Introduction

This document describes the steps for integrating IDT's Servo software with the Cavium Fusion-M evaluation board.

Media

All material referenced in this document is hosted on an IDT Dropbox. For access, please contact support-1588@idt.com. The following table contains a list of files that are hosted in the Dropbox.

Table 1. Media on the FTP Server

File	Description
idt-1588-sw-solution-on-cf-board.pdf	This document
idtConfig.json	JSON configuration file
idtPtp-fusion-m-idt-0-g5ae7c3b	Fusion-M/IDT application binary
idtPtp-fusion-m-pwm-0-g03708aa	Fusion-M/PWM application binary
vmlinux_1645M.64	Linux distribution

Hardware

Table 1 lists the connections between the Fusion-M and the IDT DCO.

Table 2. Connections between Fusion-M and IDT DCO

Board	Connector	Type	Description	Location
Fusion-M	J25	SMA	Not used.	See #20 in Figure 1
	J1	SMA	Clock input to the timestamper.	See #21 in Figure 1
	J4	SMA	PPS input to the timestamper.	
	J2	SMA	PPS output.	
	J5	SMA	Not used.	
	JP8	Header	I2C bus.	
	J11	USB mini	Serial console (USB to serial).	See #7 in Figure 1
IDT DCO	OUT2	SMA	Clock output, connects to J1 on Fusion-M.	See Blue Boxes in Figure 2
	OUT7	SMA	PPS output, connects to J4 on Fusion-M.	
	J3	Header	I2C bus, connects to JP8 on Fusion-M.	N/A

