

# Description Paper

## Net-Storage Installation Guide

---

### Content

Terms	2
Configuration	3
BS2000 IO configuration	3
BCAM generation	4
Net-Server	5
Net-Client	5
Use in BS2000 – Quickstart Guide	7
Mount the remote file system	7
Creating Net-Storage volumes	7
Creating and processing files on Net-Storage	7

## Terms

When working with Net-Storage, the following terms are used in BS2000/OSD:

### Net-Server

File server in the worldwide computer network which provides storage space (Network Attached Storage, NAS) for use by other servers and offers the corresponding file server services.

### Net-Storage

Storage space provided in the computer network by a net server and used by external servers. Net-Storage can be a file system or simply a node in the file system of the net server. Net-Storage (to be more exact: the released directory) is made available in BS2000/OSD via the command MOUNT-NET-STORAGE and mounted on the Net-Client.

### Net-Client

Implements access to Net-Storage for the operating system that wants to use it. In BS2000/OSD, Net-Client transforms the BS2000 file accesses together with the BS2000 subsystem ONETSTOR into the corresponding UNIX file accesses and executes them via NFS on the Net-Server.

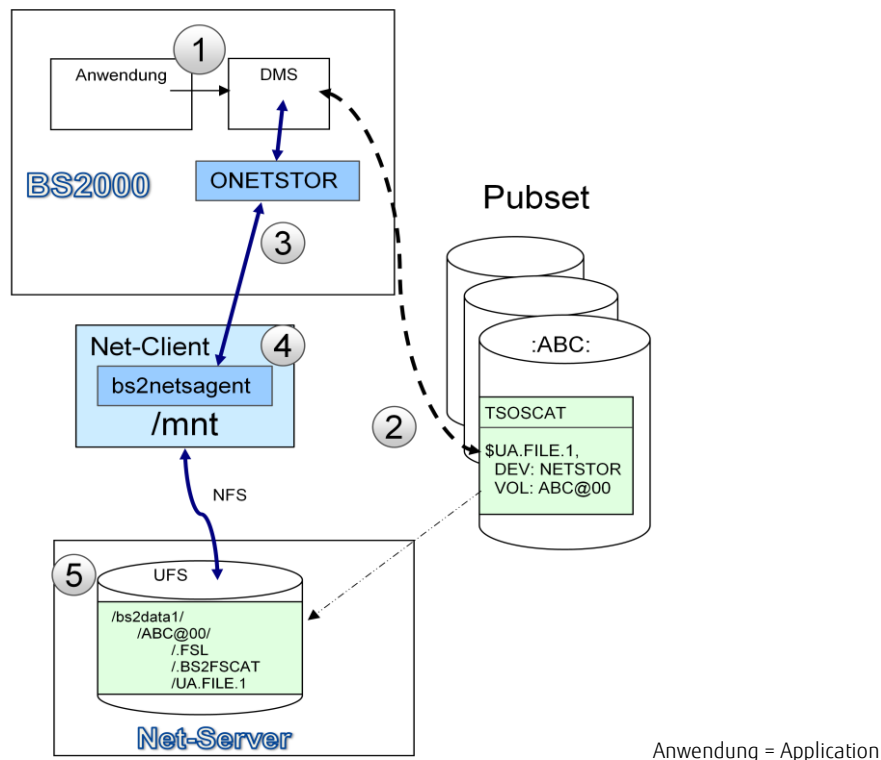
### Net Storage Volume

Net Storage volumes represent Net-Storage in BS2000/OSD. They are configured via the command ADD-NET-STORAGE-VOLUME and assigned to a pubset. A directory in the released file system of the Net-Server is configured and assigned to a local data pubset (SF or SM) as a Net-Storage volume.

Net-Storage volumes are addressed via their volume serial number (VSN) and the volume type NETSTOR. The directory name in the released file system of the Net-Server and the VSN of the Net-Storage volume are identical.

