



Quick Start Guide

for the

OCTEON Software Development Kit (SDK)
and Evaluation Boards (EVB)

Version 1.9

December 17, 2009





GPL Conformance Statement

Some of the software contained in the OCTEON SDK is covered under the Gnu Public License (GPL). All copyright remains with the authors of that software.

To conform with the GPL, all source code covered under GPL, and all changes made by Cavium Networks to that code, is contained in the SDK package. No other restrictions apply beyond the GPL.

All source code covered under GPL including all changes made by Cavium Networks can also be freely downloaded from <http://cnusers.org>.

The source code for the compilers and libraries whose binaries are included in the SDK (e.g. gcc, gdb, and glibc) are available only from <http://cnusers.org>. The tool-chain source code is not included with the OCTEON SDK distribution.

Before You Begin

Ensure your work area is ESD safe. OCTEON boards can be damaged by electrostatic discharge.

Determine how you plan to hook up your OCTEON board.

- If the board has a PCI card-edge connector, it can a PCI target and plugged into a PCI bus.
- If the board has a ATX power connector, it can be run stand-alone.

If you cannot recognize an ATX power connector, do not continue further. Please consult someone who can.

Boards that have both PCI card-edge connectors and ATX power connectors can be configured to run stand-alone or as a PCI target. (E.g. 38XX/58XX EVB)

Boards that have only card-edge connectors and not ATX power connectors can only be configured as PCI target. (E.g. XL NIC, NIC2, and NIC-4GE cards)

Boards that have ATX power connectors but no card-edge connector can only be configured stand-alone and PCI host. (E.g. 30XX, 31XX, 5XXX, 5[7-4]XX EVB)

The following paragraphs show details about hooking up these boards.

It is assumed the reader understands that all insertion or removal of OCTEON cards from a host system is performed when the host system is powered off. Attempting to install or remove a card from a powered-on system will result in damage to both the card and host system.

Connecting the OCTEON 3/58XX Evaluation board as stand-alone, power supply and a Linux development system:

- The CN3/5800-EVB-NIC4 has an ATX connector on the lower right corner and that's where the the power supply is connected.
- The null-modem serial cable is plugged into the DB9 connector marked UART0 along the right edge the OCTEON board (next to the power connector) and COM1 (/dev/ttyS0) on the Linux system.
- A Compact Flash reader/writer can be connected to any of the USB ports on the Linux development system.
- The reset button is adjacent to the power switch on the OCTEON board.
- The power switch is the 1/0 toggle switch mounted on the edge of the OCTEON board.

The OCTEON SDK is included on CD with the EVB and needs to be installed on your Linux development system. The "Installation" section below explains how to install the SDK software.

The program "minicom", which is usually included in a default Linux installation, can be set up to communicate with the OCTEON board's boot loader over a serial port (115K, 8N1). Please refer to minicom documentation for specific details on that program.

