English

FUJITSU

FUJITSU Software BS2000

SESAM-DBAccess V9.1
Server Installation, Administration

Administration Guide

October 2018

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Certified documentation according to DIN EN ISO 9001:2015

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SESAM-DBAccess

English

1 Preface

SESAM-DBAccess consists of client components and a server component.

JDBC Client

The JDBC Client is intended for users working with a platform which offers a Java Virtual Machine (e.g. Windows, Unix systems and BS2000) and provides access to a SESAM/SQL database via a JDBC interface from Java applications, Java Servlets, and Java Applets.

JDBC is a Java API used to execute SQL statements. It consists of many classes and interfaces written in Java. JDBC is a standard API which allows developers of Java applications, Java Servlets, and Java Applets to use an interface written purely in Java to access databases.

Independently of the system platform on which it runs, the JDBC Client has the following tasks:

- Handling the connection to DBAccess Server
- Forwarding requests to DBAccess Server
- Receiving responses from DBAccess Server

ADO.NET Client

ADO.NET is the interface defined by Microsoft in the context of ADO (ActiveX Data Objects) technology for .NET Clients to permit Windows systems to communicate with database systems via the internet.

The ADO.NET Client has the following tasks:

- Handling the connection to DBAccess Server
- Forwarding requests to DBAccess Server
- Receiving responses from DBAccess Server

PDO Client for PHP applications

PHP (**P**HP: **H**ypertext **P**reprocessor) is a script language with a syntax based on C and Perl which is used principally to create dynamic websites or web applications. PHP applications are used, among other things, to communicate with database systems via the internet.

The PDO Client has the following tasks:

- Handling the connection to DBAccess Server
- Forwarding requests to DBAccess Server
- Receiving responses from DBAccess Server

DBAccess Server

DBAccess Server (BS2000) provides JDBC,.NET, and PDO Clients with access to the SESAM/SQL database system.

DBAccess Server has the following tasks:

- Verifying access authorization
- Accepting requests from clients and forwarding them to the database system
- Accepting responses from the database system and forwarding them to the client
- Handling communication with the database System

JAVA-Applications JAVA-Servlets JAVA Server Pages (Any Java Platform)	ADO.Net-Applications (Windows)	PHP/PDO-Scripte (Apache / LINUX)
JDBC-Client	**ADO.Net-Client**	**PDO-Client**

BS2000

DBACCESS Server
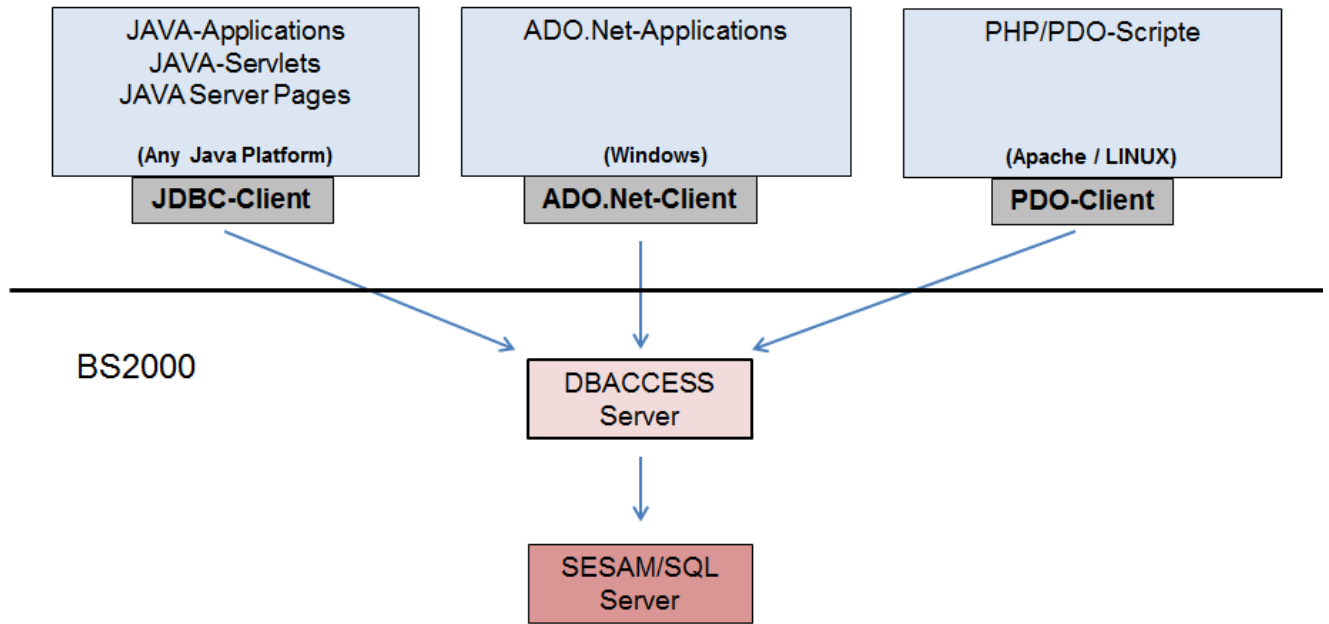
SESAM/SQL Server

Configuration of the complete system

1.1 Objectives and target groups of this manual

This manual is intended for the system administrator of DBAccess Server under BS2000. Knowledge of the SESAM /SQL database system is required.

1.2 Summary of contents

This manual describes the server component of SESAM-DBAccess used in BS2000.

The chapter "Using SESAM-DBAccess Server" provides general information on using DBAccess Server (software requirements and architecture).

The chapter "User administration" describes how to enter authorized DBAccess users.

The chapter "Starting and terminating" describes how to start and terminate DBAccess Server.

