

Firmware and Boot Code Release Notes for Emulex® OneConnect® OCe14000-Series Adapters

Version: 11.1.215.0

Date: October 14, 2016

Purpose and Contact Information

These release notes describe new features, resolved known issues, current known issues, and technical tips associated with this release of the firmware and boot code for Emulex OCe14000-series adapters.

For the latest product documentation, go to www.broadcom.com. If you have questions or require additional information, contact an authorized Broadcom® technical support representative at ecd-tech.support@broadcom.com, 800-854-7112 (US/Canada toll free), +1 714-885-3402 (International), or +49 8941352 0244 (Europe, Middle East, and Africa; UK business hours only 8:30 a.m. to 5:00 p.m. UTC Monday through Friday).

New Features

1. This release supports the following operating systems:

- Windows Server 2016
- Red Hat Enterprise Linux (RHEL) 7.3 (out-of-box)
- RHEL 6.8 (out-of-box)
- SUSE Linux Enterprise Server (SLES) 12 SP2

Resolved Issues

1. Bandwidths configured in the HP switch in Flex-QBG mode are now reflected correctly in the GET query of the Network Module.
2. The Scan for Target Devices option now works as expected when scanning for targets.

Known Issues

Firmware Known Issues

1. **Firmware version 11.x includes new features that required new flash regions to support them. Firmware versions earlier than 10.0.803.37 did not have the ability to configure the flash regions to support these new features.**

If you are updating from a firmware version earlier than 10.0.803.37, use one of these methods to update the firmware to 11.0.x:

- Use the Offline Flash International Standards Organization (ISO) flash tool.
- Use the released 11.x version of the OneCommand® graphical user interface (GUI) or OneCommand Manager command line interface (CLI) application, OneCommand for VMware vCenter application, Common Information Module (CIM) Provider utility,

or online or offline utilities. You must perform the firmware update procedure twice to ensure that the flash regions are properly configured, and you must reboot the system after each firmware update.

- Use the network interface card (NIC) configuration utility that is currently installed. After the new firmware is installed, run the new NIC configuration utility.

If you are updating from firmware version 10.0.803.37 or later, use one of these methods to update the firmware to 11.0.x:

- Use the ISO flash tool.
- Use the released 11.x version of the OneCommand GUI or OneCommand CLI application, OneCommand for VMware vCenter application, CIM Provider utility, or online or offline utilities, and reboot the system after the firmware update. (It is not necessary to perform the firmware update process twice.)
- Use the NIC configuration utility that is currently installed, and reboot the system after the firmware update. After the new firmware is installed, run the new NIC configuration utility.

Note: Do not use Linux inbox drivers when performing the firmware update.

After you have updated the firmware, you must not downgrade the firmware to a version earlier than 10.0.803.37.

2. Changing personalities might disable a Cisco switch's operator mode for priority flow control (PFC).

Workaround

Perform the following steps:

- a) Check the operator mode by typing:

```
show int eth 1/x priority-flow-control
```

- b) If the operator mode is off, for each affected port, you must then toggle the priority-flow-control mode to **off** and then back to **auto**.

At the switch type the following:

```
priority-flow-control mode off
```

```
priority-flow-control mode auto
```

3. Maximum bandwidth settings for NIC functions are ignored when multichannel is enabled.

The rate limiting features on Emulex OCE14000-series adapters are designed to provide a guaranteed rate to a given function (as noted in the minimum bandwidth setting in the Emulex management interface). The notion of work conservation applies to this approach; specifically, that any bandwidth left unused by other functions will be awarded to the function, even in excess of the guaranteed minimum. The maximum bandwidth parameter in the Emulex management interface is for a rate cap (that is, a bandwidth value must not be exceeded regardless of the behavior of other functions). The maximum bandwidth parameter was placed in the Broadcom management interface for other products; it is not currently available in the OCE14000-series adapters.

Workaround

None.

