FUJITSU

White Paper
FUJITSU Software BS2000 OSD/BC V10.0

The development and release of FUJITSU Software BS2000 OSD/BC V10.0 is usually parallel with the new FUJITSU Server BS2000 SE and the SE Manager for central administration. An important objective when developing BS2000 OSD/BC V10.0 is the provision of the required interfaces and functions. The main emphasis in BS2000 OSD/BC V10.0 is the introduction of an integrated development environment for BS2000 based on Eclipse, function extensions in SANCHECK, the extended integration of Net-Storage and performance improvements.

The important functional extensions in BS2000 OSD/BC V10.0 are:

Support of new hardware
- Functional extensions for the SE Server
- Extended peripherals support

Ease of use
- BS2IDE - Integrated development environment for BS2000 based on Eclipse
- SANCHECK - Function extensions and support of the SE Server
- EDIT commands available in programs
- Improvements in pubset management

Extended storage integration
- Net-Storage interoperability with other operating systems
- Improved performance for Net-Storage catalog accesses
- Measures to increase the availability of Net-Storage
- Handling Net-Storage when disconnecting pubset mirror (clones)

Performance improvements
- Avoid compulsory CPU removal under Nucleus Lock
- Performance measures in the allocator
- Performance improvements in SNAP

Extension of system limits
- New volume type for ETERNUS CS8000 to increase the maximum number of tape blocks
- Relief of system address space

General release of BS2000 OSD/BC V10.0: April 2015
The release of new versions for the SW products takes place within the timespan of BS2000 OSD/BC V10.0. This document also describes the main function extensions for many of these products.

The description of the functions and the schedules correspond to the currently agreed planning status. We reserve the right to make changes up to the general release.

Contents

New features in BS2000 OSD/BC V10.0

Hardware support

Support for the BS2000 Business Servers in the S and SQ line

BS2000 OSD/BC V10.0 supports all released servers in the S series (S165, S175, S200, S210) and in the SQ series (SQ200, SQ210); the SQ Servers are supported via X2000 V5.3.
BS2000 OSD/BC V10.0 is only separately available for S Servers as in the previous versions; the OSD/XC package is not released for S Servers.
OSD/BC V10.0 is released for SQ Servers as part of the package OSD/XC V10.0.

Functional extensions for the BS2000 SE Server

BS2000 OSD/BC V10.0 supports - in addition to the current S and SQ Servers - the Server Units /390 und x86 in the new SE Servers. The previous BS2000 Server Lines for the S Servers and the SQ Servers are merged in the SE Servers. The SE Servers also enable the integration of industry standard servers and peripheral devices.
The management interface (the SE Manager), which is uniform for all SE Servers, allows the view at all system components involved.
The SE Manager provides a centralized, web-based management of the entire infrastructure and much of the SE Server Units used peripherals and all the consolidation options via virtualization.

Integration of selected BS2000 functions in the SE Manager

A number of selected BS2000 functions are involved in the SE Manager as an integral part. These include the components BS2000 Backup Monitor (with HSMS and FDDRL functionality), VM Management and SANCHECK.
In addition, BS2000 software products with a web-based user interface can be installed as an add-on on the Management Unit – they are then available on the SE Manager via the navigation bar. Currently this is possible for the openSM2 Manager, the openUTM WebAdmin and the ROBAR-SV Manager.

To exchange Information between the Management Unit, the platform of the SE Manager, and the components of BS2000 on the Server Units of the SE Server a complex communication is required.
In BS2000 OSD/BC V10.0 a new web service subsystem (REWAS - REstful Web API Service) is implemented which provides the basic functions for internal applications for these requirements.

Support of the new 8Gbps FC channel and 10 Gbps Ethernet

With the Server Units /390 of the SE Server the Gbps Fibre channel and 10 Gbps Ethernet is available. The support of 8Gbps FC channel now allows direct connection of 16 Gbit switches.
The release of this new 8 Gbps FC channel for OSD/BC V10.0 also comprises the support of more than 256 devices per channel path and the support of the new feature Concurrent Sense to improve performance.
The modifications have been made so that OSD/BC V10.0 can still run on S Servers with 1 Gbps FC channels.

Support of the High Availability and Live Migration

As input to support High Availability and Live Migration in accordance with the HA and LM functionalities of SQ210 in BS2000/OSD-BC V9.0, a series of measures has already been implemented in BS2000 OSD/BC V10.0. Functional extensions to support the high availability concept were required in various components of BS2000. The release of this functionality is planned for a future version of BS2000 SE Servers.

Extended peripherals support

LTO-6 magnetic tape devices including LTO-6 drive encryption support

In addition to the previous LTO device types, the device type LTO-6 is also supported in BS2000 OSD/BC V10.0. LTO-6 drives from IBM are released for operation on SE Servers (SU x86 and SU /390) and on the currently supported S and SQ Servers on the FC channel in conjunction with the Quantum libraries Scalar i6000 or i500.

Furthermore, LTO-6 devices on the SU x86 of the SE Server and on SQ Servers can be operated on an MTC changer ETERNUS LT40 connected via FC.

LTO-6 devices have higher data rates than LTO-5 devices: the maximum data rate is 200 MB/sec (without compression) in comparison to 140 MB/sec with LTO-5. The minimum data rate required for streaming the LTO-6 tapes is 40 MB/sec.

The LTO-6 drives are equipped with the hardware feature tape encryption. The support of tape encryption is in conjunction with MAREN V12.0B. MAREN handles the key management function and the control of encryption and decryption. The data is encrypted according to the AES standard of the drive.

Only LTO drives from IBM (not from HP) are supported in the directly connected Scalar libraries.

LTO-6 support was already released with correction package 2/2013 for BS2000/OSD-BC V9.0. An X2000 supplement is required for SQ Servers.

New generation ETERNUS DX S3
The new generation ETERNUS DX500 S3 and DX600 S3 and the successor generation for ETERNUS DX8700 S2 are supported in BS2000 OSD/BC V10.0 in addition to the currently released models of the ETERNUS DX storage systems.

