

Datasheet

FUJITSU Software BS2000 SESAM/SQL Server V8.0

Relational Database Management System

BS2000 Mainframes

Mainframes are outstandingly suited as central high-performance systems to precisely meet the demand in the server pool of modern data centers.

When it comes to handling large quantities of data, economically supporting numerous end users and at the same time ensuring permanent availability the BS2000 Mainframe technology is an important component in dynamic infrastructures.

BS2000 mainframes are more than just servers: they are a complete and autonomous IT infrastructure for your applications providing the rock-solid heartbeat for your data center.

SESAM – the SQL server for BS2000

SESAM/SQL-Server is a state-of-the-art SQL server for the BS2000 environment, combining the advantages of a relational database system with all the features that users expect from a production system designed to handle heavy workloads. SESAM/SQL-Server is the perfect choice for an industrial-strength, high-performance database system for business-critical e-business solutions and midrange to high-end online transaction processing applications.

Today, there are numerous SESAM installations in which many thousands of users concurrently access shared data resources, performing many hundreds of transactions per second and accessing databases that are terabytes in size. The number of users and the size of the database are virtually unlimited. This gives users the assurance that the system will go on providing high performance in spite of rapid rises in both data capacities and numbers of users.

SESAM/SQL-Server runs on all BS2000 business servers and can be accessed as a data server from arbitrary platforms.



Topics

SQL2008 standard

SESAM/SQL-Server uses SQL as a standard language and uniform concept system for defining, building and maintaining a relational database and for creating application programs.

SESAM/SQL-Server is based closely on the current standard ISO/IEC 9075:2008. In addition to the basic SQL operations of standard SQL, SESAM/SQL-Server contains important extensions to Core SQL as defined by the SQL standard, such as multiple columns and operations to store and retrieve large objects of up to 2 GByte (BLOBs) in SQL tables.

The standard also includes functions for maintaining data consistency (such as referential integrity and check clauses). As a result, SESAM/SQL-Server offers greater security in architectures in which a large number of clients access productive databases.

For data manipulation there is also a "native call" interface (SESAM-CALL-DML) for the COBOL, Assembler, FORTRAN, PL/1, PASCAL and RPG programming languages. SESAM-CALL-DML and SQL statements can be used together in one application program. SQL statements may even be used within CALL-DML transactions.

High performance

64Bit main storage database

The 64bit main storage database can keep large amounts of data resident in memory. This is useful in any case where the physical I/O is forming a bottleneck, especially in web applications, OLAP (= Online Analytical Processing), data mining and OLTP applications with strong response time requirements.

The 64bit main storage database facilitates a significant reduction of the „elapsed time“ by saving physical I/Os.

The 64bit addressing is implemented for the primary and the secondary data buffer. Thus both together can be extended up to 48 GB.

Multithreading

Advanced parallel processing techniques ensure that OLTP operation and any additional OLAP analyses that may be running do not impede one another. This is an important requirement for eBusiness applications, where the data server often has to manage highly variable workloads.

The multithreading architecture allows the SESAM database handler (DBH) to process requests in parallel and so make use of the time in which requests are waiting for input/output operations to be completed (e.g. read and write access to hard disks). Thus, another executable request can be activated for processing while the I/O operation processing is continuing. This greatly increases throughput. Long-running and complex database queries (OLAP) can also be processed partition by partition without affecting OLTP operation.

Multitasking

SESAM/SQL-Server is available in a Standard Edition offering single-task processing or in an Enterprise Edition which supports multitasking. The multitasking architecture enables the DBH to be

loaded with up to 16 tasks for high performance requirements. In multiprocessor systems, the DBH workload can thus be distributed across multiple processors. Load balancing is handled independently by SESAM/SQL-Server, which flexibly adapts to the load situation at a given time.

Parallel processing of administration tasks

Administration utilities and sort operations are also relocated to special service tasks. They run in parallel with DBH operation and do not degrade the performance of the DBH.

Cost-based optimizer

When an SQL statement is issued by an application, an access plan is produced. This defines the type and sequence of the individual evaluation steps of the SQL statement. The cost-based optimizer ensures that a particularly efficient access plan is produced to minimize the use of system resources (CPU time, I/O access operations, etc.).

Shared SQL

The optimized access plan for static and dynamic SQL statements is stored in main memory and can be used by more than one user (shared SQL). This can increase performance significantly, particularly with OLTP applications in which certain processing steps are often repeated.

