

## Fujitsu Software BS2000 HIPLEX MSCF V21.0

### Highly Integrated System Complex

#### Operational, capacity and availability networks for BS2000 systems

HIPLEX (Highly Integrated System Complex) is the system designed by Fujitsu to implement a load sharing cluster and an availability cluster of multiple BS2000 business servers. Each server attached to the HIPLEX is referred to as a cluster element (CE).

HIPLEX MSCF establishes the basic structures for load sharing and availability clusters with up to 164 BS2000 business servers, as well as for distributed applications. The HIPLEX servers attached to the HIPLEX MSCF network must be networked together via Fujitsu Software BS2000 openNetServer.

#### HIPLEX MSCF can implement four kinds of coupled systems which build upon one another:

- **Loosely Coupled System (LCS)** with up to 164 BS2000 servers for job control, catalog access and job monitoring using JVs in the network.
- **Closely Coupled System (CCS)** The CCS network includes LCS functionality and adds password protection as well as basic functions for SPVS – and XCS-Coupled Systems.
- **Shared Pubset – SPVS Coupled System** with shared pubsets and master reconfiguration for up to 16 BS2000 Servers per pubset. The SPVS Coupled System includes CCS- functionality.
- **Cross Coupled System (XCS)** with up to 16 BS2000 servers and XCS pubset for consistent cluster administration and functions for distributed applications. The XCS Coupled System includes SPVS- functionality.



# Topics

## LCS network

In the LCS network HIPLEX MSCF extends the initially CE-local basic functions of

- catalogue access,
- file access,
- starting ENTER jobs,

on the HIPLEX MSCF network. Using job variables a load-sharing cluster can be configured in which it is possible with JVs to define dependencies between jobs and/or programs and to achieve synchronous and asynchronous event control of the production process.

## SPVS network

In the SPVS Coupled System some or all the cluster elements of a HIPLEX operate at least one shared pubset. In the SPVS Coupled System there is a master CE (master sharer), which carries out the meta operations (catalog accesses) for accessing the shared pubset, for the other CEs (slave sharers) in the shared pubset. Data access to the shared pubset on the other hand is carried out by each CE. Once a backup master has been defined out of the group of slave sharers, then automatic changeover of master takes place in the event of a master failure.

## XCS network

The XCS network is a tighter coupled system than the SPVS Coupled System. In the SPVS Coupled System a number of cluster elements of the MSCF network are interconnected, but usually not all. Consequently in the SPVS Coupled System there is no view shared by each network subscriber of all the other subscribers in the network. Each network subscriber sees only the CEs to which he has an MSCF link. In the XCS network, by contrast, HIPLEX MSCF combines up to 16 cluster elements, which are interconnected via a BCAM sub-network, very closely together: the cluster elements in the network have BCAM links to every other CE in the XCS network. Via a task on each subscriber in the XCS network, HIPLEX MSCF ensures coordinated operation of the network. The administration of the XCS Coupled System is carried out via a shared pubset, which all the CEs in the XCS Coupled System operate jointly, the XCS pubset.

## Management of the XCS network

Prior to building up the XCS Coupled System, the remote catalogs of network subscribers, which should later be accessible from a particular CE are recorded in the MRSCATs in the specified CE. Then the initiative to subscribe to a network can be taken by each CE individually. As soon as HIPLEX MSCF starts with a modified configuration file (XCS configuration manager) the new network subscriber is made

known to all the other existing network subscribers.

Conversely, the new network member learns which other CEs are subscribing to the network. The exit of a CE from the network is similarly communicated to all the remaining network subscribers. For the users, subscription to the XCS network means the extension of services on to the network.

In addition to the basic functions these include

- the Distributed Lock Manager,
- shared File System (UPAM, FASTPAM, DIV),
- shared PLAM libraries.

These functions are no longer available to a CE after it has quit the XCS network.

## Catalog access (all network types)

HIPLEX MSCF permits access to system catalogs (TSOSCATs) from cluster elements subscribing to the network. This is achieved by unique catalog IDs for the system catalogs which apply across the MSCF network. In the event of a CE failure, its system catalog can be imported to a CE and thus remains available to the remainder of the MSCF network.

## File access (SPVS-, XCS networks)

The Shared Pubset function enables up to 16 servers to operate a shared pubset. The sharing granule is the file. One of the CEs becomes the master which administers the meta data of the shared pubset and performs operations on meta data, e.g. OPEN/CLOSE operations, for all the other CEs (slaves). These operations are initiated via the BCAM links between the CEs. Access to the data of the shared pubset, by contrast, takes place via the direct hardware path between CE and shared pubset.

