Datasheet
Fujitsu Software BS2000 OS DX V1.0

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Fujitsu Software BS2000 OS DX V1.0 is the operating system package to support the Fujitsu Server BS2000 SE series

BS2000 OS DX V1.0

BS2000 OS DX V1.0 is a highly available, scalable, high-performance and absolutely compatible basis for business-critical applications. Concurrent, BS2000 OS DX V1.0 with its open interfaces enables future-proof integration into modern application architectures.

In addition to the BS2000 V21.0 operating system, the BS2000 OS DX V1.0 operating system package includes a number of system-related software components and thus provides the same range of components as the OSD/XC package. With its increased flexibility and revised structure, it forms the basis for the BS2000 DX concept - the modernized continuous provision of BS2000 software innovations.

BS2000 OS DX V1.0 serves the features relevant for data center operation

- Advanced, mainframe-type workload management
- Scalability of processor performance, memory and I/O bandwidth
- Automation of the data center operation
- Executability of open applications
- Fulfillment of highest security requirements
- Support of backup scenario

Green IT

Topics

Composition of the operating system package

The BS2000 OS DX V1.0 operating system package is made up of the following function groups and components:

Functional unit	Component
Operating System	• BS2000 • POSIX
JobControl	• JV • SDF
Communication and Internet	• APACHE • INETSERV • ONETSERV • TIAM
openSEAS	• WTOSD
Performance	• SCA
Print Management	• RSO • SPOOL
Programming Languages	• CRTE • JENV
Storage Management	• HSMS
Utilities	• BS2IDE • EDT • IMON • LMS • PERCON • SORT

The components are always included in the package in their latest version.

Components of the operating system package BS2000 OS DX V1.0

Starting with the BS2000 operating system, all other components of the operating system package are described below in alphabetical order. If data sheets are available for components, the contents of the corresponding data sheet also apply.

BS2000 operating system

BS2000 is a multiprocessor operating system with virtual memory concept for servers with /390 and with x86 architecture, which can run on mono up to 15-fold multi-processors. BS2000 is able to activate spare and extra CPUs during operation. In multi-program mode, up to 4096 tasks (including system tasks) can be managed simultaneously. The address spaces of the individual users are protected against unauthorized access by other users. Special user-friendliness is achieved by automatic resource and data management. Transaction processing is optimized by effective, high-performance and fail-safe storage systems.

BS2000 contains a number of utilities to support frequently occurring standard activities.

BS2000 OS DX and in particular the Fujitsu software product BS2000 SECOS provide the security functions required as the basis for secure processing of e-business applications.

Basic system

The base system provides all other BS2000 functional units with resources that are independent of the hardware architecture. For this purpose, the control, administration and, in some cases, operating functions for the hardware resources processor, main memory, input / output processor including channels and the peripheral devices are switched on via software functions.

Task management

Task management ensures the best possible fulfillment of the requirements placed on the operating system for processing the tasks. Its tasks include not only ensuring optimal utilization of the server and peripherals, but also achieving high program throughput. The ranking of tasks is controlled by priorities and by assignment to categories, which are managed separately. An aging mechanism ensures that even low-priority tasks are processed.

Memory management

BS2000 memory management is based on the virtual memory concept and supports virtual address spaces (user and system) of 2 GB. BS2000 maps the virtual address spaces to the actual real memory available. The real main memory can be a multiple of 2 GB. The maximum size depends on the main memory configuration of the BS2000 Business Server. The system is able to address main memory up to terabyte ranges. Only the program parts of the active tasks that are currently required must be located in the main memory. The paging process ensures that the required pages are fetched from the background memory into the main memory and that released, changed pages are written back. The size of the supported paging area is max. 4 TB.

Dataspaces

In addition to the 2 GB program address space, a program can use additional 2 GB data address spaces. T These address spaces are also sealed off like the program address space and can only contain data.   The data can be accessed at byte level by access commands as they apply to the program address space.

Fibre Channel support

Fibre Channel is the standard for host-storage connections in the Open Systems. This connectivity standard is available for the entire range of current BS2000 business servers and peripherals. The Fibre Channel connection technology is characterized by high transfer rates and extremely short response times. It enables BS2000 servers to be integrated into an enterprise storage area network (SAN) and thus also into storage consolidation based on the latest connectivity standards.

Parallel Access Volume (PAV)

PAV (Parallel Access Volume) allows multiple I/Os to occur simultaneously on a logical volume; this reduces response times on heavily loaded disks and increases maximum I/O rates on a volume. A PAV volume on the FC channel consists of a base device and one or more alias devices.

With the Extended PAV (XPAV) feature, alias devices no longer need to be in the same logical controller as the base device.