Ease of use

BS2IDE – Integrated development environment for BS2000 based on Eclipse
BS2IDE supports developers of BS2000 applications on typical tasks and integrates the benefits of modern development environments. By combining the most important tools of the software development process in one unified user interface, BS2IDE supports developers throughout the whole development cycle and raises the productivity in BS2000 software development and service.

The most important features are:
- Sytnax aware editors (e.g. for SDF-P)
- Remote launching of compilers and binder on BS2000
- Placement of problem markers directly in the corresponding lines of code
- Source oriented, graphical remote debugging (based on AID)
- openFT connection to BS2000 (Remote System Explorer)
- Local or remote source storage
- Support of open revision control systems (e.g. git)

BS2000 supports the most common programming languages of BS2000:
- COBOL85 and COBOL2000 (incl. ESQL)
- Assembler
- C/C++

For details on the functionality of BS2IDE see White Paper FUJITSU Software BS2000 BS2IDE.

SANCHECK V3.0 – Function extensions and support of the SE Server
As part of BS2000 OSD/BC V10.0 new technologies are the supported with the new version V3.0 of SANCHECK and on SE Servers the ease of use is improved through integration of SANCHECK in the SE Manager.
SANCHECK V3.0 is released on SE, SQ and S Servers from BS2000/OSD-BC V8.0.

Support of Brocade virtual fabrics
A virtual fabric is a logical group of ports of a switch or several switches which act like a fabric, consisting of one switch.
Brocade virtual fabric can be identified as of SANCHECK V3.0 and marked accordingly in the output. SANCHECK uses the SNMP v3 protocol in order to determine the data of virtual fabrics.

Support of N-Port virtualization on the FC switch
N-Port virtualization is a technology that enables several N-Port IDs to use an individual real N-Port (node port). It is the prerequisite for using SAN access gateways which are currently used in SQ Servers (additional package SIP). As of SANCHECK V3.0 such ports can now be identified and displayed.

Representation of SAN information on SE Manager
On SE Servers the SANCHECK functionality is offered as standard on SE Manager. The required SANCHECK configuration files are maintained on the Management Unit. The SAN topology and the current state of the SAN can be shown on the SE Manager (navigation hardware -> FC network) on request.

SANCHECK displays the SAN topology for SU x86 (BS2000); for SU /390 SANCHECK offers the display of the SAN topology and the check of the configuration by comparing the SAN topology with predefined device configuration (IORSF).

In order to provide the SAN information for the SE Manager a function has been created on the Management Unit which
– determines the SANCHECK information,
– retrieves the inspection results from SANCHECK and stores the information locally in result files and
– maintains the SANCHECK configuration files.

EDIT commands available in programs
The new EDIT commands introduced in BS2000/OSD-BC V9.0 and a range of additional information commands (/EDIT-FILE-ATTRIBUTE, /EDIT-FILE-GENERATION-SUPPORT, /EDIT-FILE-GROUP-ATTRIBUTES, /EDIT-FILE-LINK and /INFORM-PROGRAM) are available via the program interface. They can be called from program via the CMD macro in combination with the command INCLUDE-CMD. The functionality prerequisits the product SDF-P.

Improvements in pubset management

Modifying the pubres mnemonic is possible as of BS2000 OSD/BC V10.0 using the commands /EDIT- and /MODIFY-MASTER-CATALOG-ENTRY. After a migration of the pubset to other mnemonics the catalog entry was previously updated with the next /IMPORT-PUBSET only on the system on which the migration was carried out. Modifying the pubres mnemonic on one of the other systems was up to now only possible with /REMOVE- und /ADD-MASTER-CATALOG-ENTRY.

The mnemotechnic device name of the pubres is output irrespective of status as of BS2000 OSD/BC V10.0 in the command /SHOW-MASTER-CATALOG-ENTRY to output the mnemonic of the pubres disk. This information was previously not output for imported pubsets even if it was already entered.

Extended storage integration

Net-Storage interoperability with other operating systems

The Net-Storage functionality introduced in BS2000/OSD-BC V9.0 has been extended in BS2000 OSD/BC V10.0. BS2000 can detect and process files created by UNIX/Linux systems. Inversely files created by BS2000 can be processed by UNIX/Linux systems. This new function is released in BS2000 with introduction of the new file feature **Node-File**. A Node-File in conjunction with BS2000 is a file which on the one hand can be read and changed by BS2000 as a PAM file but which can also be read and changed by an open system as a "normal" file.
The use of the function Net-Storage Node-File on S Servers requires a software supplement for HNC; an X2000 supplement is required for SQ Servers.

Supported file formats

In BS2000 OSD/BC V10.0 the feature Node-File can only be assigned for BS2000 files with the file format PAM (BLKCNTRL=NO). From the UNIX/Linux viewpoint, a file has no special structure, which corresponds to PAM file format in BS2000.
It is planned to support Net-Storage Interoperability in a later step for SAM files as well. SAM files with the Node-File feature are then converted to a format understood by open systems when writing to Net-Storage. And vice versa when reading these files in BS2000 the control and length fields must be recalculated and supplemented so that the application finds the SAM format again. ISAM files cannot be saved as Node-File.
Files without the Node-File feature are not converted to Net-Storage when storing but are treated like a previous (BS2000/OSD-BC V9.0) Net-Storage file.
As before, FGGs (File Generation Groups), data in the PAM key format and temporary files are not supported on Net-Storage in OSD/BC V10.0 too.

Creating Node-Files in BS2000

As of BS2000 OSD/BC V10.0 files can be saved on Net-Storage which can then be read directly by open-world systems. Node-Files are created on Net-Storage via the **/CREATE-FILE** command by specifying special parameter values.
They are created in BS2000 user-specific directories below the Net-Storage volume; these directories have the name of the respective BS2000 user ID.
An ID-based access concept supports the secure file processing of Node-Files both in BS2000 as well as in the open systems (see "Authorization concept for Node-Files"). File locking between BS2000 and a UNIX system are implemented based on NFS locks.