4. **An incorrect connectivity status might be reported when the initiator link is brought down.**

Workaround

None.

5. **The host might fail to boot on certain vendor system basic input/output system (BIOS) versions when a single physical function (PF) is configured with Single Root I/O virtualization (SR-IOV) disabled.**

This situation is most commonly observed when a 1-port adapter is using the RDMA over Converged Ethernet (RoCE) protocol, but it can also occur when a 1-port adapter uses the NIC protocol with SR-IOV enabled.

Note: This issue can also be observed on 2- and 4-port adapters that support link reconfigurability and are reconfigured for a single port.

Affected vendor systems include:

- Colfax/Intel system with S2600C0 motherboard
- SuperMicro X9SRL-F motherboard
- SuperMicro X9SCL/X9SCM

Workaround

None.

6. **On OCe14401 adapters installed on Microsoft Windows systems, the number of virtual machine (VM) Queues are reduced when migrating the VMs.**

Workaround

Refer to Knowledge Base article 3031598 on the Microsoft website for more information.

7. **If you are using the OneCommand Manager application to update firmware from a previous version to version 11.x, you must first update the OneCommand Manager application or the Elxflash utility to version 11.x.**
8. **During heavy input/output (I/O) traffic on Arista switches, priority flow control (PFC) traffic might be dropped at the switch.**

Workaround

Increase switch port egress buffers using the following commands:

```
platform trident mmu queue profile emulex
    egress unicast queue 5 threshold 4
platform trident mmu queue profile emulex apply
```

9. **Boot from storage area network (SAN) does not work on x86 systems with OCe14000-series Fibre Channel over Ethernet (FCoE) adapters running Solaris 11.2 and later versions.**

Workaround

None.

10. You receive the error message `Link is up, no targets found`.

If a scan is performed and your target is not displayed, you might not have any mapped targets.

Workaround

Verify that the target is mapped.

11. The Internet Small Computer System Interface (iSCSI) utility allows the same static Internet Protocol (IP) address to be set on both ports.

Workaround

None.

12. When the newer Unified Extensible Firmware Interface (UEFI) NIC driver manages the adapter with the older firmware and issues a newer IOCTL, the older firmware returns the error status as `ILLEGAL_REQUEST/unrecognized opcode`.

Workaround

Update all adapters to the same or the latest firmware.

13. The Secure Firmware feature applies to OCe14000B-series adapters only.

14. Traffic is not adhering to the minimum bandwidth settings.

Workaround

None.

NIC UEFI Known Issues

1. If boot firmware table (iBFT) boot is non-functional, and version 10.2.370.19 or later firmware is installed, you must update the firmware to version 11.x using the ISO flash image or using a version 11.x management application or firmware update utility. You must reboot the system after the firmware update.

If you updated the firmware from a version earlier than 10.0.803.37, you must perform the update process twice using a version 11.x management application or firmware update utility. You must reboot the system after each firmware update.

Workaround

None.

2. PFC is not supported on NIC functions.

Workaround

None.

3. When the Preboot Execution Environment (PXE) Select utility is used to reset the adapter configuration, the port link speed does not reset to the default value of 10 Gb/s. The link speed is being shown as N/A, and the link status is shown as down.

Workaround

None.

4. **NIC traffic bandwidth is using 0 Mbp/s for most of the iperf connections (parallel threads) on OCe14000-series 1Gb/s adapters.**

On a 1Gb/s port, traffic flows only on single connections when traffic is run using the iperf utility with multiple connections.

Workaround

Create a 1TX queue using the `ethtool -L` command. Traffic then flows on all TCP connections.

5. **For OCe14000-series 1G LAN on motherboard (LOM) adapters, when running transmission control protocol (TCP) traffic using the iperf tool in bidirectional mode and unidirectional mode, NIC traffic bandwidth is 0 MB/s for most of the iperf connections (parallel threads).**

Workaround

None.

iSCSI UEFI Known Issues

1. **An iSCSI login does not display an error when providing invalid target information.**

Workaround

None.

