DATA SHEET

HIPLEX AF (BS2000/OSD) V3.3

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Introduction

HIPLEX stands for Highly Integrated System Complex and is Fujitsu Technology Solutions' concept for supporting an operation cluster, a load sharing cluster and an availability cluster consisting of several BS2000/OSD Business Servers.

The HIPLEX AF product enables applications to be implemented with highest possible availability as part of a multi-server concept. If one server fails, the applications monitored by HIPLEX AF are automatically switched to an intact server together with their resources. Downtime is minimized by an automatic failure detection facility and by the fact that a system restart is not required and therefore does not influence application availability.

In addition to managing a system failure, HIPLEX AF can increase availability after an application failure and provide the basis for a load sharing cluster in which specific applications can be relocated with the aid of HIPLEX AF to another server.

In case of a catastrophy, i.e. a local crash of both the server(s) and the storage-subsystem at a site, HIPLEX AF autonomously switches over to a remote data centre.
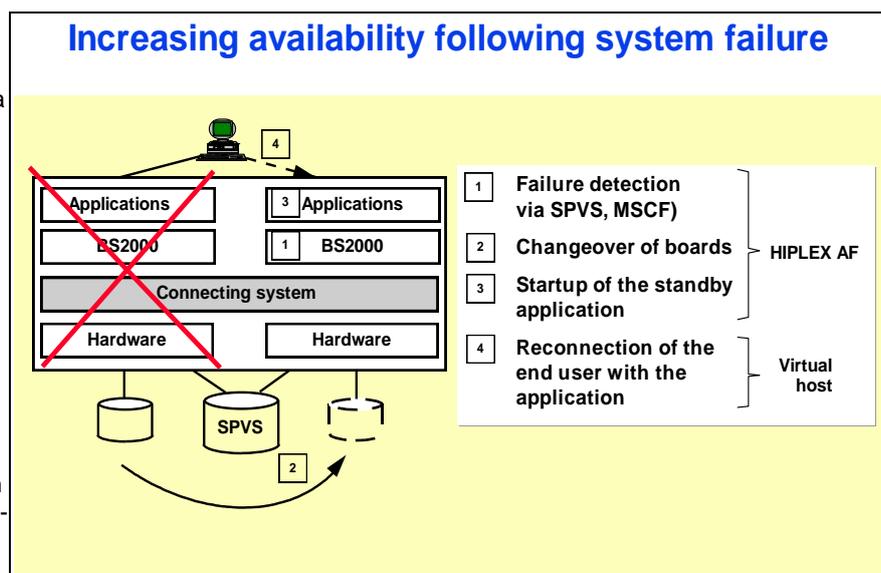
Additionally HIPLEX AF provides the perfect opportunity to configure a so-called 'warm-standby'-variant of high availability with simpler implementation and administration.

Functional Description

HIPLEX AF increases the availability of applications by minimizing application downtime. This objective is achieved by ensuring that the applications running on a work system are automatically restarted on a standby system. The work system and the standby system must be linked to one another via a shared public volume set.

HIPLEX AF supports *open*UTM and DCAM applications as well as enter jobs. The applications are monitored by means of monitor job variables.

HIPLEX AF has to relocate applications which are to be switched over and which use the same resources (disks, virtual host) to the same standby server. For this reason, HIPLEX AF must be provided with definitions of change-over units. A change-over unit contains one or more applications and a description of their resources. HIPLEX AF will then relocate all the applications of a change-over unit active at the time of failure to the same system.

Increasing availability following system failure

1	Failure detection via SPVS, MSCF)
2	Changeover of boards
3	Startup of the standby application
4	Reconnection of the end user with the application

Applications — BS2000 — Connecting system — Hardware

Applications — BS2000 — Hardware

SPVS

HIPLEX AF

Virtual host

Automatic change-over after system failure

For a system failure to be reliably detected, the servers involved must have access to a shared public volume set. In the event of the simultaneous failure of the connections to a server and the monitoring protocol implemented on the shared pubset, MSCF mechanisms are used to detect a system failure.