Commands to manage Node-Files

UNIX/Linux files can be imported from the Net-Storage volume using the new command **/IMPORT-NODE-FILE**. This command creates the BS2000 catalog entries in the BS2FSCAT and TSOSCAT in order to enable access via BS2000 and also creates the option of updating catalog entries in the TSOSCAT and BS2FSCAT based on the INODES in the UNIX/Linux system.
The imported file is cataloged in the file format PAM (BLKCTRL=NO) and neither the file structure nor the content are modified.
The command **/EXPORT-NODE-FILE** is used to delete the catalog entries of the Node-File(s) in the TSOSCAT and BS2FSCAT. However, the file on the Net-Server is retained.
A range of additional commands for managing Node-Files has been provided new and existing commands have been extended, for example, to list the Node-Files stored in Net-Storage (/LIST-NODE-FILE) or to copy Node-Files to public data media (/COPY-FILE).

Authorization concept for Node-Files

A comparison of the user IDs and group IDs for BS2000 users with those of UNIX/Linux users is necessary for the minimally required coordination of access rights from BS2000 to files created on the UNIX/Linux side and vice versa.
For that purpose the user and group number of the BS2000 user ID must be manually entered via /MODIFY-POSIX-USER-ATTRIBUTES in the user catalog of the pubset. Additionally for use of NFSv4 the connection of Net-Client and Net-Server to LDAP is absolutely required.
The BS2000 protection measures (USER-ACCESS, ACCESS, password protection, BACL, GUARDS) are only effective in BS2000.
The mechanisms which the file system provides regarding ownership (UID:GID, rwx for user, group, other) as well as ACLs are valid from the UNIX viewpoint.

Improved performance for Net-Storage catalog accesses
The time needed to create new files on Net-Storage previously depended on the filled capacity level of the Net-Storage catalog. The creation of many Net-Storage files on a volume was low in performance due to the extensive search in BS2FSCAT.
In BS2000 OSD/BC V10.0, this dependence has been removed by implementing a hash process (SCANET) for Net-Storage, comparable to the speedcat implementation for pubset/CMS. This enables consistent good performance.

Measures to increase the availability of Net-Storage
As of BS2000 OSD/BC V10.0 redundant paths can be defined for the Net-Client. The redundancy connection must be defined by the administrator via command. When the Net-Client fails, e.g. because of maintenance work, the connection on the affected HNC is removed and then configured on the redundant HNC new. Delays for applications can occur due to the switchover.
Support of redundant paths for Net-Storage on S Servers requires a software supplement for HNC.

Handling Net-Storage with separated pubset mirror (clones)
Net-Storage files are not cloned, i.e. when separating pubset mirrors on which Net-Storage files are cataloged, the corresponding references on Net-Storage must be made invalid.
So far Net-Storage volume entries have been set in TSOSCAT as "invalid" and have been automatically removed with a later IMCAT. As of BS2000 OSD/BC V10.0, the corresponding catalog entries of the Net-Storage files are also deleted from the TSOSCAT of the clone.

Performance

A range of measures to improve performance has been implemented in BS2000 OSD/BC V10.0. Apart from the improved time behaviour, these measures do not have any immediate effect on the user interface. Here is a list of the main measures.

Avoid compulsory CPU removal under Nucleus Lock
The introduction of the SE line increases the maximum number of virtual CPUs on /390 servers per guest system from 8 to 16 CPUs.
It is expected with CPU intensive loads that the affected virtual CPUs use their maximum timeslot (usually 8 msec) and can then be forced away from the real CPU by the Hypervisor.
If such a compulsory CPU removal occurs under nucleus lock, this can affect the performance behaviour of the remaining virtual CPUs in the guest system (e.g. if they are waiting for the same lock). These effects are even greater the more CPUs are used.
In order to avoid such conflicts, a communication mechanism is implemented between BS2000 and the Hypervisor via which the compulsory removal of a virtual CPU can only occur when no nucleus lock is held.

Performance measures in the allocator
When assigning new disk space reduced performance was determined in certain situations after there was a clear increase in the BS2000 disk volume. In BS2000 OSD/BC V10.0 the strategy used to search the allocator tables for small and medium requests has been optimized in order to improve performance.

Performance improvements in SNAP
Various measures have been taken in SNAP in order to improve performance.
This includes the asynchronous copying of real memory data to the SNAP file. As of BS2000 OSD/BC V10.0 the SNAP meta data are only saved or updated in the SNAP file at the beginning and end of the SNAP run.

Extension of system limits

New volume type for ETERNUS CS8000 to increase the maximum number of tape blocks
Volumes in the ETERNUS CS8000[1] were so far operated in BS2000 with the volume type TAPE-C4 irrespective of the connection type (ESCON / FC). TAPE-C4 is designed for a maximum of 2^{22}-1 blocks per volume; "large" logical volumes in ETERNUS CS8000 could thus only be partially filled with small block sizes when using the volume type TAPE-C4. These restrictions no longer apply in BS2000 OSD/BC V10.0.
With the LTO4 emulation in ETERNUS CS8000 and the support of the volume type TAPE-U4 also for ETERNUS CS8000 in BS2000 2^{32-1} blocks per volume are possible in future. The TAPE-C4 tape format is still supported compatibly for ETERNUS CS8000.

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[1] ETERNUS CS HE was renamed in ETERNUS CS800 with the release of version 6.0 in November 2013. The term ETERNUS CS8000 explicitly includes in this document the supported predecessor models ETERNUS CS (HE).

Discharge of system address area – removal to dataspaces

Without taking dataspaces into account, BS2000 has a virtual address area (total of user and system address area) of maximum 2 GB limited by 31-bit addressing. A system address area from 128 MB to 512 MB is necessary depending on the configuration; the rest is available as user address area. In order to enable the use of additional system address are for new functions and simultaneously provide the largest possible address area for non-privileged applications, measures have been taken in memory management, in DAB and in openSM2/COSMOS to regularly relieve the load on the system address area by migrating data to dataspaces; a removal of executable code to dataspaces is not possible. Furthermore, a more finely graduation of the configurable size of the system address area (SYSSIZE) in the bind procedure for the BS2000-EXEC contributes to optimal use of the address area.