Figure 1. Location of Key Jumpers on Cavium Fusion-M Board

Figure 2. Location of Key Connectors on IDT SMU Board

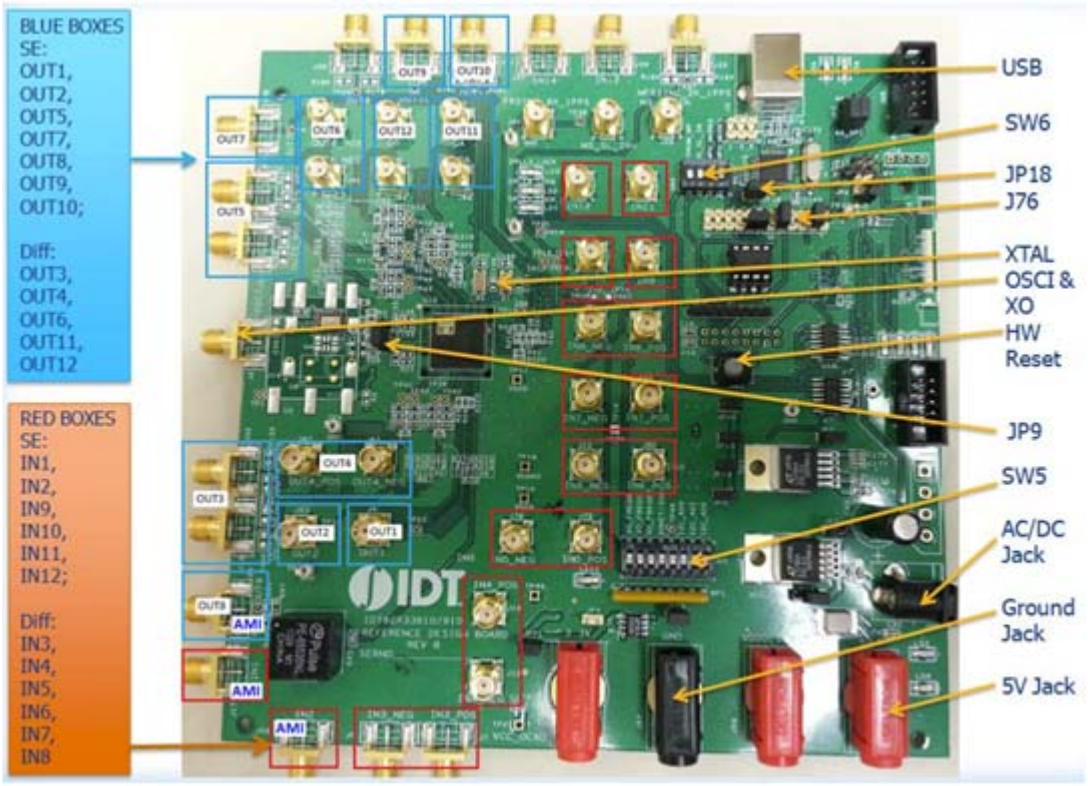
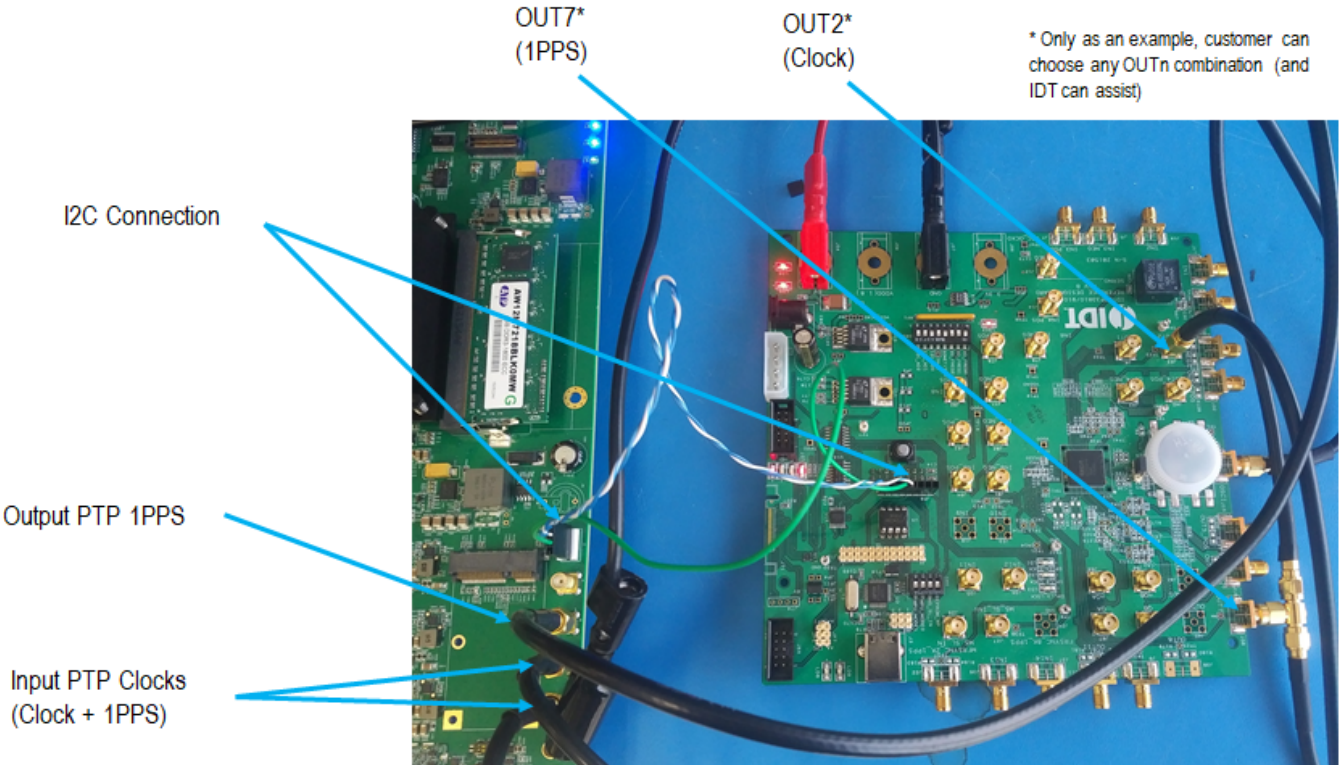


Figure 3. Cavium Fusion-M Board and IDT SMU Board Connected via Cables



Firmware Boot

1. Connect Fusion-M's serial console (J11) to the computer using a USB cable.
2. Open a terminal program such as putty and configure it to 115.2kbps, 1N8, and no flow control.
3. Switch the power on.

