFE_CICS_TA_INIT_TOUT=20



**Note:** Do not define a value below 5.

## RFE\_CICS\_KEEP\_TA

For each request sent by Natural, the Natural Web I/O Interface server 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.

<b>Default Value</b>	NO
<b>Example</b>	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 Web I/O Interface 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 Web I/O Interface server and CICS.
Bit 26	Dump entire buffer exchanged between Web I/O Interface server and CICS.
Bit 25	Dump the Natural Web I/O Interface server relevant buffer only (remote gateway buffer).
Bit 23	Trace error situations only.
Bit 07	Activate trace in the Web I/O Interface 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.

<b>Default Value</b>	0
<b>Example</b>	RFE_CICS_TRACE=0x02000011 Dump main events and buffer header in the CICS region (Bits 31 + 27 + 07).

The following is a sample server configuration file using the Natural Web I/O Interface Server CICS Adapter:

```
# the Web I/O Interface Server parameter
SESSION_PARAMETER=PROFILE=(NWO,10,930)
FRONTEND_NAME=NATCSRFE          # use the CICS Adapter front-end
PORT_NUMBER=4711                # the port number used by the Web I/O Interface Client

# 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
                                # server.
RFE_CICS_FE_NAME=NCIvrNUC       # the name of the installed Natural CICS nucleus
RFE_CICS_TA_INIT_TOUT=20        # transaction timeout is 20 seconds
```

where *vr* stands for the relevant version and release numbers.



**Note:** The server parameters `THREAD_NUMBER` and `THREAD_SIZE` are obsolete when the Natural Web I/O Interface Server CICS Adapter is used.

# 14

## Installing the Natural Web I/O Interface Client

---

This part explains how to install the Natural Web I/O Interface client on an application server or web server so that it can be used with the server part of the Natural Web I/O Interface that is running in a Natural for Mainframes, Natural for UNIX, Natural for OpenVMS or Natural for Windows runtime environment.

The following topics are covered:

<a href="#">Prerequisites</a>
<a href="#">Installing the Natural Web I/O Interface Client on Sun Java System Application Server</a>
<a href="#">Installing the Natural Web I/O Interface Client on JBoss Application Server</a>
<a href="#">Installing the Natural Web I/O Interface Client on Microsoft Internet Information Services (IIS)</a>

---

# 15 Prerequisites

---

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## Application Server or Web Server

---

The following application/web servers are supported. The application/web servers are not delivered with the Natural Web I/O Interface.

### ■ J2EE Server

The following application servers are supported.

#### ■ Sun Java System Application Server 8.1, 8.2 and 9.1

This can be downloaded from <http://www.sun.com/>.

#### ■ JBoss Application Server 4.0.5 and 4.2.2

This can be downloaded from <http://www.jboss.org/>.

On these application servers, the Natural Web I/O Interface client consists of a J2EE enterprise application (*natuniapp.ear*) and a J2EE resource adapter (*naturalunicode.rar*). Both components are installed on a J2EE server.

The prerequisite for using the Natural Web I/O Interface client on a J2EE server is that Java Runtime 5 or above is installed.

### ■ Microsoft Internet Information Services (IIS)

On this web server, the Natural Web I/O Interface client is based on the ASP.NET 2.0 technology. Therefore, the prerequisite for running the Natural Web I/O Interface client with IIS is that the .NET framework 2.0 is installed on the same server on which Microsoft Internet Information Services is installed.

When ASP.NET 2.0 has not yet been installed, you can download the .NET Framework Version 2.0 from:

<http://www.microsoft.com/downloads/details.aspx?familyid=0856eacb-4362-4b0d-8edd-aab15c5e04f5&displaylang=en>

You have to install the Natural Web I/O Interface client on one of these servers as described later in this documentation.



**Note:** Server farms are not supported.

## Apache Ant

---

Apache Ant 1.6.5 or above is required to perform the deployment on JBoss Application Server. This tool is freely available on <http://ant.apache.org/>.

## Natural for Mainframes

---

If you want to use the Natural Web I/O Interface client with Natural for Mainframes, the following must be installed:

- Natural for Mainframes Version 4.2.3 or above, and
- the Natural Web I/O Interface server.

For detailed information, see:

- the *Installation* documentation for the different operating systems which is provided for Natural for Mainframes;
- the section *Installing and Configuring the Natural Web I/O Interface Server* in the version of this *Natural Web I/O Interface* documentation which is provided for Natural for Mainframes.

## Natural for UNIX

---

If you want to use the Natural Web I/O Interface client with Natural for UNIX, the following must be installed:

- Natural for UNIX Version 6.2.5 or above, and
- the Natural Web I/O Interface server (which is implemented as a daemon).

For detailed information, see:

- the *Installation* documentation which is provided for Natural for UNIX;
- the section *Installing and Configuring the Natural Web I/O Interface Server* in the version of this *Natural Web I/O Interface* documentation which is provided for Natural for UNIX.

## Natural for OpenVMS

---

If you want to use the Natural Web I/O Interface client with Natural for OpenVMS, the following must be installed:

- Natural for OpenVMS Version 6.3.4 or above, and
- the Natural Web I/O Interface server (which is implemented as a daemon).

For detailed information, see:

- the *Installation* documentation which is provided for Natural for OpenVMS;
- the section *Installing and Configuring the Natural Web I/O Interface Server* in the version of this *Natural Web I/O Interface* documentation which is provided for Natural for OpenVMS.

## Natural for Windows

---

If you want to use the Natural Web I/O Interface client with Natural for Windows, the following must be installed:

- Natural for Windows Version 6.3.3 or above, and
- the Natural Web I/O Interface server (which is implemented as a service).

For detailed information, see:

- the *Installation* documentation which is provided for Natural for Windows;
- the section *Installing and Configuring the Natural Web I/O Interface Server* in the version of this *Natural Web I/O Interface* documentation which is provided for Natural for Windows.

## Browser Prerequisites

---

Supported browsers in this version are:

- Internet Explorer 6.0 through 8.0.
- Mozilla Firefox 2.0 through 3.5.



**Important:** Cookies and JavaScript must be enabled in the browser.

# 16 Installing the Natural Web I/O Interface Client on Sun Java

## System Application Server

---

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If you want to use the Natural Web I/O Interface client with Sun Java System Application Server, you must proceed as described in this chapter.

## Installation Steps

---

The Natural Web I/O Interface client is installed using the Administration Console of Sun Java System Application Server.

The following is assumed:

- *<host>* is the name of the machine on which the application server is installed.
- *<port>* is the name of the port where the application server is installed. In a default installation, this is port 8080.
- *<adminport>* is the name of the port where the Administration Console is installed. In a default installation, this is port 4848.
- *<sunas>* is the path to the directory in which the application server is installed. In a default installation on Windows, this is *C:/Sun/AppServer*.

The following topics are covered below:

- [First-time Installation](#)
- [Update Installation](#)

### First-time Installation

#### ► To install the Natural Web I/O Interface client

- 1 Download the Natural Web I/O Interface client for Sun Java System Application Server from Empower (<https://empower.softwareag.com/>) and unzip the contents to a directory of your choice on your hard disk.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the *nwo/⟨platform⟩/j2ee/v⟨nnnn⟩/sun-apps* directory from the installation medium to a directory of your choice on your hard disk.

- 2 On UNIX platforms: Dearchive the TAR file using the following command:

```
tar -xvf nwonnnn.tar
```

- 3 Edit the file `<sunas>/domains/domain1/config/server.policy` and add the following setting in order to enable the Java Logging API:

```
grant {  
  permission java.util.logging.LoggingPermission "control";  
};
```



**Important:** If you do not add this setting, the resource adapter will not start and the Natural Web I/O Interface client will therefore be inoperative.

- 4 Make sure that the application server is running.
- 5 Open your web browser and enter the following URL:

```
http://<host>:<adminport>
```

This opens the Administration Console.

- 6 Deploy the resource adapter `naturalunicode.rar`:
  1. Open the tree node **Applications > Connector Modules**.
  2. Choose **Deploy**.
  3. Select `naturalunicode.rar` as the package file to be uploaded to the application server.
  4. Choose **Next**. "naturalunicode" is automatically included as the application name.
  5. Choose **Finish**.
- 7 Define the JNDI name for the resource adapter:
  1. Open the tree node **Resources > Connectors > Connector Connection Pools**.
  2. Choose **New**.
  3. Enter "NatPool" (the name is arbitrary) as the name.
  4. Select **naturalunicode** as the resource adapter.
  5. Each connection to a Natural host results in a new connection being made. Since each user requires a unique host session, connection pooling cannot be used. Therefore, you should make sure there are enough sessions for your users. The default maximum number is "32".
  6. Choose **Next**.
  7. Choose **Next**.
  8. Choose **Finish**.
  9. Open the tree node **Resources > Connectors > Connector Resources**.
  10. Choose **New**.
  11. Enter "eis/NaturalUnicodeRA" as the JNDI name.

12. Select **NatPool** (or whatever name you specified previously) as the pool name.
  13. Choose **OK**.
8. Deploy the enterprise application *natuniapp.ear*:
    1. Open the tree node **Applications > Enterprise Applications**.
    2. Choose **Deploy**.
    3. Select *natuniapp.ear* as the file to upload.
    4. Choose **Next**.
    5. Choose **OK**. The deployment may take several minutes.
  9. Restart the application server.

## Update Installation

### ► To update the Natural Web I/O Interface client

1. Make a backup copy of your *sessions.xml* file which is located in *../AppServer/domains/domain1/applications/j2ee-apps/natuniapp/natuniweb\_war/WEB-INF*. If you have changed any other files (such as style sheets), also make backup copies of these files.
2. Download the Natural Web I/O Interface client for Sun Java System Application Server from Empower (<https://empower.softwareag.com/>) and unzip the contents to a directory of your choice on your hard disk.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the *nwo/<platform>/j2ee/v<nnnn>/sun-apps* directory from the installation medium to a directory of your choice on your hard disk.

3. On UNIX platforms: Dearchive the TAR file using the following command:

```
tar -xvf nwonnnn.tar
```

- 4 Edit the file `<sunas>/domains/domain1/config/server.policy` and make sure that the following setting has been defined:

```
grant {  
  permission java.util.logging.LoggingPermission "control";  
};
```



**Important:** This setting is required as of Natural Web I/O Interface Version 1.3.2. If this setting is missing, the resource adapter will not start and the Natural Web I/O Interface client will therefore be inoperative.

- 5 Make sure that the application server is running.
- 6 Open your web browser and enter the following URL:

```
http://<host>:<adminport>
```

This opens the Administration Console.

- 7 Undeploy the resource adapter `naturalunicode.rar`:
  1. Open the tree node **Resources > Connectors > Connector Connection Pools**.
  2. Mark the check box **Natpool** (or the check box for whatever name you specified previously).
  3. Choose **Delete**.
  4. Open the tree node **Applications > Connector Modules**.
  5. Mark the check box **naturalunicode**.
  6. Choose **Undeploy**.
- 8 Undeploy the enterprise application `natuniapp.ear`:
  1. Open the tree node **Applications > Enterprise Applications**.
  2. Mark the check box **natuniapp**.
  3. Choose **Undeploy**.
- 9 Deploy the resource adapter `naturalunicode.rar` as in a first-time installation.
- 10 Define the JNDI name for the resource adapter as in a first-time installation.
- 11 Deploy the enterprise application `natuniapp.ear` as in a first-time installation.
- 12 Copy your backup files back to the required places.
- 13 Restart the application server.

## Installation Verification

---

It is assumed that `http://<host>:<port>` is the URL of your application server.

### ▶ To verify the installation

- Enter the following URL in your web browser:

```
http://<host>:<port>/natuniweb/natural.jsp
```

For example:

```
http://myhost:8080/natuniweb/natural.jsp
```

The Natural Web I/O Interface client is now started in your browser. The entries which appear in the resulting logon page depend on the settings in your configuration file. For further information, see [Configuring the Client](#).

# 17 Installing the Natural Web I/O Interface Client on JBoss

## Application Server

---

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If you want to use the Natural Web I/O Interface client with JBoss Application Server, you must proceed as described in this chapter.

## Installation Steps

---

Only one version of the Natural Web I/O Interface client can be installed on the same JBoss Application Server.

You can either install the Natural Web I/O Interface client or Natural for Ajax on the same JBoss Application Server, not both.

It is assumed that `<jboss>` is the directory of your JBoss Application Server installation.

The following topics are covered below:

- [First-time Installation](#)
- [Update Installation](#)

### First-time Installation

#### ► To install the Natural Web I/O Interface client

- 1 Download the Natural Web I/O Interface client for JBoss Application Server from Empower (<https://empower.softwareag.com/>) and unzip the contents to a directory of your choice on your hard disk.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the `nwo/⟨platform⟩/j2ee/v⟨nnnn⟩/jboss` directory from the installation medium to a directory of your choice on your hard disk.

- 2 On UNIX platforms: Dearchive the TAR file using the following command:

```
tar -xvf nwo⟨nnnn⟩.tar
```

- 3 Install Apache Ant (you need Apache Ant to deploy the Natural Web I/O Interface client to the JBoss Application Server; see the [Prerequisites](#) above for the required version number):
  1. Download and unzip Apache Ant (from <http://ant.apache.org/>) into an installation directory of your choice. Avoid a directory name that contains blanks.
  2. Let the environment variable `ANT_HOME` point to the directory `<ant>` (where `<ant>` is the directory of your Ant installation).
  3. Add `<ant>/bin` to your `PATH` environment variable.

## 4 Deploy the Natural Web I/O Interface client to JBoss Application Server:

1. Copy the the Natural Web I/O Interface client distributables to a directory on a disk drive.
2. In the directory that contains the the Natural Web I/O Interface client distributables, there is an Ant script named *jbosdeploynwo.xml*. Edit this script and change the setting

```
<property name="jbossHome" value="C:/Program Files/Java/jboss-4.0.5"/>
```

to

```
<property name="jbossHome" value="<jboss>"/>
```

where *<jboss>* is your JBoss Application Server installation directory.



**Important:** Take care to use forward slashes (also on Windows) when specifying the directory path.

3. Execute the script *jbosdeploynwo.xml* by entering the following command:

```
ant -f jbosdeploynwo.xml
```

Wait for the message “BUILD SUCCESSFUL”. This indicates that the deployment was successful.

5 Edit the file *<jboss>/server/default/deploy/jbossjca-service.xml* and change the setting

```
<!-- Enable connection close debug monitoring -->
<attribute name="Debug">true</attribute>
```

to

```
<!-- Enable connection close debug monitoring -->
<attribute name="Debug">false</attribute>
```

6 JBoss Application Server 4.0.5 only: Edit the file *<jboss>/server/default/deploy/natuniapp.ear/natuniweb.war/WEB-INF/web.xml* and uncomment the section

```
<!--
Uncomment the next lines, in case the configuration tool is installed on a JBOSS
4.0.5.GA
<listener>

<listener-class>org.apache.myfaces.webapp.StartupServletContextListener</listener-class>
</listener>
-->
```

so that it looks as follows:

```
<listener>
<listener-class>org.apache.myfaces.webapp.StartupServletContextListener</listener-class>
</listener>
```



**Important:** For JBoss Application Server 4.2, you must not remove this comment.

- 7 Start JBoss Application Server.

## Update Installation

### ► To update the Natural Web I/O Interface client

- 1 Download the Natural Web I/O Interface client for JBoss Application Server from Empower (<https://empower.softwareag.com/>) and unzip the contents to a directory of your choice on your hard disk.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the `nwo/⟨platform⟩/j2ee/v⟨nnnn⟩/jboss` directory from the installation medium to a directory of your choice on your hard disk.

