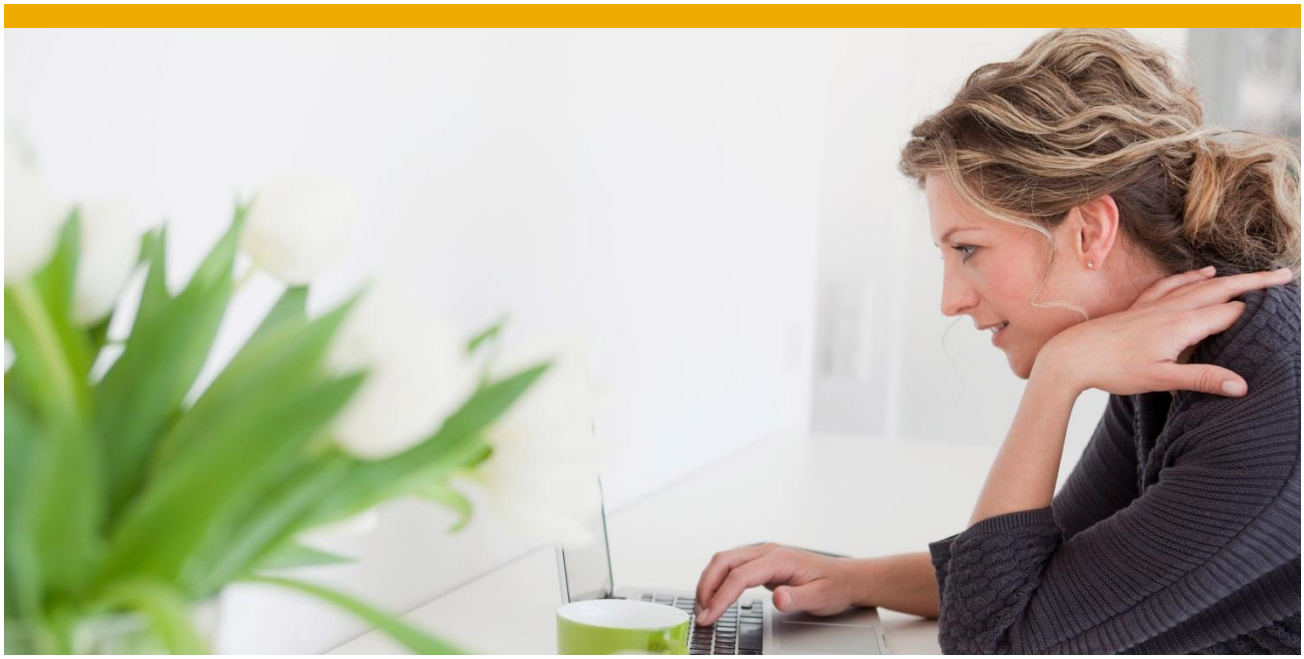

SAP HA Installations on z/OS and Windows Application Servers

TABLE OF CONTENTS

APPLIES TO

SAP HA installations on z/OS with application servers on Windows.

SUMMARY

This document is intended to help you in using Windows Services for NFS to share data between SAP systems located on z/OS and Windows.

Author(s): Dr. Christian Schaefer
Company: SAP AG
Created on: May 8, 2012
Updated: February 12, 2013

AUTHOR BIO

Dr. Christian Schaefer is Development Architect at the joint SAP/IBM platform team and has nearly 30 years of experience in SAP on IBM mainframes. He joined the SAP in 1985. He worked on the interfaces of SAP R/2 to CICS and MVS. He holds a DSC in Theoretical Physics from the University of Heidelberg, Germany.

SAP HA INSTALLATIONS ON Z/OS AND WINDOWS APPLICATION SERVERS

In a high availability (HA) installation with IBM DB2 for z/OS and SAP application servers on Windows, the following run on the z/OS mainframe server:

- DB2 database
- SAP central services for ABAP and Java (ASCS and SCS, respectively)
- Enqueue Replication Server (ERS).
- Central File system of SAP also resides on the mainframe

This document is intended to help you in using Windows Services for NFS to share data between SAP systems located on z/OS and Windows.

