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Datasheet
FUJITSU Software BS2000 OSD/BC V10.0

Operating System BS2000 OSD/BC - Basic Configuration

FUJITSU Software BS2000 OSD/BC is the operating system for the BS2000 business servers.

BS2000 OSD/BC is unrivaled in providing an available, scalable, high-performance platform for business-critical applications that is totally compatible across numerous versions. At the same time, with its open interfaces BS2000 OSD/BC offers future-proof integration into modern application architectures. The high scalability of BS2000 business servers enables tailor-made configurations with high growth potential.

Efficiency, Innovation, Openness and Continuity are the main BS2000 development goals. In BS2000 OSD/BC V10.0 the focus of development is placed on the following aspects:
■ Functional enhancements for support of new BS2000 SE business servers
■ Implementation of BS2IDE, an integrated development environment for BS2000 based on Eclipse
■ Functional enhancements on SANCHECK
■ Net-Storage interoperability with other operating systems
■ Improvements in performance and discharge of system address space
■ Support of peripheral innovations

For server units /390 and x86 of new SE business servers and for SQ servers, BS2000 OSD/BC V10.0 is available as a part of the OSD Extended Configuration Package FUJITSU Software BS2000 OSD/XC V10.0.

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Features and benefits

Main features	Benefits
Business server innovations	
■ Support of new SE business servers, including server units /390 and x86	■ Support of the latest technologies
■ Integration of selected BS2000 functions in the SE manager	■ Ease of operation by consistent interfaces for monitoring and administration
Manageability	
■ Integrated Development Environment for BS2000 based on Eclipse - BS2IDE	■ Increasing the attractiveness and productivity of BS2000 application development by state-of-the-art user interface
■ Function extensions in SANCHECK	■ Support for innovative technologies and increase ease of use when using the SE Server
Storage integration	
■ Net-Storage interoperability with other operating systems	■ Efficient exchange of information between BS2000 and UNIX systems
■ Refined access algorithm and increased availability of files on Net-Storage	■ Enhancements for Net-storage applications
Performance and system boundaries	
■ Avoid compulsory CPU removal under Nucleus Lock	■ Optimizing performance at high multi-processor degree
■ Extensive measures to increase the performance in different components of BS2000	■ Increasing throughput, particularly in data communication
■ new volume type for ETERNUS CS8000	■ Increasing the maximum number of tape blocks per volume
■ Discharge of system address area by removal to dataspaces	■ Expansion of the available address space
Peripherals innovations	
■ LTO-6 magnetic tape devices, including LTO-6 drive encryption	■ Most recent tape technology is available with BS2000
■ Support of new generations of ETERNUS DX and ETERNUS CS	■ Support for the latest peripherals with extended functionality

Product Characteristics

BS2000 OSD/BC is a multiprocessor operating system for servers based on /390 or x86 architecture. Characterized by a virtual storage concept, it runs on mono-processor to the point of15-times multiprocessor systems. BS2000 OSD/BC also has the capability to activate spare and extra CPUs during online operation. In multiprogramming mode, up to 4096 tasks (including system tasks) can be administered concurrently. The address spaces allocated to individual users are protected against unauthorized access by other users. Exceptional user friendliness is achieved through automatic resource and data management. Transaction processing is optimized with the aid of efficient, high-performance, fault-tolerant storage systems.

BS2000 OSD/BC includes a suite of utility routines to support recurrent routine activities. The products FUJITSU Software BS2000 TIAM and FUJITSU Software BS2000 openNet Server are required in addition for interactive (dialog) or remote operation of BS2000. The product FUJITSU Software BS2000 EDT (editor) is another required product for BS2000 operation.

BS2000 OSD/BC provides the security functions required as a basis for secure handling of e-business applications.

Given their security functions (in particular FUJITSU Software BS2000 SECOS), BS2000 business servers can be successfully included in security audits and with it contribute to certification of the security management of a company.

Functional Description

Basic System

The basic system provides all other functional units of BS2000 with resources that are independent of the hardware architecture. For this purpose, the control and management functions and some operating functions for hardware resources such as central processor, main memory, global storage, I/O processor, including channels and peripherals, are activated via software functions.