   You should see the firmware boot sequence on your serial terminal window.

```
Looking for valid bootloader image...
Jumping to start of image at address 0xbfd80000

U-Boot 2013.07 (Development build, svnversion: u-boot:1594, exec:)-svn1593 (Build time: Jun 16

Octeon unique ID: 02800001c919f31e0182 N0.LMC0 Configuration Completed: 8192 MB
Warning: Board descriptor tuple not found in eeprom, using defaults CNF73XX_CRB board revision major:1, minor:0, serial #:
OCTEON CNF7345-DSP pass 1.3, Core clock: 1200 MHz, IO clock: 600 MHz, DDR clock: 400 MHz (800
Base DRAM address used by u-boot: 0x20f000000, size: 0x1000000
DRAM: 8 GiB
Clearing DRAM..... done Flash: 32 MiB
QLM 4: SGMII
QLM 5: SGMII
MMC:not available
0:PCIe: Port 0 is unknown, skipping. 0:PCIe: Port 1 is unknown, skipping.
PCI console init succeeded, 1 consoles, 1024 bytes each
```

```
   Net:cvmx_sfp_read_i2c_eeprom(<NULL>):  Error:  i2c  bus  undefined  for  eeprom
cvmx_sfp_vsc7224_mod_abs_changed: Error reading the SFP module eeprom for <NULL>
   cvmx_sfp_read_i2c_eeprom(<NULL>):  Error:  i2c  bus  undefined  for  eeprom
cvmx_sfp_vsc7224_mod_abs_changed: Error reading the SFP module eeprom for <NULL>
   octeth0,     octeth1
```

4. Type the command “usb start” to scan for USB storage devices.

UBoot

Once at Uboot’s prompt, print the environment variables:

```
>    printenv
```

```
acsenable=1 atten1=25 atten2=25 autoload=n baudrate=115200
bdk_load=run reset_dlm; run enable_dlm_all; tftp 0x2000000 bdk_cnf73xx_slt.... bf=bootoct
$(flash_unused_addr)  forceboot  numcores=$(numcores) boardname=cnf73xx_crb
boardnum=10005 bootargs=ip=10.64.10.129:::255.255.254.0::eth0:off bootcmd=run  i2c_prep;  run
linux_tftp_no_dhcp bootdelay=1 bootloader_flash_update=bootloaderupdate
burn_app=erase  $(flash_unused_addr)  +$(filesize);cp.b  $(fileaddr)  $(flash_u... bw=20
calpwmreghigh=24016 calpwmreglow=37376 cfgloadby=tftp
e2ebootcmd=run mrcm_init;run reset_dlm; run enable_dlm_all; namedalloc ddrp... enable_dlm6=i2c mw
0x21 2 0x71 1; i2c mw 0x21 3 0x71 1;
enable_dlm6_0=i2c  mw  0x21  2  0x71  1;
enable_dlm6_1=i2c  mw  0x21  3  0x71  1;
enable_dlm6a_7=i2c mw  0x21 3 0xE0 1; i2c mw  0x21 2 0x1D 1;
enable_dlm6b_8=i2c mw  0x21 2 0xE0 1; i2c mw  0x21 3 0x1D 1;
enable_dlm7=i2c mw  0x21 3 0xE0 1; i2c mw  0x21 2 0x8D 1;
enable_dlm7_0=i2c mw  0x21  2  0xC5  1;
enable_dlm7_1=i2c mw  0x21 2 0xA9 1;
enable_dlm8=i2c mw  0x21 2 0xE0 1; i2c mw  0x21 3 0x8D 1;
enable_dlm8_0=i2c mw  0x21  3  0xC5  1;
enable_dlm8_1=i2c mw  0x21 3 0xA9 1;
enable_dlm_all=i2c mw 0x21 3 0x1D 1;i2c mw 0x21 2 0x1D 1; enbctrlrf=0
env_addr=1fbe0000 env_size=20000 eth1ddr=02:68:df:63:39:01 ethact=octeth1
ethaddr=02:68:df:63:39:00 fdtaddr=80000 fileaddr=20000000 filesize=234b450
flash_base_addr=1dc00000 flash_size=2000000 flash_unused_addr=1df00000 flash_unused_size=1d00000
gain1=35
gain2=35 gateway=10.64.11.254
i2c_prep=i2c dev 1; sleep 1; i2c mw 0x21 2 0xE0 1; i2c dev 0; sleep 1; i2c ... ipaddr=10.64.10.129
linux_mmc=fatload  mmc  1  $(loadaddr)  vmlinux.64;bootoctlinux  $(loadaddr)
linux_tftp_no_dhcp=run   mrcm_init;tftp   0x20000000   cavium/experimental/vmlinu...
loadaddr=0x20000000
ls=fatls mmc  0 mk_ubootenv=1
mrcm_init=i2c dev 0; sleep 1; i2c mw 0x25 3 0x00 1; i2c mw 0x25 1 0x07 1; s...
named_block_addr=0x70000000
named_block_size=0x1c713280 netmask=255.255.254.0 numcores=10   numcoreshex=0xa
octeon_failsafe_mode=0 octeon_ram_mode=0 pwdb_in_flash=1 pwmreghigh=24016 pwmreglow=37376
qlm4_mode=sgmii qlm5_mode=sgmii
reset_dlm=i2c dev 1; sleep 1; i2c mw 0x21 2 0xE0 1;i2c mw 0x21 3 0xE0 1; i2...
serverip=10.64.10.70
```

```
startapp=1  stderr=serial stdin=serial,pci,bootcmd stdout=serial swloadby=tftp
syslogd_max_size=2048 syslogd_rotated_num=2
uboot_flash_addr=bdd80000 uboot_flash_size=60180000
ver=U-Boot 2013.07 (Development build, svnversion: u-boot:1594, exec:)-svn1...
web_pass=456b7016a916a4b178dd72b947c152b7 web_pass1=a81be4e9b20632860d20a64c054c4150
web_user=admin web_user1=user

Environment size: 4009/131068 bytes
```