Extensions in SWK products

Extensions in FUJITSU Software BS2000 DAB V9.4

Assistance for the system address area

Data structures were already relocated in FUJITSU Software BS2000 DAB in the past from the system address area to dataspaces.
However, data structures which are located in DAB slots are still in the system address area as before. The data structures for the file elements are also relocated to dataspaces in the new DAB version in order to discharge the system address area.
The main beneficiaries of this measure are customers who work with AutoDAB and which cache many files with DAB.

Extensions in FUJITSU Software BS2000 FDDRL V19.0

Extended output functions

FUJITSU Software BS2000 FDDRL runs until now are only logged to SYSOUT. The progress of FDDRL runs can only transparent at the local console via the device assignment and tape assemblies.
New information functions are provided with FDDRL V19.0 (SHOW-FDDRL-STATUS and SHOW- REQUEST) and existing statements (SHOW statements and MODIFY-FDDRL-PARAMETER) have been extended by options to output in S variable (parameter STRUCTURE-OUTPUT) and to create log files.

In order to support the maximum disk size of 2 TB and the maximum pubset size of 4 TB, the PHP number is output in future in 10 digits in the FDDRL output functions

Support of the SE Server

On SE Server FDDRL is integrated into the BS2000 Backup Monitor on SE Manager. In the central monitoring an overview of the current FDDRL backup jobs (requests) of all BS2000 systems in a SE infrastructure is available and also a detailed information about the status of a backup job. The report file that is provided by FDDRL at the end of a job and that contains the FDDRL job protocol and the collected SYSOUT protocols of the FDDRL subtasks can also be displayed on the SE Manager.
When used in a SE server FDDRL V19.0 is required.

Extensions in FUJITSU Software BS2000 HSMS V10.0

Flexibility of the storage location for save files

The previous philosophy in FUJITSU Software BS2000 HSMS was the rarer a file is accessed, the "further away" its storage location. This rigid approach becomes more flexible as of HSMS V10.0 in order to enable higher level of independence from storage location; the storage position of a file should no longer affect the backup strategy in future. Significant for data backup via HSMS is only the following: which system is to access the data, the required performance and the capacity available. To enable easy transfer to other media, the save file is substantially transparent from the storage location.
The flexible use of storage levels S1 and S2 results in extensions in a variety of functions. For example, the specification of the target storage location (parameter TO-STORAGE) is extended in the instructions COPY-SAVE-FILE and ARCHIVE-FILES. In addition, the limitation of storage level S1 of 4 TB (according to the size of a volume set) is lifted.
The extended use of backups to disk also allows as of HSMS V10.0 the import of each file or JV from any save file on disk.
In HSMS V10.0 the storage location of the save file is then also transparent in order to support a simple relocation of the data to new systems/storage.

Expiration date for long-term archiving

Backups can currently be deleted when the expiration date specified by the user has been reached, irrespective of whether or not a file in the backup has a later expiration date. In future, a warning is issued if a file with a later expiration date has been included in a backup with an earlier expiration date.

Centralized Data Backup Monitoring on SE Manager

On SE Server HSMS is integrated into the BS2000 Backup Monitor on SE Manager. In the central monitoring an overview of the current FDDRL backup jobs (requests) of all BS2000 systems in a SE infrastructure is available and a detailed information about the status of a backup job.
The report files of HSMS can also be displayed on the SE Manager.
In HSMS V10.0 the SHOW functions and the reporting have been adapted to the needs of the BS2000 Backup Monitor on the SE Manager.

Support of SE feature BS2000 Backup Server

On SE Servers a relief of the productive systems can be reached by installing a marked BS2000 system as BS2000 Backup Server. The backup server takes over the backup of the Shared Pubsets independent on its role (master or slave) in SPVS.

Extensions in FUJITSU Software BS2000 ONETSERV V3.6

Measures to increase performance
A range of different measures to clearly increase the performance and throughput have been implemented in the components BCAM / SOCKETS of the openNet server.

Measures to increase performance in BCAM / SOCKETS:
- TCP Segmentation Offload (TSO) within BCAM:
  Optimized internal data communication with very large IP segments (data chunks);
  this reduces CPU times further amongst others
- Input / Output processing with several processes
  Parallelization of procedures to increase throughput
- Increase of TIDU size
  Reduction of internal administration structures and locks and thus a reduction in the associated CPU times
- SOCKETS: Performance optimization in eventing, thus reduced runtimes and reduced CPU usage

Measures to increase performance in interaction with X2000 / HNC:
- Generic Segmentation Offload (GSO) when sending
- Large Receive when reading (GRO, Generic Receive Offload)
  These mechanisms combine data from incoming IP segments and IP segments to be sent in one data stream into larger IP segments. The communication overhead between the instances involved is thus reduced and enables a significant increase in throughput.
- 256 kB data transport between BS2000 and X2000
  Doubling the I/O area size to 256K as well increasing the number of I/O areas guarantees a continuous data transport between X2000 and BS2000 and wait times are avoided. This also increases throughput.

Simple resolution of an address conflict
The BCAM commands DEACTIVATE-OWN-ADDRESS and ACTIVATE-OWN-ADDRESS have been introduced in order to handle address conflicts in IP or IPv6. They are used to specifically address own-addresses which have caused a detected address conflict. Handling via other BCAM commands is not allowed for own-addresses deactivated via DEACTIVATE-OWN-ADDRESS until further notice and they no longer have any effect in the network. If an address is to be used again, this must first be explicitly provided via the ACTIVATE-OWN-ADDRESS command.

Reverse lookup functionality
The reverse lookup functionality to display the processor name assigned to an IP address is provided as of ONETSERV V3.6 via an nslookup command interface connected to SOCKETS.

Support of the SE Server
To support the Private Control Networks for communication between the Management Unit of the SE Server and the BS2000 components on the Server Units a number of measures in ONETSERV V3.6 were required.
With support of the 8 Gbps FC channel and the 10 Gbps Ethernet on SU / 390 of the SE Server, the connection to current technologies succeeds.
From ONETSERV V3.6 and BS2000 OSD/BC V10.0 direct connection of 16 Gbit switches is possible now.