Shared record lock

Transaction performance is also enhanced by an extended lock concept. When a record is read, it is normally locked to prevent access by other transactions. With a "shared record lock" it is now possible for other transactions to read this record. This reduces the number of blocks and enables more transactions to be executed in parallel. It also means that long-running and complex queries can be started without degrading OLTP operation. Full transaction security is guaranteed.

Selectable consistency level

In addition to this general locking technique, the programmer can select a consistency level for each transaction; this level can in turn be modified for the individual statement.

Block mode

Records may be fetched and inserted in "batches". With a typical SQL statement of medium complexity, for example, fetching in batches of 15 records, each containing 10 values plus indicator bytes, saves up to 50 % of the instructions. With simple statements the improvement is even greater.

Data compression

Data is automatically compressed when it is stored. Compressing the data to significant attribute values enables the database to be configured for maximum requirements. There is no storage overhead

in defining attributes for which there are as yet no contents in the database. Attributes for which there are values in only a few records can therefore also be easily defined.

Global storage and input/output optimization

SESAM/SQL-Server can use BS2000 global storage as a data cache, thereby dramatically reducing the number of read and write operations. Overall performance can be increased significantly as a result. A number of other techniques, including database cache, buffering, asynchronous I/O, and group commit, can be used to minimize read and write operations to the relatively slow mass storage media.

Comprehensive transactional security

SESAM/SQL-Server and the universal transaction monitor openUTM together form a powerful, fully integrated DB/DC system for restartable online transaction processing (OLTP) applications. SESAM/SQL-Server allows OLTP operation to begin even before the restart process is completed and enables you to control the restart time.

Availability and reliability

Tuning of DBH parameters during the session

Almost all DBH parameters can be changed online. Thus the system can be optimized without any interruption.

Dynamic reloading of a new correction version

A new correction version of the DBH modules can be loaded without any interruption of the DBH session.

Automatic extension of database boundaries

If the predefined physical boundaries of the database prove to be too restrictive during a session as a result of intensive insertion or update activities, they are automatically extended during online operation. Since this procedure is automatic, availability is enhanced considerably.

Online data definition and utilities

With SESAM/SQL-Server, database administration can be performed online. The administrator does not have to shut down the database to perform tasks such as database loading, backup, recovery (commitment of changes) and reorganization of databases. New databases can also be created online and existing database schemas can be changed.

Space concept

With the Storage Structure Language (SSL), users can optimize the way in which storage is organized to suit their particular application and so speed up data access or control how storage resources are used. These optimizations and the reconstruction of defective databases do not affect the entire database, but only smaller physical units (spaces). A SESAM/SQL-Server database can consist of up to 400 spaces.

Partitioned tables

Large database tables can be partitioned into a number of spaces, partitions of a table can be changed dynamically. The splitting may be performed by way of primary key values. The splitting is transparent to the applications. The partitioning of a large table into a number of smaller units reduces the necessary backup and recovery times. If a partition fails, the remaining partitions are available furthermore.

Space Files

SESAM/SQL Server supports large spaces up to 4TB in size.

Comprehensive security with TimeFinder

With the support of EMC's Time Finder functionality, you can repair a database using EMC mirror disks (Business Continuance Volumes, or BCVs). This eliminates the need for a backup run and users can be absolutely certain that the backup copy will be available when they need it.

Support of SNAPS

SESAM/SQL supports the creation of foreign copies which require files to be closed physically, e.g. SNAPS. Contents of buffers and plans will remain.

Replications

Replication databases can be used for retrieval applications. A replication can also be used in shadow database operation for fast repair of a crashed original database.

Security

Access protection

SESAM/SQL-Server offers protection against unauthorized access with access protection down to field level. Access authorizations can be granted so that users can only access the data they require to perform their tasks. SQL access protection enables differentiation of access rights according to users and user groups. In combination with the openUTM transaction monitor, passwords can be assigned to give access not only to data but also to applications and procedures. If SECOS is used, the DBH supplies the Security Audit Trail (SAT) of SECOS with data from events where security is concerned.

Data encryption

The data values of selected columns can be stored encrypted with the standard algorithm AES (Advanced Encryption Standard).

Data Anonymization

For compliance with information privacy regulations (Bundesdatenschutzgesetz, Privacy Act), test data can be anonymized. Column values are shuffled so that it is not possible to infer the original content.

Easy administration

Utility monitor

A utility monitor makes database administration easier. In addition to information functions DDL and utility functions can be activated online via screen masks. The actions can be logged in a file, which can be processed in dialog as well as in batch mode. The latter is advantageous for automation of recurrent administration tasks.

