Software Product Description

PRODUCT NAME: MIRA High Availability Management Software for VMS, Version 1.0 **SPD 31.86.00**

DESCRIPTION

System Overview

MIRA Applications Switch (MIRA AS) are High Availability systems based on a Dual-Host architecture plus Watchdog modules installed in each computer and communicating via a dedicated link.

MIRA High Availability Management Software (MIRA HAMS) is a software architecture for controlling MIRA Applications Switch systems, handling the following main tasks:

- Error detection at system level as well as at device level provided that device errors are logged/recorded by their associated driver.
- Application failover and recovery initiation, upon error detected and in accordance with user-configured action templates.

The complete application recovery (regain the lost process context) must be accomplished by the application itself. Process/context shadowing is not a feature of MIRA HAMS.

Before running an application, the user must configure system environment and error recovery strategy. This should be done on both computers, and consists of filling in templates associating the devices dedicated to the application and the actions to be taken in the event of device failure.

The two computers of a MIRA Applications Switch system operate independently. MIRA HAMS is installed on each computer and handles connected applications in such a way that a complete failover is decided only if absolutely necessary, thus increasing the system availability.

Upon detecting a device failure which does not impact the whole functionality of one computer, and provided that the user has filled-in the action tables accordingly, MIRA HAMS is able to decide the failover of only those applications that are associated with this failed device. The unaffected applications are kept running on the current computer.

MIRA Applications Switch systems provide a hardware and software environment required to create high availability applications which can recover from failure without operator intervention.

MIRA Applications Switch systems are particularly suited to dedicated control applications allowing very short breaks of system availability which do not affect its overall integrity during the service/maintenance/replacement of the failed component.

Terminology

LOCAL System - System currently operating or executing commands.

REMOTE System - System at the other end of the watchdog link.

MASTER Application - Application running on any of the two computers with a backup application declared in STANDBY mode on the other computer.

MASTER BACKUP Application - Application in STANDBY mode which temporarily becomes MASTER following the failure of its partner on the remote system.

SYSTEM failure - Failure affecting the integrity of the whole system which is not recoverable by the application resulting in a SYSTEM FAILOVER.

NON-SYSTEM failure - Failure affecting a specific device and/or its associated application(s). Recovery depends on customer needs and may result in APPLICATION FAILOVER (all or part).

Failure Detection Process

MIRA HAMS is installed on each computer and exchanges status messages via the dedicated watchdog link.

- System Failure

  If the software on either computer is unable to exchange messages within a user-specified period or detects a system failure, a system failover occurs on the computer which is still in operation.

- Non-System Failure

  Once a device error threshold has been reached or whenever a MIRA Applications Switch application fails, a non-system error is generated. If the software on either computer sends a message with application or application device failure state, application failover or system failover occurs on the remote computer.

Failover Operation

In the event of system failover, the following automatically occurs on the computer still operating:

- All the applications in STANDBY mode acquire the MASTER BACKUP state, thus initiating application(s) recovery.
- All the applications in MASTER mode keep the MASTER state.

The following automatically occurs on the failed computer:

- If the feature known as "DCLOW" is enabled, a power fail is simulated thus speeding up the release of the dual-port disks that were mounted so that they can be mounted on the other system (eg: RA type disks).

  In the event of application failover, the local application is aborted. The partner application on the remote computer, in STANDBY mode, acquires the MASTER BACKUP state, thus initiating the application recovery.

application failover => recovery initiation => recovery completion

———————-> | <——————-
HAMS driven   Application driven

MIRA HAMS can perform failover, plus application recovery initialization, in less than one second on normally loaded systems.

On-Line Testing

On-line Tests can be invoked by the operator to test the specific MIRA Applications Swtich hardware on a system. Tests can be used without disturbing the applications running on either computer.

Diagnostics

MDM Diagnostics must be run on the faulty computer. In case of partial system failure, the user has to provoke a complete system failover by using an operator command. Diagnostics and repair can then be done normally on the faulty system without affecting the applications running on the computer still in operation.

Re-Start

Once a failed computer is repaired and restarted:

- Local applications having a remote partner application in master backup state acquire the master state.
- The remote partner application in master backup mode acquires the standby state.
- The local application having a remote partner application in master state acquires the standby state.
- The remote application in master state keeps the master state.

Thus, the user-configured load sharing mode will be re-established.

Swap Operation

A Customer application or the operator can command SYSTEM or APPLICATION SWAP. This operation can be disabled by an application. It is only valid from a local application in master state and with a remote partner application in standby state.

In the event of SYSTEM SWAP, on both computers:

- All the applications in standby state acquire the master state.
- All the applications in master state acquire the standby state.
- All the applications in master backup state keep this state.

In the event of APPLICATION SWAP:

- The local application in master/standby state acquires the standby/master state.
- The remote partner application in standby/master state acquires the master/standby state.

APPLICATION SWAP gives load sharing possibilities and allows use of 100% of the available CPU resource of the MIRA II system.