In addition to an existing logical controller, another logical controller (or several if required) can be configured with 256 alias devices. Extended PAV creates higher flexibility in case of (unforeseen) bottlenecks.

The "FastDPAV" function, an optimized DPAV, is provided for SU /390 server units that support Logical Unit Number (LUN) modification for alias devices when an I/O is started. With FastDPAV, a pool of FastDPAV alias devices is generated for a set of logical volumes with identical channel paths, without fixed assignment to one of these logical volumes. FastDPAV thus ensures high-performance parallel I/Os on disks.

Autonomous, dynamic control of I/O resources (IORM)

Functions for autonomous, dynamic control of I/O resources (devices, controllers, channels, paths) are implemented in the BS2000 subsystem IORM.

IORM connects to the BS2000 I/O system at startup and collects I/O data which can be used to determine the utilization of the I/O resources. IORM periodically checks whether it is necessary or advisable to intervene in I/O operation.

Data management system

File management

The BS2000 operating system is file-oriented, i.e. all data such as input/output data, programs etc. is located in BS2000 files. The files are accessed via system catalogs which are assigned to the pools of the shared volumes. With an extended "extra large" catalog format, BS2000 allows approximately 240,000 - 320,000 files to be created. BS2000 supports files and volumes with a capacity of up to 4 terabytes. By default, users can only access their own files. The owner of a file can also assign access rights for other users. As additional protection, criteria such as passwords, read-only access allowed, etc. can be assigned.

Data management

The data management supports data processing on shared disks and on private disks (magnetic tape or disk) as well as on net storage. Multiple shared disks can be combined into one volume pool, a pubset. Several pubsets can be operated in coexistence (Multiple Public Volume Sets, MPVS). In addition to the home pubset, which holds all the files required for the system run, other pubsets can also be included (imported) in the system.

The Data Management System (DMS) enables the processing of data by keeping files and the various functions necessary for file processing. The functions can be roughly divided into:

- Create and manage files incl. storage space management
- Management of catalogs
- Providing files and file processing via access methods (the most essential are sequential (SAM), index sequential (ISAM), direct access method (UPAM) and Data in Virtual (DIV)).
- Assign files to programs

Furthermore, the DMS offers you the possibility to define data protection and file protection features on file level. Data security is supported, for example, in file access by setting locks.

Device management

The device management (NDM, Nucleus Device Management) takes over the management of the peripheral device configuration and the mounted data carriers. The basic function of device management is device assignment. Since it is generally not always possible to fulfill every device request, NDM must also provide a device reservation function and manage and process queues. Device management records the number and status of devices at system startup as well as status changes during operation. With the NDM, optimal monitoring or reservation and allocation of the available resources is achieved.

Online backup with snapsets

BS2000 supports snap-based backup-restore scenarios in configurations of the Fujitsu Storage ETERNUS DX storage systems. The copy of a pubset that can be used for restore consists of the simultaneously created disk copies for all volumes of the pubset, the snapsets. Snapsets are created and deleted by the administrator. The end user can restore

individual files and job variables from the existing snapsets using DMS functions. The advantage of snap-based backups is that they take up less space than clones and are particularly worthwhile for pubsets with data that is subject to few changes.

System Managed Storage

System Managed Storage refers to the overarching concept of data and storage management by the operating system instead of the user. The principle is the separation of the logical and physical view of the data. Several pubsets can be combined to form a system managed pubset (SM pubset) and thus offer several types of services to the user. The user formulates a logical description of the structure, availability and performance requirements of his file. The optimal storage of the data within the SM pubset is done automatically by the system. The system managed pubsets are self-contained units with regard to the entire storage hierarchy. The storage administrator can use an SM pubset to define a hierarchical storage system consisting of the online processing level and the migration level (HSMS background level).
SMS enables to operate an Information Lifecycle Management (ILM) with the goal to have the right information at the right time at the right place at the lowest cost.

Net-Storage Integration

Net storage refers to NAS storage that is connected to BS2000 via NFS and can be accessed from BS2000 using BS2000 methods.
The files on Net-Storage can be stored and processed by both BS2000 and open-world systems.
The functionality is supported for BS2000 files with the file formats PAM and SAM. The corresponding files are assigned the file property Node-File in BS2000. Code conversion is optionally offered for SAM node files.
This enables text-based files to be exchanged between BS2000 and open systems.

Unicode in BS2000

Unicode support in BS2000 extends the EBCDIC character sets available in BS2000 systems to include additional characters required in the European language area. A programming and execution environment with Unicode support enables new requirements for the correct spelling of names, addresses, etc., to be met in BS2000 applications. The full range of EDT functions is also available in Unicode mode in the POSIX shell.

Encryption

In the CRYPT functional unit, cryptographic functions are available for encrypting and decrypting data with software functions on BS2000 CPUs.

