

# *Sun Enterprise Server Alternate Pathing 2.1 Reference Manual*

Sun Microsystems Computer Company  
A Sun Microsystems, Inc. Business  
901 San Antonio Road  
Palo Alto, CA 94303-4900  
U.S.A.

Part No: 805-5443-10  
Revision A, May 1998

Copyright (c) 1997,1998 Sun Microsystems, Inc. 901 San Antonio Road Palo Alto, CA 94303-4900 U.S.A. All rights reserved. This product or document is protected by copyright and distributed under licenses restricting its use, copying, distribution, and decompilation. No part of this product or document may be reproduced in any form by any means without prior written a uthorization of Sun and its licensors, if any.

Portions of this product may be derived from the UNIX. system, licensed from UNIX System Laboratories, Inc., a wholly owned subsidiary of Novell, Inc., and from the Berkeley 4.3 BSD system, licensed from the University of California. Third-party software, including font technology in this product, is protected by copyright and licensed from Sun's suppliers.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 and FAR 52.227-19. The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

TRADEMARKS Sun, Sun Microsystems, the Sun logo, Solaris and Starfire are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and certain other countries. UNIX is a registered trademark in the United States and other countries, exclusively licensed through X/Open Company, Ltd. OPEN LOOK is a registered trademark of Novell, Inc. PostScript and Display PostScript are trademarks of Adobe Systems, Inc. All SPARC trademarks are trademarks or registered trademarks of SPARC International, Inc. in the United States and other countries. SPARCcenter, SPARCcluster, SPARCcompiler, SPARCdesign, SPARC811, SPARCengine, SPARCprinter, SPARCserver, SPARCstation, SPARCstorage, SPARCworks, microSPARC, microSPARC-II, and UltraSPARC are licensed exclusively to Sun Microsystems, Inc. Products bearing SPARC trademarks are based upon an architecture developed by Sun Microsystems, Inc.

The OPEN LOOK. and Sun™ Graphical User Interfaces were developed by Sun Microsystems, Inc. for its users and licensees. Sun acknowledges the pioneering efforts of Xerox in researching and developing the concept of visual or graphical user interfaces for the computer industry. Sun holds a non-exclusive license from Xerox to the Xerox Graphical User Interface, which license also covers Sun's licensees who implement OPEN LOOK GUIs and otherwise comply with Sun's written license agreements.

X Window System is a trademark of X Consortium, Inc.

THIS PUBLICATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. THIS PUBLICATION COULD INCLUDE TECHNICAL INACCURACIES OR TYPOGRAPHICAL ERRORS. CHANGES ARE PERIODICALLY ADDED TO THE INFORMATION HEREIN. THESE CHANGES WILL BE INCORPORATED IN NEW EDITIONS OF THE PUBLICATION. SUN MICROSYSTEMS, INC. MAY MAKE IMPROVEMENTS AND/OR CHANGES IN THE PRODUCT(S) AND/OR THE PROGRAM(S) DESCRIBED IN THIS PUBLICATION AT ANY TIME.

| NAME             | Intro – AP special files  |
|------------------|---|
| DESCRIPTION      | This section describes AP files for your Sun Enterprise server.     |
| <b>ap(7)</b>     | alternate pathing librarian driver, <b>/dev/ap</b>                  |
| <b>ap_dmd(7)</b> | AP disk meta-driver   |
| <b>ap_nmd(7)</b> | AP network meta-driver group  |
| <b>mhme(7)</b>   | Sun FastEthernet 2.0; see <b>ap_nmd(7)</b>                          |
| <b>mle(7)</b>    | Lance Ethernet special character device; see <b>ap_nmd(7)</b>       |
| <b>mmf(7)</b>    | FDDI 3.0.x and 4.x special character device; see <b>ap_nmd(7)</b>   |
| <b>mqe(7)</b>    | Quad Ethernet special character device; see <b>ap_nmd(7)</b>        |
| <b>mqfe(7)</b>   | Quad Fast Ethernet special character device; see <b>ap_nmd(7)</b>   |
| <b>mvge(7)</b>   | Sun Gigabit Ethernet special character device; see <b>ap_nmd(7)</b> |