- 2 On UNIX platforms: Dearchive the TAR file using the following command:

```
tar -xvf nwo⟨nnnn⟩.tar
```

- 3 Shut down JBoss Application Server.
- 4 Deploy the Natural Web I/O Interface client to JBoss Application Server as in a first-time installation.
- 5 Make sure that the file `⟨jboss⟩/server/default/deploy/jbossjca-service.xml` contains the same settings as described for a first-time installation.
- 6 JBoss Application Server 4.0.5 only: Make sure that the file `⟨jboss⟩/server/default/deploy/natuniapp.ear/natuniweb.war/WEB-INF/web.xml` contains the same settings as described for a first-time installation.
- 7 Start JBoss Application Server.

## Installation Verification

---

It is assumed that `http://<host>:<port>` is the URL of your application server.

▶ **To verify the installation**

- Enter the following URL in your web browser:

```
http://<host>:<port>/natuniweb/natural.jsp
```

For example:

```
http://myhost:8080/natuniweb/natural.jsp
```

The Natural Web I/O Interface client is now started in your browser. The entries which appear in the resulting logon page depend on the settings in your configuration file. For further information, see [Configuring the Client](#).



# 18

## Installing the Natural Web I/O Interface Client on Microsoft Internet Information Services (IIS)

---

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If you want to use the Natural Web I/O Interface client with Microsoft Internet Information Services (IIS), you must proceed as described in this chapter.

## Installation Steps

---

The descriptions below apply when working with Windows XP. The procedure may be slightly different when working with a different Windows version.

The following topics are covered below:

- [First-time Installation](#)
- [Update Installation](#)

### First-time Installation

#### ▶ To install the Natural Web I/O Interface client

- 1 Download the Natural Web I/O Interface client for IIS from Empower (<https://empower.software-ag.com/>) and unzip the contents to a directory of your choice on your hard disk.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the `nwo/windows/iis/v<nnnn>` directory from the installation medium to a directory of your choice on your hard disk.

- 2 Open the Control Panel and choose **Administrative Tools > Internet Information Services**.
- 3 In the resulting window, expand the node with the name of your computer in the tree and select the node **Web Sites > Default Web Site**.
- 4 Open the context menu and choose **New > Virtual Directory**.

Or:

From the **Action** menu, choose **New > Virtual Directory**.

A wizard for creating a new virtual directory appears.

- 5 Choose the **Next** button to proceed to the next page of the wizard.
- 6 Enter an alias name for the virtual directory (for example, "Natural") and choose the **Next** button.



**Important:** If you want to use the Natural Execution and Debugging plug-in for Eclipse, the alias name for the virtual directory must be "Natural".

- 7 Enter the path to the directory which contains the files you have copied to your hard disk and choose the **Next** button.
- 8 Leave the access permissions with the default values (that is: **Read** and **Run script** are selected) and choose the **Next** button.
- 9 Choose the **Finish** button.

The virtual directory is now created on the IIS server.

- 10 Select the name of the new virtual directory in the tree.
- 11 Open the context menu and choose **Properties**.

Or:

From the **Action** menu, choose **New > Properties**.

- 12 In the resulting dialog box, choose the **ASP.NET** page. Select the ASP.NET version. It has to be at least 2.0.50727 (the release version of ASP.NET 2.0). Choose the **OK** button to close the dialog box.

## Update Installation

### ► To update the Natural Web I/O Interface client

- 1 On your hard disk, create a new directory for the update version that you want to install.
- 2 Download the Natural Web I/O Interface client for IIS from Empower (<https://empower.software-ag.com/>) and unzip the contents to the new directory.

Or:

Natural for UNIX, Natural for OpenVMS and Natural for Windows: Copy the complete contents of the *nwo/windows/iis/v<nnnn>* directory from the installation medium to a directory of your choice on your hard disk.

- 3 Open the Control Panel and choose **Administrative Tools > Internet Information Services**.
- 4 Open the properties for the existing virtual directory (for example, "Natural"). On the **Virtual Directory** page, change the path so that it points to the new directory which contains the update version.
- 5 Copy your *settings.xml* file from the directory which contains the previous version to the new directory (the *settings.xml* file is located in the root of your installation directory). If you have changed any other files (such as style sheets), also copy these files to the new directory.

## Installation Verification

---

It is assumed that `http://<host>:<port>` is the URL of your web server.

▶ **To verify the installation**

- When you have defined the alias name "Natural" in the IIS (see above), you can start the Natural Web I/O Interface client in the browser using the following URL:

Enter the following URL in your web browser:

```
http://<host>:<port>/Natural/Default.aspx
```

For example:

```
http://myhost:8080/Natural/Default.aspx
```

The Natural Web I/O Interface client is now started in your browser. The entries which appear in the resulting logon page depend on the settings in your configuration file. For further information, see [Configuring the Client](#).

# 19

## Configuring the Client

---

The information in this part not only applies to the Natural Web I/O Interface client, it also applies to Natural for Ajax which is also a client of the Natural Web I/O Interface server.

This part explains how to configure the client so that it can be used in a Natural runtime environment. The following topics are covered:

•	<a href="#">About the Logon Page</a>
•	<a href="#">Managing the Configuration File for the Session</a>
•	<a href="#">Using the Configuration Tool (J2EE only)</a>
•	<a href="#">Overview of Configuration File Elements</a>
•	<a href="#">Starting a Natural Application with a URL</a>
•	<a href="#">Using Style Sheets (J2EE only)</a>
•	<a href="#">Using Themes (IIS only)</a>
•	<a href="#">Configuring Security (J2EE only)</a>
•	<a href="#">Wrapping a Natural for Ajax Application as a Servlet</a>
•	<a href="#">Trust Files (J2EE only)</a>
•	<a href="#">Logging (J2EE only)</a>



# 20

## About the Logon Page

---

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- Examples of Logon Pages ..... 124
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- Browser Restrictions ..... 128

When you start the Natural Web I/O Interface client or Natural for Ajax in the browser, a logon page appears. The entries in this logon page depend on the settings in your configuration file (see [Managing the Configuration File for the Session](#)).

## Starting a Natural Application from the Logon Page

---

In order to start a Natural application from the logon page, you enter one of the URLs listed below inside your browser. Different names and locations are used for the logon pages, depending on the application/web server and the type of client that you are using.

### ■ J2EE Server

For the Natural Web I/O Interface client, you have to enter the following URL:

```
http://<host>:<port>/natuniweb/natural.jsp
```

For Natural for Ajax, you have to enter the following URL:

```
http://<host>:<port>/cisnatural/servlet/StartCISPage?PAGEURL=/cisnatural/NatLogon.html
```

### ■ Microsoft Internet Information Services (IIS)

This web server can only be used with the Natural Web I/O Interface client. You have to enter the following URL:

```
http://<host>:<port>/Natural/Default.aspx
```

where *<host>* and *<port>* are the host name and port number of your application/web server.

## Examples of Logon Pages

---

For each session definition that has been configured in the configuration file, an entry appears on the logon page. If the user selects the corresponding entry, only those parameters that were not preconfigured in the configuration file need to be specified in the logon page in order to start the application. Usually, you will preconfigure all connection parameters except user name and password.

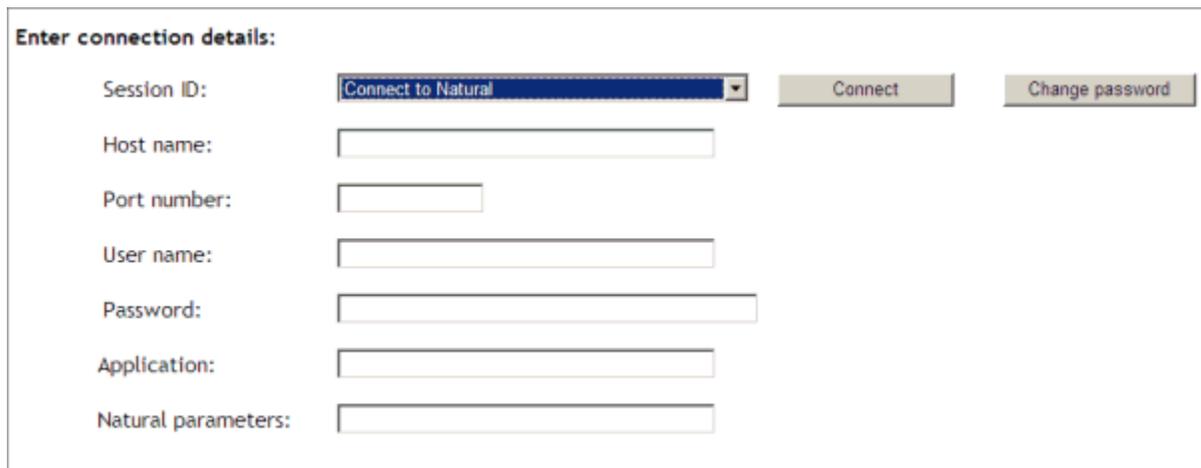
The look of the logon page depends on the type of client that you are using.

- [Natural Web I/O Interface Client](#)

- Natural for Ajax

## Natural Web I/O Interface Client

The following example shows part of a logon page which results from a configuration file in which no special entries are defined for a session:



Enter connection details:

Session ID:

Host name:

Port number:

User name:

Password:

Application:

Natural parameters:

The following example shows part of a logon page which results from a configuration file in which many settings are already predefined (including user ID and password):



Enter connection details:

Session ID:

To log on to a session, you have to specify all required information in the logon page (for example, you select a session from the corresponding drop-down list box). When you choose the **Connect** button, the screen for the selected session appears.

### Natural for Ajax

The following example shows part of a logon page which results from a configuration file in which no special entries are defined for a session:

The screenshot shows a web form with two main sections. The first section, titled "Connection Details", contains a dropdown menu for "Session ID" with the selected option "Connect to Natural". Below this are input fields for "Host name", "Port number", "User name", "Password", "Application", and "Natural parameters". The second section, titled "Change Password", contains input fields for "New password" and "Repeat new password". At the bottom of the form is a "Connect" button.

The following example shows part of a logon page which results from a configuration file in which many settings are already predefined (including user ID and password):

The screenshot shows a web form with one main section titled "Connection Details". It features a dropdown menu for "Session ID" with the selected option "Demo Application (localhost:2900)". Below the dropdown is a "Connect" button.

To log on to a session, you have to specify all required information in the logon page (for example, you select a session from the corresponding drop-down list box). When you choose the **Connect** button, the screen for the selected session appears.

---

## Changing the Password in the Logon Page

---

Currently, this functionality is only available for Natural for UNIX, Natural for OpenVMS and Natural for Windows.

The following information applies when the fields for entering a user ID and a password appear on the logon page. These fields do not appear when user ID and password have already been defined in the configuration file; in this case, it is not possible to change the password in the logon page.

When your password has expired, you are automatically asked for a new password. When you try to log on with your current password, an error message appears and input fields for changing the password are shown.

### ▶ To change the password with the Natural Web I/O Interface client

- 1 Choose the **Change password** button in the logon page.

The name of this button changes to **Don't change password** and the following two input fields are shown in the logon page:

- **New password**
- **Repeat new password**

- 2 Enter your user ID and your current password as usual.
- 3 Enter the new password in the two input fields.
- 4 Choose the **Connect** button to change the password.

Or:

If you do not want to change your password, choose the **Don't change password** button. The two input fields will then disappear.

### ▶ To change the password with Natural for Ajax

- 1 Click the title **Change Password** to show the content of this input area.

The following two input fields are shown in the logon page:

- **New password**
- **Repeat new password**

- 2 Enter your user ID and your current password as usual.

- 3 Enter the new password in the two input fields.
- 4 Choose the **Connect** button to change the password.

## Browser Restrictions

---

The browser's "Back" and "Forward" buttons do not work with the two types of clients and should therefore not be used.

If you want to run two Natural sessions in parallel, you have to start a new instance of the browser (for example, by choosing the corresponding icon in the Quick Launch toolbar of Windows). You must not use the browser's "New Window" function. This would result in one session running in two browsers, which is not allowed.

# 21

## Managing the Configuration File for the Session

---

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The configuration file is required to define the sessions that can be invoked from the logon page.

## General Information

---

The session configurations are stored in an XML file. They can be created in the following ways:

- When the Natural Web I/O Interface client or Natural for Ajax has been installed on a J2EE server, you can use the configuration tool. Using this tool has the advantage that it is not possible for you to create invalid XML code and thus damage the XML file. See [Using the Configuration Tool](#) for further information.
- You can edit the XML file manually. See [Overview of Configuration File Elements](#).

When the Natural Web I/O Interface client has been installed on IIS, this is the only way to change the XML file.

## Name and Location of the Configuration File

---

Different names and locations are used for the configuration files, depending on the application/web server that you are using.

### ■ J2EE Server

The name of the configuration file is *sessions.xml*. It can be found in the *WEB-INF* directory. The path to this directory depends on the application server and the type of client that you are using.

#### ■ JBoss Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>server/default/deploy/natuniapp.ear/natuniweb.war/WEB-INF
```

Natural for Ajax:

```
<application-server-install-dir>/server/default/deploy/njx<nnn>.ear/cisnatural.war/WEB-INF
```

#### ■ Sun Java System Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>/domains/domain1/applications/j2ee-apps/natuniapp/natuni-web_war/WEB-INF
```

Natural for Ajax:

*<application-server-install-dir>/domains/domain1/applications/j2e-apps/njx<nnn>.ear/cisnatural\_war/WEB-INF*

■ **Microsoft Internet Information Services (IIS)**

Natural Web I/O Interface client only.

The name of the configuration file is *settings.xml*. It can be found in the root directory of your application in IIS.



# 22

## Using the Configuration Tool (J2EE only)

---

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The Natural Web I/O Interface client and Natural for Ajax both offer a configuration tool. The configuration tool is used to create the session configurations which are then available in the logon page. It can also be used for logging purposes in case of problems; however, this should only be done when requested by Software AG support.

Two different versions of the configuration tool are available, one for the Natural Web I/O Interface client and another for Natural for Ajax. The configuration tool is automatically installed when you install the Natural Web I/O Interface client or Natural for Ajax on a J2EE server.

## Invoking the Configuration Tool

---

The URL with which you invoke the configuration tool determines the configuration files that are to be managed. You can either manage the configuration files for the Natural Web I/O Interface client or for Natural for Ajax.