Network Boot

Connect the board to the network. Make sure the TFTP server, the host, and Fusion-M are on the same network. Serve vmlinux.64 on a TFTP server and make sure the following environment variables are set correctly:

```
> setenv mrcm_init 'i2c dev 0; sleep 1; i2c mw 0x25 3 0x00 1; i2c mw 0x25 1
   0x07 1; sleep 1; i2c mw  0x25 1 0xF8 1; sspi 1:0.19 24 000081 ;sspi 1:0.19 24
   000008 ;sspi 1:0.19 24 010001 ;sspi 1:0.19 24 010201 ;sspi 1:0.19 24 010404
   ;sspi 1:0.19 24 010703 ;sspi 1:0.19 24 010809 ;sspi 1:0.19 24 010900 ;sspi 1


   :0.19 24  010A02  ;sspi 1:0.19  24  010B0C  ;sspi 1:0.19  24  0200FF  ;sspi 1:0.19
   24 020187 ;sspi 1:0.19 24 020403 ;sspi 1:0.19 24 020809 ;sspi 1:0.19 24 030209
   ;sspi 1:0.19 24 030809 ;sspi 1:0.19 24 030e09 ;sspi 1:0.19 24 031409 ;sspi
   1:0.19 24 031a09 ;sspi 1:0.19 24 032009 ;sspi 1:0.19 24 032100 ;sspi 1:0.19
   24 032309 ;sspi 1:0.19 24 032400 ;sspi 1:0.19 24 032609 ;sspi 1:0.19 24
   032740 ;sspi 1:0.19 24 032D00 ;sspi 1:0.19 24 040218 ;sspi 1:0.19 24 040340
   ;sspi 1:0.19 24 050502 ;sspi 1:0.19 24 050603 ;sspi 1:0.19 24 05070C ;sspi
   1:0.19 24 000F01 ;sspi 1:0.19 24 020301 ;sspi 1:0.19 24 000F01 ;sspi 1:0.19
   24  020300  ;sspi 1:0.19  24  000F01  ;sspi 1:0.19  24  032A01  ;sspi 1:0.19  24  000F01
   ;sspi 1:0.19 24 032A00 ;sspi 1:0.19 24 000F01'
> setenv linux_tftp_no_dhcp 'run mrcm_init;tftp 0x20000000 /path/to/vmlinux.64'
> setenv serverip <tftp server ip address>
> saveenv
```

Boot:

```
>   run   linux_tftp_no_dhcp
```

You should see the kernel log messages followed by the terminal prompt (login is not required).