Failover and Swap Summary

Application state BEFORE

	On Computer 1	*On Computer 2*
Failover of Application on Computer 1	Master	Standby
	Master	Unknown
	Master Backup	Unknown
	Standby	Master

	On Computer 1	*On Computer 2*
Failover of Application on Computer 2	Master	Standby
	Standby	Master
	Unknown	Master
	Unknown	Master Backup

Application state AFTER

	On Computer 1	*On Computer 2*
Failover of Application on Computer 1	Unknown	Master Backup
	Unknown	Unknown
	Unknown	Unknown
	Unknown	Master

	On Computer 1	*On Computer 2*
Failover of Application on Computer 2	Master	Unknown
	Master Backup	Unknown
	Unknown	Unknown
	Unknown	Unknown

Application state BEFORE

	On Computer 1	On Computer 2
Swap of Application on Computer 1	Master	Standby
	Standby	Master
	Master	Unknown
	Master Backup	Unknown

	On Computer 1	On Computer 2
Swap of Application on Computer 2	Master	Standby
	Standby	Master
	Unknown	Master
	Unknown	Master Backup

Application state AFTER

	On Computer 1	On Computer 2
Swap of Application on Computer 1	Standby	Master
	Standby	Master
	Master	Unknown
	Master Backup	Unknown

	On Computer 1	On Computer 2
Swap of Application on Computer 2	Master	Standby
	Master	Standby
	Unknown	Master
	Unknown	Master Backup

Operator Commands

The following set of operator commands enable the operator to control the system:

HELP	Displays information on commands.
EXIT	Exits to DCL.
START	Starts MIRA II operation.
STOP	Stops MIRA II operation.
SHOW SYSTEM	Displays local/remote system states.
TEST	Tests local/remote watchdog link.
SET LOG__FILE	Creates new log files.
SET SYSTEM	Associates system or system device failure with an action.
CLEAR SYSTEM	Cancels effect of set system.

Application Management Commands

SWAP	Forces swap of application states.
FAILOVER	Forces failover of application/system.
RUN	Starts local and remote application.
SHOW APPLICATION	Displays information about particular application.
SET APPLICATION	Adds entry in application action table.
CLEAR APPLICATION	Removes entry from application action table.
SHOW CONNECTIONS	Displays informations about the running applications.

Error Management Commands

SHOW DEVICE	Displays device/application action tables.
SET DEVICE	Adds entry in device action table.
CLEAR DEVICE	Removes entry from device action table.

User Application Interface

The User Application Interface provides a set of user-callable subroutines allowing exhanges of information via MIRA HAMS. MIRA HAMS must be active on each computer.

These subroutines comply with the VMS Standard for Procedure Calling and Condition Handling and are supported for VAX PASCAL, VAX MACRO, VAX Ada, VAX BASIC, VAX COBOL, VAX BLISS-32, VAX PL/I, VAX C and VAX FORTRAN and include the following functions:

HAMS$CONNECT	Connects the user application (maximum 16 simultaneous connections supported)
HAMS$DISCONNECT	Disconnects the user application
HAMS$SWAP	Swaps MASTER and STANDBY applications
HAMS$FAILOVER	Forces application failover
HAMS$DISABLE__SWAP	Disables Application Swap Operations
HAMS$ENABLE__SWAP	Enables Application Swap Operations
HAMS$GET__EVENT	Gets MIRA HAMS event status.

The user applications can also be notified, if requested, of changes in application status and invoke the necessary recovery procedures.

Clock Synchronization

The two computer clocks can be synchronized within a few milliseconds. This optional feature may be managed automatically by MIRA HAMS.

SOURCE CODE

The following source code modules are provided with Single-Use License, binary options on TK50 distribution media:

• Ada Application Interface routines

INSTALLATION

Digital recommends that a customer's first purchase of this software product include Digital Installation Services. These services provide for installation of the software product by an experienced Digital Software Specialist.

For subsequent purchases of this product only experienced customers should attempt installation. Digital recommends that all other customers purchase Digital's Installation Services.

Customer Responsibilities

Before installation of the software, the customer must:

- Previously have installed all requisite software and hardware including terminals.
- Make available for a reasonable period of time, as mutually agreed by Digital and the customer, all hardware, communication facilities and terminals that are to be used during installation.

Delays caused by any failure to meet the responsibilities will be charged at the then prevailing rate for time and materials.

HARDWARE REQUIREMENTS

MIRA Applications Switch Dual-Host MicroVAX configurations as specified in the System Support Addendum (SSA 31.86.00-x).

SOFTWARE REQUIREMENTS *

VMS Operating System

VAX Ada

* Refer to the Systems Support Addendum (SSA 31.86.00-x) for availability and versions of required software.

ORDERING INFORMATION

Software Licenses: QL-YHMA*-**
Software Media: QA-YHMAA-**
Software Documentation: QA-YHMAA-GZ
Software Product Services: QT-YHMA*-**

* Denotes variant fields. For additional information on available licenses, services and media refer to the appropriate price book.

SOFTWARE LICENSING

This software is furnished under the licensing provisions of Digital Equipment Corporation's Standard Terms and Conditions.

For more information about Digital's licensing terms and policies, contact your local Digital office.

LICENSE MANAGEMENT FACILITY SUPPORT

This layered product supports the VMS License Management Facility.

License units for this product are allocated on a CPU-capacity basis.

For more information on the License Management Facility, refer to the VMS Operating System Software Product Description (25.01.xx) or the VMS Operating System documentation set.

For more information about Digital's licensing terms and policies, contact your local Digital office.

SOFTWARE PRODUCT SERVICES

A variety of service options are available from Digital. For more information contact your local Digital office.

SOFTWARE WARRANTY

Warranty for this product is provided by Digital with the purchase of a license for the product as defined in the Software Warranty Addendum of this SPD.