Session administration

The SESADM program is used for administration of the DBH and the SESAM network. SESADM provides an easy-to-use SDF interface, enabling administration tasks in a distributed environment to be performed from a single central point.

SESMON performance monitor

SESAM/SQL-Server includes a performance monitor which operates without imposing a load on the DBH task. Its output data can be presented graphically and can be sent to an SNMP agent as well. This allows online evaluation and supervision of the database operation within an SNMP configuration, whereas management platforms of arbitrary manufacturers may be used.

In addition there exists a connection to the BS2000 performance monitor openSM2 (as of V8.0) for the display resp. graphical presentation of the statistical data.

The performance monitor provides information to the administrator on resource utilization (e.g. buffers, disk accesses, etc.). Based on this information, the database system can be optimally tuned to the particular application scenario.

Administration by browser interface

The administration functions of the utility monitor, the performance monitor and session administration can also be controlled using a browser.

Administration support by email

The DBH output and the service task output as well as the output of SESADM can be sent by email. Several messages can be sent immediately so that you can react to emergency events at once.

SESAM request logging

For test and diagnostic purposes, measurement data can be recorded on a request-related basis in the course of a session. The data can be analyzed in detail and according to various criteria using the SESCOSP utility.

Backup system

For tape backup, SESAM/SQL-Server uses the hierarchical storage management system HSMS (BS2000) and/or the high-performance backup system ARCHIVE (BS2000). This means that database backups can be integrated into the overall backup concept. HSMS and ARCHIVE can also work in combination with the archiving system MAREN

(BS2000), a central administration system for all tapes in a data center.

Media recovery

SESAM backups and logging files are managed by SESAM/SQL in the metadata. SESAM/SQL can thus determine and repair the defective objects during media recovery.

Importing and exporting tables

To transfer data as quickly as possible from one database to another, a table (e.g. from a backup copy) can be moved into another catalog with its metadata. The catalog into which the table is to be moved may be located on another DBH or even on another server altogether.

Great flexibility

Multi-database operation

A DBH can process up to 254 databases in parallel. This means that each application program can access more than one database at the same time. Distribution of the data among various databases according to logical association increases availability and simplifies handling. Any number of tables can be created in each database, and any one table can contain more than 25,000 columns (attributes), which gives even more scope for data structuring (database and table level).

Distributed database system with SESAM/SQL-DCN

The add-on product SESAM/SQL-DCN (BS2000) provides the means for transparent and efficient processing of distributed databases in BS2000 computer networks. As a result, performance and availability requirements and organizational structures can be addressed with great flexibility. The application programs are not affected by this distribution.

Spanned records

With SESAM/SQL-Server, the length of the records to be stored is not limited by the size of a physical database block. A record can extend over several blocks ("spanned record").

Multiple columns

SESAM/SQL-Server allows the use of multiple columns. With a multiple column, up to 255 values can be stored in one record. It is therefore possible to minimize the number and complexity of tables (many columns) and save on time-consuming links.

Binary Large Objects (BLOBs)

Binary Large Objects (BLOBs) are required for storing multimedia data content such as text, graphics, images, audio and video. By storing, reading and modifying BLOBs in the database along with the general structural data of an IT process, the user is presented with a common interface for business and multimedia data. All this is provided with the transaction security and backup mechanisms of the database systems.

Data access options

ESQL

The embedded SQL product ESQL-COBOL (BS2000) can be used to create SQL applications under COBOL.

DRIVE

DRIVE is a fourth-generation programming language (4GL). It offers a host of convenience features and powerful tools for achieving huge productivity gains in the development process.

XML

XML is becoming increasingly important both for Web applications and also more generally as a format for exchanging documents between applications and databases. SESAM/SQL-Server supports the storage of XML documents in their entirety. SESAM/SQL-Server provides the appropriate function calls which make it possible to read and write XML documents. XML support is implemented in SESAM/SQL-Server on the basis of the "BLOB" functionality (Binary Large Object).

Generating XML documents from existing SQL tables and mapping XML documents to SQL tables is offered as WebRowSets on the JDBC interface. This can also be realized in pre-database components. To this purpose, openUTM offers an XML parser and a DOM interface. This has the added benefit that existing openUTM database applications can be easily migrated to XML.