Extensions in FUJITSU Software BS2000 openSM2 V10.0 (including COSMOS V19.0)

openSM2 Manager
FUJITSU Software BS2000 openSM2 has been extended to include a web application on SE Servers. The openSM2 Manager can be installed on the Management Unit of the SE Server as an add-on product and is then available via a standard web browser. It runs integrated on the Management Unit of the SE Server.
The master agent on Linux receives the measurement data from the BS2000 agent and updates the measurement values database. The BS2000 agent must also be installed in future on each monitored BS2000 system in order to gather the required measurement values.
The functionality of ANALYZER and INSPECTOR has been merged for the most part in the openSM2 Manager so that there is no longer any split into different programs (with a different "look and feel").

Major functional enhancements:
- Automatic recording of all units of a SE Server
- Performance monitoring – overview display
  Performance values (CPU%, Mem%, Disk/s) of the units are visible at a glance. There is a flexible presentation by filtering and sorting the values.

The evaluation programs in their previous range of functions are provided in openSM2 V10.0 for use outside the SE Server and for the further use of existing scripts/macros (ANALYZER functionality).

Take live migration into account in the automatic bottleneck analysis

The characteristic numbers for the system performance which are the basis for the automatic bottleneck analysis so far remained constant during a BS2000 session. They were thus only gathered at the beginning of the measurement and written to the measurement value file. However, with support of the live migration functionality the system performance can change during a BS2000 session and can thus falsify the results when there is an automatic bottleneck analysis. In order to prevent this, the modified characteristic numbers will be stored in future in the measurement value after a live migration.

An automatic bottleneck analysis is only permitted for a period of time where there has been no change in system performance. In a conflict situation, the user is notified via the appropriate messages.

Role concept and user management
The Administrator role is used to select the monitored systems, setting and activating monitoring parameters and the user administration. The monitor role allows the display of reports.

Extension of the SM2/UTM interface
The measurement data for openUTM applications has been extended to include specific values for TAC classes.

Extensions in COSMOS
- Writing to the measurement value file in COSMOS is implemented via an SVC-free interface in order to avoid interrupts and avoid "missed events".
- Timestamps are output with nanosecond accuracy for the support of quick servers.
- Data buffers are removed to dataspaces in COSMOS in order to relieve the system address area.

Note: Since August 2013 COSMOS is a delivery component in the order unit openSM2 und is supplied as standard.

Extensions in FUJITSU Software openUTM V6.3

Support of the SE Server
FUJITSU Software openUTM as of V6.2 offers a web-based user interface for administration via the tool openUTM WebAdmin.
As of openUTM V6.3 openUTM WebAdmin can be installed on the Management Unit of the SE Server as an add-on product. The openUTM WebAdmin then runs integrated analog to openSM2 on the Management Unit of the SE Server.

Functional extensions
- The Capture & Replay of UPIC application keys permits the simulation of workload peaks expected in the future and, with a server migration, the simulation of existing application loads in the new servers.
- The openUTM-Client V6.3 can run on Windows x86-64 platforms not only in 32-bit address mode but also in the 64-bit address mode.
- openUTM V6.3 also offers an optimized task management for distributed transactions and for those to be coordinated with the database systems.

Extensions in FUJITSU Software BS2000 PCS V3.1

The product FUJITSU Software BS2000 PCS takes control actions in the operating system when there are overload situations. PCS initiates that only that number of tasks is permitted which corresponds to the required response times or an optimal system performance rate. This can even mean that the number of active tasks is reduced or the task scheduler is stopped for a category, and that the task activation is stopped when the MAX-MPL value has been reached. When PCS in future takes control actions in the operating system it will issue a message to the console (and thus in CONSLOG as well).

Extensions in FUJITSU Software BS2000 ROBAR V7.0

Extension of the web-based user interface
Further developments for ROBAR V6.5 have seen the provision of a web-based user interface for individual functions of the ROBAR-SV Manager. With FUJITSU Software BS2000 ROBAR V7.0 now the functionality of the old menu interface is fully integrated into the web-based user interface, i.e. the user interface has now been extended by the functions SAVE, MANUAL, DEFINES (process and release RRF) and LIST (output of statistics). Furthermore, the following function extensions have been implemented in the web-based user interface:
- a clear display (one view) of the status information for the instances and their connections
- an assistant for step-by-step creation of instances
- filtering and sorting capability for different tables
- an option to activate/deactivate the automatic update of data on the web-based user interface and to set a timer for the update
- extensions in the overview for messages and devices
- the output and processing of the global configuration file /etc/robar.conf
- management (view and edit) of partner configurations through CMX
- the output of information regarding the managed server and location

Other extensions in the range of functions
- conversion of an old configuration file to the new format introduced with ROBAR V6.5, after the output of a corresponding inquiry
- verification of the SLES version during the installation and output of a message if the version is not supported
- introduction of an optional function in the ROBAR-SV to delete the trace file
- size of the console window is changeable

Support of the SE Server
ROBAR-SV V7.0 can be installed on the Management Unit as an add-on product; the management of ROBAR-SV instances is then possible from the SE Manager. ROBAR-SV runs integrated on the Management Unit of the SE Server analog to openSM2 web application and openUTM WebAdmin. An additional run platform for the ROBAR server is no longer required.

Extensions in FUJITSU Software BS2000 SHC-OSD V11.0
FUJITSU Software BS2000 SHC-OSD V11.0 completes the support of ETERNUS DX storage systems in BS2000 OSD/BC and also provides new functions for ETERNUS DX S3 in BS2000.