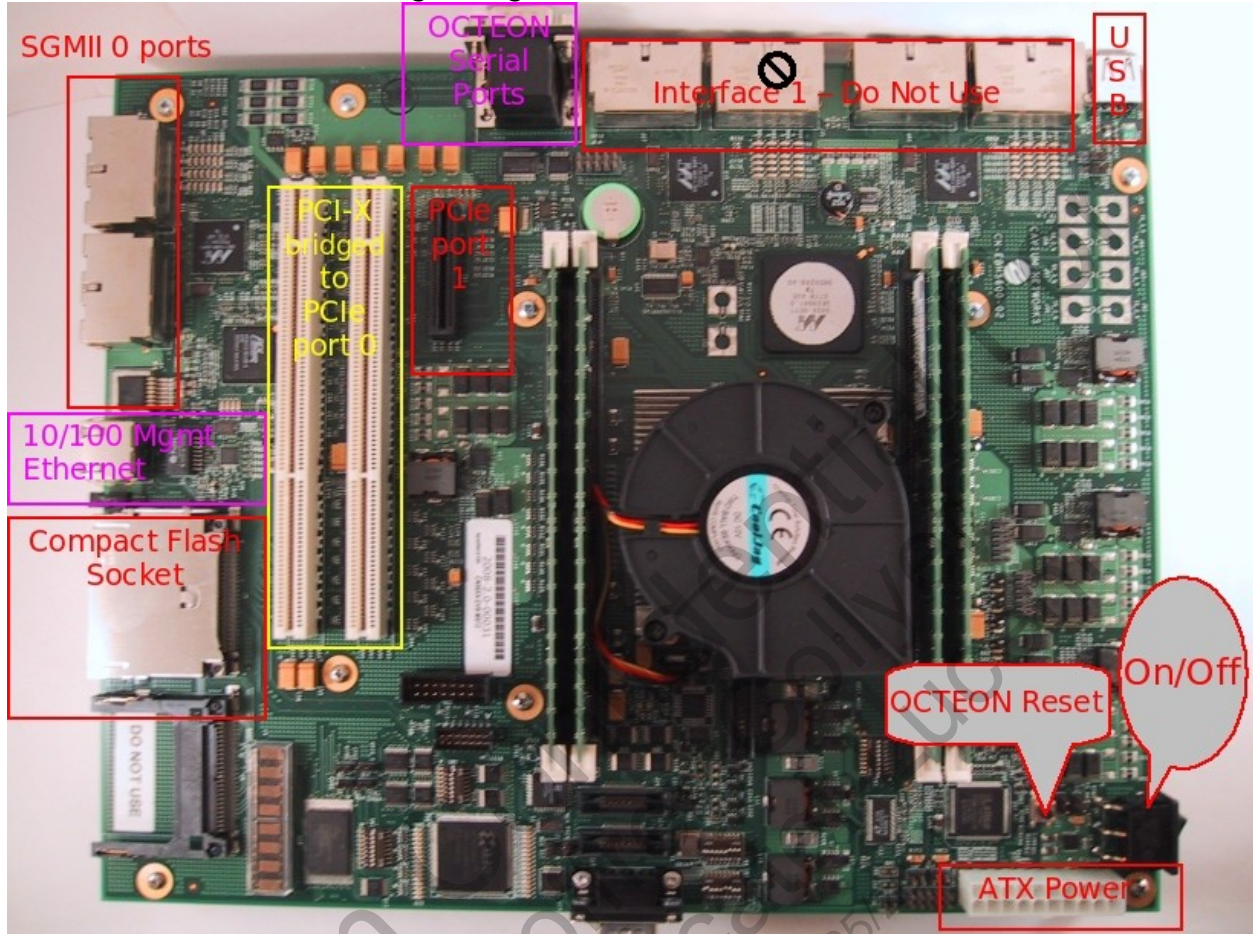
See the "[Loading and Booting](#)" section below for more details.

Note: When plugging the EVB into a 3.3V PCI-X slot, you must remove the Host Mode jumper and provide 5V/12V via a drive power connector from the host system's power supply. **Do not connect the ATX power** as you will cause irreparable harm to both the EVB and the host system.

For details regarding using the EVB as a PCI target, please refer to the SDK documentation page: "[Remotely Controlling an Octeon through PCI, PCIe, or EJTAG](#)".

The 56XX Eval Board

Refer to the following diagram for board locations:



Follow the stand-alone directions for the 38XX/58XX EVB. This board cannot be a PCIe target.

Connecting an OCTEON XL NIC, NIC2 and NIC 4GE:

For details, refer to the SDK document section called, "[Remotely Controlling an OCTEON through PCI, PCIe, or EJTAG](#)".