The chapter "Operating DBAccess Server" describes settings which affect operation of DBAccess Server. This chapter also describes the functions which can be used to provide information about client connections and DBAccess Server.

The chapter "Troubleshooting" contains important information for the administrator in the event of an error.

The Appendix contains an overview of files, procedures, libraries and programs created and needed by DBAccess Server.

1.3 Changes since the last edition of the manual

The following important changes have been made since the last version of the manual:

- Support of secure SSL connections

1.4 Notational conventions

In this manual, the term **clients** is used for short to mean the JDBC, .NET, and PDO Clients.

This manual uses the following notational conventions:

> **i**   Indicates notes that are of particular importance.

2 Using SESAM-DBAccess Server

Hardware and software requirements

DBAccess Server V9.1 can be used on any server supported by BS2000/OSD-BC V9.0 or higher.

The software products currently required are listed in the release notes.

Architecture of the DBAccess Server

The DBAccess Server is usually started with `/START-SESDBA-SERVER` in a batch task. This task is called an **admin task** below. The admin task starts a further task called a **main task.**

The main task creates further tasks called **server tasks**. There are two types of server tasks:

- **Free server tasks** are tasks that have been started and initialized but have not yet established a connection.
- **Active server tasks** are tasks that have already established a connection.

Admin task

Admin tasks receive administration requests (e.g. to terminate the server) that are also processed within this task.

Main task

After it is started, the main task creates a number of server tasks corresponding to the number of free tasks to be reserved (setting in the initialization file, see section "Initialization file (start parameters)").

Connect requests from the clients for SESAM/SQL sessions are sent to the main task. The main task forwards these connect requests to a free server task.

A new server task is then started if the total number of free and active tasks is smaller than the maximum number of tasks (setting in the in the initialization file, see section "Initialization file (start parameters)").

Server task

A server task is responsible for communication with the requesting user (client). SESAM/SQL requests are forwarded to the database system and processed within this task.
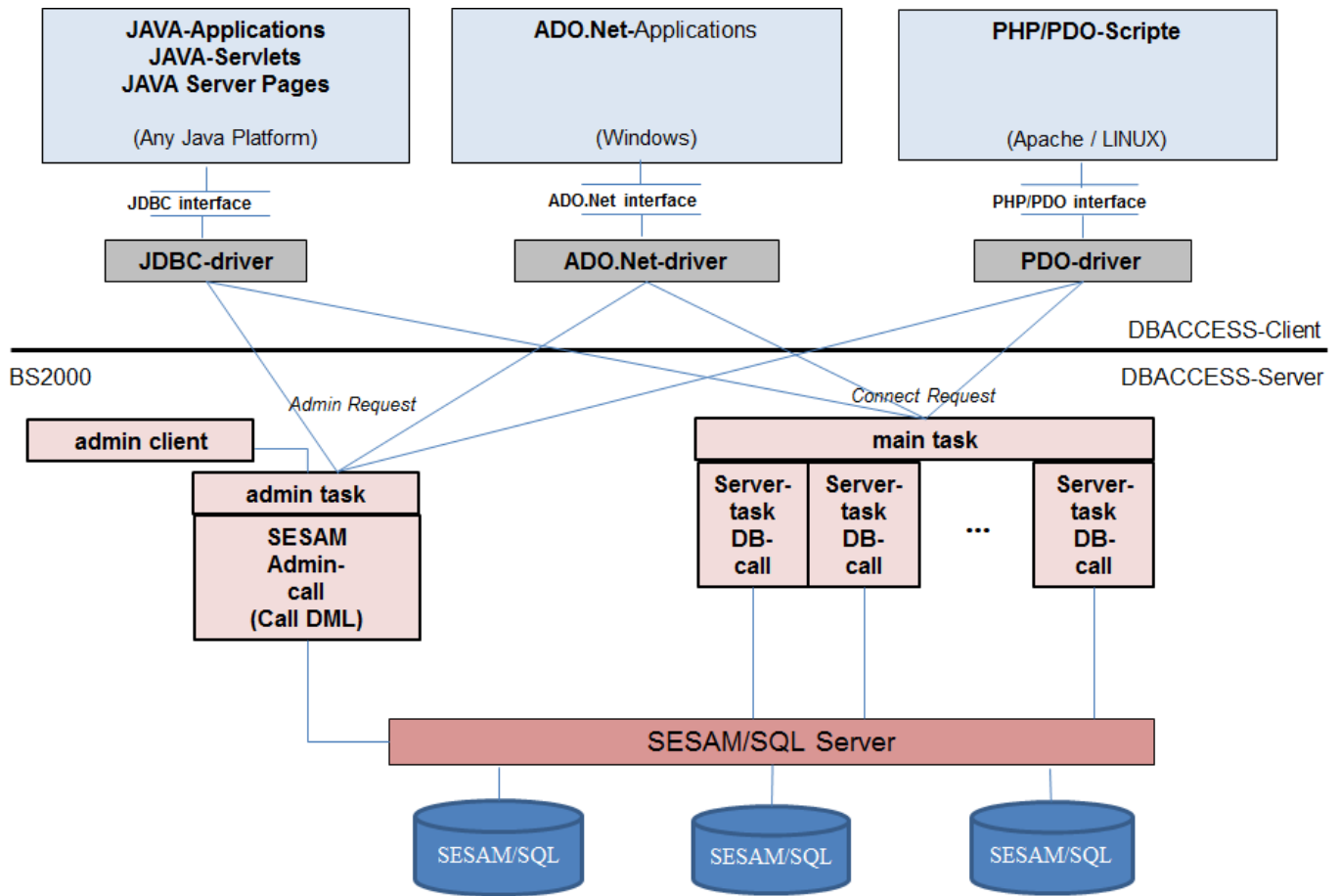
Architecture of SESAM-DBAccess

3 User administration

- User checking
- Data entry procedure SYSPRC.SESDBA.091.USER

3.1 User checking

The DBAccess Server can be used either with or without user checking. You can set this in the initialization file (see section "Initialization file (start parameters)").