2. **Dell PowerEdge R720 systems might appear to be locked up when configuring the adapter in the NIC UEFI utility, because popup messages are not supported on this specific Dell platform.**

Note: The system is not in a **locked up** state, but it is actually waiting for the **Esc** key to be pressed.

Workaround

If the system appears to be locked up and making configuration changes, press the **Esc** key to see if the system responds.

3. **Changing the boot target to Primary on a non-boot target with mutual Challenge-Handshake Authentication Protocol (CHAP) configuration deletes the target.**

Workaround

None.

4. **When an Erase Configuration is performed on an OCe14000-series adapter with iSCSI multipath I/O (MPIO) enabled on both ports and the boot target is configured on Port 0, the server freezes.**

Workaround

Reboot the server.

PXE BootBIOS Known Issues

1. **If iBFT boot is nonfunctional and version 10.2.370.19 or later firmware is installed, you must update the firmware to version 10.2.370.19 using the ISO flash image or using a**

version 10.2 management application or firmware update utility. You must reboot the system after the firmware update.

If you updated the firmware from a version earlier than 10.0.803.37, you must perform the update process twice using a version 10.2 management application or firmware update utility. You must reboot the system after each firmware update.

Workaround

None.

- 2. The PXE Boot Support attribute on the PXESelect utility's Port Configuration page does not match the Option Read Only Memory (ROM) attribute on the UEFI NIC Configuration page.**

Workaround

None.

- 3. PXE virtual local area network (VLAN) is not supported in multichannel environments.**

Workaround

Set the logical port VLAN ID (LPVID) to the same value as the PXE VLAN.

iSCSI BootBIOS Known Issues

- 1. Changing the target's digest parameters might cause the boot logical unit number (LUN) to revert to LUN 0.**

Workaround

None. You must re-select the appropriate boot LUN.

- 2. The iSCSISelect utility might attempt to connect to targets even when the connect option is not selected in the iSCSI UEFI utility.**

Workaround

None.

- 3. Adapter failover using MPIO with iSCSI boot might not work properly on VMware ESXi 5.0 systems.**

Workaround

None.

- 4. A boot target might not be seen immediately after enabling Discover Boot Target using Dynamic Host Configuration Protocol (DHCP).**

Workaround

Use the iSCSI UEFI utility to configure the boot target.

- 5. When entering the iSCSI BIOS on Windows Server 2008 x86 SP2 systems, an iSCSI Initiator Name mismatch error message might be displayed.**

The error message states:

```
Error: There is an iSCSI Initiator Name mismatch for the
OneConnect controllers in this system. Please use the iSCSI
```

Initiator Configuration screen to set a single iSCSI Initiator Name for all controllers in the system.

Workaround

None.

FCoE x86 BootBIOS Known Issues

1. **The Configure Boot Devices menu scans only for the next 16 LUNs from the starting LUN, which limits the number of LUNs that are displayed.**

Workaround

None.

Other Known Issues

1. **Certain Cisco breakout cables are not properly detected by the OCe14401B adapter.**

The following Cisco breakout cables do not provide the correct codes to the OCe14401B adapter to support the SFF-8436 standard:

- QSFP-4X10G-AOC10M
- QSFP-4X10G-AOC7M
- QSFP-4X10G-AOC5M
- QSFP-4X10G-AOC3M
- QSFP-4X10G-AOC2M
- QSFP-4X10G-AOC1M

If you are using one of these cables to connect an OCe14401B adapter to a Cisco Nexus-series switch, the following error will be reported:

```
Optics faulted/incorrectly installed/not installed -Reseat optics, if  
issue not resolved, replace. Link is Non Operational
```

Workaround

Use Arista, Brocade, or International Business Machines (IBM) breakout cables with OCe14401B adapters.