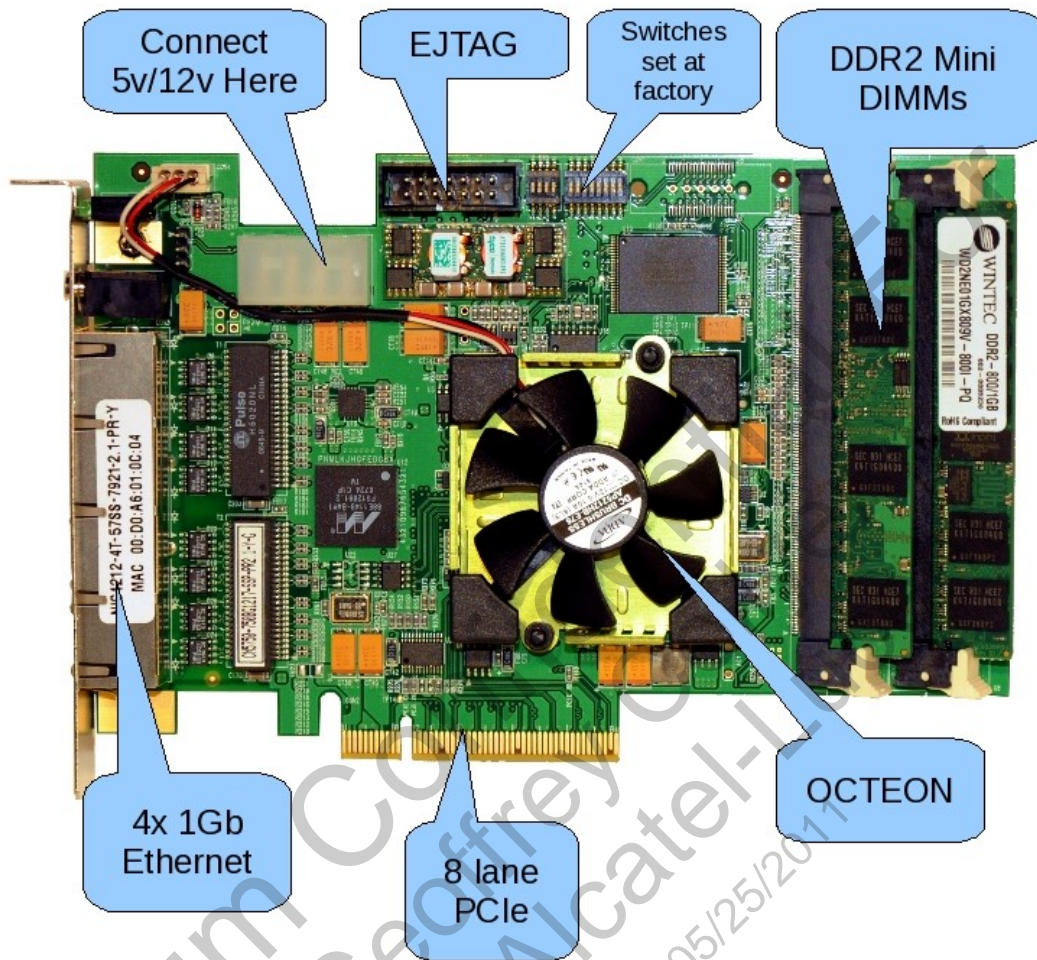
Most importantly:

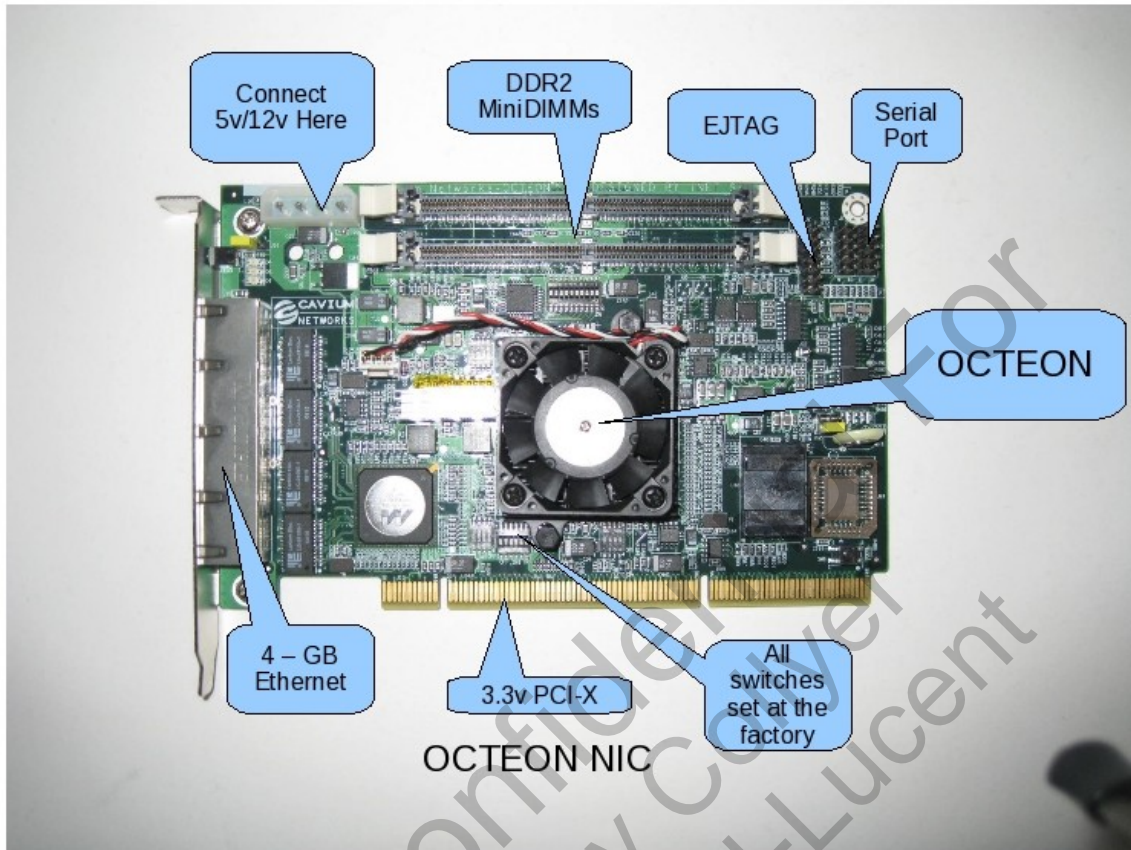
- XL NIC and NIC2: Install the board ONLY in a 3.3v slot.
- NIC 4GE: Install the board in an 8-lane PCIe slot.
- Install the 5v/12v "drive" power connector to the board
- Connect the serial port dongle to the right-angled 10-pin header at the top-rear of the board adjacent to J1 (XL NIC). The serial connector on the NIC2 and NIC 4GE is a 1/8" phono plug at the rear of the boards.