A Net-Storage volume (to be more exact: the directory with the name of the Net-Storage volume on the Net-Server) contains the following files:

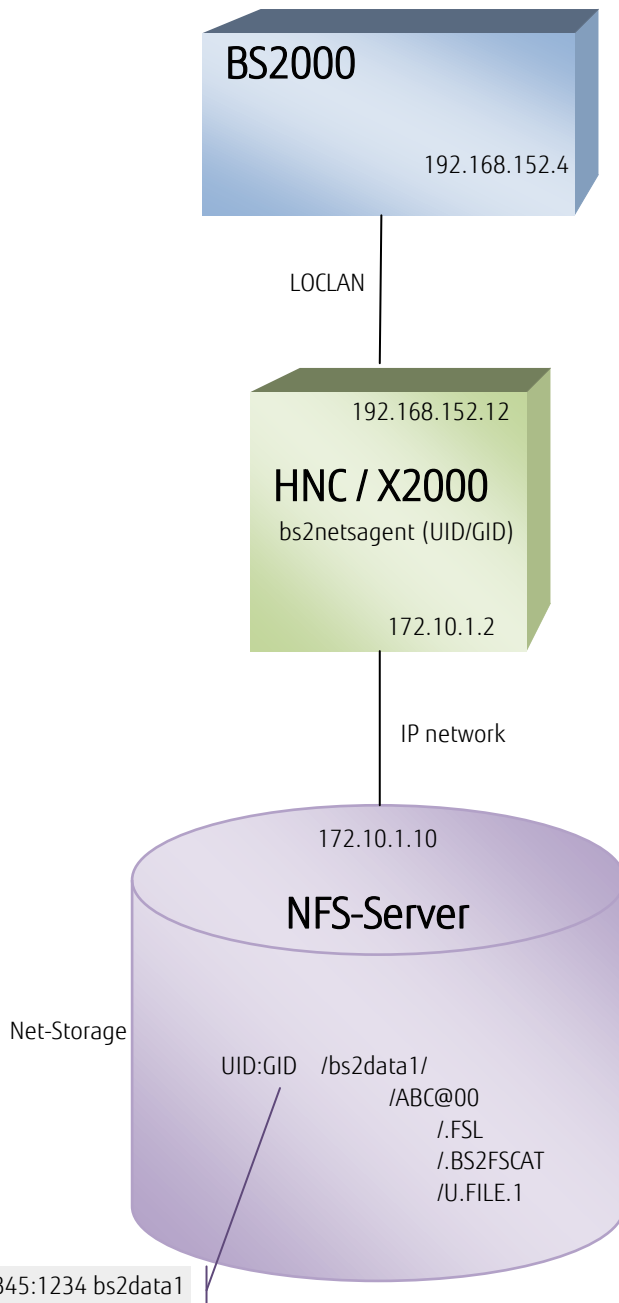
- A file system label (file name .FSL) and a file catalog (file name .BS2FSCAT) with the meta data of the files stored on Net-Storage
- The user files themselves



An application (1) accesses a file via the DMS. The DMS recognizes that the file is located on Net-Storage via the catalog entry in TSOSCAT on the pubset(2). The file access is accessed via the subsystem ONETSTOR (3) and the Net-Client (4) via NFS on the Net-Server (5).

## Configuration

In order to enable the use of Net-Storage in BS2000, a connection (node, line) must be defined in BS2000 and the Net-Client must be defined as end system (processor). An enable with the required permissions must be configured on the Net-Server and the authorized user and group IDs must be entered on the Net-Client accordingly.



### BS2000 IO configuration

The generation of the IO configuration on S-servers is via the utility IOGEN (see System Installation Manual). A CTL instruction and two DVC instructions (for the read and write channels respectively) are specified for HW generation of the HNC.

Example of a generation instruction to connect the HNC via an FC switch on the FC channel A4:

```
CTL C0,, (A4,0,10000000C954F718)
```

```
DVC 4D20,6D,A,0000,(C0)
DVC 4D21,6D,A,0001,(C0)
```

or

```
CTL C0,,(A4,0,10000000C954F718)
DVC 4D20,6D,A,0000,(C0),MULT=2
```

The configuration on SQ servers is via the SQ-Manager BS2000 devices -> devices -> LAN. A LOCLAN LAN device is required for NET-STORAGE.