Job management system and accounting

Local job management

The local job management controls and manages all waiting orders (jobs). Jobs can be placed as dialog or batch jobs. In the case of batch jobs, time specifications (time or calendar jobs) can be made and regular repetition can be provided for. Each job is assigned to a job class, which defines service levels and resource limits.
Job classes themselves can again be grouped into different job streams, where each job stream can control the start of jobs according to a separate scheduling strategy.

Accounting

The accounting system collects consumption data about the entire system and about the individual programs / tasks (e.g. CPU time, input/output, resources used) and writes this data in the form of accounting records to the accounting file.
This file can be evaluated with separate accounting programs.

System operation

The system operation of BS2000 includes all functions to support the operation of the system by users, system administrators and operating, in particular the functional units SDF and CMD (with SYSFILE), MIP and operating.
SDF or CMD realizes the command interface of the user and the system administrator. It is controlled by the command and statement specifications located in the enabled syntax files.
The SYSFILE functional unit provides the basic function for running nested command procedures and manages the respective assignment of system files to user files. The function unit MIP realizes the processing and output of the messages of the system. Further functions for system operation are partly realized by utility programs.

Programming system

The BS2000 programming system contains functions which are available to BS2000 users who want to create their own programs.
The programming system consists of the following functional units:
- BS2IDE
- Editor
- Compiler
- Binder loader system
- Test support and program library system

Of these, the BS2IDE, the binder loader system, and the library access method are included in the OS DX operating system package.
The Binder loader system of the BS2000 provides static and dynamic mounting, loading and starting of user programs.

Availability

BS2000 is at the top of the world in terms of stability and the minimum required planned downtimes (high degree of parallelization).

BS2000 achieves this high quality through consistent implementation of the following techniques:

- high component reliability and thus high MTBF values
- Bypassing single points of failure through redundancy
- Avoidance of operating errors and uninterrupted operation thanks to largely automatable system management
- dynamic switching on and off of hardware and software components
- support of life migration
- quality management

Utilities

A number of utilities are also part of the BS2000 operating system. They provide support for the processing of volumes and files, as well as the control of I/O resources.

This also includes the components BS2ZIP (compression tool, compatible with WinZip) and CONV2PDF (converting text files into PDF format).

System Exits

The customer can specifically influence the system behavior with his own routines, so-called exit routines. This is achieved by system modules calling exit routines at specific points on instruction from the customer. Parameters and input data are transferred to the exit routine, which can be partially modified or supplemented on an exit-specific basis. Also exit-specific, the exit routine can generally determine at the return whether the execution of the system function is to be carried out or rejected.

Conditions for using the system exits:

The customer is liable for any infringements of property rights resulting from the expansion of BS2000 to include separate exit routines. If the customer has extended BS2000 with his own exit routines, Fujitsu is not obliged to take this into account when modifying its products. If the extension of BS2000 with the customer's own exit routines increases the expenditure for the maintenance and care of the hardware and software products provided, the increased expenses can be invoiced separately to the customer.

Apache

The Apache component contained in BS2000 OS DX is a porting of the Apache httpd 2.4.41 web server with integrated SSL (Secure Socket Layer) support. Furthermore, the contents of the current Apache data sheet apply to the Apache component.

BS2IDE

BS2IDE is an integrated development environment for BS2000 based on Eclipse. It supports the developer of BS2000 applications in typical tasks. It combines the most important tools of the software development process, such as editor, compiler(-control), binder(-control) and version management in one interface. BS2IDE is offered as a plug-in to the open development environment Eclipse with limited maintenance. Please refer to the BS2IDE datasheet and especially the terms of use when installing the product.

CRTE

CRTE is the common runtime system for COBOL2000, COBOL85 and C/C++ programs and includes language-specific and cross-language libraries. Furthermore, the contents of the current CRTE data sheet apply to the CRTE component.

EDT

EDT is the file editor of BS2000 with which BS2000 standard files in the format SAM and ISAM as well as text-like library elements and POSIX files can be created and edited in a convenient way. Furthermore, the contents of the current EDT data sheet apply to the EDT component.

HSMS

HSMS is the hierarchical storage management system of BS2000. It provides extensive functions for backing up and restoring, archiving and migrating BS2000 datasets. A uniform interface can be used to back up files, databases and also libraries including library elements. The contents of the current HSMS data sheet also apply to the HSMS component.

IMON

The IMON (Installation MONitor) component is used to install and manage software products.

interNet Services

The "open" communications network is essentially determined by the Internet Protocol Suite (IPS) of the TCP/IP world. With the products FTP, TELNET, DNS, NTP, OpenSSL, OpenSSH and e-mail, summarized in the product INETSERV (interNet Services), functions are provided that support the interoperability of communication partners in "open" TCP/IP-based networks. The products of the interNet Services delivery unit are ports of corresponding Internet standard products from the "open" world, but adapted to the specific conditions that exist in BS2000.