### ▶ To invoke the configuration tool

- Enter the following URL in browser, depending on the type of client that you are using:

- Natural Web I/O Interface client:

```
http://<host>:<port>/natuniweb/conf_index.jsp
```

- Natural for Ajax:

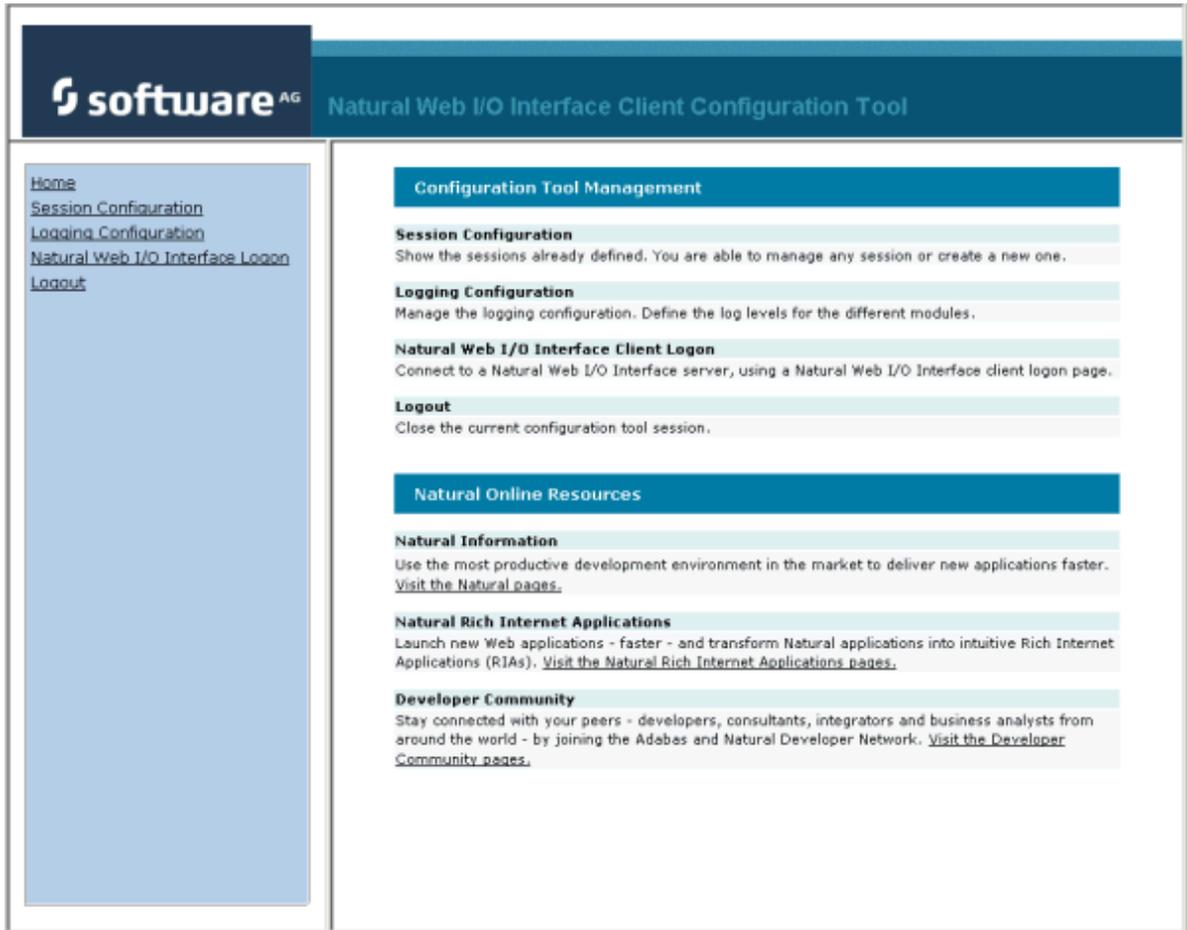
```
http://<host>:<port>/cisnatural/conf_index.jsp
```

where *<host>* and *<port>* are the host name and port number of your application server.



**Note:** You might wish to protect the configuration tool against unauthorized access. See [Configuring Security](#) for information on how to restrict the access to sensitive areas of the application server environment. If you have restricted access to the configuration tool, an authentication dialog appears. The appearance of this dialog depends on the authentication model you have chosen.

The configuration tool appears. Example for the Natural Web I/O Interface client:



The configuration tool has two frames.

The home page of the configuration tool is initially shown in the right frame. It provides brief descriptions for the links provided in the left frame. It also provides links to several Software AG pages on the web.

When you have invoked a function (for example, when you are currently viewing the session configuration), you can always choose the **Home** link in the left frame to return to the home page of the configuration tool.

The functions that are invoked by the other links in the left frame are described below.



**Note:** With Natural for Ajax, an additional link for invoking the Natural for Ajax logon page is provided in the left frame.

## Session Configuration

---

This section explains how to manage the content of the configuration file for the sessions.

- [Invoking the Session Configuration Page](#)
- [Global Settings](#)
- [Adding a New Session](#)
- [Editing a Session](#)
- [Overview of Session Options](#)
- [Duplicating a Session](#)
- [Deleting a Session](#)
- [Adding a New User](#)
- [Saving the Configuration](#)

### Invoking the Session Configuration Page

The content of the configuration file for the sessions is managed using the **Session Configuration** page.

#### ▶ To invoke the Session Configuration page

- In the frame on the left, choose the **Session Configuration** link.

The **Session Configuration** page appears in the right frame. It shows the global settings and lists all sessions and users that are currently defined. For a session, some of the configuration file information is shown. Example:

## Session Configuration

### Global Settings

Last activity timeout (n seconds):

Trace directory:

SSL trust file path:

SSL trust file password:

### Sessions

Session ID	Host Name	Port Number	Application	Natural Parameters	Edit	Duplicate	Delete
Connect to Natural					<a href="#">Edit</a>	<a href="#">Duplicate</a>	<a href="#">Delete</a>
localtestserver	localhost	6640			<a href="#">Edit</a>	<a href="#">Duplicate</a>	<a href="#">Delete</a>

### Users

User ID	Edit	Duplicate	Delete
user1	<a href="#">Edit</a>	<a href="#">Duplicate</a>	<a href="#">Delete</a>

## Global Settings

The global settings apply for all defined sessions. You can define the following global settings in the configuration file:

Option	Description
<b>Last activity timeout (n seconds)</b>	<p>Timeout after the last activity of the user in seconds. The default is 3600 seconds (1 hour). When the defined number of seconds has been reached, the session is closed.</p> <p>You can also set an individual timeout value for each session (see <a href="#">Overview of Session Options</a> below).</p>
<b>Trace directory</b>	<p>Optional. Location of a different trace directory.</p> <p>When a different trace directory is not defined, the trace files are written to the default trace directory. For further information, see <a href="#">Tracing</a>.</p> <p>Tracing can be enabled individually for each session (see <a href="#">Overview of Session Options</a> below). However, it should only be enabled when requested by Software AG support.</p>

Option	Description
SSL trust file path	Optional. The path to your trust file. See <a href="#">Trust Files (J2EE only)</a> for further information.
SSL trust file password	If your trust file is password-protected, you have to specify the appropriate password.  When you do not specify the password for a password-protected trust file, the trust file cannot be opened and it is thus not possible to open an SSL session.  When your trust file is not password-protected, you should not specify a password.

## Adding a New Session

You can add a new session to the configuration file.

### ▶ To add a new session

- 1 Choose the **Add New Session** button.

The **Edit Session** page appears.

- 2 Specify all required information as described below in the section [Overview of Session Options](#).
- 3 Choose the **OK** button to return to the **Session Configuration** page.

The new session is not yet available in the configuration file.

- 4 Choose the **Save Configuration** button to write the new session to the configuration file.

## Editing a Session

You can edit any existing session in the configuration file.

### ▶ To edit a session

- 1 Choose the **Edit** link that is shown next to the session that you want to edit.

The **Edit Session** page appears.

- 2 Specify all required information as described below in the section [Overview of Session Options](#).
- 3 Choose the **OK** button to return to the **Session Configuration** page.

The modifications are not yet available in the configuration file.

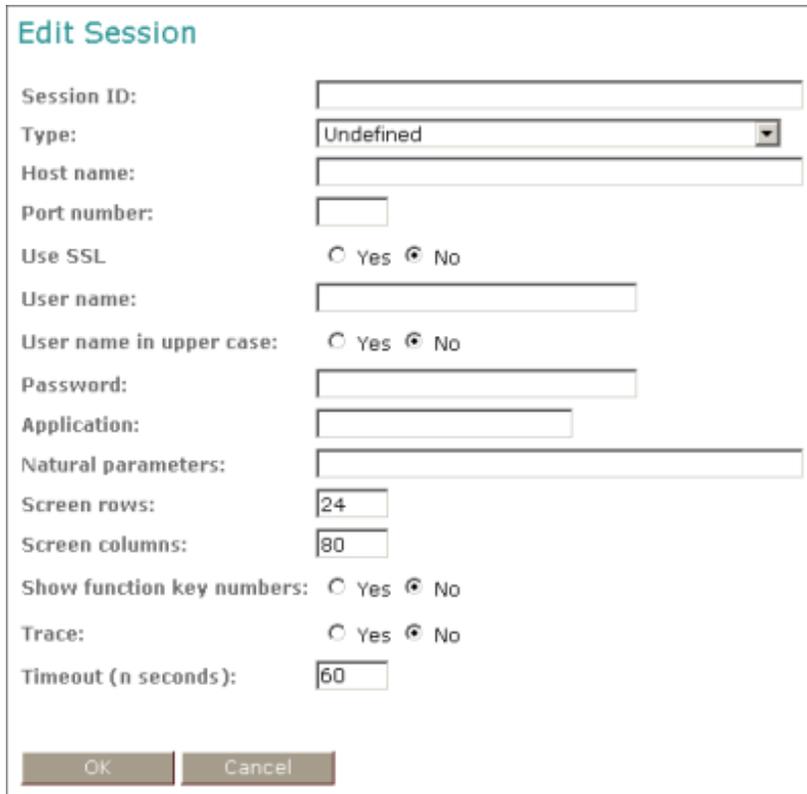
- 4 Choose the **Save Configuration** button to write the modifications to the configuration file.

## Overview of Session Options

The **Edit Session** page appears when you

- **add** a new session, or
- **edit** an existing session.

Example for the Natural Web I/O Interface client:



The screenshot shows a dialog box titled "Edit Session" with the following fields and options:

- Session ID:
- Type:
- Host name:
- Port number:
- Use SSL:  Yes  No
- User name:
- User name in upper case:  Yes  No
- Password:
- Application:
- Natural parameters:
- Screen rows:
- Screen columns:
- Show function key numbers:  Yes  No
- Trace:  Yes  No
- Timeout (n seconds):

At the bottom, there are two buttons: "OK" and "Cancel".

With Natural for Ajax, more options are provided on the **Edit Session** page:

**Note:** If you need to set the protocol version for the Natural Web I/O Interface (which is only required for older Natural versions), you have to do this manually in the configuration file. See the description of the `protocol` attribute in the section [Overview of Configuration File Elements](#).

The **Edit Session** page provides the following options:

Option	Description
Session ID	Mandatory. A session name of your choice. On the logon page, the session name is provided in a drop-down list box.

Option	Description
<b>Type</b>	<p>The platform on which user ID and password are authenticated. You can select the required setting from the drop-down list box.</p> <ul style="list-style-type: none"> <li>■ <b>Undefined</b> Default. User ID and password can have a maximum of 32 characters. See also the description for Natural for Windows, UNIX or OpenVMS below.</li> <li>■ <b>Natural for Mainframes</b> User ID and password can have a maximum of 8 characters.</li> <li>■ <b>Natural for Mainframes with Natural Security</b> User ID and password can have a maximum of 8 characters. The user ID must comply with the Natural naming conventions for library names.</li> <li>■ <b>Natural for Windows, UNIX or OpenVMS</b> User ID and password can have a maximum of 32 characters. When a domain is required, you have to specify it together with the user ID (in the form "<i>domain\user-ID</i>").</li> </ul>
<b>Show style sheet selector</b>	<p>Natural for Ajax only.</p> <p>With Natural for Ajax, the users can switch to another style sheet during a running session. If set to <b>No</b>, the users are no longer able to select another style sheet.</p>
<b>Style sheet</b>	<p>Natural for Ajax only.</p> <p>The name of the style sheet which determines the colors, fonts and PF key button style of the current session. See <a href="#">Using Style Sheets</a>. When this element is specified, a fixed style sheet is used. In this case, the corresponding field does not appear on the logon page and the user is thus not able to select a different style sheet.</p>
<b>Host name</b>	<p>The name or TCP/IP address of the server on which Natural and the Natural Web I/O Interface server are running. When this is specified, the corresponding field does not appear on the logon page.</p>
<b>Port number</b>	<p>The TCP/IP port number on which the Natural Web I/O Interface server is listening. When this is specified, the corresponding field does not appear on the logon page.</p>
<b>Use SSL</b>	<p>If set to <b>Yes</b>, a secure connection is established between the Natural Web I/O Interface client or Natural for Ajax on the application server and the Natural Web I/O Interface server.</p> <p><b>Important:</b> If you want to use SSL with Natural for Mainframes, one of the corresponding mainframe types must be selected; the type must not be <b>Undefined</b> or <b>Natural for Windows, UNIX or OpenVMS</b>. The other way around, if you want to use SSL with Natural for Windows, UNIX or OpenVMS, you must not select one of the mainframe types; the type may also be <b>Undefined</b> in this case.</p>
<b>User name</b>	<p>Optional. A valid user ID for the current machine. When this is specified, the corresponding field does not appear on the logon page.</p>
<b>User name in upper case</b>	<p>If set to <b>Yes</b>, the input field for the user ID is in upper-case mode.</p>

Option	Description
<b>Password</b>	<p>Optional. A valid password for the above user ID. When this is specified, the corresponding field does not appear on the logon page.</p> <p>The configuration tool saves the password in encrypted form.</p>
<b>Save user credentials</b>	<p>Natural for Ajax only. Applies only to applications that are designed as Application Designer workplaces.</p> <p>If set to <b>Yes</b> (default), the default behavior of the option <b>Share session user</b> applies.</p> <p>If set to <b>No</b>, the user credentials (user ID and password) are not saved in the Application Designer session and are therefore not available for an Application Designer subsession.</p> <p>An example for a workplace application is available under the following URL:</p> <p><i>http://&lt;host&gt;:&lt;port&gt;/cisnatural/servlet/StartCISPage?PAGEURL=/njxdemos/wpworkplace.html</i></p> <p>where <i>&lt;host&gt;</i> and <i>&lt;port&gt;</i> are the host name and port number of your application server.</p>
<b>Share session user</b>	<p>Natural for Ajax only. Applies only to applications that are designed as Application Designer workplaces.</p> <p>If set to <b>No</b> (default), the user credentials of the main Application Designer session are automatically used in an Application Designer subsession if the server and port of the subsession is the same as in the main session. If the server and port are not the same, the user has to specify the user ID and password in a logon dialog.</p> <p>If set to <b>Yes</b>, the user credentials of the Application Designer main session are always used for all Application Designer subsessions on all involved servers - even if the server and port are different.</p>
<b>Application</b>	<ul style="list-style-type: none"> <li>■ <b>Natural for Mainframes</b> The name of the Natural program or a command sequence that starts your application as you would enter it on the NEXT prompt. Example:  TEST01 data1,data2</li> <li>■ <b>Natural for UNIX</b> The name of the UNIX shell script for starting the Natural application (a file similar to <i>nwo.sh</i>).</li> <li>■ <b>Natural for OpenVMS</b> The name of the Natural image file (for example, <i>natural&lt;version&gt;</i> or <i>natural&lt;version&gt;.exe</i>).</li> <li>■ <b>Natural for Windows</b> The name of the Windows command file (<i>.bat</i>) for starting the Natural application.</li> </ul> <p>When this is specified, the corresponding field does not appear on the logon page.</p>
<b>Natural parameters</b>	<p>Optional. Parameters for starting the Natural application. This can be stack parameters, a parameter file/module or other Natural-specific information.</p>

Option	Description
	<ul style="list-style-type: none"> <li>■ <b>Natural for Mainframes</b> Used to pass dynamic Natural profile parameters to the session, for example:  SYSPARM=(MYPARMS) STACK=(LOGON MYAPPL)  <b>Note:</b> It is recommended to specify the Natural program that starts the application with the option <b>Application</b> instead of passing it with the profile parameter STACK.</li> <li>■ <b>Natural for UNIX and Natural for Windows</b> Used when the above shell script (UNIX) or command file (Windows) uses the parameter \$5 after "natural", for example:  PARM=MYPARM STACK=(LOGON MYLIB;MENU)</li> <li>■ <b>Natural for OpenVMS</b> Used for starting a Natural application, for example:  BP=BPnode-name NLDCHK WEBIO=ON "STACK=(LOGON SYSEXT;MENU)"</li> </ul>
<b>Language</b>	<p>Natural for Ajax only.</p> <p>You can select the required language from the drop-down list box. See also <i>Multi Language Management</i> in the <i>Natural for Ajax</i> documentation. Default: English.</p>
<b>Double-click behavior</b>	<p>Natural for Ajax only. Applies only to Natural maps, not to rich GUI pages.</p> <p>The key that is to be simulated when double-clicking an output field. By default, this is the ENTER key.</p> <p>It is possible to disable the double-click behavior, or to define a function key (PF1 through PF12).</p> <p>You can select the required setting from the drop-down list box.</p> <p><b>Tip:</b> When context-sensitive help has been defined for the output fields, it may be useful to define PF1. The help function will then be invoked when the user double-clicks an output field.</p>
<b>PF keys display style</b>	<p>Natural for Ajax only. Applies only to Natural maps, not to rich GUI pages.</p> <p>By default, only the named function keys are shown as buttons.</p> <p>It is also possible to show buttons for all function keys, including those which do not have names. You can specify whether to display buttons for 12, 24, 36 or 48 function keys. Each line always contains 12 function key buttons. The first line also contains a button for the ENTER key. Each function key button is always displayed at the same position.</p> <p>You can select the required setting from the drop-down list box.</p>
<b>Screen rows</b>	<p>Applies only to Natural maps, not to rich GUI pages.</p> <p>The number of rows in the output window. Possible values: minimum 24, no upper limit. Default: 24.</p>

Option	Description
	Not used by Natural for Mainframes which uses the profile parameter <code>TMODEL</code> instead.
<b>Screen columns</b>	Applies only to Natural maps, not to rich GUI pages. The number of columns in the output window. Possible values: minimum 80, no upper limit. Default: 80. Not used by Natural for Mainframes which uses the profile parameter <code>TMODEL</code> instead.
<b>Show function key numbers</b>	Applies only to Natural maps, not to rich GUI pages. If set to <b>Yes</b> , the PF key numbers are shown next to the PF keys.
<b>Trace</b>	Should only be set to <b>Yes</b> when requested by Software AG support. For further information, see <a href="#">Tracing</a> .
<b>Timeout (n seconds)</b>	The number of seconds that the client waits for an answer from Natural after an update of a page was sent to Natural. The default is 60 seconds. Normally, you need not change this default value.