## BCAM generation

From a BCAM point-of-view, only the following must be described regarding the above physics:

(1) The connection of the BS2000 node and line

Either an HNC in the case of S servers or a channel adapter in the case of an SQ server which does not differentiate BCAM in the description (see below "Defining the line" and SHOW-BCAM-ENVIRONMENT OWN-IP-ADDRESS 192.168.152.4)

(2) The processor on a node must be described with the address with which it must be reached from the BS2000. The BS2000 communication partner is the Net-Client with the running bs2netsagent (PROCESSOR-NAME: LOCFCAP and IP address: 192.168.152.12) which controls access to the files stored on the NFS server (the addresses in the IP network of the NFS server and the NFS server itself are not known to BCAM).

(3) Settings must be made for optimum use of the transport system

LPDU Link-Layer Protocol Data Unit (determined by the device)

TSDU Transport Service Data Unit (set for processor)

The following BCAM commands are used for the description which can be saved in the SOF or a CALL-BCAM-COMMAND file to restart BCAM.

### Define nodes

```
/CREATE-NODE NODE-NAME=LOCFCCAP see (1)
```

### Defining the line

```
/CREATE-LINE LINE-NAME=LOCFCCAP - see (1)
/ ,IP-ADDRESS=192.168.152.4/24 -
/ ,L2-PROTOCOL=*CSMACD( -
/ NODE-NAME=LOCFCCAP -
/ ,WRITE-DEVICE=4D20 -
/ ,READ-DEVICE=4D21 -
/ ,MAX-LPDU-SIZE=*BY-DEVICE - see (3)
/ )
```

### Define processor/route (on the node)

```
/CREATE-PROCESSOR PROCESSOR-NAME=LOCFCAP see (2)
/ ,MAX-TDSU-SIZE=65530 see (3)
/
/CREATE-ROUTE ROUTE-NAME=LOCFCAP -
/ ,PATH=*NODE( -
/ NODE-NAME=LOCFCCAP -
/ LINE-NAME=LOCFCCAP -
/ ,L3-PROTOCOL=*IP( -
/ ,IP-ADDRESS=192.168.152.12 -
/ ))
```

### Set slow-poll for line

This setting is used for restart after a line failure

```
/MODIFY-LINE LINE-NAME=LOCFCCAP -
/ ,SLOW-POLL=*ON
```

### Activate line and node

```
/ACTIVATE-LINE LINE-NAME=LOCFCCAP
/BCIN NODE=LOCFCCAP
```

The output of the BCAM objects, that have been created to describe this partial configuration, is via:

```
/SHOW-BCAM-ENVIRONMENT PROCESSOR=LOFCAP, INFORMATION=*ADDRESS

SHOW-BCAM-ENVIRONMENT                                2012-06-06 08:46:11
Route "LOFCAP " of Processor "LOFCAP "
Host:                S170G04 , *NORMAL      *ACTIVE
  Own IP address     192.168.152.4/24
Line:                LOFCAP                 *ACTIVE, *WORKING
  Mnemonic           4D20, 4D21
Node:               LOFCAP, *NORMAL        *ACTIVE
Route:             LOFCAP                 *ACTIVE, *READY, *WORKING
  IP address        192.168.152.12
Processor:         LOFCAP                 *ACTIVE
```

## Net-Server

The system administrator of the NFS server configures a release on the NFS server and determines the user ID and group ID of the user who receives access authorization for this release. On Linux-based systems, the directory to be released is entered in the file `/etc/exports`, e.g. with the following line, if the directory `/bs2data1` is to be released for the client `172.10.1.2`:

```
/bs2data1 172.10.1.2(rw)
```

This is where the path name of the directory to be released is specified and the processor (in the example, its IP address) that is permitted to mount this directory. In this case the address of the BS2000 should not be entered, but that of the HNC (S-Server) or that of the X2000 (SQ-Server). Mount options follow in brackets; read and write rights have been entered in the example.