The above referenced SDK documentation page describes the set of oct-pci-* utilities provided for working with OCTEON PCI-target boards. Also described is how gdb can be used to debug, over PCI, applications running on OCTEON.

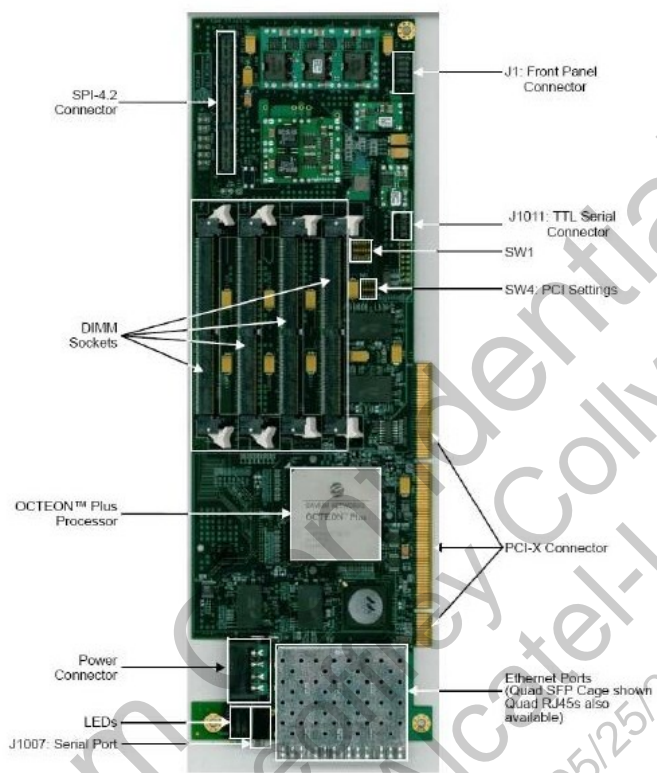
Please refer to the following annotated pictures.