## Duplicating a Session

You can add a copy of any existing session to the configuration file.

### ▶ To duplicate a session

- 1 Choose the **Duplicate** link that is shown next to the session that you want to duplicate.  
A new entry is shown at the bottom of the list of sessions. Its name is "Copy of *session-ID*". The duplicated session is not yet available in the configuration file.
- 2 **Edit** and save the duplicated session as described above.

## Deleting a Session

You can delete any existing session from the configuration file.

### ▶ To delete a session

- 1 Choose the **Delete** link that is shown next to the session that you want to delete.  
The session is deleted from the list of sessions. It is not yet deleted in the configuration file.
- 2 Choose the **Save Configuration** button to delete the session from the configuration file.

## Adding a New User

You can predefine Natural users and their passwords in the configuration file.

When a Natural page is opened with a URL that specifies a user in the URL parameter `natuser`, the specified user is matched against the list of users in the configuration file. When the specified user is defined in the configuration file, the corresponding password is used to authenticate the user when the Natural session is started. See also [Starting a Natural Application with a URL](#).

Example - when the following URL is used, the password defined for "user1" is used:

- **Natural Web I/O Interface Client**

*http://myhost:8080/natuniweb/natural.jsp?natuser=user1...*

- **Natural for Ajax**

*http://myhost:8080/cisnatural/servlet/StartCISPage?PAGEURL=/cisnatural/NatLogon.html&xciParameters.natuser=user1 ...*



**Note:** With Natural for Ajax, the URL parameters have the prefix `xciParameters`.

### ▶ To add a new user

- 1 Choose the **Add New User** button.

The **Edit User** page appears.

- 2 Specify a user name and password
- 3 Choose the **OK** button to return to the **Session Configuration** page.

The new user is not yet available in the configuration file.

- 4 Choose the **Save Configuration** button to write the new user to the configuration file.



**Note:** You edit, duplicate and delete a user in the same way as a session (see the corresponding descriptions above).

## Saving the Configuration

When you choose the **Save Configuration** button, all of your changes are written to the configuration file. The server picks up the new settings automatically the next time it reads data from the configuration file.



**Caution:** If you do not choose the **Save Configuration** button but logout instead or leave the configuration tool by entering another URL, the new settings are not written to the configuration file.

## Logging Configuration

---

The content of the configuration file for logging is managed using the **Logging Configuration** page. See the section *Logging (J2EE only)* for detailed information.

## Logon Page

---

The configuration tool provides one or both of the following links in the left frame, depending on the type of client that you are using:

- **Natural Web I/O Interface Logon**
- **Natural for Ajax Logon** (not available with the configuration tool for the Natural Web I/O Interface client)

Each of these links opens the corresponding logon page in the right frame.

The logon page uses the current settings in the configuration file. When you select a session from the drop-down list box, you can check whether the connection details are shown as desired. If not, you can go back to the session configuration and modify the settings of the corresponding session.

See also *About the Logon Page*.

## Logout

---

When the configuration tool is protected against unauthorized access and you log out of the configuration tool, you make sure that no other user can change the client configuration when you leave your PC unattended for a while.

### ▶ To log out

- In the frame on the left, choose the **Logout** link.

When the configuration tool is protected against unauthorized access, the authentication dialog is shown again.

When it is not protected, the home page is shown again.

# 23 Overview of Configuration File Elements

---

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## Contents of the Configuration File

By default, the configuration file is delivered with the following entries, depending on the type of client that you are using:

### ■ Natural Web I/O Interface Client

```
<?xml version="1.0" encoding="utf-8" ?>
<settings>
  <global>
    <last_activity_timeout>3600</last_activity_timeout>
  </global>
  <sessions>
    <session id="Connect to Natural" trace="false">
      </session>
    <session id="localtestserver" trace="false">
      <natural_server>localhost</natural_server>
      <natural_port>6640</natural_port>
      <natural_program/>
      <user id="" pwd=""/>
      <natural_parameter/>
    </session>
  </sessions>
</settings>
```

### ■ Natural for Ajax

```
<?xml version="1.0" encoding="utf-8" ?>
<settings>
  <global>
    <last_activity_timeout>3600</last_activity_timeout>
  </global>
  <sessions>
    <session id="Connect to Natural" trace="false">
      </session>
    <session id="Natural for Ajax Examples (UNIX)" trace="false">
      <natural_server>127.0.0.1</natural_server>
      <natural_port>2800</natural_port>
      <natural_program>nwo.sh</natural_program>
      <natural_parameter>STACK=(LOGON SYSEXNJK;MENU-NJX)</natural_parameter>
    </session>
    <session id="Natural for Ajax Examples (Windows)" trace="false">
      <natural_server>127.0.0.1</natural_server>
      <natural_port>2900</natural_port>
      <natural_program>nwo.bat</natural_program>
      <natural_parameter>STACK=(LOGON SYSEXNJK;MENU-NJX)</natural_parameter>
    </session>
    <session id="Natural for Ajax Examples (Mainframe)" trace="false">
```

```

        <natural_server>myhost</natural_server>
        <natural_port>4711</natural_port>
        <natural_program>MENU-NJX</natural_program>
        <natural_parameter>STACK=(LOGON SYSEXNJX)</natural_parameter>
    </session>
    <session id="Local" trace="false">
        <natural_program>nwo.bat</natural_program>
    </session>
    <session id="127.0.0.1" trace="false">
        <natural_program>nwo.bat</natural_program>
    </session>
    <session id="Session template" trace="false">
        <natural_server></natural_server>
        <natural_port></natural_port>
        <natural_program></natural_program>
        <user id="" pwd="" />
        <natural_parameter></natural_parameter>
    </session>
</sessions>
</settings>

```



**Note:** With Natural for Mainframes, it is recommended to specify the Natural program that starts the application in the element `natural_program` instead of passing it with the profile parameter `STACK`.

The first session that is defined in the configuration file has the name "Connect to Natural". This session is automatically preselected in the logon page. Since no further elements are defined for this session, all required input fields for logging on to a session are shown on the logon page and the user has to specify all required information.



**Note:** The `global` section containing the timeout value is only available in a J2EE configuration file. See also [Setting the Timeout](#).

To add a new session definition to the configuration file, you must add a new `session` element. It should have the following minimum entries:

```

<session id="your-session-name" trace="false">
    <natural_server>your-Natural-server</natural_server>
    <natural_port>port-ID-of-Natural-server</natural_port>
    <natural_program>Natural-program-name</natural_program>
</session>

```

## Sessions

The following table explains the elements and attributes that can be used in the `sessions` section of the configuration file for adding a new session.

Element Name	Attribute Name	Description
session	id	Mandatory. A session name of your choice. On the logon page, the session name is provided in a drop-down list box.
session	type	<p>Optional. The platform on which user ID and password are authenticated. Possible values:</p> <ul style="list-style-type: none"> <li>■ <b>MF</b> Natural for Mainframes. User ID and password can have a maximum of 8 characters.</li> <li>■ <b>MF-NSC</b> Natural for Mainframes with Natural Security. User ID and password can have a maximum of 8 characters. The user ID must comply with the Natural naming conventions for library names.</li> <li>■ <b>OS</b> Natural for UNIX, Natural for OpenVMS or Natural for Windows: User ID and password can have a maximum of 32 characters. When a domain is required, you have to specify it together with the user ID (in the form <code>"domain\user-ID"</code>).</li> </ul> <p>Default: "OS".</p>
session	protocol	<p>Optional. The current protocol version for the Natural Web I/O Interface is 6. The latest Natural versions automatically use the appropriate protocol version. For older Natural versions, it is required to define the appropriate protocol version in the configuration file:</p> <ul style="list-style-type: none"> <li>■ Natural versions 6.2.1 through 6.2.4 (UNIX) require protocol version 2.  As of version 6.2.5 it is no longer required to define a protocol version.</li> <li>■ Natural versions 6.3.1 and 6.3.2 (UNIX) require protocol version 3.  As of version 6.3.3, it is no longer required to define a protocol version.</li> <li>■ Natural versions up to version 4.2.3.2 (mainframe) require protocol version 3.</li> </ul>

Element Name	Attribute Name	Description
		<p>As of version 4.2.3.3 and 4.2.4, it is no longer required to define a protocol version.</p> <p>Possible values: 2, 3, 4, 5 and 6. Default: 6.</p>
session	ssl	<p>J2EE only.</p> <p>Optional. If set to "true", a secure connection is established between the Natural Web I/O Interface client or Natural for Ajax on the application server and the Natural Web I/O Interface server.</p> <p><b>Important:</b> If you want to use SSL with Natural for Mainframes, the type "MF" or "MF-NSC" must be defined; the type must not be "OS". The other way around, if you want to use SSL with Natural for Windows, UNIX or OpenVMS, the type must be "OS".</p> <p>Default: "false".</p>
session	trace	<p>Optional. Should only be set to "true" when requested by Software AG support. For further information, see <a href="#">Tracing</a>.</p> <p>Default: "false".</p>
session	savesessionuser	<p>Natural for Ajax only. Applies only to applications that are designed as Application Designer workplaces.</p> <p>If set to "true" (default), the default behavior of <code>sharesessionuser</code> applies.</p> <p>If set to "false", the user credentials (user ID and password) are not saved in the Application Designer session and are therefore not available for an Application Designer subsession.</p> <p>An example for a workplace application is available under the following URL:</p> <p><code>http://&lt;host&gt;:&lt;port&gt;/cisnatural/servlet/StartCISPage?PAGEURL=/njxdemos/wpworkplace.html</code></p> <p>where <code>&lt;host&gt;</code> and <code>&lt;port&gt;</code> are the host name and port number of your application server.</p> <p>Default: "true".</p>
session	sharesessionuser	<p>Natural for Ajax only. Applies only to applications that are designed as Application Designer workplaces.</p> <p>If set to "false" (default), the user credentials of the main Application Designer session are automatically used in an Application Designer subsession if the server and port of the subsession is the same as in the main session. If the server and</p>

Element Name	Attribute Name	Description
		<p>port are not the same, the user has to specify the user ID and password in a logon dialog.</p> <p>If set to "true", the user credentials of the Application Designer main session are always used for all Application Designer subsessions on all involved servers - even if the server and port are different.</p> <p>Default: "false".</p>
user	id	Optional. A valid user ID for the current machine. When this attribute is specified, the corresponding field does not appear on the logon page.
user	pwd	Optional. A valid password for the above user ID. When this attribute is specified, the corresponding field does not appear on the logon page.
user	encrypted	J2EE only. Used by the configuration tool which stores the password in encrypted form.
user	ucase	Optional. If set to "true", the input field for the user ID is in upper-case mode. Default: "false".
natural_server		The name or TCP/IP address of the server on which Natural and the Natural Web I/O Interface daemon (Natural for UNIX and Natural for OpenVMS) or the Natural Web I/O Interface server (Natural for Mainframes) or the Natural Web I/O Interface service (Natural for Windows) are running. When this element is specified, the corresponding field does not appear on the logon page.
natural_port		The TCP/IP port number on which the Natural Web I/O Interface daemon (Natural for UNIX and Natural for OpenVMS) or the Natural Web I/O Interface server (Natural for Mainframes) or the Natural Web I/O Interface service (Natural for Windows) is listening. When this element is specified, the corresponding field does not appear on the logon page.
natural_program		<p>■ <b>Natural for Mainframes</b> The name of the Natural program or a command sequence that starts your application as you would enter it on the NEXT prompt. Example:  TEST01 data1,data2</p>

Element Name	Attribute Name	Description
		<ul style="list-style-type: none"> <li>■ <b>Natural for UNIX</b> The name of the UNIX shell script for starting the Natural application (a file similar to <i>nwo.sh</i>).</li> <li>■ <b>Natural for OpenVMS</b> The name of the Natural image file (for example, <i>natural&lt;version&gt;</i> or <i>natural&lt;version&gt;.exe</i>).</li> <li>■ <b>Natural for Windows</b> The name of the Windows command file (<i>.bat</i>) for starting the Natural application.</li> </ul> <p>When this element is specified, the corresponding field does not appear on the logon page.</p>
natural_parameter		<p>Optional. Parameters for starting the Natural application. This can be stack parameters, a parameter file/module or other Natural-specific information.</p> <ul style="list-style-type: none"> <li>■ <b>Natural for Mainframes</b> This element is used to pass dynamic Natural profile parameters to the session, for example:  <code>SYSPARM=(MYPARMS) STACK=(LOGON MYAPPL)</code>  <b>Note:</b> It is recommended to specify the Natural program that starts the application in the element <code>natural_program</code> instead of passing it with the profile parameter <code>STACK</code>.</li> <li>■ <b>Natural for UNIX and Natural for Windows</b> This element is used when the above shell script (UNIX) or command file (Windows) uses the parameter <code>\$5</code> after "natural", for example:  <code>PARM=MYPARM STACK=(LOGON MYLIB;MENU)</code></li> <li>■ <b>Natural for OpenVMS</b> This element is used for starting a Natural application, for example:  <code>BP=BPnode-name NLDCHK WEBIO=ON "STACK=(LOGON SYSEXT;MENU)"</code></li> </ul>
natural_parameter	visible	<p>IIS only.</p> <p>If set to "true", a field containing the Natural parameters is shown on the logon page.</p> <p>Default: "false".</p>
language		Natural for Ajax only.