To plan your SAP HA-Installation with DB2 for z/OS in general please refer to the following guides:

SAP Planning Guide: DB2 for z/OS
SAP Security Guide: DB2 for z/OS

The guides are available on the SAP Service Marketplace: www.service.sap.com/instguides

Details about the HA-Setup on the mainframe are available in IBM Guide “Business Continuity for SAP on IBM System z”, IBM publication number SC33-8206-xx. The current version of the guide is available at

http://www.ibm.com/systems/z/os/zos/features/sap/businesscontinuity.html

Further details about NFS on the mainframe can be found in:
z/OS V1R13.0 Network File System Guide and Reference (SC26-7417-xx)
Select the version according to your z/OS release.

1 Software Prerequisites

The following software releases and levels are required:

- Windows 2008 R2
- DB2 Connect V9.7 FP3a
- DB2 for z/OS V9
- z/OS V1.13 with PTFs UA67142 and UA67141 applied

Information about SAP products and SAP Kernels that support Windows 2008 R2 can be found in SAP note 1383873, 1476239.

2 SAP File Systems

SAP installations on Unix typically have two file systems under '/sapmnt/SID' and '/usr/sap/SID ':

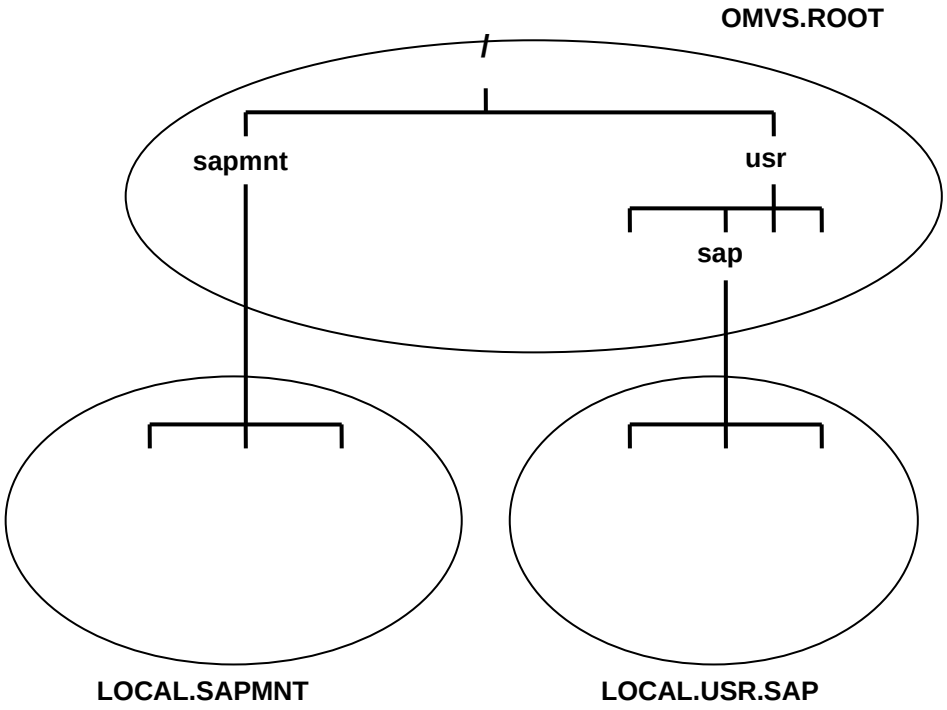

Figure 1: SAP directories and file systems under Unix

On the other hand in Windows there is only one directory structure '\usr\sap\SID', where '\usr\sap' is shared as 'sapmnt'.
The SAP directories located on the mainframe under "/usr/sap" must be available to Windows through the share "/sapmnt" on Windows. This enables Windows to access the data in "/usr/sap" in USS on z/OS:

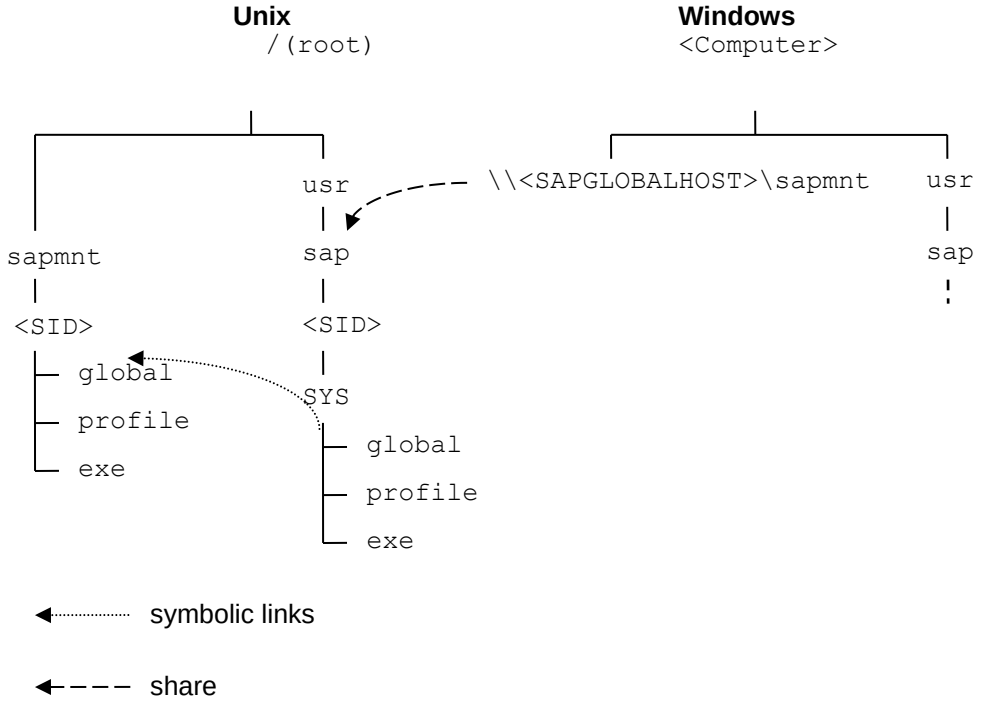

Figure 2: SAP Directories

NFS does not follow symbolic links, which point outside the exported file system. So we must have just one file system under Unix System Services (USS) on the mainframe that contains all data of the SAP system to be installed.

3 Procedure

The following steps must be carried out to setup your SAP system to use application servers on Windows:

- Define and export mainframe file systems
- Prepare Windows host with SAP Installer (sapinst)
- Map z/OS USS user IDs to Windows user IDs
- Install Central Services on z/OS with REXX installer zscsinst
- Install Database Instance and Central Instance on Windows
- Install further dialog instances on Windows or Unix machines

4 Define Mainframe File System

To prepare the SAP installation on the mainframe you have first to create a new file system, which will be exported via NFS and contains all SAP data. Mount this new file system under a directory of your choice. In this document we will use ‘/usr/sapalldataSID’ as an example for this directory. ‘SID’ stands for the SAP System Id.

Export this directory as described in the Business Continuity Guide. ‘security(exports)’ must be used, because there is no mvslogin command on Windows. For example, to allow for root access from three Windows hosts you need the following entry in your NFS export dataset in NFS parmlib:

```
/hfs/usr/sapalldataSID     -rw=WindowsHost1<root>|\
                               WindowsHost2<root>|\
                               WindowsHost3<root>
```

‘hfs’ is the file system prefix defined in NFS parmlib.

Note: The SAP installation on a remote application server requires root access to all NFS mounted SAP file systems.

Create two new subdirectories in /usr/sapalldataSID :

```
mkdir /usr/sapalldataSID/sapmnt
mkdir –p /usr/sapalldataSID/usr.sap/SID
```

In these new directories you install the structures, which normally reside in /sapmnt and /usr/sap/SID (figure 1).

Create the following symbolic link:

```
ln -s /usr/sapalldataSID/usr.sap/SID /usr/sap/SID
```

The link is needed for the SAP installation tool zscsinst to find your new file system.