In addition, the contents of the current data sheet on interNet Services apply to the interNet Services component.

JENV

With the BS2000 Environment for Java (JENV), all Java programs created on any platform can be run on BS2000 systems. Java applications developed for BS2000 can also be run on other platforms.

The contents of the current JENV data sheet also apply to the JENV component.

JV

JV (Job Variables) are a flexible tool for job control under user control. They offer the possibility to easily define dependencies of complex production processes and form the basis for event-driven job processing.
Furthermore, the contents of the current JV data sheet apply to the JV component.

LMS

LMS, the BS2000 library management system, creates and manages program libraries and edits the elements they contain. LMS thus supports program creation, maintenance and documentation. The contents of the current LMS data sheet also apply to the LMS component.

openNet Server

The openNet Server communications manager (abbreviation: ONETSERV) is the central communications platform for BS2000. It provides complete communication services for all protocols and networks relevant in BS2000.

openNet Server (BS2000) comprises the products BCAM, DCAM, CMX and SOCKETS with their respective versions of the user program interfaces, as well as IPSec for encrypted transmission of user data, LWRESD for access to DNS servers, VTSU-B for support of logical terminals and XHCS for conversion of character strings between different character sets.

For the openNet Server component, the content of the current openNet Server data sheet also applies.

PERCON

PERCON offers extensive functions for transferring and converting data between files and data carriers of the same or different types.
For the component PERCON the content of the current data sheet for PERCON is furthermore valid.

POSIX

BS2000 is equipped with standardized interfaces according to POSIX / XPG4.2. The POSIX-BC function complex includes the POSIX programming and application interfaces as library functions for the C programming language, the POSIX subsystem, e.g. the runtime environment for the POSIX system calls, and the entire POSIX shell. Metadata journaling is available for fast restart of the POSIX file system. The BS2000 file system bs2fs allows BS2000 files to be accessed transparently from the POSIX environment and via NFS.

RSO

RSO (Remote Spool Output) is a supplementary product to the central BS2000 spool system which can be used to print to decentralized printers in a LAN network (host-to-LAN printing).
The contents of the current RSO data sheet also apply to the RSO component.

SCA

SCA (Speed Catalog Access) optimizes catalog access. This can significantly increase the throughput of a system. Furthermore, the contents of the current SCA data sheet apply to the SCA component.

SDF

The software component SDF (System Dialog Facility) supports the input of commands and program statements in dialog, from procedures and in batch.

SORT

SORT is an efficient sorting/mixing program for sorting sets of input files according to specified ordering criteria and for mixing sets of multiple sorted input files into a single output file.
Furthermore, the contents of the current data sheet for SORT apply to the SORT component.

SPOOL

Via SPOOL, job descriptions can be read in (SPOOLIN) and result data can be output (SPOOLOUT). The configuration of the devices that can be operated via SPOOL and the assignment of special usage types can be changed dynamically and is taken into account when processing the jobs.

TIAM

TIAM (Terminal Interactive Access Method) is a BS2000 access method for dialog mode.
For the TIAM component, the contents of the current TIAM data sheet also apply.

WebTransactions

The openSEAS component "WebTransactions for OSD" for web integration of BS2000 applications, executable on BS2000 under POSIX, is also available as part of the OS DX operating system package.
For the WTOSD component, the contents of the current WTOSD data sheet also apply.

Innovations with Service Pack 23.2:
The new operating system package BS2000 OS DX V1.0B is released with Service Pack 23.2.
The current change status of the package products can be found in the BS2000 release note on the [manual server](#).
A comprehensive overview of the functional enhancements of the BS2000 operating system can be found in the [white paper](#).

Technical details

Requirements	

Technical requirements Hardware	Fujitsu Server BS2000 SE Series
	• supported models:
	  SE730B, SE730, SE710, SE700B and
	  SE330B, SE330, SE320, SE310
	• SE Software as of V6.4 SP2

Technical requirements Software	none
Requirements for the user	BS2000 knowledge

Installation and operation	
Operating mode	Dialog, transaction and batch operation
Implementation language	Assembler, SPL, C++
User interface	Commands english, message texts german/english
Operating mode	Dialog, transaction and batch operation

Documentation and training	
Documentation	The manuals for the components included in OS DX V1.0 are available on the manual server.
Training	See course offer (German)

Reference and delivery	
Conditions	This software product is provided to customers under the terms and conditions for the use of software products against ongoing payment. If separate data sheets are available for the individual components of the operating system package, the conditions from the corresponding data sheets also apply to the respective components.
Ordering and delivery information	The software product can be obtained from your local Fujitsu regional office.