Element Name	Attribute Name	Description
		<p>Sets the language to be used. You can specify a one-character code which corresponds to one of the language codes which can be set in the Natural system variable *LANGUAGE. See also <i>Multi Language Management</i> in the <i>Natural for Ajax</i> documentation.</p> <p>Default: English.</p>
double_click		<p>Natural for Ajax only. Applies only to Natural maps, not to rich GUI pages.</p> <p>The key that is to be simulated when double-clicking an output field. Possible values:</p> <ul style="list-style-type: none"> <li>■ "50" for the ENTER key (default).</li> <li>■ "1" through "12" for PF1 through PF12.</li> <li>■ "disabled" to disable the double-click behavior.</li> </ul> <p><b>Tip:</b> When context-sensitive help has been defined for the output fields, it may be useful to define PF1. The help function will then be invoked when the user double-clicks an output field.</p>
pfkeys_display		<p>Natural for Ajax only. Applies only to Natural maps, not to rich GUI pages.</p> <p>The number of PF keys that are to be shown as buttons. Possible values:</p> <ul style="list-style-type: none"> <li>■ "0": only the named function keys are shown (default).</li> <li>■ "1": the function keys PF1 through PF12 are shown.</li> <li>■ "2": the function keys PF1 through PF24 are shown.</li> <li>■ "3": the function keys PF1 through PF36 are shown.</li> <li>■ "4": the function keys PF1 through PF48 are shown.</li> </ul> <p>The values "1" through "4" always shows buttons for all function keys, including those which do not have names. Each line always contains 12 function key buttons. The first line also contains a button for the ENTER key. Each function key button is always displayed at the same position.</p>
nattimeout		<p>J2EE only.</p> <p>Optional. Timeout for the response from the host. See <a href="#">Setting the Timeout</a>.</p>
theme		<p>IIS only.</p> <p>The theme (style) that the web page is using. For a first test, you can use the theme with the name "3270Theme" (see <a href="#">Using</a></p>

Element Name	Attribute Name	Description
		<i>Themes (IIS only)</i> ). When this element is specified, the corresponding field does not appear on the logon page. When themes are shown on the logon page, they are provided in a drop-down list box.
style_sheet		<p>Natural for Ajax only.</p> <p>The name of the style sheet which determines the colors, fonts and PF key button style of the current session. See <i>Using Style Sheets</i>.</p> <p>When this element is specified, a fixed style sheet is used. In this case, the corresponding field does not appear on the logon page and the user is thus not able to select a different style sheet.</p> <p>Default: natural.css.</p>
screen	styleselect	<p>Natural for Ajax only.</p> <p>With Natural for Ajax, the users can switch to another style sheet during a running session.</p> <p>Optional. If set to "false", the users are no longer able to select another style sheet.</p> <p>Default: "true".</p>
screen	rows	<p>Applies only to Natural maps, not to rich GUI pages.</p> <p>Optional. The number of rows in the output window. Possible values: minimum 24, no upper limit. Default: 24.</p> <p>Not used by Natural for Mainframes which uses the profile parameter TMODEL instead.</p>
screen	columns	<p>Applies only to Natural maps, not to rich GUI pages.</p> <p>Optional. The number of columns in the output window. Possible values: minimum 80, no upper limit. Default: 80.</p> <p>Not used by Natural for Mainframes which uses the profile parameter TMODEL instead.</p>
screen	top	<p>IIS only.</p> <p>The top position of the output window inside the browser. Use "0" for the very top. This value is given in Natural units, not pixels.</p>
screen	left	IIS only.

Element Name	Attribute Name	Description
		The left position of the output window inside the browser. Use "0" for the very left. This value is given in Natural units, not pixels.
screen	size	IIS only.  The size of the output window. Possible values: "normal", "small", "tiny" and "extratiny". Default: "normal".
screen	pfkeypos	IIS only.  The position of the PF keys. Possible values: "bottom" and "right". Default: "bottom".  <b>Note:</b> For J2EE, the position of the PF keys is determined in the style sheet. See <a href="#">Using Style Sheets</a> .
screen	showfkeynumbers	Applies only to Natural maps, not to rich GUI pages.  Optional. If set to "true", the PF key numbers are shown next to the PF keys.  Default: "false".

If a field is not to appear on the logon page, you can specify the corresponding element or attribute as described above. To do so, you either specify a value for the attribute or element or you omit the value. For example, you can specify either of the following:

```
<natural_program></natural_program>
```

or

```
<natural_program>sysprof</natural_program>
```

In both cases, the corresponding field does not appear on the logon page.

Only when an element name or attribute name is not mentioned at all, the corresponding field is shown on the logon page.

## Global Settings

The following table explains the global settings that can be defined in the `global` section of the configuration file.

Element	Description
<code>last_activity_timeout</code>	The timeout after the last activity of the user. See <a href="#">Setting the Timeout (J2EE only)</a> below.
<code>trace_dir</code>	Optional. Location of a different trace directory. See <a href="#">Tracing</a> below.
<code>trustfile_name</code>	J2EE only. Optional. The path to your trust file. See <a href="#">Trust Files (J2EE only)</a> for further information.
<code>trustfile_password</code>	J2EE only. If your trust file is password-protected, the appropriate password is required. The password can only be specified with the <a href="#">configuration tool</a> . It is stored in encrypted form.

### Setting the Timeout (J2EE only)

You can set two different timeouts:

#### ■ Last activity timeout

This is the timeout after the last activity of the user. It is defined with `last_activity_timeout` in the `global` section of the configuration file and is set in seconds. The default is 3600 seconds (1 hour). When the defined number of seconds has been reached, the session is closed.

```
<?xml version="1.0" encoding="utf-8"?>
<settings>
  <global>
    <last_activity_timeout>3600</last_activity_timeout>
  </global>
  <sessions>
    ...
```

#### ■ Natural server timeout

This timeout defines the number of seconds that the client waits for an answer from Natural after an update of a page was sent to Natural. It is defined in the `nattimeout` element of a session definition. The default is 60 seconds. Normally, you need not change this default value. This timeout can be set individually for each session.

```
...
  <session id="Test (UNIX)" trace="false">
    <natural_server>Myserver2</natural_server>
    <natural_port>4321</natural_port>
    <natural_program>test.sh</natural_program>
    <nattimeout>60</nattimeout>
  </session>
...
```

## Tracing

Tracing should only be enabled when requested by Software AG support. To enable tracing, you set the `trace` attribute in a session definition to "true". Example:

```
<session id="MySession" trace="true">
```

### Default Trace Directory for J2EE

By default, the trace files are written to the directory which has been set by the Java property `java.io.tmpdir`. On Windows, this is normally the environment variable `TMP` for the user who started the application server. On UNIX, this is normally `/tmp` or `/var/tmp`.

You can also set this property in the start script for the application server. The following examples apply to JBoss.

- Example for Windows (*run.bat*):

```
set JAVA_OPTS=%JAVA_OPTS% -Djava.io.tmpdir=C:\temp
```

- Example for UNIX (*run.sh*):

```
set JAVA_OPTS="$JAVA_OPTS -Djava.io.tmpdir=/tmp
```

### Default Trace Directory for IIS

By default, the trace files are written to the *Software AG\Natural WebIO\Traces* directory. The path to this directory depends on the operating system:

- **Windows XP**

```
<drive>:\Documents and Settings\<pc-name>\ASPNET\Local Settings\Application Data\Software AG\Natural WebIO\Traces
```

### ■ Windows 2003 Server

```
<drive>:\Documents and Settings\Default User\Application Data\Software AG\Natural
WebIO\Traces
```

### ■ Windows Vista

```
<drive>:\Windows\ServiceProfiles\NetworkService\AppData\Local\Software AG\Natural
WebIO\Traces
```

## Defining a Different Trace Directory

It is possible to define a different trace directory by defining the element `trace_dir` in the `global` element of the configuration file. Example:

```
<global>
  <trace_dir>E:\mytracedir</trace_dir>
</global>
```

When a different trace directory is not defined, the default trace directory will be used.

## Users and Passwords

It is possible to predefine Natural users and their passwords. This is done in the `users` section of the configuration file.

The syntax is as follows:

```
<settings>
  ...
  <users>
    <user id="user1" pwd="password1"/>
    <user id="user2" pwd="password2"/>
    <user id="user3" pwd="password3"/>
  </users>
  ...
</settings>
```

When a Natural page is opened with a URL that specifies a user in the URL parameter `natuser`, the specified user is matched against the list of users in the configuration file. When the specified user is defined in the configuration file, the corresponding password is used to authenticate the user when the Natural session is started. See also [Starting a Natural Application with a URL](#).

### Example

When the following URL is used, the password defined for "user1" is used (which is "password1" in the above syntax example):

■ **Natural Web I/O Interface Client**

*http://myhost:8080/natuniweb/natural.jsp?natuser=user1...*

■ **Natural for Ajax**

*http://myhost:8080/cisnatural/servlet/StartCISPage?PAGEURL=/cisnatural/NatLogon.html&xciParameters.natuser=user1 ...*



**Note:** With Natural for Ajax, the URL parameters have the prefix `xciParameters`.

# 24 Starting a Natural Application with a URL

---

The connection parameters available in the configuration file for the session and on the logon page can also be specified as URL parameters of the logon page URL. This allows bookmarking the startup URL of a Natural application or starting an application by clicking a hyperlink in a document.

With Natural for Ajax, the URL parameters have the prefix `xciParameters` (for example, `xciParameters.natsession`).

The URL parameters overrule the definitions in the configuration file, with the exception described below.

The following URL parameters are available for the logon page:

URL Parameter	Corresponding Option in the Session Configuration
<code>natsession</code>	<b>Session ID</b>
<code>natserver</code>	<b>Host name</b>
<code>natport</code>	<b>Port number</b>
<code>natuser</code>	<b>User name</b>
<code>natprog</code>	<b>Application</b>
<code>natparam</code>	<b>Natural parameters</b>
<code>natparamext</code>	<b>Natural parameters</b>  The URL parameter <code>natparamext</code> extends an existing Natural parameter definition in the configuration file. The extension works in the following way: the Natural parameters defined in the configuration file come first. Then, the Natural parameters defined in the URL parameter <code>natparamext</code> are added, separated by a space character.  If you want to overrule the definition in the configuration file, use the URL parameter <code>natparam</code> instead.
<code>nattimeout</code>	<b>Timeout (n seconds)</b>

URL Parameter	Corresponding Option in the Session Configuration
savesessionuser	<b>Save user credentials</b> (Natural for Ajax only)
sharesessionuser	<b>Share session user</b> (Natural for Ajax only)

 **Important:** All parameter values must be URL-encoded.

### Example for the Natural Web I/O Interface Client

In order to start the Natural program `dump`, while your application server is running on `myhost:8080` and your Natural Web I/O Interface server is running on `myserver1:4811`, you can use the following URL:

`http://myhost:8080/natuniweb/natural.jsp?natserver=myserver1&natport=4811&natprog=dump&natuser=my-username`

### Example for Natural for Ajax

In order to start the Natural program `MENU-NJX` from the library `SYSEXNJX`, while your application server is running on `myappserver:4711`, your Natural Web I/O Interface server is running on `mywebio:4712`, and the name of the Natural startup script is `nwo.sh`, you can use the following URL:

`http://myappserver:4711/cisnatural/servlet/StartCISPage?PAGEURL=%2Fcisnatural%2FNatLogon.html&xcParameters.natserver=mywebio&xcParameters.natprog=nwo.sh&xcParameters.natport=4712&xcParameters.natparam=stack%3D%28logon+SYSEXNJX%3BMENU-NJX%3Bfin%29`

# 25

## Using Style Sheets (J2EE only)

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The font, the color and the representation of the PF keys is controlled by a style sheet (CSS file).

The Natural Web I/O Interface client is delivered with the style sheet *3270.css*.

Natural for Ajax is delivered with a number of predefined style sheets. The default style sheet is *natural.css*.

For more information on style sheets, see <http://www.w3.org/Style/CSS/>.

## Location of the Style Sheets

---

The location of the style sheets depends on the application server and type of client that you are using.

### ■ JBoss Application Server

Natural Web I/O Interface client:

```
../natuniapp.ear/natuniweb.war/resources
```

Natural for Ajax:

```
../njax<nn>.ear/cisnatural.war/resources
```

### ■ Sun Java System Application Server

Natural Web I/O Interface client:

```
../j2ee-apps/natuniapp/natuniweb_war/resources
```

Natural for Ajax:

```
../j2ee-apps/njax<nn>.ear/cisnatural_war/resources
```

where *<nn>* is the current Natural for Ajax version.

## Editing the Style Sheets

---

It is recommended that you have a basic understanding of CSS files.

You can edit the predefined style sheets or create your own style sheets.

It is recommended that you work with backup copies. When a problem occurs with your style sheet, you can thus always revert to the original state.

To see your changes in the browser, you have to

1. delete the browser's cache, and
2. restart the session.

## Switching to Another Style Sheet During the Session

This feature is available with Natural for Ajax only.

If enabled in the configuration file for the session, a user can switch to another style sheet during a running session. In this case, the user can open the **Style Sheet** control in the output screen.



To switch to another style sheet, the user has to select it from the drop-down list box and then choose the **Apply** button.

## Modifying the Position of the Main Output and of the PF Keys

Applies when only the named PF keys are displayed. This feature cannot be used when all PF keys are displayed, since they are always displayed at the same position. See also [Overview of Session Options](#).

The following elements are available:

Element Name	Description
#mainlayer	Controls the position of the main output in the output window.
#pfkeydiv	Controls the position of the PF keys in the output window.

If the PF keys are to appear at the bottom, define these two elements as shown in the following example:

```
#mainlayer {
  top: 0px;
  left: 0px;
  height: 600px;
}

#pfkeydiv {
  top: 610px;
  left: 0px;
```

```
width: 100%;  
height: 100px;  
}
```

If the PF keys are to appear at the left, define these two elements as shown in the following example:

```
#mainlayer {  
    top: 0px;  
    left: 100px;  
    height: 600px;  
}  
  
#pfkeydiv {  
    top: 0px;  
    left: 0px;  
    width: 100px;  
    height: 600px;  
}
```

Predefined sample CSS files are also provided in which the PF keys are defined to appear at the right or at the top.

## Modifying the Font Size

---

Depending on the screen resolution, one of the following style sheets for defining the font size is used in addition to the default style sheet:

- *model2.css*
- *model3.css*
- *model4.css*
- *model5.css*

These style sheets are located in the *tmodels* subdirectory of the *resources* directory in which all style sheets are located.

Depending on what comes closest to the standard 3270 screen model, the corresponding style sheet from the *tmodels* subdirectory is automatically used. It is selected according to the following criteria:

Standard 3270 Screen Model	Criteria	Style Sheet
Model 2 (80x24)	30 rows or less.	<i>model2.css</i>
Model 3 (80x32)	Between 31 and 40 rows.	<i>model3.css</i>
Model 4 (80x43)	41 rows or more.	<i>model4.css</i>
Model 5 (132x27)	30 rows or less, and more than 100 columns.	<i>model5.css</i>

The font sizes in the above style sheets can be adjusted. Example for *model4.css*:

```
body {
    font-size: 10px;
}
```

The default font sizes for the above 3270 screen models are:

Standard 3270 Screen Model	Default Font Size
Model 2	18px
Model 3	14px
Model 4	10px
Model 5	12px

When you modify the font size in one of the above style sheets, it is recommended that you also adjust the font width multiplication factor in the following JavaScript files:

- *natunicript-ie.js* (for Internet Explorer)
- *natunicript-ff.js* (for Firefox)

These JavaScript files are located in the *scripts* directory which can be found in the directory which also contains the *resources* directory.

You enter the font width multiplication factors in the definitions of the variables `FONT_WIDTH_MULT_MOD2` to `FONT_WIDTH_MULT_MOD5`. The following example shows the default values:

```
var FONT_WIDTH_MULT_MOD2 = 0.612;  
var FONT_WIDTH_MULT_MOD3 = 0.573;  
var FONT_WIDTH_MULT_MOD4 = 0.600;  
var FONT_WIDTH_MULT_MOD5 = 0.586;
```

The following table shows the multiplication factors that should be used for the default font "Courier New":

Font Size	Multiplication Factor
9px	0.557
10px	0.60
11px	0.635
12px	0.586
13px	0.615
14px	0.572
15px	0.60
16px	0.625
17px	0.589
18px	0.612
19px	0.579
20px	0.600
21px	0.619
22px	0.591
23px	0.608
24px	0.584

## Modifying the Font Type

---

As a rule, you should only use monospace fonts such as Courier New or Lucida Console. With these fonts, all characters have the same width. Otherwise, when using variable-width fonts, the output will appear deformed.

If you want to define a different font type, you should define the same font type for the body, the output fields and the input fields as shown in the following example:

```
body {
  background-color: #F3F5F0;
  font-family: Lucida Console;
}

.OutputField {
  white-space:pre;
  border-width:0;
  font-family: Lucida Console;
  font-size: 100%;
}

.InputField {
  background-color: white;
  font-family: Lucida Console;
  border-width: 1px;
  font-size: 100%;
  border-color: #A7A9AB;
}
```

## Defining Underlined and Blinking Text

The following elements are available:

Element Name	Description
.natTextDecoUnderline	Defines underlined text.
.natTextDecoBlinking	Defines blinking text.
.natTextDecoNormal	Defines normal text (no underline, no blinking).