Technical Tips

1. **Under SLES 11, the bond 5 and 6 modes must be configured properly to work with the firmware.**

When configuring the bond mode, change the default setting to include "updelay=100". For example, the correct setting for bond 6 is `BONDING_MODULE_OPTS='mode=6 miimon=100 updelay=100'`.

2. **For Cisco switches, the access mode must be set in trunk mode, and native VLAN cannot be FCoE VLAN; that is, the FCoE VLAN must be in the allowed list. For example, if VLAN 2 is the FCoE VLAN and VLAN 1 is the Ethernet VLAN, you would enter the following:**

- `Switchport mode trunk`
- `Switchport trunk native vlan 1`
- `Switchport trunk allowed vlan 1-2`

3. **For Brocade switches, trunk mode must be set in converged mode. For example, if VLAN 2 is the FCoE VLAN, you would enter the following:**
 - Switchport mode converged
 - Switchport converged allowed vlan add 2
4. **For best performance, disable the Spanning Tree Protocol (STP) on all networked switches if you are using the following:**
 - Adapter fault tolerance (AFT)
 - Automatic load balancing (ALB)
 - Static link aggregation teaming
5. **When using SR-IOV within VMs on Windows 2012 and Windows Server 2012 R2 systems, VM-to-VM communication on SR-IOV-enabled switches always works; however, a difference exists in how data is transferred.;**
 - When virtual Ethernet bridge (VEB) is enabled and physical link tracking is disabled, the virtual function (VF) link is always up and VF-VF is always used.
 - When VEB and physical link tracking are enabled (default):
 - a) When the physical link is up, VF to VF is used.
 - b) When the physical link is down, an emulated path through a virtual switch is used.
 - When virtual Ethernet port aggregator (VEPA) is enabled:
 - a) When the physical link is up, the VF to VF traffic flows through the external switch.
 - b) When the physical link is down, an emulated path through a virtual switch is used.
6. **Universal Multichannel (UMC) NIC channels on the same physical port cannot be placed in the same team on Windows and VMware systems.**

Each of the NIC channels is presented to the operating system as a separate and unique port running a NIC function. However, this situation can create an issue if the NIC channels on the same physical port are placed in the same team.

While teaming can provide increased reliability and increased bandwidth, this is not the case in this circumstance. Because the channels are assigned to the same physical port, reliability is not increased because it is still the same as a single physical port and not equal to two ports combined. In addition, bandwidth increases are not actually realized. Greater throughput could be achieved by assigning the combined bandwidths of the channels to a single channel, because the overhead of teaming would not be a factor in that case.
7. **The Broadcom Emulex OneConnect Firmware Update Utility might fail to update all OCe14000-series adapters due to the Secure Firmware feature.**

The utility might display the following text:

```
Secure Firmware Mode is active - Flash updates are prohibited.  
Remove the Secure Firmware jumper to allow Flash updates with this tool.  
Please reboot your system after removing the Secure Firmware jumper.
```

OpenSSL Notice

This is a copy of the current LICENSE file inside the CVS repository.

LICENSE ISSUES =====

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See below for the actual license texts. Actually both licenses are BSD-style Open Source licenses. In case of any license issues related to OpenSSL please contact openssl-core@openssl.org.