Working without user checking

If you are working without user checking, you do not need to enter information on DBAccess users. The clients can use any user name that exists in SESAM/SQL and has a link to a system entry for the DBAccess Server (see "Requirements for starting"). In this case there is no password check.

Working with user checking

If you are working with user checking, you must create a user file before starting DBAccess Server.

All users who are to have access to SESAM/SQL via clients must be entered in this file with their passwords. Whenever a connection is made from a client, the name and password of the user are checked against this file. The outcome decides whether the client can work with the DBAccess Server.

User names must also exist in SEAM/SQL and be linked with a system entry for the DBAccess Server (see "Requirements for starting").

Use the menu-driven procedure `SYSPRC.SESDBA.091.USER` to enter users.

Use the following command to start to create a user file:

```
/CALL-PROCEDURE FROM-FILE=SYSPRC.SESDBA.091.USER,-

/               PROC-PARAMETERS=(USERFILE=SESDBA.USERFILE)
```

The `USERFILE` parameter specifies the name of the relevant user file for the users. The name `SESDBA.USERFILE` is already entered in the procedure as a default. It is **not** permissible to use the same user file as for the other DBAccess components.

Other procedure parameters (`PROCLIB`, `INIFILE`, `CRTELIB`) contain default names for the DBAccess procedure library, the initialization file and the CRTE runtime system library (see section "Files, procedures, libraries, programs").

> **i** Changes made to the user file during operation of the DBAccess Server become valid when the next connection is established.

3.2 Data entry procedure SYSPRC.SESDBA.091.USER

When you start the `SYSPRC.SESDBA.091.USER` procedure, the following screen will be displayed to allow users to be entered.

```
DBS200 Definition of the service users
  +--X(Change)/D(Delete)
  !
  v          User                 Password
>.<   00001  >...................<  >...................<
>.<   00002  >...................<  >...................<
>.<   00003  >...................<  >...................<
>.<   00004  >...................<  >...................<
>.<   00005  >...................<  >...................<
>.<   00006  >...................<  >...................<
>.<   00007  >...................<  >...................<
>.<   00008  >...................<  >...................<
>.<   00009  >...................<  >...................<
>.<   00010  >...................<  >...................<
>.<   00011  >...................<  >...................<
>.<   00012  >...................<  >...................<
>.<   00013  >...................<  >...................<
>.<   00014  >...................<  >...................<
>.<   00015  >...................<  >...................<

(...................)   (position to an entry)
(..) +/-/++/--/RE/EN   (scroll/quit data entry/conclude data entry)

  LTG                                    TAST
```

You can enter user names and their passwords in this screen. These are then stored and used later to check users when a client connection is made. The user name corresponds to the SESAM/SQL authorization identifier.

User

> You can enter the user name in either uppercase or lowercase characters, although no distinction is made during logon. Do not use spaces in the user names.

Password

> You can also enter the user password in either uppercase or lowercase characters, but no distinction is made during logon. The password can contain spaces. If you are entering a new user, you must specify a password. After you press the DUE key (transmission key), all the passwords entered are hidden. If you change a user name, you will have to enter a new password.

Marking column *(* `X` *(Change)* | `D` *(Delete)*)

> New user entries are recorded in empty lines, i.e. you do not need to make an entry in the marking column.

> After pressing the DUE key all the passwords entered are hidden and all entries are set to write-protected.

> The marking column can contain the following information:

X	An existing user entry can be overwritten and changed. The password remains hidden. If the user name is changed, a new password must be entered.
D	A user entry will be deleted.

Position to an entry

To move to a certain user in the table, enter the user name in this field. If you type an incomplete name, you will be moved to the first user name corresponding to these characters.

Scroll/quit data entry/conclude data entry

You can choose from:

+	go to next page
-	go to previous page
++	go to end of table
-	go to beginning of table
RE	terminate entry without saving new information in the user file
EN	terminate entry, sorting and saving new information in the user file

> **i** Passwords are encrypted when saved and are also encrypted during transmission by the client. Thereby, there is an influence of the ASCII-EBCDIC conversion onto the passwords. Consequently, if passwords contain special characters and the conversion table is altered, you will have to re-enter and encrypted these passwords (see also section "EBCDIC-ASCII conversion").

4 Starting and terminating

- Requirements for starting
- Starting DBAccess Server
- Termination of DBAccess Server
- Job variable of DBAccess Server

4.1 Requirements for starting

DBH

Before you start SESAM-DBAccess, the DBH of SESAM/SQL-Server must be booted.

SESAM/SQL configuration file

To operate the DBAccess Server you need a SESAM configuration file. This file must be created by the administrator. Its default name is `SESDA.SESCONF`. If the name has been changed, the new name must be entered in the initialization file (see section "Initialization file (start parameters)"). The SESAM/SQL configuration file must contain the following information:

```
CNF=<c>
NAM=<n>
NOTYPE
PREFETCH-BUFFER=<pb>
CCSN=<ccs_name>
```

`CNF` and `NAM` are used to address the SESAM/SQL DBH. `NOTYPE` suppresses display on the console. `PREFETCH-BUFFER` specifies a buffer in 4-KB blocks, which is used for unchangeable results between the DBH and the server.

The `CCSN` operand defines the coded character set with which the values for columns that are declared in the database to be of the type NATIONAL CHARACTER or NATIONAL CHARACTER VARYING are to be interpreted. If the database referenced has a significant CCSN (i.e. not equal to *NONE), the database's CCSN must be specified here. Otherwise communication with the database is not possible.