NIC 4GE



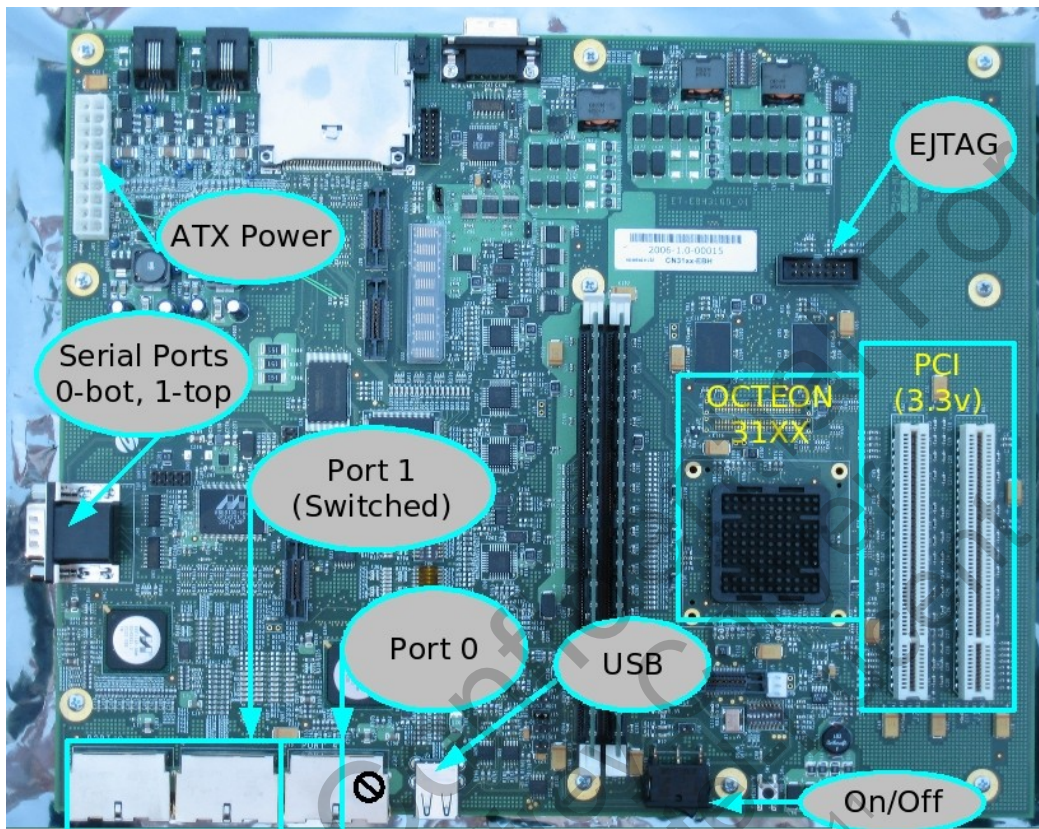


NIC Pro 2



Connecting an OCTEON 30XX/31XX Evaluation Board

Refer to the following board diagram:



- Connect the ATX power supply to the power connector.
- The null-modem serial cable is plugged into the lower DB9 connector along the left edge the board to your development system.
- RGMII port 0 is directly connected to the marked port.
- GMII port 1 is connected through a Marvell switch to the four marked ports.

What's in the SDK Package

This Software Development Kit for the Cavium Networks OCTEON™ contains several items:

- The compiler, linker and libraries optimized to take advantage of the cnMIPS™ processors contained within the OCTEON™.
- A complete GNU-based tool chain (gcc, gdb, ...).
- The OCTEON™ software simulator with extensive performance measuring capabilities.
- Cavium Network's "Simple Executive" that enables quick development of super fast data plane applications.
- Several example applications.

All of these features are delivered in binary RPM named:
OCTEON-SDK-1.9-*.i386.rpm.

What packages can be used with the SDK?

In addition to the SDK package, a package is available containing the Linux kernel and run-time environment ported to OCTEON™ and designed to work with the SDK called:

OCTEON-LINUX-1.9-*.i386.rpm.

This package is included on the CD that comes with the EVB.

Visit Cavium Networks support site:

<http://support.caviumnetworks.com>

as we are continuously updating and providing more SDK add-on packages.

Installation

First, insert the included CD into your Linux development

system's CDROM drive. Make sure it's mounted. Usually, the CDROM will automatically get mounted as `/mnt/cdrom`. Installing the packages can be accomplished by running, as root, the command:

```
rpm -i /mnt/cdrom/*.rpm
```

This will install all the packages contained on the CD. By default, the SDK will be installed in:

```
/usr/local/Cavium_Networks/OCTEON-SDK
```

This directory has no special requirement beyond being readable by all users intending to utilize the SDK.

Optionally, the SDK can be installed in an alternate path by using the `--prefix dir` option to the rpm command shown above. e.g.

```
rpm --prefix /opt -i OCTEON-SDK-1.9-*.i386.rpm
```

will install the SDK in the directory `/opt/OCTEON-SDK`.

Note: If installing the Linux or any application packages, it is required they be installed with the same "prefix".

Within each directory in this archive, there are "README" files containing detailed information about their contents.

It is *strongly recommended* that in order to allow multiple users to share the SDK that the `examples` and `linux` directories be copied to a user's workspace prior to modification. E.g.:

```
cp -r /usr/local/Cavium_Networks/OCTEON-SDK/examples ~/
```

Now that I've installed the SDK, how do I use it?

In the SDK directory, there are an environment setup script: `env-setup`. Its usage is described in the `README.txt` file found there. The easiest way to set up the SDK environment is to add the following line to your `.bash_profile`:

```
pushd /usr/local/Cavium_Networks/OCTEON-SDK
source env-setup <OCTEON_MODEL>
popd
```

or if your login shell is csh, add the following to your .login:

```
pushd /usr/local/Cavium_Networks/OCTEON-SDK
source env-setup <OCTEON_MODEL>
popd
```

Where valid values for <OCTEON_MODEL> are listed in octeon-models.txt file under OCTEON-SDK directory.