In comparison to the procedure with shared private disk (SPD), the analogous function in relation to private disks, with shared pubsets the lockout protocol is not applicable to disk. This small communication overhead leads to a high transmission rate, which is largely determined by the data transfer rate of the disk subsystem and which is not diminished even by a high OPEN/CLOSE rate.

The XCS pubset is the central shared pubset, which contains the meta data of the XCS network. The XCM manages the meta data and thereby also the network. In contrast to other pubsets, the XCS pubset has to be attached to all the BS2000 servers which subscribe to the HIPLEX MSCF network.

## Reconfiguration of shared pubsets

To cover the possibility of a master failure, a slave CE is predefined as a backup master. Via live monitoring, which is based on a query of specific counters in the SPVS pubset and on a periodic check of the BCAM link, the backup master initiates an automatic recovery and takes on the new role of

master CE. Via XCM all the network subscribers which are still active are informed about the configuration change. Where a slave failure occurs, this is similarly configured by XCM out of the network and communicated to the rest of the network (consistent display). In addition, on the master all the resource-locks held by the slave are replaced, i.e. the resources are released for the rest of the network.

## Job variables

The software products HIPLEX MSCF and Fujitsu Software BS2000 JV make job variables and conditional job control available across the MSCF network. Their uses include job distribution and monitoring in the MSCF network.

## Static Load sharing

HIPLEX MSCF provides functions relating to job distribution and monitoring within the HIPLEX MSCF network. After the network has been set up, jobs can be initiated and distributed to any of the network partners and their status monitored across the network. For distributing jobs the target CE can be addressed directly via a BCAM name or indirectly via job variables. This enables user-driven load sharing in accordance with the distribution of resources in the network. The job variables allow cross-CE dependencies between jobs to be taken into consideration. Job distribution can also be automated using products like Fujitsu Software BS2000 AVAS (job networks covering several CEs).

## Dynamic Load Sharing (XCS network with HIPLEX JMS)

HIPLEX JMS extends the highly efficient Job-Management System (JMS) on each BS2000 server to BS2000 multi-servers. In an XCS network, this allows an optimizing and system-driven distribution of batch loads. The basis is formed by the server-local JMSs with their TU schedulers, job classes, streams and a class scheduler per server. Before the start of a job, HIPLEX JMS does a search for the server with the lightest load. It does this by performing a network-wide job class analysis across the XCS systems and then, with the aid of the local JMS, starts the job on the server that currently has the lightest load. The request for dynamic distribution for a job is made by means of the new host parameter \*ANY in the ENTER-JOB, ENTER-PROCEDURE commands. Dynamic and static job distribution is of course possible concurrently in an XCS network (for different jobs).

## Availability cluster (SPVS-, XCS networks)

The failure of a CE in the MSCF network is recognized by HIPLEX MSCF. Subsequently, a reconfiguration of the network takes place.

## Distributed Lock Manager (DLM, XCS network)

DLM is the basic structure implemented in HIPLEX MSCF to manage competition for access to resources in distributed applications, e.g. in ORACLE PARALLEL SERVER. DLM possesses various types of interconvertible locks. Using these, finely granular locks can first be defined and then very flexibly managed. By distributing to all the CEs the DLM is fail-safe, i.e. using XCM it can successfully be reconfigured in the event of a CE failure.

## Shared file system (XCS network)

Based on DLM and HIPLEX MSCF in a shared file system (UPAM, FASTPAM, DIV) a file in an XCS pubset can be shared at data record level, i.e. the lock granule is a data block: Two or more CEs can simultaneously gain read and/or write access to various data records in one and the same file.

## Shared library (XCS network)

With HIPLEX MSCF, DLM and Fujitsu Software BS2000 LMS as of V3.4, all PLAM-libraries on shared pubsets are automatically "shared libraries". All CEs, which are members of a XCS Coupled System, can open them. Library elements are the locked objects.

# Technical details

## Requirements

Technical requirements Hardware	Fujitsu Server BS2000 SE Serie
Technical requirements Software	Fujitsu Software BS2000 OS DX V1.0
Requirements for the user	Knowledge of BS2000

## Installation and operation

Operating mode	Time-sharing mode
User interface	Commands in English, message texts in German/English (optional)
Installation	By the customer according to the User Guide and Release Notice

## Documentation and training

Documentation	The Manual and Release Notice for HIPLEX MSCF are available on the <a href="#">manual server</a> .
Training	See <a href="#">course offer</a> (German)

## Reference and delivery

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

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