The contents of the SESAM configuration file can be modified during operation. Modifications to the SESAM configuration file apply to new tasks only. They do not apply to tasks that have already been started.

SESAM/SQL database access rights for clients

Users authorized to access the system via clients must be set up by the SESAM/SQL administrator (CREATE USER command) and they must be granted appropriate authorization (GRANT command).

A system entry must be defined for the users:

`CREATE SYSTEM_USER ({hostname | *}, [*], {bs2000_userid | *})` FOR user AT CATALOG catalog

The variables `hostname` and `bs2000_userid` refer to the names of the host and the user ID under which DBAccess Server was started.

If clients are not using the authorization identifier of the *Universal User*, you must grant read authorization to DBAccess users in the tables SYS_UNIQUE_CONSTRAINTS, SYS_REFERENTIAL_CONSTRAINTS and SYS_INDEXES in the schema SYS_INFO_SCHEMA, e.g. as follows:

`GRANT SELECT ON TABLE SYS_UNIQUE_CONSTRAINTS`	`TO PUBLIC`
`GRANT SELECT ON TABLE SYS_REFERENTIAL_CONSTRAINTS`	`TO PUBLIC`
`GRANT SELECT ON TABLE SYS_INDEXES`	`TO PUBLIC`

Cancel authorization for clients

Clients can cancel their own SESAM/SQL requests. DBAccess Server must be authorized to execute SESAM administration commands via the SESAM-CALL-DML interface. This authorization must be entered for the host and the BS2000 user ID under which DBAccess Server is running.

You can grant authorization with the SESAM-DBH option

```
ADMINISTRATOR = *ANY(...)
```

or

```
ADMINISTRATOR = *TIME-SHARING-USER(...)
```

The administration password used must be entered in the SESAM-DBAccess INI file, in the section [Connect], key "SESAMAdmPass".

BS2000 systems support

TP processes should be permissible for the BS2000 user ID and the job class under which DBAccess Server is running. In addition, the permissible program priority (RUN-PRIO) should be the same program priority entered in the SESAM-DBAccess INI file in the section [MainTask] and key "RunPrio" for batch jobs created with fork().

4.2 Starting DBAccess Server

Shared code for DBAccess Server

Parts of DBAccess Server contain shared modules. These modules are contained in the SESDBA subsystem and can be loaded to class 4 memory using the `/START-SUBSYSTEM` command before DBAccess Server starts.

As DBAccess Server is started with several server tasks, this reduces the load on main memory and shortens the load times of the server tasks.

Example

```
/START-SUBSYSTEM SUBSYSTEM-NAME=SESDBA,VERSION=9.1A00,

                 VERSION-PARALLELISM=*COEXISTENCE_MODE
```

The value `*COEXISTENCE_MODE` is recommended for DBAccess Server.

Starting DBAccess Server

In general, DBAccess Server is started as a batch job with the command

```
/START-SESDBA-SERVER
```

The server uses an initialization file (see section "Initialization file (start parameters)") whose name is read from SYSDTA. The default name for this file is `SYSDAT.SESDBA.091.INIT`. If the default name is to be used, you simply have to press the DUE key or enter an empty line in procedures.

Example of a command sequence in a procedure

```
(IN) /ASSIGN-SYSDTA TO-FILE=*SYSCMD
(IN) /START-SESDBA-SERVER
(OUT) Enter Name of INI-file (default is SYSDAT.SESDBA.091.INIT):
(IN) <INI-filename> or space
```

4.3 Termination of DBAccess Server

To terminate DBAccess Server, start the administration program with the command

```
/START-SESDBA-ADMINISTRATION
```

In the same ways as the server, the administration program uses an initialization file (see section "Initialization file (start parameters)") whose name is read from SYSDTA. The default name is `SYSDAT.SESDBA.091.INIT`. If the default name is to be used, you simply have to press the DUE key or enter an empty line in procedures.

The program then requests a command from SYSDTA. All commands and parameters may also be entered using lowercase characters. The following commands can be used to terminate the server:

CLOSE	DBAccess Server (main task and free server tasks) is terminated. Active server tasks continue to run. Active clients retain their connection; but no more clients can log on. Administration is still available. Warning: Before the server can be restarted, the administration program must also be terminated using CLOSE ALL.
CLOSE ALL	DBAccess Server is terminated completely (including the administration program). Even active server tasks are terminated, i.e. open transactions are rolled back. The administration program then terminates.
CLOSE_ALL	This command continues to be supported for reasons of compatibility. It cannot be abbreviated. It has the same effect as CLOSE ALL.
END	The administration program is terminated.

The administration program can be started either interactively, in a procedure or as a batch job. In procedures and batch jobs the command to be executed can be specified in the procedure.

> **i** The termination of the server can take a few minutes when the SessionLog=True option is activated because in this case the server tasks which exist write an end message (serially) into the SessionLog. A subsequent restart of the server should take place only when all the server tasks of the preceding run have terminated.

Example of a command sequence in a procedure

```
(IN)  /ASSIGN-SYSDTA TO-FILE=*SYSCMD
(IN)  /START-SESDBA-ADMINISTRATION
(OUT) Enter Name of INI-file (default is SYSDAT.SESDBA.091.INIT):
(OUT) Enter administration command:
(IN)  CLOSE ALL
```

4.4 Job variable of DBAccess Server

DBAccess Server shows that it is ready to operate by means of the job variable:

`SESAM.DBA-SERVER.<admin-port>`

`<admin-port>` is the port number of administration of DBAccess Server.