Example:

```
/* Text decoration */
.natTextDecoUnderline { text-decoration:underline; }
.natTextDecoBlinking {text-decoration:blink; }
.natTextDecoNormal {text-decoration:normal;}
```

Blinking text is not supported by the Internet Explorer.

## Defining Italic Text

---

The following elements are available:

Element Name	Description
<code>.natFontStyleItalic</code>	Defines italic text.
<code>.natFontStyleNormal</code>	Defines normal text (no italics).

Example:

```
/* font style */
.natFontStyleItalic {font-style:italic;}
.natFontStyleNormal {font-style:normal;}
```

## Defining Bold Text

---

The following elements are available:

Element Name	Description
<code>.natFontWeightBold</code>	Defines bold text.
<code>.natFontWeightNormal</code>	Defines normal text (not bold).

```
/* Font weight */
.natFontWeightBold {font-weight:bolder}
.natFontWeightNormal {font-weight:normal;}
```

## Defining Different Styles for Output Fields

The following elements are available:

Element Name	Description
.FieldVariableBased	Defines the style for output fields that are based on a variable.
.FieldLiteralBased	Defines the style for output fields that are based on a literal.

Example:

```
.FieldVariableBased {
    /* font-style:italic; */
}

.FieldLiteralBased {
    /* font-style:normal; */
}
```



**Note:** In the above example, as well as in the standard CSS files delivered by Software AG, the variable-based output fields are defined as italic, but are commented out.

## Modifying the Natural Windows

The following elements are available:

Element Name	Description
.naturalwindow	Controls the rendering of the Natural windows.
.wintitle	Controls the rendering of the titles of the Natural windows.

Example:

```
.naturalwindow {
    border-style: solid;
    border-width: 1px;
    border-color: white;
    background-color: black;
}

.wintitle {
    left: 0px;
    top: 1px;
}
```

```
height: 17px;
width: 100%;
color: black;
font-size: 100%;
font-weight: bold;
background-color: white;
text-align: center;
font-family: Verdana;
border-bottom-style: solid;
border-bottom-width: 2px;
}
```

 **Note:** In a mainframe environment, you have to set the Natural profile parameter `WEBIO` accordingly to enable this feature. See *WEBIO - Web I/O Interface Screen Rendering* in the *Parameter Reference* which is provided with Natural for Mainframes.

## Modifying the Message Line

---

The rendering of the message line is controlled by the `.MessageLine` element.

Example:

```
.MessageLine {
  color: blue;
}
```

 **Note:** In a mainframe environment, you have to set the Natural profile parameter `WEBIO` accordingly to enable this feature. See *WEBIO - Web I/O Interface Screen Rendering* in the *Parameter Reference* which is provided with Natural for Mainframes.

## Modifying the Background Color

---

The background color is defined in the `body` element.

Example:

```
body {  
    background-color: #F3F5F0;  
    font-family: Lucida Console;  
}
```

## Modifying the Color Attributes

---

You can define different colors for all Natural color attributes. These are:

Red  
Green  
Blue  
Yellow  
White  
Black  
Pink  
Turquoise  
Transparent

You can define these color attributes for input fields and output fields, and for normal output and reverse video.

The following examples show how to define the color attribute “Red”.

Define the color for a normal output field:

```
.natOutputRed {color: darkred;}
```

Define the foreground and background colors for an output field with reverse video:

```
.reverseOutputRed {background-color: darkred; color:#F3F5F0;}
```

Define the color for a normal input field:

```
.natInputRed {color: darkred;}
```

Define the foreground and background colors for an input field with reverse video:

```
.reverseInputRed {background-color: darkred; color:#F3F5F0;}
```

## Modifying the Style of the PF Key Buttons

---

The following elements are available:

Element Name	Description
.PFButton	Controls the style for normal rendering.
.PFButton:hover	Controls the style that is used when the mouse hovers over a PF key button.

Example:

```
.PFButton {  
  text-align: center;  
  width: 90px;  
  border-style: ridge;  
  border-width: 3px;  
  padding: 2px;  
  text-decoration: none;  
  font-family: Verdana;  
  font-size: 12px;  
  height: 22px;  
}  
  
.PFButton:hover {  
  color: #FFFFF0;  
  background-color: #222222;  
}
```



**Note:** In a mainframe environment, you have to set the Natural profile parameter `WEBIO` accordingly to enable this feature. See *WEBIO - Web I/O Interface Screen Rendering in the Parameter Reference* which is provided with Natural for Mainframes.

# 26

## Using Themes (IIS only)

---

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The information in this chapter applies only to Microsoft Internet Information Services (IIS).

Themes are used to define the output style for the Natural application. Some themes are already delivered in the installation package.

Themes are standard functionality in ASP.NET 2.0. They must be contained in the *App\_Themes* folder. For each theme, the *App\_Themes* folder contains a subfolder. For example, the theme with the name "3270Thema" is contained in the folder *3270Theme*.

Each subfolder which is provided for a theme must contain the following files:

- *SkinFile.skin* (see below)
- *StyleSheet.css* (see below)

## The Skin File

---

The skin file (*SkinFile.skin*) contains entries for Natural elements (such as fields) in the following form:

```
<asp:Label SkinId="Red" runat="server" forecolor="red" />
<asp:Label SkinId="Green" runat="server" forecolor="green" />
<asp:Label SkinId="Blue" runat="server" forecolor="blue" />
...
```

The table below shows the minimum settings that are required in the skin file to map the Natural screen in the Natural Web I/O Interface. This table contains the following columns:

- **Natural Attributes**  
The attributes that can be set in Natural.
- **Output Fields**  
The Natural output fields for text.
- **Input Fields**  
The Natural fields in which you can enter data.
- **Read-only Input Fields**  
When a window is displayed on a Natural screen, the input fields in the main screen are set to read-only. The input fields of the windows that are lying behind the top window are also displayed as read-only.

Natural Attributes	Output Fields	Input Fields	Read-only Input Fields
Red	<code>&lt;asp:Label runat="server" SkinId="Red"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Red"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="RedReadOnly"/&gt;</code>
Green	<code>&lt;asp:Label runat="server" SkinId="Green"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Green"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="GreenReadOnly"/&gt;</code>
Blue	<code>&lt;asp:Label runat="server" SkinId="Blue"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Blue"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="BlueReadOnly"/&gt;</code>
Pink	<code>&lt;asp:Label runat="server" SkinId="Pink"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Pink"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="PinkReadOnly"/&gt;</code>
Yellow	<code>&lt;asp:Label runat="server" SkinId="Yellow"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Yellow"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="YellowReadOnly"/&gt;</code>
Turquoise	<code>&lt;asp:Label runat="server" SkinId="Turquoise"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Turquoise"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="TurquoiseReadOnly"/&gt;</code>
White	<code>&lt;asp:Label runat="server" SkinId="White"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="White"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="WhiteReadOnly"/&gt;</code>
Black	<code>&lt;asp:Label runat="server" SkinId="Black"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Black"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="BlackReadOnly"/&gt;</code>
Intensified	<code>&lt;asp:Label runat="server" SkinId="Intensified"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Intensified"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="IntensifiedReadOnly"/&gt;</code>
No attribute	<code>&lt;asp:Label runat="server" SkinId="Normal"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="Normal"/&gt;</code>	<code>&lt;asp:TextBox runat="server" SkinId="NormalReadOnly"/&gt;</code>

The information in the cells of the above table shows the settings of the ASP.NET web server controls. ASP.NET defines a lot of web server controls. The attribute `runat="server"` indicates that the web controls are interpreted at the server site.

The following controls are used in the default skin files:

Control	Description
asp:Label	A text output field.
asp:TextBox	A text input field.
asp:Table	A table where the field elements are the PF key buttons.
asp:Button	A PF key button.
asp:Image	An image link.
asp:Panel	A container for other web controls.

In addition to defining colors as shown above, the `SkinId` is also used to define the following:

Natural Element	Description	ASP.NET Skin File
Message line	Information text line in the Natural screen.	<code>&lt;asp:Label runat="server" SkinId="messageline"/&gt;</code>
Child window	The child windows of a Natural application.	<code>&lt;asp:Panel runat="server" SkinId="WindowPanel"/&gt;</code>
Child window title	The title of a Natural child window.	<code>&lt;asp:TextBox runat="server" SkinId="WindowTitle"/&gt;</code>
Child window shadow	The child window is shown with a shadow.	<code>&lt;asp:Panel runat="server" SkinId="WinShadow"/&gt;</code>
PF key table	The row of PF key buttons is defined in a table.	<code>&lt;asp:Table runat="server" SkinId="PFKeys"/&gt;</code>
PF key button	The definition of the PF keys.	<code>&lt;asp:Button runat="server" SkinId="Pfkey"/&gt;</code>
Head picture	Picture displayed at the top of the page.	<code>&lt;asp:Image runat="server" SkinId="headpic"/&gt;</code>

## The Style Sheet

In the style sheet (*StyleSheet.css*), you can define styles according to the CSS standard. See <http://www.w3.org/Style/CSS/>.

---

The following is an example style sheet which defines the background color and font of the web page:

```
body
{
background-color: transparent;
font-family: Courier New, Monospace;
}
```



**Note:** If you define the font size in a CSS file, this has no influence on the screen size. If the font size is changed, only smaller text is displayed.



# 27

## Configuring Security (J2EE only)

---

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The Natural Web I/O Interface client and Natural for Ajax come as standard J2EE applications. For the ease of installation, the access to these applications is by default not secured. You might, however, wish to restrict the access to certain parts of these applications to certain users. An important example is the **configuration tool**, which enables you to modify the Natural session definitions and the logging configuration of the Natural Web I/O Interface client and of Natural for Ajax. Other examples are the Application Designer development workplace contained in Natural for Ajax or the Natural logon page.

This chapter does not cover the concepts of J2EE security in full extent. It provides, however, sufficient information to activate the preconfigured security settings of the Natural Web I/O Interface client and of Natural for Ajax and to adapt them to your requirements. More information on the topics described in this chapter can be found, for instance, at <http://www.jboss.org/jbossas/docs/> (security on JBoss is described in the *Configuration Guide*) or <http://java.sun.com/j2ee/1.4/docs/tutorial/doc/index.html> (see the chapter on security).

## Name and Location of the Configuration File

---

Security is configured in the file *web.xml*. The path to this file depends on the application server and the type of client that you are using.

### ■ JBoss Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>server/default/deploy/natuniapp.ear/natuniweb.war/WEB-INF
```

Natural for Ajax:

```
<application-server-install-dir>/server/default/deploy/njx<nn>.ear/cisnatural.war/WEB-INF
```

### ■ Sun Java System Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>/domains/domain1/applications/j2ee-apps/natuniapp/natuniweb_war/WEB-INF
```

Natural for Ajax:

```
<application-server-install-dir>/server/domains/domain1/applications/j2ee-apps/njx<nn>/cisnatural_war/WEB-INF
```

## Activating Security

Great care must be taken when editing and changing the configuration file *web.xml*. After a change, the application server must be restarted.

Edit the file *web.xml* and look for the section that is commented with "Uncomment the next lines to add security constraints and roles.". Uncomment this section by removing the comment marks shown in boldface below:

```
<!-- Uncomment the next lines to add security constraints and roles. -->
<!--
<security-constraint>
  <web-resource-collection>
    <web-resource-name>Configuration Tool</web-resource-name>
    <url-pattern>/conf_index.jsp</url-pattern>
    <url-pattern>/faces/*</url-pattern>
  </web-resource-collection>
  ...
<security-role>
  <description>Administrator</description>
  <role-name>nwoadmin</role-name>
</security-role>
-->
```

## Defining Security Constraints

The security constraints defined by default are just examples. A `<security-constraint>` element contains of a number of `<web-resource-collection>` elements combined with an `<auth-constraint>` element. The `<auth-constraint>` element contains a `<role-name>`. The whole `<security-constraint>` element describes which roles have access to the specified resources.

**Example** - the following definition specifies that only users in the role "nwoadmin" have access to the configuration tool:

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>Configuration Tool</web-resource-name>
    <url-pattern>/conf_index.jsp</url-pattern>
    <url-pattern>/faces/*</url-pattern>
  </web-resource-collection>
  <auth-constraint>
    <role-name>nwoadmin</role-name>
  </auth-constraint>
</security-constraint>
```

In the following section, you will see where and how the roles are defined.

## Defining Roles

---

A few lines below in the file *web.xml*, there is a section `<security-role>`. Here, the roles that can be used in `<security-constraint>` elements are defined. You can define additional roles as needed. The assignment of users to roles is done outside this file and will often be done in a user management that is already established at your site.

Example:

```
<security-role>
  <description>Administrator</description>
  <role-name>nwoadmin</role-name>
</security-role>
```

## Selecting the Authentication Method

---

In the file *web.xml*, there is a section `<login-config>`. The only element that should possibly be adapted here is `<auth-method>`. You can choose between the authentication methods "FORM" and "BASIC". Form-based authentication displays a specific page on which users who try to access a restricted resource can authenticate themselves. Basic authentication advises the web browser to retrieve the user credentials with its own dialog box.

Example:

```
<login-config>
  <auth-method>FORM</auth-method>
  ...
</login-config>
```

## Choosing the Login Module (JBoss Application Server only)

---

In the directory `<application-server-install-dir>/server/default/conf`, there is a file named *njxnwo-login-config.xml*. The relevant part in this file is the selection of the login module specified in the `<login-module>` element and the configuration of this login module. The login module determines where the user definitions and the assignment of users to roles is maintained.

By default, the `UsersRolesLoginModule` is preconfigured. The `UsersRolesLoginModule` expects the role definitions in one file (*props/njxnwo-roles.properties*) and the user definitions (password

and assignment to roles in another file (*props/njxnwo-users.properties*). An example user "admin" with the password "adminadmin" and the role "nwoadmin" is defined to begin with.

You can choose and configure a different login module, for instance, one that expects the user and role definitions in a database or in an LDAP directory, or even write a custom login module.

More information on using JBoss login modules is provided at <http://www.jboss.org/jbossas/docs/> (see the *Configuration Guide*).

## Defining the Security Realm and Users (Sun Java System Application Server only)

The following information applies to Sun Java System Application Server 9.1, however, the procedure is similar in other versions.

### ▶ To create a new security realm and define the user

- 1 Open the tree node **Configuration > Security > Realms**.
- 2 Choose **New**.
- 3 Enter "NaturalWebIOAndAjaxRealm" as the name of the new realm.
- 4 Select `com.sun.enterprise.security.auth.realm.file.FileRealm` as the class name.

Use the following properties which are predefined for this class:

Option	Value
JAAS Context	fileRealm
Key File	<code>\${com.sun.aas.instanceRoot}/config/keyfile</code>

- 5 Choose **OK**.
- 6 Edit the new realm `NaturalWebIOAndAjaxRealm` and choose the **Manage Users** button.
- 7 Choose **New**.
- 8 Enter the user names and the passwords for the users. The name of the group list must be "nwoadmin".
- 9 Choose **OK**.



# 28

## Wrapping a Natural for Ajax Application as a Servlet

---

In a production environment, it is inconvenient to start an application with a URL such as the following:

```
http://myappserver:4711/cisnatural/servlet/StartCISPage?PAGEURL=%2Fcisnatural%2FNatLogon.html&xciParameters.natserver=mywebio&xciParameters.natprog=nwo.sh&xciParameters.natport=4712&xciParameters.natparam=stack%3D%28logon+SYSEXNJX%3BMENU-NJX%3BFIN%29
```

The URL can be shortened by defining a corresponding session profile in the [configuration tool](#). For example:

```
http://myappserver:4711/cisnatural/servlet/StartCISPage?PAGEURL=%2Fcisnatural%2FNatLogon.html&xciParameters.natsession=DemoApplication
```

However, this shortened URL is still not practical for security reasons because end users should not be allowed to access the generic servlet `StartCISPage`.

When you define a dedicated servlet for each application, you can easily define the security constraints for each application in the file `web.xml` (for further information on this file, see [Configuring Security](#)). With the servlet `com.softwareag.cis.server.StartCISPageWithParams`, you define a wrapper servlet for a given Natural for Ajax application so that the application can later be invoked with a URL such as the following:

```
http://myappserver:4711/cisnatural/servlet/DemoApplication
```

The following example shows how you define an application as a servlet in the file *web.xml*.

