

# Natural as a Server under z/OS

This document applies under z/OS only. It covers the following topics:

- Functionality
  - Natural Nucleus Installation in a Server Environment
  - Print and Work File Handling with External Datasets in a Server Environment
- 

## Functionality

Besides being a programming language, Natural can also act as a server in a client/server environment. It can provide services, such as the execution of Natural subprograms. Part of the server functionality is the enhanced batch driver. There are a lot of underlying protocols for the client/server communication, such as the execution of stored procedures for DB2 and the execution of remote procedure calls, see the *Natural Remote Procedure Call (RPC)* documentation.

## Natural Server Stub

Natural as a server runs in a separate region or within the server subsystem region, for example, for DB2 stored procedures. To run Natural as a server, a service-specific server stub is required. This server stub is supplied as part of the server product. It controls all service requests and is the only interface to the Natural server frontend.

There are different server stubs for DB2, for Natural RPC and for others.

## Natural Batch Driver

The Natural batch driver (that is, for example, NATOS under z/OS) has been enhanced to act as the environment-specific interface component which maintains the Natural server sessions and supplies environment-specific services to Natural. It can be linked to the server stub module or loaded by the server stub as a separate module.

The batch driver is able to create and to control multiple sessions by using storage threads including functionality for thread storage compression, decompression and rollout to external storage devices.

When the batch driver is called by the server stub for the first time (during server initialization), the storage threads are created in main storage. The number and size of the storage threads is determined by the server stub. Then a static Natural session is initialized. This includes profile parameter evaluation and the allocation of static storage buffers. The resulting pre-initialized storage thread is saved in main storage separately. For every new Natural session, this initial 'session clone' is copied into the thread.

When decided by the server stub, a session can be rolled out to be resumed at a later point of time. The Natural Roll Server is used by the driver to save the compressed thread storage of a session. As an alternative, main storage can be used to save the compressed thread storage. In this case, the number of sessions in rolled-out state is limited by the region size.

## Natural Nucleus Installation in a Server Environment

The Natural nucleus and its batch driver are designed to support both, server and non-server environments. For the server-specific definitions and requirements, please refer to the specific documentation (for example, to the *Natural Remote Procedure Call (RPC)* documentation or to the *Natural for DB2* documentation).

If the number of sessions is not limited to a small number and if the server type supports session rollout, the Natural Roll Server must be installed and be started before the server initializes. To do this, ensure that the SUBSID parameter in the Natural parameter module is set to the correct value. For the server, the Adabas link interface (ADALNK) must be generated so that ADALNK is also reentrant, in addition to the server.

You can use a local or a global Natural buffer pool. If you define a local buffer pool, it will be shared by all sessions within the server region.

If a logical print or work file number is to be used for processing within any server session, it must be associated with an access method at session start time. This can be done in NATPARM with the macros NETWORK and NTPRINT, as in the following example, if you want to allow the full range of all print and work file numbers possible:

```
NTPRINT (1-31),AM=STD,OPEN=ACC,DEST=*
NETWORK (1-32),AM=STD,OPEN=ACC,DEST=*
```

The subparameter DEST=\* defines generic DD name generation during the first DEFINE WORK FILE or DEFINE PRINTER statement, OUTPUT clause (see below). Subparameter OPEN=ACC avoids pre-opening of the files at program start time. The open is issued upon the first access of the file.

## Print and Work File Handling with External Datasets in a Server Environment

When running many concurrent sessions in one region, there may be resource conflicts with external print and work files. The logical names (DD names) for print and work files are defined by the subparameter DEST of macro NTPRINT, respectively NETWORK or its dynamic equivalents, PRINT or WORK (defaults CMPRTnn and CMWKFnn). For normal Natural batch processing, these files are defined in JCL by a logical (DD) and a physical dataset name.

However, DD names are reserved by the operating system for exclusive use by one task, respectively session, that is, if CMWKF01 is opened by one session for processing, no other session could use this file until it is closed again. Other sessions would get an error if they would try to open it.

In a server environment, all print and work file requests are handled by a dedicated I/O subtask. This ensures dataset integrity and avoids resource contention. It enables the shared usage of print and work files across Natural session boundaries, that is, multiple sessions can access the same file concurrently. This is true only for print and work files whose DD-name starts with CM. All other files are considered as exclusive and cannot be shared.

For exclusive usage of print and work files, Natural offers the following two features to support print and workfiles in a server environment (both require a special implementation within the Natural application programs for the server environment):

- `DEFINE WORK FILE` or `DEFINE PRINTER` statements, `OUTPUT` clause and
- dynamic dataset allocation (application programming interface `USR2021N`, see *SYSEXT - Natural Application Programming Interfaces*).

The `DEFINE WORK FILE` and the `DEFINE PRINTER` statement `OUTPUT` clause can be used

- to define the logical DD name for a work or print file, or
- to define the physical dataset name, or
- to define an output spool class.

If a DD name is specified, the access method checks whether the dataset is allocated. If not, an error is issued. The dataset can be allocated by any Natural program using the `USR2021N` subprogram supplied in library `SYSEXT`.

If a physical dataset name or a spool file class is specified, the access method itself allocates the dataset dynamically during the execution of the `DEFINE . . .` statement. To ensure a unique DD name name is used, `DEST=*` should be predefined in the `NATPARM` file. This avoids any DD name conflicts.

If the application is using the application programming interface `USR2021N`, it may specify an asterisk value for the DD name variable to get back a unique DD name from the access method. This DD name can be used for a subsequent `DEFINE . . .` statement.

By default, the access properties of the server job are used for print and work files. Some server types, for example, Natural Development Server and Natural RPC, support impersonation, that is, the access properties of the individual client account is used for exclusive print and work files. For more information, refer to the corresponding section in your server documentation.