Task management

Task management ensures that the operating system handles task processing requirements in the most efficient way possible. This includes ensuring optimum utilization of server and peripherals as well as delivering high program throughput. Task management can also involve giving precedence to individual tasks in order to fulfill specific requirements. The sequence in which tasks are processed is controlled by means of priorities, as well as by assigning separately managed categories. A system of "service slots" ensures that no task can make excessive use of the processor(s) without explicit permission. An aging mechanism makes sure that lower-priority tasks are also processed.

Memory management

Memory management in BS2000 OSD/BC is based on the virtual storage concept and supports 2 GB virtual address spaces (user and system). BS2000 OSD/BC maps the virtual address spaces onto the actually available real memory. Real main memory can be a multiple of 2 GB. The maximum size is determined by the main memory capacity of the BS2000 business servers. The system is capable of addressing memory in the terabyte range. Real memory is automatically reorganized by the system. Only the program sections actually required at a given time for active tasks need to be resident in main memory. This function is handled by a paging mechanism, which makes the relevant program sections available to the tasks as necessary. The paging mechanism fetches the required pages from background storage into main memory and writes these pages back to background storage once they have been updated and released. The size of the supported paging area is max. 4 TB.

Data spaces

As well as the 2 GB program address space, a program can make use of additional 2 GB data address spaces. These address spaces are partitioned like the program address space and may only contain data. The data can be accessed at byte level by access commands as applicable for the program address space.

Fibre Channel support

Fibre Channel is the standard for host-storage connections in the open systems world. This connectivity standard is available for the entire range of the current BS2000 business servers and peripheral devices. Key benefits of Fibre Channel connection technology are high transmission rates and extremely short response times. It enables the integration of the servers into an enterprise storage area network (SAN) thereby also allowing their integration into a storage consolidation scheme based on the most advanced connection standards. The SANCHECK utility supports the detection of generation errors and the location of error states in the SAN.

Support of new device type LTO-6

In addition to the previous LTO device types, the device type LTO-6 is also supported in BS2000 OSD/BC V10.0. LTO-6 devices are intended for operation in current BS2000 servers on the FC channel in conjunction with a library system Quantum Scalar i6000 and i500. Support for LTO-6 tape encryption is provided in conjunction with MAREN V12.0B.

Parallel Access Volume (PAV)

PAV (Parallel Access Volume) can be used for several I/Os to take place simultaneously on one logical volume. PAV can be used to reduce the response times for disks with great loads and to increase the maximum I/O rates to one volume.

A PAV volume on the FC channel consists of a basic device and one or more alias devices, which must be generated in BS2000. Alias devices must be generated as separate devices, on standard PAV they must be in the same logical control as the basic device and with the same LUN, but they must have a different unit address.

With extended PAV (XPAV) functionality an alias device no longer need to be in the same logical control as the basic device. A further

logical control (even several if required) with 256 alias devices can be configured to an existing logical control. Extended PAV creates higher flexibility in case of (unforeseen) bottlenecks.

Autonomous Dynamic I/O Resources Control (IORM)
The BS2000 IORM subsystem comprises the following functions to control I/O resources in an autonomous dynamic manner (devices, controllers, channels, paths):
- IOPT - I/O Priority Handling for Tasks
- DPAV - Dynamic Parallel Access Volume: allocates PAV alias devices dynamically
- DDAL - Dynamic Device Allocation: optimizes load balancing for ETERNUS CS8000 operation
- IOLVM - I/O Limit for Virtual Machines

IORM connects itself at the BS2000 I/O system at start up and collects I/O data about it. With these data, the I/O resource load can be determined. IORM checks periodically, if the I/O operation must be intervened.
The IORM functions IOPT, DPAV and IOLVM deal with disk devices, the DDAL function deals with tape devices.

Data management system
The data management system functions are subdivided into the following categories:
- file management,
- data management and
- device management.

File management
The BS2000 operating system is file-oriented, i.e. all data such as I/O data, programs etc. are held in BS2000 files. The files are accessed via system catalogs which are allocated to the pools of shared (public) data volumes. With its expanded catalog format "extra large", BS2000 OSD/BC supports to create approx. 240.000-320.000 files. BS2000 supports files and volumes with capacities up to 4 Terabyte. By default, users can access only their own files. The owner of a file can also assign access rights to other users. As an added safeguard, other criteria such as passwords, read-only access, etc. can be set.