```
<servlet id="DemoApplication">
  <servlet-name>DemoApplication</servlet-name>
  <display-name>DemoApplication</display-name>
  <servlet-class>com.softwareag.cis.server.StartCISPageWithParams</servlet-class>
  <load-on-startup>1</load-on-startup>
  <init-param id="OVERWRITE">
    <param-name>OVERWRITE</param-name>
    <param-value>>false</param-value>
  </init-param>
  <init-param id="PAGEURL">
    <param-name>PAGEURL</param-name>
    <param-value>/cisnatural/NatLogon.html</param-value>
  </init-param>
  <init-param id="xciParameters.natsession">
    <param-name>xciParameters.natsession</param-name>
    <param-value>Local</param-value>
  </init-param>
  <init-param id="xciParameters.natserver">
    <param-name>xciParameters.natserver</param-name>
    <param-value>localhost</param-value>
  </init-param>
  <init-param id="xciParameters.natport">
    <param-name>xciParameters.natport</param-name>
    <param-value>2900</param-value>
  </init-param>
  <init-param id="xciParameters.natparamext">
    <param-name>xciParameters.natparamext</param-name>
    <param-value>STACK=(LOGON SYSEXNJX;MENU-NJX;FIN)</param-value>
  </init-param>
</servlet>
```

You can omit the parameters `xciParameters.natserver`, `xciParameters.natport` and `xciParameters.natparamext` if the corresponding values are defined in the session definition that is referenced in `xciParameters.natsession`. This is the recommended way, because the settings can thus be changed in the configuration tool at any time without the need to adapt the file *web.xml*.

To complete the definition, you define a corresponding servlet mapping in the file *web.xml*:

```
<servlet-mapping>
  <servlet-name>DemoApplication</servlet-name>
  <url-pattern>/servlet/DemoApplication</url-pattern>
</servlet-mapping>
```

As the last step, you exchange the servlet class `com.softwareag.cis.server.StartCISPage` with a different servlet class, namely `com.softwareag.cis.server.StartCISPageInSession`. This servlet class cannot be called directly; it can only be called in an Application Designer session which is

already active. Therefore, each attempt to start an arbitrary - not wrapped - application by just building a URL based on `StartCISPage` will result in an error message.

To exchange the servlet class, you change the following in the file `web.xml`

```
<servlet id="StartCISPage">
  <servlet-name>StartCISPage</servlet-name>
  <display-name>StartCISPage</display-name>
  <servlet-class>com.softwareag.cis.server.StartCISPage</servlet-class>
  <load-on-startup>1</load-on-startup>
</servlet>
```

to

```
<servlet id="StartCISPage">
  <servlet-name>StartCISPage</servlet-name>
  <display-name>StartCISPage</display-name>
  <servlet-class>com.softwareag.cis.server.StartCISPageInSession</servlet-class>
  <load-on-startup>1</load-on-startup>
</servlet>
```

For a workplace application (see *Working with Workplaces* in the *Natural for Ajax* documentation), the definition looks slightly different. You do not define the start-up page of the workplace directly in the `PAGEURL` parameter. Instead, you define an intermediate navigation page `/HTMLBasedGUI/com.softwareag.cis.util.navigatetopage.html`. The start-up page of the workplace is specified in the `navPage` parameter. The navigation page makes sure that an Application Designer session is created before it navigates to the start-up page of the workplace.

```
<servlet id="WorkplaceDemo">
  <servlet-name>WorkplaceDemo</servlet-name>
  <display-name>WorkplaceDemo</display-name>
  <servlet-class>com.softwareag.cis.server.StartCISPageWithParams</servlet-class>
  <load-on-startup>1</load-on-startup>
  <init-param id="OVERWRITE">
    <param-name>OVERWRITE</param-name>
    <param-value>>false</param-value>
  </init-param>
  <init-param id="PAGEURL">
    <param-name>PAGEURL</param-name>
    <param-value>/HTMLBasedGUI/com.softwareag.cis.util.navigatetopage.html</param-value>
  </init-param>
  <init-param id="navPage">
    <param-name>navPage</param-name>
    <param-value>/njxdemos/wpdynworkplace.html</param-value>
  </init-param>
</servlet>
```

In this case, the corresponding servlet mapping is defined as follows:

```
<servlet-mapping>
  <servlet-name>WorkplaceDemo</servlet-name>
  <url-pattern>/servlet/WorkplaceDemo</url-pattern>
</servlet-mapping>
```



**Note:** For further information on the above mentioned servlets, see the Java API documentation which is provided with Application Designer.

## 29 Trust Files (J2EE only)

---

Trust files are used for a secure connection between the Natural Web I/O Interface server and the Natural Web I/O Interface client or Natural for Ajax. Server authentication cannot be switched off. A trust file is always required.

A trust file contains the certificates that you trust. These can be certificates of a CA (Certificate Authority) such as VeriSign, or self-signed certificates.

In the **configuration tool**, you define the path and, if required, the password for the trust file. With the server authentication, the Natural Web I/O Interface client or Natural for Ajax checks whether the certificate of the Natural Web I/O Interface server is known. If it is not known, the connection is rejected.

When a trust file is not defined in the configuration tool, the Natural Web I/O Interface client or Natural for Ajax tries to read the file *calist* from the *lib/security* directory of the Java Runtime Environment (JRE). The default password for this file is "changeit".

To create your own trust file, you can use, for example, Sun's keytool utility which can be found in the *bin* directory of the Java Runtime Environment (JRE). Here are some helpful examples:

- Create an empty, password-protected trust file:

```
keytool -genkey -alias foo -keystore truststore.jks -storepass "your-password"  
keytool -delete -alias foo -keystore truststore.jks
```

- Import a certificate:

```
keytool -import -alias "name-for-ca" -keystore truststore.jks -storepass  
"your-password" -file server.cert.crt
```

You should use a meaningful name for the alias.

- List the certificates in a trust file:

```
keytool -list -v -keystore truststore.jks
```

- Delete a certificate from a trust file:

```
keytool -delete -alias "name-for-ca" -keystore truststore.jks
```

When you modify the trust file or its password, you have to restart the application server so that your modification takes effect.

# 30

## Logging (J2EE only)

---

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The Natural Web I/O Interface client and Natural for Ajax use the Java Logging API. In case of problems with the Natural Web I/O Interface client or Natural for Ajax, you can enable logging and thus write the logging information to an output file. This should only be done when requested by Software AG support.

You configure logging using the [configuration tool](#).



**Note:** Some logging information is also written to the console, regardless of the settings in the configuration file. The console shows the information which is normally provided by the logging levels SEVERE, WARNING and INFO.

## Name and Location of the Configuration File

---

The name of the configuration file is *natlogger.xml*. The path to this file depends on the application server and type of client that you are using.

### ■ JBoss Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>server/default/deploy/naturalunicode.rar/log
```

Natural for Ajax:

```
<application-server-install-dir>/server/default/deploy/njx<nn>ra.rar/log
```

### ■ Sun Java System Application Server

Natural Web I/O Interface client:

```
<application-server-install-dir>/domains/domain1/applications/j2ee-modules/naturalunicode/log
```

Natural for Ajax:

```
<application-server-install-dir>/domains/domain1/applications/j2ee-modules/njx<nn>rallog
```

## Logging on Sun Java System Application Server

---

On Sun Java System Application Server, the logging information is written to the normal server log. That is because Sun Java System Application Server uses the same Java Logging API as the Natural Web I/O Interface client and Natural for Ajax. You can thus use a powerful Sun Java System Application Server tool, the Log Viewer, for analyzing the log. The Log Viewer is started from the web-based Admin Console; for further information, see the documentation of the Sun Java System Application Server.

We recommend that you disable the file handler in the configuration file *natlogger.xml*. Thus, you avoid that the logging information is written to two different log files (that is, the normal server log and the output file defined in *natlogger.xml*).

## Logging on JBoss Application Server

---

JBoss Application Server uses a different logging API (log4j). In this case, we recommend that you enable the file handler in the configuration file *natlogger.xml*.

## Invoking the Logging Configuration Page

---

The content of the configuration file *natlogger.xml* is managed using the **Logging Configuration** page of the [configuration tool](#).

### ▶ To invoke the Logging Configuration page

- 1 In the frame on the left, choose the **Logging Configuration** link.

The **Logging Configuration** page appears in the right frame. Example for the Natural Web I/O Interface client:

### Logging Configuration

Specify the output log file characteristics.

- "/" : The local pathname separator
- "%t": The system temporary directory
- "%h": The value of the "user.home" system property
- "%g": The generation number to distinguish rotated logs
- "%u": A unique number to resolve conflicts
- "%%": Translates to a single percent sign "%"

File pattern name:

File type:

File size (0=unlimited):

Number of files:

File enabled:  Yes  No

Append mode:  Yes  No

Specify log levels for individual modules. The available settings are:

- SEVERE: Events that interfere with normal program execution
- WARNING: Warnings, including exceptions
- INFO: Messages related to server configuration or server status, excluding errors
- CONFIG: Messages related to server configuration
- FINE: Minimal verbosity
- FINER: Moderate verbosity
- FINEST: Maximum verbosity

Communication:

Resource adapter:

Session beans:

Message beans:

Configuration file:

Logging:

Utilities:

Natural Web I/O Interface pages:

With Natural for Ajax, additional modules are provided at the bottom of the **Logging Configuration** page.

- 2 Specify the characteristics of the output file as described below in the section *Overview of Options for the Output File*.
- 3 Specify the log levels for individual modules by selecting the log level from the corresponding drop-down list box.

A brief description for each log level is provided on the **Logging Configuration** page.

- 4 Choose the **Save Configuration** button to write the modifications to the configuration file.



**Caution:** When you do not choose the **Save Configuration** button but logout instead or leave the configuration tool by entering another URL, your modifications are not written to the configuration file.

## Overview of Options for the Output File

The following options are provided for specifying the characteristics of the output file:

Option	Description
<b>File pattern name</b>	<p>The pattern for generating the output file name. Default: "%h/nwolog%g.log".</p> <p>The default value means that an output file with the name <i>nwolog&lt;number&gt;.log</i> will be created in the home directory of the user who has started the application server.</p> <p>For detailed information on how to specify the pattern, see the Java API documentation at <a href="http://java.sun.com/j2se/1.5.0/docs/api/java/util/logging/FileHandler.html">http://java.sun.com/j2se/1.5.0/docs/api/java/util/logging/FileHandler.html</a>.</p>
<b>File type</b>	<p>The format of the output file. Select one of the following entries from the drop-down list box:</p> <ul style="list-style-type: none"> <li>■ <b>Text format</b> Output in simple text format (default).</li> <li>■ <b>XML format</b> Output in XML format.</li> </ul> <p>The corresponding formatter class is then used.</p>
<b>File size</b>	The maximum number of bytes that is to be written to an output file. Zero (0) means that there is no limit. Default: "0".
<b>Number of files</b>	The number of output files to be used. This value must be at least "1". Default: "10".
<b>File enabled</b>	If set to <b>Yes</b> (default), the file handler is enabled. If set to <b>No</b> , the file handler is disabled.
<b>Append mode</b>	If set to <b>Yes</b> , the logging information is appended to the existing output file. If set to <b>No</b> (default), the logging information is written to a new output file.

---

# 31

## Operating and Monitoring the Natural Web I/O Interface Server

---

•	<b>Operating the Natural Web I/O Interface Server</b>
•	<b>Monitor Client NATMOPI</b>
•	<b>HTML Monitor Client</b>



# 32

## Operating the Natural Web I/O Interface Server

---

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This chapter describes how to operate a Natural Web I/O Interface server. Unless otherwise noted, the information below applies to all operating systems.

## Starting the Natural Web I/O Interface Server

---

### Under z/OS:

The Web I/O Interface server can be started as a “started task”:

```
//NWOSRV  PROC
//KSPSRV  EXEC PGM=NATRNO,REGION=4000K,TIME=1440,
// PARM=('POSIX(ON)/NWOSRV1')
//STEPLIB DD DISP=SHR,DSN=NWOvrs.LOAD
//        DD DISP=SHR,DSN=NATvrs.LOAD
//CMPRINT DD SYSOUT=X
//STGCONF DD DISP=SHR,DSN=NWOvrs.CONFIG(SRV1)
//STGTRACE DD SYSOUT=X
//STGSTDO DD SYSOUT=X
//STGSTDE DD SYSOUT=X
```

- where

*vrs* is the version, release, system maintenance level number of NWO or Natural.



**Note:** PARM=('POSIX(ON)/NWOSRV1') - POSIX(ON) is required for a proper LE370 initialization, and NWOSRV1 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 z/OS UNIX System Services.

### Under z/VSE and VM/CMS:

Under z/VSE, a prerequisite is a running SMARTS address space that is configured to run the Natural Web I/O Interface server (see *Installing the Web I/O Server under z/VSE*).

```
<msg-id> NATRNO <server-id>
```

- where

*msg-id* is the message identifier assigned to the SMARTS partition, and

*server-id* is the name of your Natural Web I/O Interface server.

**Example for z/VSE:**

```
141 NATRNWO NWOS1
```

Under VM/CMS, a prerequisite is a running SMARTS in your CMS that is configured to run the Natural Web I/O Interface server (see *Installing the Web I/O Server under VM/CMS*). If you have a running SMARTS in your CMS, your terminal operates as a SMARTS console where you can enter SMARTS commands.

Under VM/CMS, start the Natural Web I/O Interface server with the SMARTS console command

```
NATRNWO <server-id>
```

- where

*server-id* is the name of your Natural Web I/O Interface server.

**Example for VM/CMS:**

```
NATRNWO NWOS1
```



**Note:** If you qualify the Natural Web I/O Interface server datasets by *server-id*, the server ID is restricted to a maximum length of 6 characters.

Alternatively you can automatically start Natural Web I/O Interface servers during SMARTS initialization by using the SMARTS SYSPARM parameter `STARTUPPGM`. In the SMARTS SYSPARM file specify:

```
STARTUPPGM='NATRNWO <server-id>'
```

**Example:**

```
STARTUPPGM='NATRNWO NWOS1'
```

**Under BS2000/OSD:**

Under BS2000/OSD, start the Natural Web I/O Interface server with the SDF command:

```
/ENT-PROCSTART-NWO
```

The SDF procedure START\_NWO has to be supplied with the following parameters:

Parameter	Definition	Default Value
NWO-JOBS	The NWO (SMA) job library.	NW0vrs.JOBS
ENV-MOD	The NWO environment-specific module library. This library contains the linked Natural nucleus module.	NW0vrs.JOBS
NWO-MOD	The NWO module library.	\$SAG.NW0vrs.MOD
NCF-MOD	The Natural Com-plete interface module library.	\$SAG.NCFvrs.MOD
APS-LIB	The SMARTS library (modules and procedures).	\$SAG.APSvrs.LIB
ADA-MOD	The Adabas module library.	ADAvrs.MOD
PROC-NAME	The name of the NWO START procedure. The procedure must reside in the NWO-JOBS library.	START-NWO
NWO-CONFIG	The NWO configuration file. It must reside in the NWO-JOBS library (Type S).	NWO-CONFIG
NWO-SYSPARM	The SMARTS configuration file. It must reside in the NWO-JOBS library.	NWO-SYSPARM
NWO-ADAPARM	The ADALNK parameter file (IDTNAME, etc). It must reside in the NWO-JOBS library.	NWO-ADAPARM
LOG-FILE-PREFIX	The log-file prefix for the SYSOUT files of all SMARTS tasks.	L.NWO.
WORKER-JOB-NAME	The job name of the worker-tasks.	NWOWORK
WORKER-JOB-CLASS	The job class of the worker-tasks.	*STD
WORKER-CPU-LIMIT	The CPU time limit for the SMARTS worker tasks.	*NO
LOGGING	Switches logging for diagnostic purposes.	*NO
MAIN-TASK	For internal use only. Do not modify!	