SD Card Boot

1. Prepare an SD card with a single partition running the FAT file system.
2. Copy vmlinux.64, the idtPtp binary, and the JSON configuration file to that partition.

```
> fdisk -l
>  fdisk  /dev/mmcblk0
>  mount  /dev/mmcblk0p1  /mnt/
>   cp   /path/to/vmlinux.64   /mnt
> (Repeat for idtPtp and JSON file)
```

3. Insert the SD card into the SD card connector on Fusion-M. Make sure the following environment variables are set correctly:

```
> setenv mrcm_init 'i2c dev 0; sleep 1; i2c mw 0x25 3 0x00 1; i2c mw 0x25 1
   0x07 1; sleep 1; i2c mw  0x25 1 0xF8 1; sspi 1:0.19 24 000081 ;sspi 1:0.19 24
   000008 ;sspi 1:0.19 24 010001 ;sspi 1:0.19 24 010201 ;sspi 1:0.19 24 010404
   ;sspi 1:0.19 24 010703 ;sspi 1:0.19 24 010809 ;sspi 1:0.19 24 010900
   ;sspi 1:0.19 24  010A02  ;sspi 1:0.19  24  010B0C  ;sspi 1:0.19  24  0200FF  ;sspi 1:0.19
   24 020187 ;sspi 1:0.19 24 020403 ;sspi 1:0.19 24 020809 ;sspi 1:0.19 24 030209
   ;sspi 1:0.19 24 030809 ;sspi 1:0.19 24 030e09 ;sspi 1:0.19 24 031409 ;sspi
   1:0.19 24 031a09 ;sspi 1:0.19 24 032009 ;sspi 1:0.19 24 032100 ;sspi 1:0.19
   24 032309 ;sspi 1:0.19 24 032400 ;sspi 1:0.19 24 032609 ;sspi 1:0.19 24
   032740 ;sspi 1:0.19 24 032D00 ;sspi 1:0.19 24 040218 ;sspi 1:0.19 24 040340
   ;sspi 1:0.19 24 050502 ;sspi 1:0.19 24 050603 ;sspi 1:0.19 24 05070C ;sspi
   1:0.19 24 000F01 ;sspi 1:0.19 24 020301 ;sspi 1:0.19 24 000F01 ;sspi 1:0.19
   24  020300  ;sspi 1:0.19  24  000F01  ;sspi 1:0.19  24  032A01  ;sspi 1:0.19  24  000F01
   ;sspi 1:0.19 24 032A00 ;sspi 1:0.19 24 000F01'
   > setenv linux_mmc 'run mrcm_init;faload mmc 0 $(loadaddr) vmlinux.64;bootoctlinux
   $(loadaddr)'
   > saveenv
```

Boot:

```
> run linux_mmc
```

You should see the kernel log messages followed by the terminal prompt (no login required).

Run the Application

On the Network

1. Serve the application and configuration file on an NFS share. Mount the share as follows.

```
> mount -o nolock,hard,intr <server ip addr>:/path/to/application /home
```

2. Run the application:

```
> cd /home
> ./idtPtp
```

On the SD Card

1. Serve the application and configuration file on the SD card. Mount the partition:

```
> mount /dev/mmcblk0p1 /home
```

2. Run the application:

```
> cd /home
> ./idtPtp
```

NFS Mount

The following instructions show how to set up an NFS server/client on Debian based systems. Execute all commands as root.

Development Host

1. Install the necessary packages:

```
#apt-get install nfs-kernel-server
#apt-get install nfs-common
#apt-get install rpcbind
```

2. Create the directory to be NFS mounted as shown in the following example:

```
#mkdir /mnt/cavium
#chmod 777 /mnt/cavium
```

3. Edit /etc/exports to add the lines similar to the following example:

```
/mnt/cavium*(rw,no_root_squash,async)
```

4. Export the share and (re)start the NFS server:

```
#exportfs -a
#service nfs-kernel-server start
```

Target Board

Create a local NFS client directory to mount substituting the NFS server IP address in the following example:

```
#mkdir  /home
#chmod  777  /home
#mount -o nolock,intr,hard <nfs server ip address>:/mnt/cavium /home
```

Revision History

Revision Date	Description of Change
November 1, 2017	Initial release.

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit www.renesas.com/contact-us/.

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.