Data management
Access to the files is handled by the data management function. The user has a choice of access methods, the most important being sequential (SAM), indexed sequential (ISAM), user primary access method (UPAM), and Data in Virtual (DIV). DIV enables a user-oriented access method in memory. A feature of DIV is that it does not require data to be structured and the user does not have to invoke any explicit I/O operations.
Disks are always initialized in a standard basic format. Three different disk formats are available for data storage:
- 2K key-formatted disks
- 2K keyless disks
- 4K keyless disks.

Pubsets always consist of a uniform disk type, i.e. either keyless or key-formatted volumes. The HOME pubset must always consist of key-formatted or keyless volumes in 2 K format.
Non-key (NK) access methods (NK-SAM, NK-ISAM, NK-UPAM) are also available to support disk operation in keyless mode. The NK access methods can be used on pubsets with PAM key as well as on keyless pubsets. NK-ISAM (NON-KEY-ISAM) also delivers a significant improvement over ISAM in terms of throughput and parallelization of

data processing. The buffers (NK-ISAM pools) are always related to single files and are automatically generated by the system.

Device management
BS2000 differentiates between shared public volumes (disk) and private volumes (magnetic tape or disk). A number of shared disks can be grouped together to form a pool, called a pubset. Several pubsets can be operated in parallel (Multiple Public Volume Sets, MPVS). One HOME pubset must be permanently available. Failing explicit specification otherwise, files are written to pubsets by default. Volumes are assigned automatically by the system. When retrieving data, users also have no need to be concerned with where the files are physically located. All the relevant information is held in the catalogs. The use of preformatted volumes gives the user programs a high level of hardware independence. It is possible to perform pubset-oriented reconfiguration by attaching and detaching (ATTACH / DETACH) disks also at the level of an entire pubset. This increases operating reliability and allows a higher degree of automation.

Online backup using Snapsets
BS2000 OSD/BC supports snap-based backup/restore scenarios in configurations of storage systems FUJITSU ETERNUS DX as of S2 and EMC^2 Symmetrix. The pubset copy that can be used for restore consists of the simultaneously generated snap units for all volumes of the pubset and is called the „snapset". Snapsets are created and deleted by the administrator. New DMS functions enable the end user to restore individual files and job variables from the available snapsets. The advantage of snap-based backups is the lower space requirement compared with clones and is especially worthwhile for pubsets with data from a small change in volume.

System Managed Storage
System Managed Storage (SMS) denotes an extended concept for data management by the system. It is based on the principle of separate logical and physical views of the data. Multiple pubsets can be grouped together to form a system-managed pubset (SM pubset) in order to offer the user different types of services. The user formulates a logical description of the structural, availability and performance requirements of his file. The system then automatically finds the optimum storage location for the data within the system-managed pubset. System-managed pubsets are self-contained switchover units within the overall storage hierarchy. Using an SM pubset the storage administrator can define a hierarchical storage system consisting of the online processing level and the migration level (HSMS background level).
SMS supports operation of an Information Lifecycle Management (ILM) system aimed at providing the right information at the right time and at the right place at minimum cost.

Net-Storage integration
BS2000 OSD/BC as of V9.0 enables the access to UNIX file systems via NFS, the so-called Net-Storage. The storage and processing of the files is done from BS2000. UNIX systems may have only read access to those files.
From BS2000 as of OSD/BC V10.0, now files stored on Net-Storage can be processed by UNIX systems. Conversely, files, created by UNIX systems can be read and changed in BS2000. Thus, a simple exchange of information between BS2000 and UNIX systems is possible.
The functionality is currently supported for BS2000 files with the file format PAM. The corresponding files are associated with the new file

property Node-File in BS2000. They are stored on Net-Storage in BS2000 user-specific directories.

Job management system

The job management system in BS2000 includes the following functional groups:
- Local job management system,
- SPOOL system and
- Accounting.