Read/write rights are always required for BS2000 access!

Once the `/etc/exports` has been modified, the `nfs-Daemon` must reload this file. This usually happens under Linux via

```
# exportfs -fa
```

The required user ID and the group ID must be assigned to the released directory (using the command `chown`).

Depending on the manufacturer of the NFS server, these settings can also be made via special GUIs.

Notes:

- The configuration on the various UNIX and Linux derivatives can differ from the procedure described here. For example, the configuration file under Solaris is called `/etc/dfs/dfstab` instead of `/etc/exports`; this file contains "share" commands. Various NFS servers provide graphic interfaces to configure the releases. Details are in your NFS server documentation.
- The NFS server releases can be determined from other Linux systems via the following command:  
# `showmount -e <nfs-server>`
- For security reasons, the mount option `no_root_squash` should not be set. If access from the client side is via `root`, it would also access with `root` rights in the released file system. However, the mount option `root_squash` is used for access with the rights of the ID `nobody`.

## Net-Client

With S servers, the Net-Client runs on an HNC-IV 91853 or HNC-V 91854 as of V2.0A03 or V5.3A04 for SQ servers on X2000. These versions are installed by Service.

Additional settings are made by the system administrator who logs on to the HNC-Manager with S-servers on the HNC, or to the SQ-Manager with SQ servers (under `sysadm`, via CLI). Here is an overview:

### LOCLAN address and MTU

Communication between the BS2000 and the `bs2netsagent` is via LOCLAN.

LOCLAN is automatically configured during installation. The LOCLAN address can be displayed with

```
# bs2netsConf list -l
```

The system administrator can define another LOCLAN network address via the following command:

```
# bs2netsConf set -l <loclan-net address>
```

Also after an HNC upgrade and restore of an old configuration backup the LOCLAN net address has to be checked and set to the new value (192.168.15x ; x refers to the HostId).

The LOCLAN network is always a network with the prefix 24 (which corresponds to network mask 255.255.255.0) and its own address 12. The default MTU is 65512. This value is scanned by the BS2000 (see section BCAM generation CREATE-LINE ... MAX-LPDU-SIZE=\*BY-DEVICE).

### **Configuration of LAN for NFS**

Communication between HNC or X2000 and the NFS server is via a LAN connection. The NFS server is generally in the production network; in this case, a LAN connection on a PCI slot is used. This can be either the LAN connector already used or a spare one. In each case, an IP address must be assigned via which the bs2netsagent can communicate with the NFS server. This is via the command:

```
# bs2netsConf set -i <ip-addr/prefix> -p s<x>p<y> [-m <mtu>]
```

whereby <x> and <y> is the slot or the port number. This command can also be used to modify the MTU size (sensible values: 1500 for standard frames and 9000 for jumbo frames).

The current settings are output via

```
# bs2netsConf list -i
```

For further details, see the description under: bs2netsConf info

### **Routing**

The configuration of a router can be carried out via the following command:

```
# bs2netsConf set -r <target address/prefix> -g <router>
```

and the output:

```
# bs2netsConf list -r
```

### **UID and GID of the bs2netsagent process.**

The Net-Client authenticates itself to the Net-Server (NFS server) via its (external) IP address (not the LOCLAN address! In the example above this would be the IP address 172.10.1.2; see section Net-Server /etc/exports). Access to the released directory in the NFS server is permitted according to the user ID and the group ID. The user ID and the group ID must be agreed with the administrator of the NFS server(s).

```
# bs2netsConf set -u <uid> <gid>
```

As the bs2netsagent can only be assigned one user ID and group ID, the same user IDs and group IDs must also be assigned on the Net-Servers for all these directories released for this Net-Client.

The current values are displayed via

```
# bs2netsConf list -u
```

If no ID is assigned, access is via uid and gid 0(=root).

More information about the command bs2netsConf can be obtained on the CLI using:

bs2netsConf (without additional options) outputs an overview of the commands

bs2netsConf info [-e] outputs a detailed explanation of the options (with -e in English)

### **DNS**

In the BS2000, the NFS server to be mounted can be specified via the IP address or FQDN (Fully Qualified Domain Name). When specifying FQDN, the Net-Client must ensure the resolution in an IP address. A DNS server must be specified via the HNC manager or the SQ manager.