|                    |   |                              |
|--------------------|---|------------------------------|
| <b>NAME</b>        | ap – alternate pathing librarian driver, /dev/ap  |                              |
| <b>SYNOPSIS</b>    | <b>ap</b>   |                              |
| <b>DESCRIPTION</b> | The AP driver provides a pseudo-driver interface to the kernel Alternate Pathing (AP) Librarian features. |                              |
| <b>FILES</b>       | <b>/kernel/drv/ap</b>   | AP driver module             |
|                    | <b>/kernel/drv/ap.conf</b>  | AP driver configuration file |
| <b>SEE ALSO</b>    | <i>Sun Enterprise Server Alternate Pathing User's Guide</i><br><b>ap(1M)</b> , <b>ap_daemon(1M)</b>       |                              |

|                    |   |
|--------------------|---|
| <b>NAME</b>        | ap_dmd – AP disk meta-driver  |
| <b>SYNOPSIS</b>    | <b>ap_dmd</b> @target,lun:partition   |
| <b>DESCRIPTION</b> | <p>The <b>ap_dmd</b> driver works with the AP software to support Alternate Pathing for physical devices handled by the <b>ssd</b> SCSI disk driver. See <b>ssd(7)</b> in <i>man Pages(7): Device and Network Interfaces</i> of the <i>SunOS Reference Manual</i>.</p> <p>The AP feature lets you configure alternate SCSI paths to a physical device. These paths are associated with a <i>meta-disk device</i>, which is one of the file system special nodes associated with a particular meta-driver.</p> <p><b>ap_dmd</b> allows the AP Librarian, <b>ap(7)</b>, to configure or unconfigure physical paths to a SCSI device via an interface that allows APSET, APUNSET, and APSWITCH commands. These commands are issued by <b>ap(7)</b> at the behest of the user-invoked AP commands and AP daemon. To change the SCSI path information associated with a particular <b>ap_dmd</b> device, use <b>apconfig(1M)</b>, <b>apdb(1M)</b> and <b>apdisk(1M)</b>. For more information, see the <i>Sun Enterprise Server Alternate Pathing User's Guide</i>.</p> <p>All device operations supported by the <b>ssd</b> driver are also valid on <b>ap_dmd</b> devices that have been created via AP commands. See the other AP commands for details regarding other components of AP software, and <b>ssd(7)</b> man page for information about block/character file accesses, I/O requests, disk partitioning schemes, CD-ROM support, and ioctl.</p> |
| <b>ERRORS</b>      | <p><b>ENXIO</b>           No physical SCSI path to the target device exists.</p> <p><i>Other</i>            For information on other errors, see <b>sd(7)</b>.</p>  |
| <b>FILES</b>       | <p><b>apdmd.conf</b>                   driver configuration file</p> <p><b>/dev/ap/dsk/mncntndnsn</b>       block files</p> <p><b>/dev/ap/rdisk/mncntndnsn</b>     raw files</p> <p>where <b>m</b> identifies the device as a meta-device and:</p> <p>   <b>cn</b>       Controller number</p> <p>   <b>tn</b>       Target number</p> <p>   <b>dn</b>       Logical unit number</p> <p>   <b>sn</b>       Slice (partition) number</p>   |
| <b>DIAGNOSTICS</b> | See <b>ssd(7)</b> in <i>man Pages(7): Device and Network Interfaces</i> of the <i>SunOS Reference Manual</i> .  |
| <b>SEE ALSO</b>    | <p><i>Sun Enterprise Server Alternate Pathing User's Guide</i></p> <p><b>apconfig(1M)</b>, <b>apdb(1M)</b>, <b>apdisk(1M)</b>, <b>apnet(1M)</b>, <b>ap_daemon(1M)</b>, <b>ap(7)</b>, <b>ap_nmd(7)</b> in this reference manual</p> <p><b>ssd(7)</b> in <i>man Pages(7): Device and Network Interfaces</i> of the <i>SunOS Reference Manual</i></p>  |