Extensions in the range of functions
- The support of the **asynchronous remote replication** for DR scenarios between remote storage systems in conjunction with ETERNUS DX S3: in addition to a *Consistency Mode*, that ensures consistency in the remote storage system, a *Stack Mode* with delayed transmission for example for migration purposes is also supported.
- The support of the functions **Cascaded and Concurrent Remote Copy** as base of combined HA/DR configurations:
  with Cascaded Remote Copy the target unit of a synchronous REC pair is simultaneously also the source unit of a cascaded remote copy replication (synchronous or asynchronous) on a further target unit which is connected via remote connections. Concurrent Remote Copy describes the simultaneous mirroring (synchronous or asynchronous) on multiple target units. Cascaded REC and Concurrent REC including the asynchronous remote replication are supported for ETERNUS DX S3.
- Support of the ETERNUS SF function "**Automated Storage Tiering (AST)**":
  AST automatically moves the storage resources for different storage tiers and offers at any time optional performance and resource utilization. SHC-OSD V11.0 supports AST for BS2000 by providing information and monitoring functions for monitoring the AST volumes and pools.
- The provision of the **RESTORE function** for Equivalent Copy (EC) and Remote Equivalent Copy (REC):
  The reconstruction of the original unit from the clone unit can now be done for the local mirroring in only one step via the SHC-OSD command RESTORE-FROM-CLONE. The reconstruction of the original unit of a remote copy pair from the target unit is provided in the SHC-OSD command RESUME-REMOTE-COPY via the parameter RESTORE=*TO-SOURCE.
- **Increase availability** via redundancy of the StorMan server:
  when the external StorMan server is down, SHC-OSD will in future support the automatic switchover to a redundant StorMan server.

Support of the SE Server
On the SE Server the component StorMan is integrated in the SE Manager. An additional platform for the StorMan server is no longer required. For use on the SE server SHC-OSD V11.0 is required.

Extensions in FUJITSU Software BS2000 VM2000 V11.0

Support of the SE Server
The virtual machine system FUJITSU Software BS2000 VM2000 V11.0 exclusively supports the new SE Server. A release of VM2000 V11.0 for S and SQ Servers is not planned.
VM2000 runs both on a Server Unit /390, as well as on a Server Unit x86. On Server Unit /390 up to 15 guest systems are now released under VM2000, on Server Units x86 up to 31.
The administration of the virtual systems in the VM2000 is now integrated in the SE Manager.

Persistent VMs
The support of persistent VMs is new in VM2000 V11.0. It comprises the administration of the persistent configuration descriptions, consisting of functions to configure, update, activate, read and delete the entries.
The configuration description of a persistent VM has the following features:
- It is persistent, i.e.it is also still available after a downtime or restart of the Server or the Server Unit. The VM can be configured and started again using the configuration description.
- It is up-to-date, i.e. all the changes in the VM configuration are always transferred immediately to the configuration description.

Overview of extensions in SWK products

The following overview contains the SWK products (from SWE OS/LP/SOL), for which a new version is released within the time frame for the OSD/BC V10.0 with a summary of the respective new functions.

Product	Version	New function with OSD/BC V10.0
CRTE	10.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
DAB	9.4	– Relieve system address area
FDDRL	19.0	– Support BS2000 Backup Monitor on the SE Manager
HIPLEX-MSCF	8.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
HSMS / ARCHIVE	10.0	– More flexible storage location for save files – Centralized BS2000 Backup Monitor on the SE Manager – Support of SE feature BS2000 Backup Server
LMS	3.5	– Extension of some instructions
ONETSERV	3.6	– Measures to improve performance – Simple resolution of an address conflict – Reverse lookup functionality – Support of SE Server
openSM2	10.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product) – openSM2 web application on Linux – Consider Live Migration with automatic bottleneck analysis – Measures to improve performance and relieve system address area in COSMOS
openUTM	6.3	– openUTM WebAdmin: integration in SE Manager – Capture & Replay application loads – Port openUTM-Client to Windows 64bit. – Optimized task management
PCS	3.1	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product) – Output of a console message with intervention in the operating system
RFA	19.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
ROBAR	7.0	– Extension of web-based user interface – Support of the SE Server
SCA	19.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
SHC-OSD	11.0	– Extensions for ETERNUS DX: - Support of asynchronous REC - Support of Automated Storage Tiering - RESTORE functionality for EC and REC - Cascaded and concurrent Remote Copy
SPACEOPT	7.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
SORT	8.0	– Sorting more than 2 GB records
TASKDATE	19.0	– Adaptation to BS2000 OSD/BC V10.0 (technically coupled product)
VM2000	11.0	– Support of the SE Server – Persistent VMs

Overview of the offered OSD/XC packages

BS2000 OSD/BC V10.0 is offered for the Server Units of the SE Servers and the SQ Servers only as a part of the package OSD/XC V10.0.
The product INETSERV has been included new in the package OSD/XC V10.0 in addition to the components contained in V9.0.
INETSERV (interNet services) provides functions which support the interoperability of communication partners in "open" TCP/IP-based networks,
e.g. FTP, TELNET and email and is a prerequisite for some functions of the operating system, such as the mail functionality. It is thus already in
use with almost all customers.

BS2000/OSD-BC V9.0 is also offered for use on SE Servers but with restrictions for LM and only as a part of the new package OSD/XC V9.5.

As a guest system under VM2000, BS2000/OSD-BC V8.0 can also be used on SE Servers but only as part of a newly formed package OSD/XC V8.5.
However, live migration is then not available.

The packages OSD/XC V9.5 and V8.5 contain in addition to the corresponding BS2000 OSD/BC version and the associated versions of the
technically coupled products (CRTE und SCA) the current components of the package OSD/XC V10.0.