**Additional information:**

Secure mode: The standard `sys (=specified user ID)` is used as a secure mode for the authentication of an NFS connection.

Mount: The `bs2netsagent` automatically detects whether an NFSv4 or NFSv3 is in used. Configuration here is not necessary.

Firewall: NFS works via port 2049. If a firewall is between the NFS server and the HNC, they must be opened for port 2049 and 111 (RPC) for TCP and for UDP. A change of the standard port 2049 is currently not planned.

When carrying out maintenance work (e.g. a software update or new installation) and configuration changes with `bs2netsConf`, make sure that Net-Storage operated via the respective Net-Client is previously disconnected via an `UMOUNT-NET-STORAGE`, from all of the connected BS2000 systems.

## Use in BS2000 – Quickstart Guide

Having implemented the above configuration stages, Net-Storage can now be used in the BS2000. Proceed as follows:

### Mount the remote file system

The remote file system is mounted via `MOUNT-NET-STORAGE`. The mount is initiated in the Net-Client.

```
/MOUNT-NET-STORAGE DIRECTORY='/bs2data1',NET-SERVER=*IP(172.10.1.10),NET-CLIENT=*IP(192.168.152.12)
```

`SHOW-NET-STORAGE` provides an overview of the mounted releases and, if necessary, any existing Net-Storage volumes.

### Creating Net-Storage volumes

Net-Storage volumes are created on the mounted Net-Storage via `ADD-NET-STORAGE-VOLUME`. The Net-Storage Volume is permanently assigned to a pubset.

```
/ADD-NET-STORAGE-VOLUME VOLUME=*STD, pubset=ABC, DIRECTORY='/bs2data1', SERVER=*IP(172.10.1.10)
```

A volume with the name `ABC@00` is assigned to the pubset `ABC`. This is implemented by creating a directory with the name `ABC@00` under the release `/bs2data1` of the NFS server with the IP address `172.10.1.10`. The administration files `.FSL` and `.BS2FSCAT` are created in this directory. An administration entry for the Net-Storage volume is created on the pubset `ABC`.

Instead of the standard name derived from the pubset name, the system administrator can assign any volume name for the Net-Storage volume. Several Net-Storage volumes can be defined for a pubset.

The Net-Storage volumes assigned to a pubset can be viewed via `SHOW-PUBSET-NET-STORAGE`.

### Creating and processing files on Net-Storage

Create file as follows on the Net-Storage volume under 2.:

```
/CREATE-FILE :ABC:$USER.FILE.1, SUPPORT=*PUBLIC-DISK (STORAGE-TYPE=*NET-STORAGE)
```

If several Net-Storage volumes exist for a pubset, the volume (in this example `Volume NET001`) can be specified as follows:

```
/CREATE-FILE :ABC:$USER.FILE.1, SUPPORT=*PUBLIC (STORAGE-CLASS=*NONE (VOLUME=NET001 -  
/ , DEVICE-TYPE=NETSTOR) )
```

From now on, the file can be accessed via its path names. The storage location of the file is completely transparent for the application.

Notes:

No Net-Storage can be assigned to the Home-PVS.

The assignment of the Net-Storage volumes to a pubset is retained beyond `EXPORT-/IMPORT-PUBSET` and shutdown/startup.

After a system restart, make sure that MOUNT-NET-STORAGE is only executed after BCAM has been started and the subsystem ONETSTOR has been loaded.

It is appropriate that before an IMPORT-PUBSET of a pubset, to which Net-Storage volumes have been assigned, it must first be made available in the system via MOUNT-NET-STORAGE so that the data stored there can be accessed immediately.

BCAM must not be terminated as long as pubsets with an attached Net-Storage are imported.

**For further details about the administration of Net-Storage, see the manual "Introduction to system support"; for information about using Net-Storage, see the OSD V9 Manual "DVS Introduction".**