Loading and Booting

Please refer to the SDK documentation section titled "[OCTEON Bootloader](#)" for more details about booting OCTEON boards.

Loading application binaries can be accomplished via the Compact Flash, serial port, PCI, or Ethernet via TFTP. Details specific to each of the methods are described in the SDK documentation referenced in the previous paragraph.

To make software development quicker, a Compact Flash and USB-connected writer are included in the Evaluation kit.

How to put files on CF:

- 1.Plug writer into USB. It will usually get configured as: /dev/sda1
but check your /var/log/messages to be sure.
- 2.Mount the CF file system. E.g. mount /dev/sda1 /mnt/usb
- 3.Copy program file(s) to CF. E.g. cp hello /mnt/usb
- 4.Unmount CF file system. E.g. umount /mnt/usb

How to load and boot from CF:


1. Insert CF into board
2. Reset board to read CF directory
3. Type the following command to load the program into RAM:
`fatload ide 0 0 <file name>`
where:
`<file name>` is the name of the file on the CF
4. Type the following to boot programs from CF:
`bootoct 0 [coremask=<hexmask>]`
where:
`<hexmask>` optionally specifies which cores run the program on

How to build, load and run Linux:

Please refer to the SDK documentation page "[Linux on the Octeon](#)" for the details.

Package Details

This package is organized as follows:

- ▼  OCTEON-SDK
 - ▷  applications
 - ▷  bootloader
 - ▷  components
 - ▷  diagnostic
 - ▷  docs
 - ▷  ejtag
 - ▷  examples
 - ▷  executive
 - ▷  gpl-executive
 - ▷  host
 - ▷  licenses
 - ▷  linux
 - ▷  simulator
 - ▷  target
 - ▷  tools
 - ▷  tools-gcc-4.3

Most importantly, there is extensive indexed HTML documentation under the `docs` directory. Within that directory, there is an `html` directory which contains `index.html` that can be displayed with your favorite browser. This documents the OCTEON™ simulator, simple executive, debugger, and boot loader. The following figure illustrates the index tab of this documentation.

Octeon Software Development Kit

- Octeon SDK Documentation Table of Contents
- File List
- Data Structures
- Data Fields
- Globals
- Related Pages
 - Octeon Simple Executive Overview
 - Octeon Bootloader
 - Octeon SDK config and build system
 - Octeon software package not installed
 - Running Debian GNU/Linux on Octeon
 - Simple Executive Debugger
 - Octeon Diagnostics
 - Octeon SDK examples overview
 - Profile-feedback optimization
 - Linux on Small Octeon Systems
 - Linux Userspace on the Octeon
 - Linux on the Octeon
 - Linux Userspace Debugging
 - Booting Octeon from NAND Flash
 - Performance Profiling using Oprofile
 - Octeon as a PCI host
 - Remotely Controlling an Octeon through PCI, PCIe, or EJTAG.
 - Octeon SDK overview
 - Octeon Simulator
 - Octeon Toolchains
 - Performance Profiling using Viewzilla
 - Deprecated List

Additionally, you will find many helpful Read Me and Release Notes text files. Please refer to these as they document many of the individual SDK components in detail.

README.txt
bootloader/README-new-board-porting.txt
bootloader/nand-boot/README.txt

docs/README-flash-crash-dump.txt
docs/README.txt
ejtag/README.txt
ejtag/macraigor/README.txt
examples/README.txt
examples/application-args/README.txt
examples/crypto/README-Linux.txt
examples/crypto/README.txt
examples/debugger/README.txt
examples/hello/README.txt
examples/low-latency-mem/README-Linux.txt
examples/low-latency-mem/README.txt
examples/mailbox/README.txt
examples/named-block/README.txt
examples/passthrough/README-Linux.txt
examples/passthrough/README.txt
examples/pcie-scan/README.txt
examples/queue/README.txt
examples/release-notes.txt
examples/traffic-gen/README.txt
examples/uart/README.txt
examples/zip/README.txt
executive/README.txt
host/pci/README.txt
octeon-models.txt
release-notes.txt
simulator/bin/README-license.txt
simulator/boot-reset/README.txt

Perhaps the most interesting items you can find in the SDK are the example applications under the `examples` directory. There are several example applications running under the OCTEON™ Simple Executive and some also under Linux on OCTEON. Please refer to the individual Read Me files for details.