APACHE Webserver with SESAM connection

The APACHE Webserver (runnable on BS2000 as well as on UNIX, Linux and Windows systems) has its own connection to SESAM/SQL-Server. The scripting language PHP (Hypertext Preprocessor) can be used to query and modify SESAM/SQL databases. The PHP code is executed exclusively on the server, with only HTML code being transferred to the client. This means that the application logic remains hidden from the Web user, which ensures that increased security demands can be met in full. APACHE also supports Java servlets, which access the SESAM/SQL databases via the JDBC interface.

ODBC interface

SESAM/SQL-Server supports the ODBC (Open Database Connectivity) interface defined by Microsoft to allow communication between Windows applications and database systems. The partner product ODBC-Rocket from gfs, Hamburg, is an ODBC driver for SESAM/SQL-Server and also supports access to UDS/SQL, LEASY and ISAM.

Java

A JDBC driver is supplied at no extra cost together with SESAM/SQL-Server. JDBC (Java DataBase Connectivity) is the standard call-level interface for accessing SQL databases in Java programs. It allows the programmer to create database-independent Java applications, Java servlets and Java applets by using a standardized DB interface according to the definition by SUN. The JDBC driver is a type 4 driver,

i.e. a "native-protocol fully Java technology-enabled driver", and is written in pure Java. The advantage of this is that no binary code at all needs to be installed on the client machine and the JDBC driver can therefore run on any Java-capable platform.

With the JDBC driver, SESAM/SQL-Server also supports applications developed on the basis of the Enterprise JavaBeans (EJB) component architecture.

.NET interface

As of SESAM/SQL V8.0, the database can be accessed from Microsoft's .NET environment using a free-of-charge ADO.NET driver (on product CD and for download).

WebTransactions

WebTransactions (BS2000) is a software product which can be used to Web-enable existing openUTM and SESAM/SQL-Server applications.

Unicode support

The introduction of the new NCHAR and NVARCHAR data types enables Unicode characters to be stored in SQL tables and to be processed using SQL tools. As well as support for the new data types by the SQL data manipulation language, their use in the different utility functions (e.g. LOAD, UNLOAD, IMPORT, EXPORT) is also allowed.

CSV format for exchanging data

The CSV (Comma Separated Value) format can be used with LOAD and UNLOAD as well as in an SQL statement. So data can be exchanged between different platforms.

Technical Details

Requirements

Technical Requirements Hardware	BS2000 Business Server
Technical Requirements Software	BS2000 OSD-BC as of V8.0 oder OSD-XC as of V4.0 CRTE as of V2.8E ONETSERV as of V3.3 (enthält auch XHCS V2.1) SORT as of V7.9 TIAM as of V13.2
Software required for specific functions	ARCHIVE as of V9.0 for backup COBOL85 as of V2.3 COBOL2000 as of V1.4 EDT as of V17.0 ESQL-COBOL as of V2.0 DRIVE as of V3.1A10 HSMS as of V9.0 JV as of V15.0 LMS as of V3.4 INETSERV as of V3.3 openUTM as of V5.3 SDF-P as of V2.5 for tool procedures SECOS as of V5.2 SSC-BS2 as of V6.0 for SNMP mit RDBMS MIB SHC-OSD as of V7.0 for Verwendung von BCV/Timefinder Java JRE as of 6.0 zur Nutzung der JDBC-Schnittstelle
Demands on the user	Knowledge of BS2000

Installation and operation

Operating mode	Interactive (dialog), transaction and batch mode
Implementation language	Assembler, C
User interface	Commands in English, message texts in German/English
Installation	By the customer according to the release notice

Documentation and training

Documentation	SESAM/SQL-Server Basishandbuch SESAM/SQL-Server Datenbankbetrieb SESAM/SQL-Server SQL-Sprachbeschreibung Teil 1 SESAM/SQL-Server SQL-Sprachbeschreibung Teil 2 SESAM/SQL-Server Utility-Monitor SESAM/SQL-Server Meldungen SESAM/SQL-Server CALL-DML-Anwendungen SESAM/SQL-Server Fachwörter und Masterindex SESAM/SQL-Server Performance SESAM-DBAccess
Training	See course offer at: https://training.ts.fujitsu.com/de/bs2000-osd.html (German)

Purchasing

Conditions	This software product can be leased by the customer in accordance with the conditions for the use of software products.
Ordering and delivery	This software product may be obtained from your local Fujitsu Technology Solutions GmbH regional office.

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Contact

Fujitsu Technology Solutions GmbH
Mies-van-der-Rohe-Straße 8, 80807 München
Website: www.fujitsu.com/fts
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