|                        |   |
|------------------------|---|
| <b>NAME</b>            | ap_nmd, mhme, mle, mnf, mqe, mqfe, mvge – AP network meta-driver group  |
| <b>SYNOPSIS</b>        | <pre> /devices/pseudo/clone@0:mhme /devices/pseudo/clone@0:mle /devices/pseudo/clone@0:mnf /devices/pseudo/clone@0:mqe /devices/pseudo/clone@0:mqfe /devices/pseudo/clone@0:mvge </pre>   |
| <b>DESCRIPTION</b>     | <p><b>ap_nmd</b> is a group of multi-threaded, loadable, clonable, STREAMS meta-network device drivers that support the connectionless Data Link Provider Interface, <b>dlpi</b>(7), for <b>hme</b>(7) (Sun FastEthernet 2.0), <b>le</b>(7) (Lance Ethernet), <b>nf</b>(7) (FDDI 5.x), <b>qe</b>(7) (Quad Ethernet), <b>qfe</b> (Quad FastEthernet), and <b>vge</b> (Sun Gigabit Ethernet).</p> <p><b>Note:</b> SunOS man pages that describe drivers for optional packages, such as FDDI and Sun FastEthernet, are available only on systems that have those packages installed.</p> <p><b>ap_nmd</b> works with the AP software to support Alternate Pathing for physical network devices.</p> <p>Device operations of <b>ap_nmd</b> are an extension of the operations of the underlying network drivers. <b>ap_nmd</b> normally operates as a transparent pass-through module; it neither interprets nor modifies any of the STREAMS DLPI type messages. However, it does intercept and modify the DL_ATTACH_REQ and DL_INFO_ACK messages.</p> <p>DL_ATTACH_REQ messages are captured and used to drive the initial connection between logical and physical devices. DL_INFO_ACK messages are captured and responded to with a prebuilt response to eliminate the possibility of the message response timing out due to induced message delays.</p> <p>The cloning character-special device <b>/dev/mxx</b> is used to access all device-specific instances of the <b>ap_nmd</b> within the system.</p> |
| <b>ap_nmd and AP</b>   | <p>The <b>ap_nmd</b> driver provides an interface to support Alternate Pathing. The APSET interface allows a user to provide a mapping between physical path and logical path. The APUNSET provides an interface to remove a physical-to-logical path mapping and APSWITCH provide a mechanism to switch a logical path from its existing physical path to a new physical path. For a more complete description of the AP capability, see the <i>Sun Enterprise Server Alternate Pathing User's Guide</i>.</p>  |
| <b>ap_nmd and DLPI</b> | <p>The <b>ap_nmd</b> driver is a "style 2" Data Link Service provider. All DLPI processing is handled by the underlying physical device driver. See the man page that corresponds to each underlying driver.</p>  |
| <b>ERRORS</b>          | <p><b>EBUSY</b> An attempt was made to unload a busy device, or to APUNSET an active device</p>   |

|                    |                  |   |
|--------------------|------------------|---|
|                    | <b>EEXIST</b>    | An attempt was made to APSET an existing logical-to-physical mapping and a logical path when the system was out of memory   |
|                    | <b>EIO</b>       | An attempt to switch between physical devices failed  |
|                    | <b>ENODEV</b>    | No physical mapping exists  |
|                    | <b>ENOMEM</b>    | System memory was exhausted during an attempt to create a mapping between a physical path and a logical path  |
| <b>FILES</b>       | <b>mhme.conf</b> | Driver configuration file   |
|                    | <b>mle.conf</b>  | Driver configuration file   |
|                    | <b>mnf.conf</b>  | Driver configuration file   |
|                    | <b>mqe.conf</b>  | Driver configuration file   |
|                    | <b>mqfe.conf</b> | Driver configuration file   |
|                    | <b>mvge.conf</b> | Driver configuration file   |
|                    | <b>/dev/mhme</b> | hme special character device  |
|                    | <b>/dev/mle</b>  | le special character device   |
|                    | <b>/dev/mnf</b>  | nf special character device   |
|                    | <b>/dev/mqe</b>  | qe special character device   |
|                    | <b>/dev/mqfe</b> | qfe special character device  |
|                    | <b>/dev/mvge</b> | vge special character device  |
| <b>DIAGNOSTICS</b> |                  | See <b>le(7)</b> and <b>qe(7)</b> in <i>man Pages(7): Device and Network Interfaces</i> of the <i>SunOS Reference Manual</i> .  |
| <b>SEE ALSO</b>    |                  | <i>Sun Enterprise Server Alternate Pathing User's Guide</i><br><b>ap_daemon(1M)</b> , <b>apconfig(1M)</b> , <b>apdb(1M)</b> , <b>apnet(1M)</b> , <b>ap(7)</b> , <b>ap_dmd(7)</b> , in this reference manual<br><b>driver.conf(4)</b> in <i>man Pages(4): File Formats</i> of the <i>SunOS Reference Manual</i><br><i>man Pages(7): Device and Network Interfaces</i> of the <i>SunOS Reference Manual</i> and other optional reference manuals (for example, <i>FDDI Reference Manual</i> ), as appropriate |