This event is recorded in HIPLEX AF, whereupon HIPLEX AF first imports the local storage peripherals (public volume sets and private disks) defined for a change-over unit on the BS2000 system selected by HIPLEX AF as the standby server. HIPLEX AF then activates the virtual host on the standby system and, if necessary, switches over the PDN front-end processor; in the case of LAN connections, BCAM uses routing protocol elements to make known the active virtual host in the network itself.
Finally, all the applications of the change-over unit are started up by HIPLEX AF. Clients can then reconnect to these applications. This can now take place without changing the network address, i.e. it is not necessary to know the network address of the failed system.

Selective relocation after failure or termination of an application

If only an application fails, and not the system, an attempt should be made to restart the application on the same server because all the necessary resources will already be available on this server. However, there may well be situations in which this is not possible or desirable, perhaps because only some of the required resources or performance capacity are available.

Explicit relocation of applications is necessary if applications are to be temporarily executed on a different server, perhaps as part of planned maintenance activities. Once again, HIPLEX AF can help, though here too only complete change-over units can be relocated.

If a change-over unit is to be relocated, this can be initiated via an appropriate HIPLEX AF command. If the application in question is still active, it is first terminated by HIPLEX AF. Things then proceed as in the case of a system failure. Reconnection of all clients to this application is hardly acceptable, however, particularly in the case of planned relocations of applications. With *open*UTM applications this can be resolved by giving clients access to the *open*UTM application via OMNIS. In such cases, OMNIS will maintain the connection to the clients despite the fact that the application is terminated. Once HIPLEX AF has started up the application on the standby server, OMNIS reestablishes the connection to this application.
When this has been completed, all the clients are reconnected to the application without having to do anything themselves.

HIPLEX AF offers customers the following benefits:

- Compared with single systems, the time taken to load the base system software and communication software does not influence application availability, reducing downtime to only a few minutes depending on the particular configuration.
- Error recovery takes place automatically (unmanned, rapid reaction, no operator errors).

- Once change-over has taken place, all the clients have to do is to reestablish the connection. There is no need to know the server to which the application has been transferred.
- If clients are given access to the *open*UTM application via OMNIS, the connection to the clients will be retained after the application has been relocated despite the fact that the application will have been terminated (interplay between HIPLEX AF and OMNIS).
- This is a turnkey solution and can be used without the need for customized programming or intervention in the applications; it is based on standard products.

Increasing availability following application failure application relocation
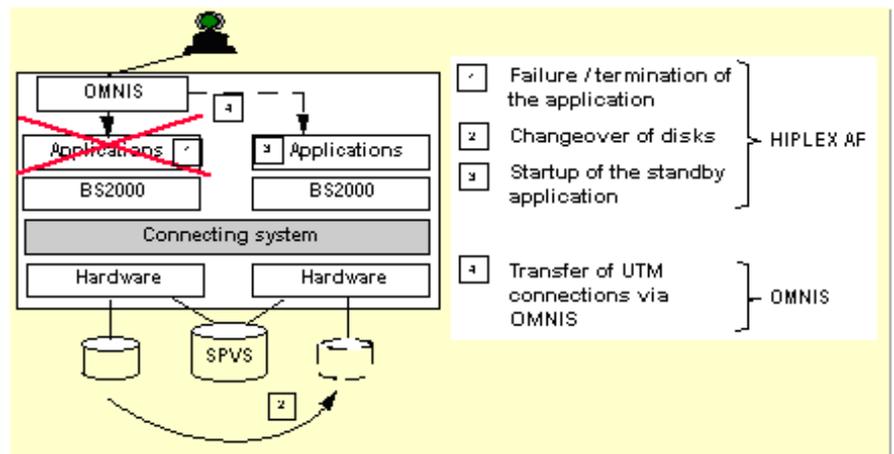
Live Monitor in HIPLEX AF V3.3

The **Live Monitor** of HIPLEX AF V3.3 supports HIPLEX MSCF (as of V4.0) in recognizing crashes and in securing the consistency of the HIPLEX-cluster.

- **Crash-detection:** The **Live Monitor** detects a system crash and reports it to HIPLEX MSCF.
- **Consistency preservation I:** HIPLEX MSCF asks the **Live Monitor** to check the state of a system. In case of "SYSTEM DOWN" the result "SYSTEMDOWN" is reported back to HIPLEX MSCF.
- **Consistency preservation II:** HIPLEX MSCF asks the **Live Monitor** to check the state of a system *and to terminate it* in case it isn't found alive. The result "SYSTEM DOWN" is reported back to HIPLEX MSCF.