Products and versions contained in the OSD/XC packages:

Function area	Product name	Version in OSD/XC V10.0	Version in OSD/XC V9.5	Version in OSD/XC V9.0	Version in OSD/XC V8.5	Version in OSD/XC V4.1
Operating system	OSD/BC	V10.0	V9.0	V9.0	V8.0	V8.0
Data backup	ARCHIVE	V10.0	V10.0	V9.0B	V10.0	V9.0
	HSMS	V10.0	V10.0	V9.0B	V10.0	V9.0
Job control	JV	V15.1	V15.1	V15.1	V15.1	V15.0
Communication and Internet	INETSERV	V3.4	V3.4	-	V3.4	-
	ONETSERV	V3.6	V3.6	V3.5	V3.6	V3.4
	TIAM	V13.2	V13.2	V13.2	V13.2	V13.2
Performance management	SCA	V19.0	V18.0	V18.0	V17.0	V17.0
Print management	RSO	V3.6	V3.6	V3.6	V3.6	V3.6
Programming systems	CRTE	V10.0	V2.9	V2.9	V2.8	V2.8
Utilities	EDT	V17.0	V17.0	V17.0	V17.0	V17.0
	LMS	V3.5	V3.5	V3.4	V3.5	V3.4
	PERCON	V2.9	V2.9	V2.9	V2.9	V2.9
	SORT	V8.0	V8.0	V7.9	V8.0	V7.9

Overview for using OSD/XC packages:

	SE Server (SU 390 and SU x86)	S Server	SQ Server
BS2000/OSD-BC V8.0	OSD/XC V8.5	BS2000/OSD-BC V8.0	OSD/XC V4.1
BS2000/OSD-BC V9.0	OSD/XC V9.5	BS2000/OSD-BC V9.0	OSD/XC V9.0
BS2000 OSD/BC V10.0	OSD/XC V10.0	BS2000 OSD/BC V10.0	OSD/XC V10.0

SW configuration

The following table shows which versions of the current system-related software products are released in conjunction   with BS2000 OSD/BC V8.0/V9.0/V10.0.
Since a large number of new versions of the software products also have to be used with BS2000 OSD/BC V10.0, we recommend introducing new versions already under BS2000/OSD-BC V8.0 or V9.0 wherever possible.

List of in current OSD/BC and OSD/XC versions supported SWK product versions (status: 30.04.2015)								
OSD/BC	V10.0		V9.0			V8.0		
OSD/XC	-	V10.0	-	V9.5	V9.0	-	V8.5	V4.1
Server	S	SE, SQ	S	SE	SQ	S	SE	SQ
AID [U]	V3.4	V3.4	V3.4	V3.4	V3.4	V3.4	V3.4	V3.4
ARCHIVE	V10.0/ V11.0	*(V10.0)*	V9.0/ V10.0	*(V10.0)*	*(V9.0)*	V9.0/ V10.0	*(V10.0)*	*(V9.0)*
ASSEMBH	V1.3	V1.3	V1.3	V1.3	V1.3	V1.2/ V1.3	V1.2/ V1.3	V1.2/ V1.3
AVAS/AVAS-SV	V8.5	V8.5	V8.5	V8.5	V8.5	V8.0/ V8.5	V8.0/ V8.5	V8.0/ V8.5
C/C++	V3.2	V3.2	V3.2	V3.2	V3.2	V3.1/ V3.2	V3.1/ V3.2	V3.1/ V3.2
COBOL85	V2.3	V2.3	V2.3	V2.3	V2.3	V2.3	V2.3	V2.3
COBOL2000 [U]	V1.5	V1.5	V1.5	V1.5	V1.5	V1.4/ V1.5	V1.4/ V1.5	V1.4/ V1.5
COLUMBUS85	V1.1	V1.1	V1.1	V1.1	V1.1	V1.0/ V1.1	V1.0/ V1.1	V1.0/ V1.1
CRTE [U]	V2.9/ V10.0	*(V10.0)*	V2.9	*(V2.9)*	*(V2.9)*	V2.8	*(V2.8)*	*(V2.8)*
DAB	V9.4	V9.4	V9.3	V9.3	V9.3	V9.2	V9.2	V9.2
Distributed Print Services (DPRINT)	V1.2	V1.2	V1.2	V1.2	V1.2	V1.2	V1.2	V1.2
DRIVE	V3.1	V3.1	V3.1	V3.1	V3.1	V3.1	V3.1	V3.1
DRV	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2
EDT [U]	V17.0	*(V17.0)*	V17.0	*(V17.0)*	*(V17.0)*	V17.0	*(V17.0)*	*(V17.0)*
ESQL-COBOL [U]	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0
FDDRL	V19.0/ V20.0	V19.0/ V20.0	V18.0/ V19.0	V19.0	V18.0/ V19.0	V17.0/ V18.0/ V19.0	V19.0	V17.0/ V18.0/ V19.0
FHS [U]	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3
FOR1	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2
HIPLEX-AF	V3.3	V3.3	V3.3	V3.3	V3.3	V3.3	V3.3	V3.3
HIPLEX-MSCF	V8.0	V8.0	V7.0	V7.0	V7.0	V6.0	V6.0	V6.0
HSMS	V10.0/ V11.0	*(V10.0)*	V9.0/ V10.0	*(V10.0)*	*(V9.0)*	V9.0/ V10.0	*(V10.0)*	*(V9.0)*
IFG [U]	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3	V8.3
interNet Services (INETSERV)	V3.4	*(V3.4)*	V3.3/ V3.4	*(V3.4)*	V3.3/ V3.4	V3.3/ V3.4	*(V3.4)*	V3.3/ V3.4
JV	V15.1	*(V15.1)*	V15.1	*(V15.1)*	*(V15.1)*	V15.0/ V15.1	*(V15.1)*	*(V15.0)*