**Caution:** Do not modify the variable names and parameter names that are used in the procedure START\_NWO. This procedure is called recursively to attach the worker-tasks. For this purpose, the ENTERPARM string is internally executed and several variables are read from the system, using the GETVAR function of SDF-P.

Example procedure for entering the START-NWO procedure:

```

/ENT-PROC      ($SAG.APSvrs.LIB,START-NWO,J), (
/              NWO-JOBS          = $SAG.NW0vrs.JOBS,
/              NWO-MOD           = $SAG.NW0vrs.MOD,
/              NCF-MOD           = $SAG.NCFvrs.MOD,
/              APS-LIB           = $SAG.APSvrs.LIB,
/              ADA-MOD           = $SAG.ADAvrs.MOD.NW0vr,
/              NWO-SYSPARM       = NWO-SYSPARM,
/              NWO-CONFIG        = NWO-CONFIG,
/              NWO-ADAPARM       = NWO-DDLNKPAR,
/              LOG-FILE-PREFIX   = L.NWO.OUT.NWOS01.)
    
```

## Terminating the Natural Web I/O Interface Server under z/OS, z/VSE and VM/CMS

Under z/OS and z/VSE, the Natural Web I/O Interface server can be terminated from within the Monitor Client NATMOPI, see [Monitor Commands](#) below.

Under VM/CMS, terminate SMARTS with the console command `EOJ FORCE`.

## Terminating the Natural Web I/O Interface Server under BS2000/OSD

The Natural Web I/O Interface server can be terminated with the console command:

```
/INTR <TSN smarts-main-task>,EOJ
```

## Changing the SYSOUT File Assignment of the FSIO Task under BS2000/OSD

The central logical system file `SYSOUT` written by the `FSIO` task can be reassigned at SMARTS server execution time, using the `SDF` procedure `SHOW-SYSOUT`.

Thus it is possible to look up trace outputs, error reports, etc., without having to terminate the server.

The procedure `SHOW-SYSOUT` has to be called with the following parameters:

APS-LIB	The SMARTS module library.
TSN	The TSN of the SMARTS server main-task.

As a result of the `SHOW-SYSOUT` execution, the logical system file `SYSOUT` of the `FSIO` task will be reassigned to a new file and the previous one will be opened with the `SHOW-FILE` command. The new logical system file `SYSOUT` is built by appending a numerical suffix to the file name. The value of the suffix is incremented by 1, each time `SHOW-SYSOUT` is executed.

**Example:**

```
/CLP FROM-FILE=*LIBRARY-ELEMENT(LIBRARY=APSVrs.LIB,ELEMENT=
SHOW-SYSOUT),PROCEDURE-PARAMETERS=(APS-IB=APSVrs.LIB,TSN=7445),
LOGGING=*PARAMETERS"
```

## Monitoring the Natural Web I/O Interface Server

---

To enable the administrator to monitor the status of the Natural Web I/O Interface 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.



**Note:** Monitoring is not currently supported under VM/CMS.

The following topics are covered below:

- [Monitor Communication](#)
- [Monitor Commands](#)

### Monitor Communication

To communicate with the monitor, you can use the monitor client `NATMOPI`; see *Monitor Client NATMOPI*. Or you can use the HTML Monitor Client that supports standard web browser, see *HTML Monitor Client*.

Under z/OS, you can alternatively use the operator command `MODIFY` to execute the monitor commands described below in the section *Monitor Commands*. The output of the executed monitor command will be written to the system log.

**Example:**

```
F jobname,APPL=ping
```

sends the command `ping` to the Web I/O Interface server running under the job `jobname`.

## Monitor Commands

The Natural Web I/O Interface server supports the following monitor commands:

Monitor Command	Action
ping	Verifies whether the server is active. The server responds and sends the string  <code>I'm still up</code>
terminate	Terminates the server.
abort	Terminates the server immediately without releasing any resources.
set <i>configvariable value</i>	With the <code>set</code> command, you can modify server configuration settings. For example, to modify <code>TRACE_LEVEL</code> :  <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 ( <i>session-id</i> ).
cancel session <i>session-id</i>	Cancels a specific Natural session within the Natural Web I/O Interface server. To obtain the session ID, use the monitor command <code>list sessions</code> .
help	Returns help information about the monitor commands supported.

## Runtime Trace Facility

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

The following topics are covered below:

- [Trace Medium](#)
- [Trace Configuration](#)

- [Trace Level](#)

## Trace Medium

Under z/OS and z/VSE, the Natural Web I/O Interface server writes its runtime trace to the logical system file `SYSOUT` of the `FSIO` task.

Under z/OS, z/VSE and BS2000/OSD, the Natural Web I/O Interface server writes its runtime trace to the logical system file `SYSOUT` of the `FSIO` task.

Under VM/CMS, the Natural Web I/O Interface server writes its runtime trace to a file named `<server id>T` of file type `RTS` to your A disk.

## Trace Configuration

The trace is configured by a [trace level](#) which defines the details of the trace. Once a trace is switched on, it can be restricted to particular clients or client requests by specifying a [trace filter](#), see also Web I/O Interface server configuration parameter [TRACE\\_FILTER](#).

Every Natural session is provided with a 32-bit trace status word (TSW) which defines the trace level for this session. The value of the TSW is set in the Web I/O Interface server configuration parameter [TRACE\\_LEVEL](#). 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 send/reply buffer.
Bit 26	Dump send/reply buffer short. Only the first 64 bytes are dumped.
Bit 25	Dump I/O buffer.
Bit 24	Dump I/O buffer short. Only the first 64 bytes are dumped.
Bit 23	Call back gateway event.
Bit 22-16	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

---

It is possible to restrict the trace by a logical filter in order to reduce the volume of the server trace output.

- The filter can be set with the configuration parameter `TRACE_FILTER`.
- The filter may consist of multiple `keyword=filtervalue` assignments separated by spaces.
- To activate the filter definition, the trace bit 14 in the trace status word (see *Trace Level*) must be set.

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.
- Asterisk notation is possible.

### Example:

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

Each request of the user ID "KSP" and each request of the user IDs starting with a "P" are traced.



# 33 Monitor Client NATMOPI

---

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**Note:** The Monitor Client NATMOPI is not currently supported under VM/CMS.

## Introduction

---

The Monitor Client NATMOPI is a character-based command interface for monitoring the various types of servers that are provided in a mainframe Natural environment. Each of these servers has its own set of monitor commands which is described in the corresponding server documentation. In addition, a set of directory commands is available which can be used independent of the server type. One NATMOPI can be used to monitor different server types.

## Prerequisites for NATMOPI Execution on BS2000/OSD

---

Execute NATMOPI with the following SMARTS console command:

```
/INTR <SMARTS-tsn>,NATMOPI <mopi-command>
```

where *SMARTS-*tsn** is the TSN of your SMARTS main task.

### Example:

```
/INTR 4711,NATMOPI -dls
```

The output is written to the SYSOUT file of the FSIO task.



**Note:** The server to be monitored must be running in the same SMARTS environment as NATMOPI.

## Command Interface Syntax

---

Basically the syntax of the command interface consists of a list of options where each option can/must have a value. For example:

```
-s <server-id> -c help
```

where *-s* and *-c* are options and *<server-id>* and *help* are the option values.

It is possible to specify multiple options, but each option can have only one value assigned.

The command options available are listed below.

## Command Options Available

Words enclosed in  $\langle \rangle$  are user supplied values.

Command Option	Action
-s $\langle server-id \rangle$	Specify a server ID for sending a <b>monitor command</b> . If the server ID is not unique in the server directory, NATMOPI prompts the user to select a server.
-c $\langle monitor command \rangle$	Specify a <b>monitor command</b> to be sent to the server ID defined with the -s option
-d $\langle directory command \rangle$	Specify a <b>directory command</b> to be executed.
-a	Suppress prompting for ambiguous server ID. Process all servers which apply to the specified server ID.
-h	Print NATMOPI help.

## Monitor Commands

These are commands that are sent to a server for execution. The monitor commands available depend on the type of server, however, each server is able to support at least the commands `ping`, `terminate` and `help`. For further commands, refer to [Operating the Web I/O Interface Server](#) where the corresponding server commands are described.

## Directory Commands

Directory commands are not executed by a server, but directly by the monitor client NATMOPI.

You can use the directory commands to browse through the existing server entries and to remove stuck entries.

The following directory commands are available. Words enclosed in  $\langle \rangle$  are user supplied values and words enclosed in [ ] are optional.

Directory Command	Action
ls [ <i>&lt;server-id&gt;</i> ]	List all servers from the server directory that apply to the specified server ID. The server list is in short form.
ll [ <i>&lt;server-id&gt;</i> ]	Same as ls, but the server list contains extended server information.
rs [ <i>&lt;server-id&gt;</i> ]	Remove server entries from server directory.  <b>Note:</b> If you remove the entry of an active server, you will lose the ability to monitor this server process.
cl [ <i>&lt;server-id&gt;</i> ]	Clean up server directory. This command pings the specified server. If the server does not respond, its entry will be removed from the directory.
ds	Dump the content of the server directory.
lm	List pending IPC messages.

## Command Examples

natmopi -dls	List all servers registered in the directory in short format.
natmopi -dcl TST -ls TST	Clean up all servers with ID TST* (ping server and remove it, if it does not respond), and list all servers with ID TST* after cleanup.
natmopi -sSRV1 -cping -sSRV2 -sSRV3 -cterminate	Send command ping to SRV1. Send command terminate to SRV2 and SRV3.
natmopi -cterminate -sSRV1 -cping -sSRV2 -sSRV3	Is equivalent to the previous example. That is, NATMOPI sends the command following the -s option to the server. If no -c option follows the -s option, the first -c option from the command line will be used.
natmopi -sSRV1 -cterminate -a	Send command terminate to SRV1. If SRV1 is ambiguous in the server directory, send the command to all SRV1 servers without prompting for selection.

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**Note:** The HTML Monitor Client is not currently supported under VM/CMS.

## Introduction

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The HTML Monitor Client is a monitor interface that supports any web browser as a user interface for monitoring the various types of servers that are provided in a mainframe Natural environment. Each of these servers has its own set of monitor commands which are described in the corresponding server documentation. The HTML Monitor Client enables you to list all existing servers and to select a server for monitoring.

## Prerequisites for HTML Monitor Client

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To run the HTML Monitor Client, any server must host an HTTP Monitor Server. The HTTP Monitor Server is a subtask that can run in any Web I/O Interface server address space. It is configured with the NWO server configuration parameter `HTPMON_PORT` and `HTPMON_ADMIN_PSW`. An HTTP Monitor Server is accessible through a TCP/IP port number and can monitor all servers running on the current node (for SMARTS: running within the current SMARTS). Although it is not necessary, you can run multiple HTTP Monitor Servers on one node. But each one needs an exclusive port number.

## Server List

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Open your web browser and connect the HTTP Monitor Server using the following url: `http://node-name:port`, where *nodename* is the name of the host on which the NWO server hosting the monitor is running. And *port* is the port number the administrator has assigned as the monitor port in the NWO server configuration file.

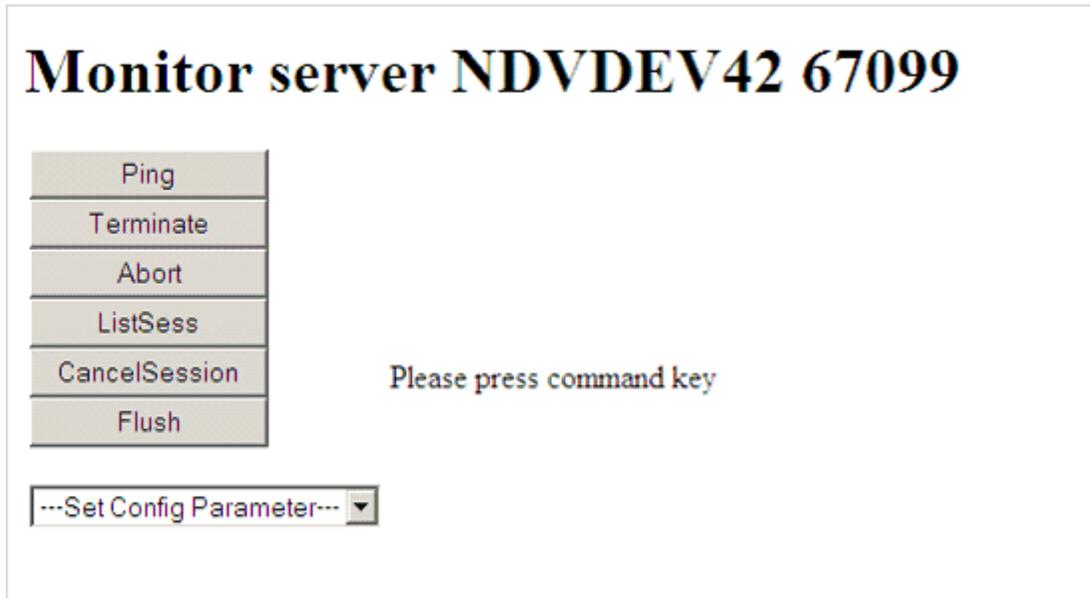
The server list contains details about each server, such as server ID, date and time when started as well as the configuration and session parameters used.

Active servers are shown on a green background.

Entries marked with a red background color represent potentially dead server entries which can be deleted from the server directory by choosing the attached **Remove** button. The **Remove** button appears only for the red entries. "Potentially dead" means, that the HTTP Monitor Server "pinged" the server while assembling the server list, but the server did not answer within a 10 seconds timeout. Thus, even if you find a server entry marked red, it still might be active but could not respond to the ping. Choosing the **Remove** button would not terminate such a server but would remove its reference in the monitor directory. Hence, it cannot be reached by the monitor anymore.

Choosing the **Select** button opens a window for monitoring the selected server.

## Server Monitor



With the buttons, you can perform the labeled monitor commands.

The selection box allows you to modify the server configuration parameters. If you select a parameter for modification, it has a predefined value. This predefined value does not reflect the setting of the server. It is just a sample value.

If you choose the **ListSess** button, a list of all Natural sessions appears in the window, for example:

## Monitor server

Ping

Terminate

Abort

ListSess

CancelSession

Flush

...Set Config Parameter... ▾

Reply for server pid 67099:

	UserId	SessionId	InitTime	LastActivity	St
1	ASO	BE6FD61E1D5A3582	01 12:18:07	01 12:20:04	I
2	CF	BE6F9F6D6C6E07C2	01 08:13:26	01 08:39:22	I
3	INIT	BE6D8051A1271CC2	27 15:43:36	27 15:43:37	
4	NAU	BE6FCFCC26524E02	01 11:49:50	01 11:50:36	I
5	NAU	BE6FCA37073EA302	01 11:24:52	01 11:45:42	I
6	NAU	BE6FC9FEB43D2842	01 11:23:52	01 11:50:21	I
7	NAU	BE6FC5306C352702	01 11:02:22	01 11:18:45	I
8	NAU	BE6FC51B881CD680	01 11:02:01	01 11:18:44	I
9	NAU	BE6FB5BE5D126740	01 09:53:16	01 10:55:25	I
10	NAU	BE6FB554C21F1F42	01 09:51:26	01 10:55:25	I
11	UF	BE6FBC732C88D202	01 10:23:16	01 13:52:40	I
12	WBE	BE6FF0713CBD5842	01 14:15:53	01 14:23:29	I

You can cancel sessions by selecting the session ID in the **SessionId** column and choosing the **CancelSession** button.

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(see set up client)

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