5 Install the SAP Central Services on the Mainframe with zscsinst

Now install the SAP Central Services on the mainframe using the installation tool zscsinst. zscsinst is part of the SL-Toolset. The SAP Installation Guides describe the tool.

First install the ASCS instance. zscsinst asks for the SAP mount point 'sapmnt'. In our example this mount point is the directory `/usr/sapalldataSID/sapmnt`, which you have created in the previous step.

When the installation process is completed, zscsinst tries to start the installed instance. This should fail, because of our special setup with one file system only. If the instance nevertheless is running after the installation, sign on as user sidadm and stop the instance with stopsap.

If you need other instances of SAP Central Services (SCS, ERS) on this LPAR install them now with zscsinst.
When you finished these installations, stop running instances with stopsap:

"`stopsap instance virtual_hostname`"

Example: "`stopsap ASCS80 ihsapke`"

5.1 Mainframe Post-Installation Steps

The installed SAP directory structure contains absolute symbolic links. NFS will not follow these links because the root file system is not exported. So you have to replace these absolute symbolic links by relative symbolic links:
Sign on as user sidadm, if your SAP Central Services instances are running, stop them with stopsap.

Make `/usr/sapalldataSID/usr.sap/SID/SYS` your working directory:

```
cd /usr/sapalldataSID/usr.sap/SID/SYS
```

In this directory remove the links for the global and profile directory:

```
rm profile
rm global
```

Create the following new symbolic links:

```
ln –s ../../../sapmnt/SID/profile profile
ln –s ../../../sapmnt/SID/global global
```

Make `/usr/sapalldataSID/usr.sap/SID/SYS/exe` your working directory:

```
cd /usr/sapalldataSID/usr.sap/SID/SYS/exe
```

In this directory remove four absolute links:

```
rm uc
rm nuc
rm run
rm dbg
```

Create the following new symbolic links:

```
ln –s ../../../../sapmnt/SID/exe/uc/os390_64 dbg
ln –s ../../../../sapmnt/SID/exe/nuc nuc
ln –s ../../../../usr.sap/SID/SYS/exe/dbg run
ln –s ../../../../sapmnt/SID/exe/uc uc
```

Restart the instance(s) with startsap: “`startsap instance virtual_hostname`”

5.2 Installation of further instances (ASCS, SCS, ERS, …)

You install further instances of SAP Central Services on other LPARs of your HA-System. To mount the Central File System on the mainframe from these LPARs, you have to use the following mount command on the other LPAR:

mount `<mainframe>:/hfs/usr/sapalldataSID/sapmnt/SID /sapmnt/SID`

Now you can install instances on other LPARs with zscsinst and perform the post installation steps as described above.

6 Prepare the Windows Application Server

6.1 Install Windows Services for NFS.

For this step please refer to the Microsoft documentation :

http://technet.microsoft.com/en-us/library/dd758767(WS.10).aspx

6.2 Apply Windows Hotfix KB2649107

Download Hotfix KB2649107 for your Windows System from Microsoft. This hotfix is not part of the standard Windows Update procedure. You have to download and apply it manually.

6.3 Prepare Windows host for SAP

This preparation is performed with a special version of sapinst (GlobalHost.ZIP), which can be downloaded from SAP Community Network SCN:

http://www.sdn.sap.com/irj/scn/index?rid=/lw/uuid/d03d0a36-8b97-2f10-9581-da4f39d09a47&overridelayout=true

Unpack GlobalHost.SAR into a directory of your choice on the Windows machine and execute sapinst from this package as usual. The preparation process creates new directories and users needed for the SAP system.

6.4 Perform user mapping for SAP userids on the domain controller

Now you perform the mapping between Windows userids and mainframe unix (z/OS USS) userids on the Windows domain controller:

Windows Application Server		**Mainframe (z/OS USS)**
<sid>adm	maps to	uid(<sid>adm), gid(sapsys)
SAPService<SID>	maps to	uid(<sid>adm), gid(sapsys)
Windows Installation User (admin)	maps to	uid(<sid>adm), gid(sapsys)
Group of Administrators	maps to	gid(sapsys)

6.5 Configure the mapping source of Windows Services for NFS

On the Windows Application Server open ‘Services for Network File System’. Use right mouse click to select Services for NFS properties. Specify your Active Directory Domain Name as mapping source.