The content of the job variable is:

Date	*yyyy.mm.dd*
Time	*hh.mm.ss*
`<text>`	

`<text>` contains:

`DBA-SERVER_STARTED`	after successfully starting DBAccess Server
`DBA-SERVER_NORMAL_END`	after successfully terminating the server session
`DBA-SERVER_ABNORMAL_END`	after aborting the server session

5 Operating DBAccess Server

- Initialization file (start parameters)
- EBCDIC-ASCII conversion
- Information functions
  - Logging in the session log file
  - Information about current connections
  - Information on current parameters
- Secure Connections with SSL

5.1 Initialization file (start parameters)

Operation of DBAccess Server is controlled by start parameters. These start parameters are stored in an initialization file called `SYSDAT.SESDBA.091.INIT`. The initialization file has the following entries:

```
[DBMS]
Product=SESAM/SQL
Version=9.1A

[Connect]
SESCONF=<ses_conf>
SESAMAdmPass=<SESAM_administration-password>
DefaultCatalog=<default-catalog>
DefaultSchema=<default-schema>
DefaultUser=<default-user>
UserIdentification=<True/False>

[SSLConnect]
SSLUsage=NO
SSLCertificate=<Certificate-file>
SSLKey=<Key-file>

[MainTask]
ServerPort=2112
AdminPort=2113
UserFile=<user-filename>
ConvTable=<EBCDIC-ASCII-conversion-filename>
MsgFile=<message-filename>
SessionLogFile=<True/False>
RunPrio=210
TasksPrestart=3
TasksMaximum=100
ConnectQueue=5
PackageLen=8192
OptLogMsgLen=8192
MaxPreparableStatements=64

[ServerTask]
SESAM_Prefetch=20



[Trace]
AdminTask=0
MainTask=0
ServerTask=0[AdminClient]
ServerHost=127.0.0.1
```

These entries can and must be modified by the administrator to enable control of DBAccess Server. This applies in particular when the ADO.NET interface is operated parallel to the JDBC interface.

Description of the entries

The entries in the initialization file have the following meanings:

Section [DBMS]

Key	Default	Meaning	A
Product	SESAM/SQL	DBMS product name	N
Version	9.1A	DBMS version	N

Section [Connect]

Key	Default	Meaning	A
SESCONF	SESDBA. SESCONF	SESAM configuration file	Y
SESAMAdmPass	(empty)	Password for SESAM/SQL administration	Y
DefaultCatalog	D0CATALOG	Default catalog name, used as default for the CONNECT client operation. [1]	Y
DefaultSchema	D0SCHEMA	Default schema name, used as default for the CONNECT client operation [1]	Y
DefaultUser	D0USER	Default user name, used as default for the CONNECT client operation. Not casesensitive.	Y
UserIdentification	true	Switch determines whether the server works with (true) or without (false) user identification.	Y

[1]Regular names must be written in uppercase characters. Non-regular names must not be enclosed in quotation marks. In other words, the names must be written as they appear in the INFORMATION_SCHEMA (e.g. TABLES table).

Abschnitt [SSLConnect]

Schlüssel	Standard	Erläuterung	A
SSLUsage	NO	NO: (default) Server accepts unsecure connection requests only PREFER: Server accepts both secure and unsecure connection requests. REQUIRE: Server accepts secure connection requests only (unsecure connection requests are rejected)	N
SSLCertificate	(empty)	Certificat specification (file containing certificatet) for SSL connections	N
SSLKey	(empty)	File with private key for network traffic encryption for SSL connections	N

Section [MainTask]

Key	Default	Meaning	A
ServerPort	2112	Port number of the main task; this port number must also be administered at the client computer.	N
AdminPort	2113	Port number of the admin task	N
UserFile	SESDBA. USERFILE	Name of the user file of the server	N
ConvTable	SYSDAT. SESDBA. 091. EBCASC	File name of the conversion table of the server. *SESAM: with this specification the CCSN which is entered in the SESAM configuration file is used as the CCSN for conversion via XHCS.	N
MsgFile	SYSMES. SESDBA.091	Name of the SESAM-DBAccess message file	N
SessionLogFile	False	True: information about connections is written in a session log file.	D
RunPrio	210	Run priority for tasks (BS2000 parameter RUN-PRIO, 128 - 255)	P
TasksPrestart	3	Number of tasks that the server starts in advance to increase connection speed[1](0 - 500).	P
TasksMaximum	100	Maximum number of server tasks that the server can start simultaneously [1] (1 - 500).	P
ConnectQueue	5	Number of queued connect requests if the server has already reached the maximum number of server tasks (0-100).	P
PackageLen	8192	Size of message packages (1024 - 32768).	P
OptLogMsgLen	8192	Optimum size of logical messages (PackageLen - 65536).	P
MaxPreparable Statements	64	Max. number of prepared statements (64 - 1000).	P

[1]The number of tasks which the server can start is limited by the parameters above. If the values specified for TasksPrestart / TasksMaximum are not reached, you should check the MAXUP / NPROC values of the Posix installation which limit the number of processes per user / in the system.

Section [ServerTask]

Key	Default	Meaning	A
SESAM_Prefetch	20	Number of records requested by SESAM in prefetch mode.	P

Section [Trace]

Key	Default	Meaning	A
AdminTask	0	Trace level of the admin task	D
MainTask	0	Trace level of the main task	D
ServerTask	0	Trace level of the server task	D

Section [AdminClient]

Key	Default	Meaning	A
ServerHost	127.0.0.1	IP address of the server (127.0.0.1 defines the local host)	N

The column **A** indicates whether the administrator must modify the standard values:

N	In general, no modifications are necessary.
Y	Default values must be modified in accordance with the SESAM installation and database.
P	Default values can be modified to improve performance if the user profile is known.
D	Modifications are only necessary to produce debugging information.