These additional capabilities of HIPLEX AF result in a speed up of the failover-procedure and in a reduction of the overall system downtime.

Autoswap with HIPLEX AF V3.3

Zero-Downtime-Failover with Autoswap in case of data disaster:

Autoswap is an automaton which enables the owner of mirrored Symmetrix-configurations **to switch via command** from the Source-Symmetrix to the Target-Symmetrix (the mirror) without any interrupt or application restart (planned Symmetrix-Downtime scenario). Shortly after the applications continue running on the same server with the consistent data set on the Target Symmetrix.

Even in the case of unplanned Symmetrix-Downtimes **Autoswap** enables the HIPLEX AF V3.3 High Availabiltiy Monitor to switch the applications automatically from a work-system to a standby-system **and** to automatically switch from

the crashing Symmetrix of the work-system to a SRDF-mirrored Target-Symmetrix of the standby-system.
This way the failover-procedure is accelerated and the system-downtime is reduced.
Similarly an automated data-disaster recovery for clusters with SX-/SQservers (as of OSD/XC V4.0) and mirrored FibreCats (via MirrorView) is possible.

Warm-Standby with HIPLEX AF V3.3

The new ‚warm-standby' variant provides high availability at the cost of slightly increased downtimes but with the advantage of reduced initial effort and reduced service costs. This is achieved by using a second system (e.g. a VM2000 monitor system) for supervising the productive system. Whenever this second system detects that the productive system crashes it starts a new system via shutdown/restart or via start-VM using the IPL-disk of the crashed system.

Program description

HIPLEX AF is implemented with PROP-XT administration procedures. PROP-XT administration procedures are SDF-P procedures which can define events on the console via

PROP-XT and which are notified by PROP-XT when the events occur. HIPLEX AF consists of the HIPLEX AF main procedure and the HIPLEX AF change-over procedures. They are started on the work system and on standby systems of the shared public volume set network.
The HIPLEX AF command server processes the HIPLEX AF commands (change-over command, command for terminating the HIPLEX AF function) and coordinates the processing of the HIPLEX AF change-over procedures.
The HIPLEX AF change-over procedure implements the HIPLEX AF functionality for a change-over unit. It detects the failure of the work system by treating the console messages from the watchdog mechanism of the shared public volume set as events.
The HIPLEX AF procedures on the individual systems communicate with one another by means of job variables on the shared public volume set.
The HIPLEX AF procedures are supplied as ready compiled SDF-P procedures so there is no need to run the SDF-P product, just SDF-P-BASYS.

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Supplementary Data on
HIPLEX AF (BS2000) V3.3

Technical Requirements

Hardware

Two or more (maximum 16) BS2000/OSD S series or SX-,SQ- series Business Servers linked (via DAST/LAN/ ESCON-CTC, Fibre Channel-Switch) to an SPVS (Shared Public Volume Set).
Application specific disk peripherals connected to the BS2000/OSD Business Servers via multi-channel switches or line switches or TYP S-Directors or FC-switches.
Data communication network connected to the BS2000/OSD Business Servers via a shared LAN or a shared front-end processor.

Software

For S series servers, SX-servers, SQ-servers:
BS2000/OSD-BC V6.0 or **OSD/XC V2.0**
*open***Net Server as of V3.3**
SDF as of V4.7
SDF-P as of V2.5
JV as of V15.0
HIPLEX MSCF as of V4.0
PROP-XT as of V1.3A
optional:
OMNIS V8.4 or higher for the function of retaining connections for openUTM applications

Operating Mode

Timesharing mode

Implementation Language

BS2000 command language

User Interface

English

Installation

By user with the release notice or installation instructions in the HIPLEX AF V3.2/V3.3 User Guide.

Documentation

User Guide HIPLEX AF V3.2/V3.3
User Guide HIPLEX MSCF V4.0/V5.0/V6.0.
Online-manuals are available via
        http://manuals.ts.fujitsu.com/mainframes.html

Conditions

This software product is supplied to the customer under the conditions for the use of software products against a single payment or installments.

Ordering and Delivery

This software product may be obtained from your Fujitsu Technology Solutions regional office.