If you plan a local installation of SAP on Windows without a Windows domain, you can install Microsoft Active Directory Lightweight Directory Services (ADLDS) on your Windows machine to perform the user mapping. Refer to the Microsoft documentation for details :

http://technet.microsoft.com/en-us/library/dd764497(WS.10).aspx

6.6 Link Windows directory to the mainframe file system

After the user mapping is set up, you can access your exported SAP file system on the mainframe. We cannot mount the exported mainframe file system to a Windows drive letter, because the drive letter is user dependant. We have to use Windows UNC (\\server\volume\file).

On your Windows host open a Windows command prompt as administrator:

Click the symbol ‘Command Prompt’ using the right mouse button and select ‘Run as Administrator’.

Change to the windows directory <L>:\usr\sap\SID. <L>: stands for the drive letter, where you installed the local SAP directories e.g. C:. Now remove the directory SYS:

```
<L>:\usr\sap\SID>rmdir SYS
```

To connect to the exported files system on the mainframe you define the following link:

```
<L>:\usr\sap\SID>mklink /d SYS \\<mainframe>\hfs\usr\sapalldataSID\usr.sap\SID\SYS
```

where <mainframe> is the name of your z/OS host.

When you now change your directory to SYS, you see the files on the mainframe.

If you get the error:

```
“The symbolic link cannot be followed because its type is disabled”
```

you have to set the right symbolic link evaluation mode:

The default symbolic link evaluation for Windows Vista, Windows 7, Windows Server 2008 and Windows Server 2008 R2 is Local-to-local enabled, Local-to-remote enabled, Remote-to-local disabled, Remote-to-remote disabled. Symbolic link evaluation settings can be viewed and altered by the following commands respectively:

```
fsutil behavior query SymlinkEvaluation
fsutil behavior set SymlinkEvaluation [L2L:{0|1}] | [L2R:{0|1}] | [R2R:{0|1}] |
[R2L:{0|1}]
```

0 disables the specified evaluation mode, while 1 enables it.

Enabling Remote-to-local and Remote-to-remote will overcome the “The symbolic link cannot be followed because its type is disabled” error when trying to access a symlink on a UNC share.
The symlink evaluation settings can also be controlled via Group Policy. Go to Computer Configuration > Administrative Templates > System > Filesystem and configure "Selectively allow the evaluation of a symbolic link".

7 Install SAP Primary Application Server on Windows

Now you install the SAP Primary Application Server on your Windows machine. Your Central File system resides on your mainframe and not on the Windows machine. This special setup requires an additional step to run the SAP Installer sapinst.

7.1 Edit DEFAULT.PFL

Before you can start with the installation of SAP instances on Windows you must edit the SAP profile DEFAULT.PFL in the SAP profile directory:

Replace the line

```
SAPGLOBALHOST = <z/OS-Host>
```

with the line

```
SAPGLOBALHOST = <Windows-Host>
```

and save the file.

This change is required only to install the Primary Application Server (PAS) on Windows with sapinst correctly. The profile parameter has no implications on the running SAP System after the installation, especially High Availability scenarios are not affected or impacted.

7.2 Run SAP Installer (sapinst)

Now you run sapinst from the installation master DVD as usual to install the database instance of your system.
After this step is finished you run sapinst again to install the primary application server instance.

8 Install additional dialog instances on Windows Systems

You can install additional dialog instances on other Windows systems. To prepare these hosts perform the following steps as described above:

- Install Windows Services for NFS (->6.1)
- Apply Windows Hotfix KB2649107 (->6.2)
- Configure the mapping source of Windows Services for NFS (->6.5)
- Now you can install the dialog instances from your modified installation master DVD (as described above) as usual. (->7.2)
- Link Windows directory /usr/sap/SID to the mainframe system. (->6.6)
  There is no /usr/sap/SYS directory in the Dialog Instance.
  You can immediately define the Link to the mainframe.
  Check symlink evaluation settings and enable all evaluation modes.
- The service ‘sapSID_nn’ must be redefined. nn is the instance number of the dialog instance. To redefine the service open a command prompt.