Time at which keys are evaluated

All keys are evaluated when the server is startup. The keys are stored within a memory pool, so they can be accessed by all tasks. Any modifications made during the current operation have no effect. The modifcations become valid when the server is restarted.

By using the administration command `REUSE-INI-FILE` the changed entries in section [trace] can be made valid for all the tasks.

5.2 EBCDIC-ASCII conversion

When data is transferred from the SESAM-DBAccess server to the client computer, DBAccess converts this data from EBCDIC.DF4.04 to ISO8859-1 (8-bit ASCII) and vice versa.

However, if a different conversion is necessary, e.g. if national character sets are used or the data has other peculiarities, DBAccess allows you to specify the required ASCII conversion individually for every EBCDIC character in the `SYSDAT.SESDBA.091.EBCASC` conversion table. However, you can only change the notation for special characters.

This file has the following default contents:

```
# Converting EBCDIC.DF.04 to ISO8859-1 (ASCII 8 bit)
# This conversion table differs from standard conversion in following items:
# - EBCDIC 0x15 Newline -> ASCII 0x0a Newline instead of 0x1a
# - EBCDIC 0x25        -> ASCII 0x85        instead of 0x0a
# - The conversion is extended to a bijective conversion
#
 EBCDIC->ASCII
#     -0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -a -b -c -d -e -f
 0-    00 01 02 03 9c 09 86 7f 97 8d 8e 0b 0c 0d 0e 0f    0
 01-   10 11 12 13 9d 0a 08 87 18 19 92 8f 1c 1d 1e 1f    1
 12-   80 81 82 83 84 85 17 1b 88 89 8a 8b 8c 05 06 07    2
 23-   90 91 16 93 94 95 96 04 98 99 9a 9b 14 15 9e 1a    3
 34-   20 a0 e2 e4 e0 e1 e3 e5 e7 f1 60 2e 3c 28 2b 7c    4
 45-   26 e9 ea eb e8 ed ee ef ec df 21 24 2a 29 3b 9f    5
 56-   2d 2f c2 c4 c0 c1 c3 c5 c7 d1 5e 2c 25 5f 3e 3f    6
 67-   f8 c9 ca cb c8 cd ce cf cc a8 3a 23 40 27 3d 22    7
 78-   d8 61 62 63 64 65 66 67 68 69 ab bb f0 fd de b1    8
 89-   b0 6a 6b 6c 6d 6e 6f 70 71 72 aa ba e6 b8 c6 a4    9
 9a-   b5 af 73 74 75 76 77 78 79 7a a1 bf d0 dd fe ae    a
 ab-   a2 a3 a5 b7 a9 a7 b6 bc bd be ac 5b 5c 5d b4 d7    b
 bc-   f9 41 42 43 44 45 46 47 48 49 ad f4 f6 f2 f3 f5    c
 cd-   a6 4a 4b 4c 4d 4e 4f 50 51 52 b9 fb fc db fa ff    d
 de-   d9 f7 53 54 55 56 57 58 59 5a b2 d4 d6 d2 d3 d5    e
 ef-   30 31 32 33 34 35 36 37 38 39 b3 7b dc 7d da 7e    f#
#     -0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -a -b -c -d -e -f
#
```

The body of the table shows the appropriate ASCII notation for every EBCDIC character indicated by the values around the margins of the table. DBAccess automatically converts values in the opposite direction (e.g. SQL statements and entry parameters) by inverting this table.

Notes

- Comment lines are marked in the file with # at the first position.

- For example: EBCDIC 0xF0 is converted to ASCII 0x30 according to the EBCDIC-ASCII conversion table.

- The representation is bijective, i.e. every hexadecimal value in EBCDIC is paired uniquely with one hexadecimal value in ASCII and vice versa.

- If you make any modifications, you must ensure that a bijective representation is created and that none of the characters which appear in reserved SQL words is modified.

- Passwords are encrypted when saved and are also encrypted during transmission by the client. Thereby, there is an influence of the ASCII-EBCDIC conversion onto the passwords. For the case that the passwords include special characters and the conversion table is changed, these passwords have to be entered and encrypted again.

Generating a new conversion table

When the default name for the server's conversion table is replaced by `*SESAM` in the initialization file, the CCSN which is entered as the CCSN in the SESAM configuration file is used for conversion via XHCS.

The administration command WRITE_NEW_CONVTABLE <file_name> enables this new conversion table to be stored, and it can then be used as the server's new conversion table when required.

A password file can only be used with the conversion table with which it was created, see "Data entry procedure SYSPRC.SESDBA.091.USER". The new conversion table should therefore be used to generate a new password file.

5.3 Information functions

DBAccess Server can log data for historic client connections in a session log file and provide information about current connections.

5.3.1 Logging in the session log file

DBAccess Server can log historic data for client connections in a session log file. To do this the key SessionLogFile must be set to True in section [MainTask] of the initialization file (see section "Initialization file (start parameters)").

The name of the file is `SESDBA.SESSIONLOG.<ServerPort>` where `ServerPort` is the port number of the main task.

If the file already exists, it is not deleted when the server is started. Data is simply appended to it.

> **i** The session log file should not be displayed using /SHOW-FILE while the server is running, since this locks the file. However, the file can be displayed using EDT, without interfering with the server output.

The following information is written to the file

- When the server is started, the following messages are written:

```
Start of SESAM-DBAccess-Server (<ServerPort>) (Version <Version>)
(TSN = <Tsn>, PID = <Pid>) Administration Task at YYYY-MM-DD hh:mm:ss
Start of SESAM-DBAccess-Server (<ServerPort>) (Version <Version>)
(TSN = <Tsn>, PID = <Pid>)  Distributor Task at YYYY-MM-DD hh:mm:ss
```

Here, the `ServerPort` stands for the port number of the main task, `Version` is the version of the DBAccess Server, `Tsn` is the task sequence number, and `Pid` the process ID of the relevant task.