Local job management

The local job management system controls and manages all pending jobs. Jobs can be submitted as interactive or batch jobs. Time settings can be specified for batch jobs (time or calendar jobs) so that they are repeated at regular intervals. Each job is assigned to a job class, which determines the service level and resource limitations. Job classes can in turn be combined into different job streams, with each job stream being able to control job starts according to a separate scheduling strategy.

SPOOL system

SPOOL is used to read in job descriptions (SPOOLIN) and to output the results (SPOOLOUT). For output, the temporal link between provision of the data and the actual output of the data to a device is broken. Spooled-in user jobs and output jobs in progress are saved beyond the end of a system run and can be processed in the next session. The configuration of devices operated via SPOOL can be changed. The assignment of special usage modes (e.g. printers for special character sets or types of paper) can be changed dynamically and is taken into account when jobs are processed.

Accounting

The accounting system collects data on the overall system and on the individual programs/tasks (e.g. CPU time, input/output, allocated resources) and writes this data to the accounting file in the form of accounting records. This file can be analyzed using special accounting software tools, e.g. FUJITSU Software BS2000 RAV.

System handling

Operator interface system

The BS2000 operator interface system includes all functions to support operation of the system by the user, system administrator or operator. The main function of the system administrator is to manage system access authorizations for timesharing mode. Users are also granted detailed privileges for system use by means of a system user ID. The operator is responsible for starting up the system, controlling and monitoring its operation and providing any manual support needed, e.g. by operating peripheral devices. For specific installations, some of the system administrator's tasks can be handled by the operator. Support for the operator is provided by the tele-service and by an option enabling operator functions to be delegated to the automatic operator, authorized applications and other servers. This enables systems to be operated without a human operator needing to be in attendance on-site.

The operator interface system includes the functional units SDF/CMD (with SYSFILE), MIP, JOIN, Operating and NDM. SDF/CMD implements the command interface for the user and the system administrator. It is controlled by the command and statement specifications contained in the activated syntax files. The SYSFILE functional unit provides the basic function for running nested command procedures and manages

the allocation of system files to user files. The MIP functional unit implements functions for editing and output of system messages. NDM (Nucleus Device Management) is responsible for managing the peripheral device configuration and the mounted volumes. NDM provides optimal monitoring / reservation and utilization of available resources.

System administration

BS2000 system administration includes:
- Functions for setting up and installing an executable software configuration that provides the user with the required operating functions and resources and is parameterized to ensure that existing performance and reliability requirements are met.
- Operation monitoring functions, for recording and evaluating qualitative performance (fault diagnosis).
- Support functions that respond to hardware failures or system software problems either by initiating hardware or software reconfiguration measures to permit operation to continue, or by ensuring an orderly shutdown.

Some system administration functions are also implemented via utility routines.

Programming system

The BS2000 programming system includes a set of functions for BS2000 users wanting to write their own programs. The programming system consists of the following functional units:
- BS2IDE
- Editor
- Compiler
- Binder Loader System
- Debugging aid and program library system.

Of these the BS2IDE, the Binder Loader System and the library access method are already included in BS2000 OSD/BC.

The Binder Loader System (BLS) in BS2000 supports static and dynamic mounting, loading and starting of user programs.

BS2IDE

The BS2IDE (IDE - Integrated Development Environment) is an integrated development environment for BS2000 based on Eclipse. It is plug-in for open development environment Eclipse with reduced maintenance available from BS2000 OSD/BC as of V10.0 (please note the special terms and conditions during the product installation). BS2IDE supports the developer of BS2000 applications on typical applications. It combines the most important tools of the software development process, as editor, compiler (control), binders (control) and version management in a surface and supports the programming languages COBOL, C/C++ and ASSEMBH. Syntax-conscious editors are provided for the languages C/C++ and ASSEMBH, as well as for SDF-P. For advanced COBOL features, such as Syntax highlighting, the "P3/COBOL-Editor for BS2IDE" of the company EasiRun Europe GmbH is supported.

Interoperability

POSIX in BS2000

BS2000 OSD/BC features standardized interfaces conforming to POSIX / XPG4.2. The POSIX-BC function complex of BS2000 OSD/BC includes the POSIX programming and application interfaces as library functions for the C programming language, the POSIX subsystem, i.e. the runtime environment for the POSIX system calls, as well as the entire POSIX shell. Metadata journaling enables fast restart of the POSIX file

system. The BS2000 file system bs2fs allows to access BS2000 files transparently from POSIX and via NFS.