  Below an example how to perform the redefinition. The following parameters are used, replace them with the correct values of your environment:

  SID = ‘P8K’
  nn = ‘00’
  hostname of primary application server = ‘ibmvx47’
  hostname of secondary application server (this server) = ‘ibmvx60’

- Query the service:

```
D:\usr\sap\P8K\SYS>sc.exe qc sapp8k_00
```

  Windows response:

```
[SC] QueryServiceConfig SUCCESS

SERVICE_NAME: sapp8k_00
        TYPE               : 10  WIN32_OWN_PROCESS
        START_TYPE         : 2   AUTO_START
        ERROR_CONTROL      : 1   NORMAL
        BINARY_PATH_NAME   : "D:\usr\sap\P8K\D00\exe\sapstartsrv.exe"
pf="\\ibmvx47\sapmnt\P8K\SYS\profile\P8K_D00_ibmvx60"
        LOAD_ORDER_GROUP   :
        TAG                : 0
        DISPLAY_NAME       : SAPP8K_00
        DEPENDENCIES       : RPCSS
                           : LanmanServer
        SERVICE_START_NAME : SAPZOS\SAPServiceP8K
```

- Redefine the service:

```
D:\usr\sap\P8K\SYS>sc.exe config sapp8k_00 binPath=
"D:\usr\sap\P8K\D00\exe\sapstartsrv.exe
pf=D:\usr\sap\P8K\SYS\profile\P8K_D00_ibmvx60"
```

  Windows response:

```
[SC] ChangeServiceConfig SUCCESS
```

- Check the redefinition:

  ```
  D:\usr\sap\P8K\SYS>sc.exe qc sapp8k_00
  ```

  Windows response:

  ```
  [SC] QueryServiceConfig SUCCESS

  SERVICE_NAME: sapp8k_00
          TYPE               : 10  WIN32_OWN_PROCESS
          START_TYPE         : 2   AUTO_START
          ERROR_CONTROL      : 1   NORMAL
          BINARY_PATH_NAME   : D:\usr\sap\P8K\D00\exe\sapstartsrv.exe
  pf=D:\usr\sap\P8K\SYS\profile\P8K_D00_ibmvx60
          LOAD_ORDER_GROUP   :
          TAG                : 0
          DISPLAY_NAME       : SAPP8K_00
          DEPENDENCIES       : RPCSS
                             : LanmanServer
          SERVICE_START_NAME : SAPZOS\SAPServiceP8K
  ```

- Edit instance profile `D:\usr\sap\P8K\SYS\profile\P8K_D00_ibmvx60`:

  Insert or Replace the Parameterdefinition:

  ```
  DIR_INSTALL=D:\usr\sap\P8K\SYS
  ```

- Stop instance
- Stop service sapp8k_00
- Start service sapp8k_00
- Start instance

9 Install additional dialog instances on Unix systems

Up to now you have installed instances on Windows hosts only. You also can extend the system with additional dialog instances on Unix.

Before installing further instances on Unix hosts you have to convert the file connect.ini in the SAP global directory from Windows to Unix format:

Sign on to the mainframe as sidadm and switch to the SAP global directory:

```
cd /usr/sapalldataSID/sapmnt/SID/global
```

Rename `connect.ini` to `connect.windows`:

```
mv connect.ini connect.windows
```

Convert `connect.windows` to Unix format:

```
tr –d '\r' < connect.windows > connect.ini
```

`connect.ini` is now Unix format, `connect.windows` is Windows format.

Note: This step is not required if you're already using db2radm according to note 1808398

To mount the SAP Central File System on the mainframe from a Unix host, you have to use the following mount command on the Unix machine:

```
mount <mainframe>:/hfs/usr/sapalldataP8K/sapmnt/P8K /sapmnt/P8K
```

Now install dialog instances on Unix as usual.

www.sap.com