- When the server is running, the server tasks log the connections:

  The outputs have the following format:

Position	Contents
1 – 19	Time stamp of the initialization of the server task.
21 – 24	TSN (task sequence number) of the server task.
26 -30	PID (process ID) of the server task.
32	Status: empty = no connection was established. F = connection was rejected. D = controlled termination of connection. A = connection terminated due to loss of network connection or the CLOSE ALL administration command.
34 – 47	Time stamp of connection setup, only if status = F/D/A.
49 – 66	User name, only if status = F/D/A.
As of 68	Host name or IP address of the client computer, only if status = F/D/A.
As of 89	Time stamp of connection cleardown, only if status = D/A.

  The outputs occur when:

  - a connection setup fails, e.g. due to an incorrect user identification (status = F).
  - a connection is terminated in a controlled fashion by the client (status = D).
  - a connection is terminated for another reason (e.g. by the CLOSE ALL administration command, breakdown of the TCP/IP connection) (status = A).
  - an initialized task which did not have a connection is terminated (CLOSE ALL administration command or CLOSE) (status = empty).

- The following messages are written when the server is terminated:

```
Maximum number of simultaneous connections was <n1>
Maximum number of simultaneous connections allowed by configuration: <n2>
Shutdown of SESAM-DBAccess-Server (<ServerPort>) Administration Task at
YYYY-MM-DD hh:mm:ss
Shutdown of SESAM-DBAccess-Server (<ServerPort>) Distributor Task at
YYYY-MM-DD hh:mm:ss
```

n1 is the maximum number of simultaneous client connections during the server run.

n2 is the maximum permitted number of simultaneous client connections specified with the key TasksMaximum in the [MainTask] section of the initialization file.

ServerPort is the port number of the main task.

5.3.2 Information about current connections

DBAccess Server supplies information about current connections. To do this, start the SESDBAADM administration program as described in section "Termination of DBAccess Server". You can now enter the following administration commands:

GET_INFO	ACTIVE [number]	Lists current active tasks and TCP/IP connections. Number > 0 specifies the number of records that are to be output simultaneously. If more records are available, the following message is output: "Press ENTER to continue". Number = 0 (default) indicates that there is no limit.
GET_INFO	STATISTICS	Outputs statistical information.

> **i** The commands and parameters can also be entered using lowercase characters.

The outputs from the command GET_INFO ACTIVE have the following format:

Position	Contents
1 – 19	Time stamp of the initialization of the server task.
21 – 24	TSN (task sequence number) of the server task.
26 -30	PID (process ID) of the server task.
32	Status: Empty = no connection created F = connection finished with error C = active unsecure connection S = active secure connection P = suspended unsecure connection Q = suspended secure connection D = disconnected
34 – 47	Time stamp of the connection setup, only if status = F/C/S/P/Q/D.
49 – 66	User name, only if status = F/C/S/P/Q/D.
As of 68	Host name or IP address of the client computer, only if status = F/C/S/P/Q/D.

The command `GET_INFO STATISTICS` creates the following outputs:

```
Number of current connections: <n1>
Maximum number of simultaneous connections up to now: <n2>
Maximum number of simultaneous connections allowed by configuration: <n3>
```

`n1` is the current number of connections.

`n2` is the maximum number of simultaneous connections during the server run.

`n3` is the maximum permitted number of simultaneous client connections specified with the key TasksMaximum in the [MainTask] section of the initialization file

5.3.3 Information on current parameters

DBAccess Server supplies information on the current parameters of the active session. These are normally the same as the settings in the ini file, but can also contain other values, e.g. in the case of errors in the ini file which do not result in initialization aborting.

To do this, start the SESDBAADM administration program as described in . The following administration command can then be entered:

GET_INFO PARAMETERS

Lists the parameters of the session which are currently valid

> **i** The command can also be entered in lower case.

Sample output

```
IniFileName:            SYSDAT.SESDBA.091.INIT
Product:                SESAM/SQL
Version:                9.1A
SESCONF:                SESDBA.SESCONF
SESAMAdmPass:           ***
DefaultCatalog:         D0CATALOG
DefaultSchema:          D0SCHEMA
DefaultUser:            D0USER
UserIdentification:     True
SSLUsage:               NO
SSLCertificate:
SSLKey:
ServerPort:             2112
AdminPort:              2113
UserFile:               SESDBA.USERFILE
ConvTable:              SYSDAT.SESDBA.091.EBCASC
MsgFile:                SYSMES.SESDBA.091
SessionLogFile:         False
RunPrio:                210
TasksPrestart:          3
TasksMaximum:           100
ConnectQueue:           5
PackageLen:             8192
OptLogMsgLen:           8192
MaxPreparableStatements: 64
SESAM_Prefetch:         20
AdminTask:              0
MainTask:               0
ServerTask:             0
ServerHost:             127.0.0.1
```

5.4 Secure Connections with SSL

Some applications may require a higher security level for the communication between a client and a DBACCESS server. Therefore the DBACCESS server offers the option to use socalled "Secure Connections" by using SSL.

There are the following options regarding SSL usage (see. initialization file):

- The server could be cofigured without SSL usage, that means it uses unsecure connections only (hence called a NoSSL server).

- The server could be configured using SSL only, that means it uses secure connections only (hence called a SSL server).

- The server could be configured to accept both secure and unsecure connections (it will always choose a secure connection if the client doesn't request explicitly a secure or unsecure connection) (hence called SSL/NoSSL server).