OpenSSL License -----

```
/* =====
* Copyright (c) 1998-2011 The OpenSSL Project. All rights reserved.
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
*
* 1. Redistributions of source code must retain the above copyright
* notice, this list of conditions and the following disclaimer.
*
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in
* the documentation and/or other materials provided with the
* distribution.
*
* 3. All advertising materials mentioning features or use of this
* software must display the following acknowledgment:
* "This product includes software developed by the OpenSSL Project
* for use in the OpenSSL Toolkit. (http://www.openssl.org/)"
*
* 4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to
* endorse or promote products derived from this software without
* prior written permission. For written permission, please contact
* openssl-core@openssl.org.
*
* 5. Products derived from this software may not be called "OpenSSL"
* nor may "OpenSSL" appear in their names without prior written
* permission of the OpenSSL Project.
*
* 6. Redistributions of any form whatsoever must retain the following
* acknowledgment:
* "This product includes software developed by the OpenSSL Project
* for use in the OpenSSL Toolkit (http://www.openssl.org/)"
*
* THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS'' AND ANY
* EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
* PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR
* ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
* SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT
* NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
* LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,
* STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)
* ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED
* OF THE POSSIBILITY OF SUCH DAMAGE.
* =====
*
* This product includes cryptographic software written by Eric Young
* (eay@cryptsoft.com). This product includes software written by Tim
* Hudson (tjh@cryptsoft.com).
*
*/
```

Original SSLeay License -----

```
/* Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com)
* All rights reserved.
*
* This package is an SSL implementation written
* by Eric Young (eay@cryptsoft.com).
* The implementation was written so as to conform with Netscapes SSL.
*
* This library is free for commercial and non-commercial use as long as
* the following conditions are aheared to. The following conditions
* apply to all code found in this distribution, be it the RC4, RSA,
```

* lhash, DES, etc., code; not just the SSL code. The SSL documentation
* included with this distribution is covered by the same copyright terms
* except that the holder is Tim Hudson (tjh@cryptsoft.com).
*
* Copyright remains Eric Young's, and as such any Copyright notices in
* the code are not to be removed.
* If this package is used in a product, Eric Young should be given attribution
* as the author of the parts of the library used.
* This can be in the form of a textual message at program startup or
* in documentation (online or textual) provided with the package.
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
* 1. Redistributions of source code must retain the copyright
* notice, this list of conditions and the following disclaimer.
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in the
* documentation and/or other materials provided with the distribution.
* 3. All advertising materials mentioning features or use of this software
* must display the following acknowledgement:
* "This product includes cryptographic software written by
* Eric Young (eay@cryptsoft.com)"
* The word 'cryptographic' can be left out if the routines from the library
* being used are not cryptographic related :-).
* 4. If you include any Windows specific code (or a derivative thereof) from
* the apps directory (application code) you must include an acknowledgement:
* "This product includes software written by Tim Hudson (tjh@cryptsoft.com)"
*
* THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS'' AND
* ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
* ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE
* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
* SUCH DAMAGE.
*
* The licence and distribution terms for any publically available version or
* derivative of this code cannot be changed. i.e. this code cannot simply be
* copied and put under another distribution licence
* [including the GNU Public Licence.]
*/

Secure Hash Algorithm (SHA-1) Notice

/*
* Written by Aaron D. Gifford <me@aarongifford.com>
*
* Copyright 1998, 2000 Aaron D. Gifford. All rights reserved.
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
* 1. Redistributions of source code must retain the above copyright
* notice, this list of conditions and the following disclaimer.
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in the
* documentation and/or other materials provided with the distribution.
* 3. Neither the name of the copyright holder nor the names of contributors
* may be used to endorse or promote products derived from this software
* without specific prior written permission.
*
* THIS SOFTWARE IS PROVIDED BY THE AUTHOR(S) AND CONTRIBUTORS ``AS IS'' AND
* ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
* ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR(S) OR CONTRIBUTORS BE LIABLE
* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
* SUCH DAMAGE.
*/

PolarSSL and RedBoot GPLv2 Notice

GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Lesser General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
- b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.
- c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

- a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

For product information and a complete list of distributors, please go to our web site: www.broadcom.com. Broadcom, the pulse logo, Connecting everything, Avago, Avago Technologies, the A logo, Emulex, OneCommand, and OneConnect are among the trademarks of Broadcom in the United States, certain other countries and/or the EU. Copyright © 2015–2016 Broadcom. All Rights Reserved. The term “Broadcom” refers to Broadcom Limited and/or its subsidiaries. For more information, please visit www.broadcom.com. Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design. Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.