Java

With the Java "write once, run everywhere" concept, it is possible to run applications across networks of heterogeneous computer systems – across the most disparate platforms and operating system boundaries. With the BS2000 Environment for Java (JENV), all Java programs, regardless of the platforms on which they were written, can be run on BS2000 systems. Similarly, Java applications developed for BS2000 can also run on other platforms.

Apache, WebTransactions

BS2000 OSD/BC includes the Apache web server V2.2 with integrated SSL (Secure Socket Layer) support. Another component provided as part of the BS2000 OSD/BC operating system basic configuration is the openSEAS component WebTransactions for OSD, enabling web integration of BS2000 applications, executable on BS2000 under POSIX, with unlimited user licenses.

Unicode in BS2000

With Unicode support in BS2000, the EBCDIC character sets available in BS2000 systems are being extended by additional characters that will be required in the European language area in the future. Users are provided with the programming and runtime environment that they need in order to extend their existing applications with Unicode data fields. In POSIX shells the entire functional range of EDT in Unicode mode is available.

High availability

BS2000 is a world-beater in terms of stability and minimal need for scheduled downtimes (high parallelization level). BS2000 achieves this high quality through systematic application of the following techniques:
- high component reliability, resulting in high MTBF values for the hardware,
- avoidance of single points of failure through use of redundant hardware components,
- avoidance of operator errors, and interrupt-free operation through wide-ranging automation of system management,
- dynamic attachment and detachment of hardware and software components,
- version coexistence and quality management.

Utility routines

The following utility routines (selection) are included as part of the BS2000 OSD/BC V9.0 software product:

Diagnostics
SLED	Self-loading emergency dump routine
DAMP	Tool for analyzing area, user, system, SLED and SNAP dumps

System generation
SIR	System installation and restore
IOGEN	Hardware generation utility

Binder
BINDER	Static binder

Utilities
BS2ZIP	WinZip-compatible compression tool
DPAGE	Outputting and modifying disk files
INIT	Initialization of magnetic tapes
IORM	Dynamic control of I/O resources
JMU	Processing of job classes and scheduling algorithms
MSGMAKER	Message file management and editing routine
PASSWORD	Password encryption
PRM	Print(er) resources management routine
PVSREN	Pubset renaming routine
SANCHECK	Checking the SAN configuration
SDFCONV	Conversion tool for converting ISP command procedures into SDF format
SMPGEN	System-managed pubset generation routine
SPCCNTRL	Disk space allocation monitoring routine
SPSERVE	SPOOL parameter management routine
TPCOMP2	Tape compare routine
VOLIN	Disk volume initialization routine

System Exits

Customers can selectively modify system behavior by adding their own custom routines, called exit routines. This is achieved by inserting customer instructions that cause system modules to call exit routines at specific points. Parameters and input data are then passed to the exit routine. The input data can be partially modified or supplemented for specific exits. On a similar exit-specific basis, the exit routine can generally determine on its return whether the system function is to be executed or rejected.

Conditions for the use of System Exits

The customer is liable for any industrial property right infringements resulting from extending BS2000 with custom-built exit routines. Where customers add their own exit routines to BS2000, Fujitsu Technology Solutions is under no obligation to take this into account when making changes to its products. If the support and maintenance overhead for the supplied hardware and software products increases as a result of customers extending BS2000 with their own exit routines, customers may be invoiced separately for the extra costs involved.

Technical Details

Requirements	
Technical Requirements Hardware	BS2000 Business Server
Technical Requirements Software	openNet Server V3.6
	TIAM V13.2
	EDT V17.0
Demands on the user	Knowledge of BS2000
Installation and operation	
Operating mode	Interactive (dialog), transaction and batch mode
Implementation language	Assembler, SPL, C++
User interface	Commands in English, message texts in German/English
Installation	By the customer according to the release notice
Documentation and training	
Documentation	The manuals of the components, contained in BS2000 OSD/BC V10.0 are available on the manual server.
Training	See course offer (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.

More information

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Fujitsu products, solutions & services

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Fujitsu green policy innovation

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Green Policy Innovation

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