The DBACCESS server needs a server certificate (see initialization file) for negotiations about encrytion algorithms with a client when a secure connection is requested (both partners must be able to use a common encryption algorithm).

You can order a certificate from official certificate authorities (by providing a certificate and a Certificate Signing Request (CSR)); those official certificates will be kept on the official authority side and could be accessed by an appropriate URL by web access or they could be stored in files on the server side.

Or you can generate a self signed certificate by using the BS2000 procedure make.cert which is contained in the library $TSOS.SYSSPR.TCP-IP-AP.0nn.

Usage of this procedure is described in manual "interNet Services User Guide".

Please note that there are two parts of a certificate: The certificate file itself and a file with the private key for the encryption (should not be public available). Both parts are required for configuration of an SSL or NoSSL/SSL server (see initialization file).

When connecting to a DBACCESS server, a client could request

- an unsecure connection
- a secure connection
- a secure connection if the server offers secure connections or an unsecure connection otherwise (prefer secure)

See readme-file of the corresponding client (JDBC, ADO.Net, PHP/PDO).

Then the following matrix shows the type of the connection between client and server:

Client Request	Server Type	NoSSL	SSL	SSL /NoSSL
unsecure		unsecure	error	unsecure
secure		error	secure	secure
prefer secure		unsecure	secure	secure

Encryption and Decryption could be very expensive in terms of CPU both on client and server; especially creating a secure connection is much more expensive (in terms of CPU and network traffic) than creating an unsecure connection.

Hence we recommend to use connection pooling for secure connections, if connection pooling is available for the client interface. In SESAM/SQL connection pooling is only available for JDBC clients (s. readme file of the JDBC client).

6 Troubleshooting

Errors and trace information appear in the following:

- SYSOUT log
- User log file

6.1 SYSOUT log

Serious errors that cause the server to stop operation, such as errors when logging on to the sockets or when requesting resources, are listed on SYSOUT. In trace level 1 these messages also appear in the relevant trace file.

A warning or message is given in SYSOUT in the following cases:

- *Main task:* after completion, the maximum number of concurrent connections and tasks is listed.
- *Main task:* a warning is issued if the maximum number of concurrent connections and tasks has been reached.
- *Admin task:* a warning is issued if the EBCDIC-ASCII conversion table is not bijective.
- *Admin task:* a warning is issued if the IA5 core has been changed in the EBCDIC-ASCII conversion table.

> **i** SYSOUT output from child processes can be seen only under very special conditions:
> the shell variable PROGRAM-ENVIRONMENT='SHELL' must be set and the server program must be started interactively and not in a procedure. Therefore, output from the main task and from server tasks can usually only be found in the appropriate trace file if trace level 1 is used.

6.2 User log file

In every task trace information can be written into a user log file irrelevant of which log level is set.

Admin task trace

A trace for the admin task can be activated with the AdminTask key in the [Trace] section of the initialization file (see section "Initialization file (start parameters)").

The following values can be used for the trace level. Higher levels include the lower levels:

Value	Scope of the trace
0	Trace deactivated
1	Error conditions
3	Administration requests
7	SESAM administration interface and administration request execution
15	Socket interface
31	Important functions

The trace file of the admin task is given the name TRC.SESDBA.<port>.ADM.<tsn>.<n>, where <port> is the port number for SESAM/SQL requests, <tsn> is the TSN of the task and <n> equals 1 up to 5. The files with the suffixes 1 up to 5 are created and overwritten in wraparound mode.

Main task trace

A trace for the main task can be activated with the MainTask key in the [Trace] section of the initialization file (see section "Initialization file (start parameters)").

The following values can be used for the trace level. Higher levels include the lower levels:

Value	Scope of the trace
0	Trace deactivated
1	Error conditions
3	Establishment of connection and activation of server task
7	Server task management
15	Socket interface
31	Important functions

The trace file of the main trask is given the name TRC.SESDBA.<port>.DST.<tsn>.<n>, where <port> is the port number for SESAM/SQL requests, <tsn> is the TSN of the task and <n> equals 1 up to 5. The files with the suffixes 1 up to 5 are created in wraparound mode.

Server task trace

A trace for the server tasks can be activated with the ServerTask key in the [Trace] section of the initialization file (see section "Initialization file (start parameters)").

The following values can be used for the trace level. Higher levels include the lower levels:

Value	Scope of the trace
0	Trace deactivated
1	Error conditions
3	SQL statements forwarded to SESAM/SQL
7	Entire SESAM/SQL interface
15	Client log interface
31	Important functions

The trace file of the server is given the name TRC.SESDBA.<port>.SRV.<tsn>.<n>, where <port> is the port number for SESAM/SQL requests, <tsn> is the TSN of the task and <n> is in the range 1 up to 5. The files with the suffixes 1 up to 5 are created in wraparound mode.

7 Appendix

Files, procedures, libraries, programs

Names are listed alphabetically.

SESAM.DBA-SERVER.<admin-port>	Job variable of the DBAccess Server
SESDBA.SESCONF	SESAM configuration file
SESDBA.USERFILE	SESAM-DBAccess user file
SYSDAT.SESDBA.091.EBCASC	Conversion table
SYSDAT.SESDBA.091.INIT	Initialization file
SYSLIB.SESDBA.091.PROCLIB	SESAM-DBAccess library with procedures
SYSMES.SESDBA.091	SESAM-DBAccess message file
SYSOML.SESDBA.091	SESAM-DBAccess module library
SYSPRC.SESDBA.091.USER	Procedure for creating the user file
TRC.SESDBA.<port>.ADM.<tsn>.<n>	Trace file for the admin task
TRC.SESDBA.<port>.SRV.<tsn>.<n>	Trace file for the server tasks
TRC.SESDBA.<port>.DST.<tsn>.<n>	Trace file for the main task