List of in current OSD/BC and OSD/XC versions supported SWK product versions (status: 30.04.2015)							
OSD/BC	V10.0		V9.0			V8.0		
OSD/XC	-	V10.0	-	V9.5	V9.0	-	V8.5	V4.1
Server	S	SE, SQ	S	SE	SQ	S	SE	SQ
LEASY	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2
LMS	V3.5	*(V3.5)*	V3.4/ V3.5	*(V3.5)*	*(V3.4)*	V3.4/ V3.5	*(V3.5)*	*(V3.4)*
MAREN	V12.0/ V12.5	V12.0/ V12.5	V12.0	V12.0	V12.0	V12.0	V12.0	V12.0
NFS	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0	V3.0
OMNIS	V8.5	V8.5	V8.5	V8.5	V8.5	V8.4/ V8.5	V8.4/ V8.5	V8.4/ V8.5
OMNIS-MENU	V3.5	V3.5	V3.5	V3.5	V3.5	V3.4/ V3.5	V3.4/ V3.5	V3.4/ V3.5
OMNIS-PROP	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2	V3.2
openCRYPT-SERV	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3
openFT [U]	V12.0	V12.0	V11.0/ V12.0	V11.0/ V12.0	V11.0/ V12.0	V10.0/ V11.0/ V12.0	V10.0/ V11.0/ V12.0	V10.0/ V11.0/ V12.0
openNet Server [U] (ONETSERV)	V3.6/ V4.0	*(V3.6)*	V3.5/ V3.6	*(V3.6)*	*(V3.5)*	V3.3/ V3.4/ V3.5/ V3.6	*(V3.6)*	*(V3.4)*
openSM2 (BS2000) einschließlich COSMOS	V10.0	V10.0	V9.0	V9.0	V9.0	V8.0	V8.0	V8.0
openUTM	V6.2/ V6.3/ V6.4	V6.2/ V6.3/ V6.4	V6.1/ V6.2/ V6.3	V6.1/ V6.2/ V6.3	V6.1/ V6.2/ V6.3	V6.0/ V6.1/ V6.2/ V6.3	V6.0/ V6.1/ V6.2/ V6.3	V6.0/ V6.1/ V6.2/ V6.3
Oracle	11g	11g	10g/ 11g	10g/ 11g	10g/ 11g	10g/ 11g	10g/ 11g	10g/ 11g
OSS	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1
PASCAL-XT	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2	V2.2
PCS	V3.1	V3.1	V3.0	V3.0	V3.0	V2.9	V2.9	V2.9
PERCON [U]	V2.9	*(V2.9)*	V2.9	*(V2.9)*	*(V2.9)*	V2.9	*(V2.9)*	*(V2.9)*
PLI1	V4.2	V4.2	V4.2	V4.2	V4.2	V4.2	V4.2	V4.2
PROP-XT	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3	V1.3
RAV	V5.1	V5.1	V5.1	V5.1	V5.1	V5.1	V5.1	V5.1
RFA	V19.0	V19.0	V18.0	V18.0	V18.0	V17.0	V17.0	V17.0
ROBAR	V7.0/ V7.5	V7.0/ V7.5	V6.5/ V7.0/ V7.5	V6.5/ V7.0/ V7.5	V6.5/ V7.0/ V7.5	V6.0/ V6.5/ V7.0	V6.0/ V6.5/ V7.0	V6.0/ V6.5/ V7.0
RSO [U]	V3.6	*(V3.6)*	V3.6	*(V3.6)*	*(V3.6)*	V3.6	*(V3.6)*	*(V3.6)*
SBA-BS2	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2	V6.2
SCA	V19.0	*(V19.0)*	V18.0	*(V18.0)*	*(V18.0)*	V17.0	*(V17.0)*	*(V17.0)*
SDF-A	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1	V4.1
SDF-P	V2.5	V2.5	V2.5	V2.5	V2.5	V2.5	V2.5	V2.5

List of in current OSD/BC and OSD/XC versions supported SWK product versions (status: 30.04.2015)								
OSD/BC	V10.0		V9.0			V8.0		
OSD/XC	-	V10.0	-	V9.5	V9.0	-	V8.5	V4.1
Server	S	SE, SQ	S	SE	SQ	S	SE	SQ
SECOS	V5.4	V5.4	V5.3/V5.4	V5.3/V5.4	V5.3/V5.4	V5.2/V5.3/V5.4	V5.2/V5.3/V5.4	V5.2/V5.3/V5.4
SESAM/SQL [U]	V7.0/V8.0/V9.0	V7.0/V8.0/V9.0	V6.0/V7.0/V8.0/V9.0	V6.0/V7.0/V8.0/V9.0	V6.0/V7.0/V8.0/V9.0	V5.0/V6.0/V7.0/V8.0	V5.0/V6.0/V7.0/V8.0	V5.0/V6.0/V7.0/V8.0
SHC-OSD	V11.0/V12.0	V11.0/V12.0	V9.0/V10.0/V11.0/V12.0	V11.0/V12.0	V9.0/V10.0/V11.0/V12.0	V7.0/V8.0/V9.0/V10.0/V11.0	V11.0	V7.0/V8.0/V9.0/V10.0/V11.0
SM2-PA	V2.0	V2.0	V2.0	V2.0	V2.0	V2.0	V2.0	V2.0
SORT [U]	V8.0	(V8.0)	V7.9/V8.0	(V8.0)	(V7.9)	V7.9/V8.0	(V8.0)	(V7.9)
SPACEOPT	V7.0	V7.0	V6.0	V6.0	V6.0	V5.0	V5.0	V5.0
SSA-OUTM-BS2	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0
SSA-SM2-BS2	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0	V5.0
SSC-BS2	V6.0	V6.0	V6.0	V6.0	V6.0	V6.0	V6.0	V6.0
TASKDATE	V19.0	V19.0	V18.0	V18.0	V18.0	V17.0	V17.0	V17.0
TIAM	V13.2	(V13.2)	V13.2	(V13.2)	(V13.2)	V13.2	(V13.2)	(V13.2)
UDS/SQL [U]	V2.6/V2.7/V2.8	V2.6/V2.7/V2.8	V2.5/V2.6/V2.7/V2.8	V2.5/V2.6/V2.7/V2.8	V2.5/V2.6/V2.7/V2.8	V2.4/V2.5/V2.6/V2.7/V2.8	V2.4/V2.5/V2.6/V2.7/V2.8	V2.4/V2.5/V2.6/V2.7/V2.8
VM2000	V10.0	V10.0/V11.0[1]	V9.0/V10.0	V10.0	V9.5/V10.0	V9.0/V10.0	-	V9.5/V10.0
WebTransactions for openUTM	V7.5	V7.5	V7.5	V7.5	V7.5	V7.1/V7.5	V7.1/V7.5	V7.1/V7.5

[U]   Products with UNICODE-specific enhancements
[1]   VM2000 V11.0 is not released on SQ servers

Product versions, which are painted cursive and in brackets (e.g. *(V10.0)*), are part of the respective OSD/XC package and do not have to be ordered separately.