ebrick: EPICS Brick Support

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Overview

The EPICS brick (EBRICK) is designed to be a low cost solution for an IOC with soft real-time requirements. The next generation EBRICK, referred to as EBRICK-II, aligns as close as possible with suggestions made by the review committee (ICMS:APS_1239772) as well as replaces the Athena from Diamond Systems since it is now at end of life (announced 2008.01.23). The EBRICK-II is based on the Poseidon Single Board Computer (SBC) from Diamond Systems. It consists of both PC104 and PC104+ busses, fanless 1GHz VIA Eden ULV processor, 512MB DDR2 RAM, 4 serial ports, 4 USB 2.0 ports, VGA, PS/2 mouse and keyboard, 10/100/1000 Ethernet, SATA/IDE interface, ACPI power management, 32 16bit ADCs, 4 12bit DACs, and 24bit digital IO. This configuration provides a cost effective solution with sufficient processing power, longevity, and functionality for soft IOC real-time requirements. Furthermore, other COTS (commercial off-the-shelf) modules as well as in-house developed PC104/PC104+ modules can be incorporated.

The Poseidon can be purchased from Diamond Systems, refer to www.diamondsystems.com for addition information about the processor boards. The recommended hardware for an EPICS Brick IOC consists of the following.

Poseidon SBC	PSDE10-512A (http://www.diamondsystems.com/products/poseidon)
Triton enclosure (3")	TRI-PSDA-KIT (http://www.diamondsystems.com/products/triton)
60GB hard drive	HITACHI TRAVELSTAR 5K160 HDD (0A28416)

As mentioned above, the previous implementation was based on the PC104 Athena Single Board Computer from Diamond Systems Corporation. Although it is at end of life, support is still provided by BCDA.

The EBRICK is no longer distributed with EPICS base or synApps. EPICS base 3.14.8.2 and synApps 5.2.1 are known to work. EPICS base can be acquired from the EPICS website (http://www.aps.anl.gov/epics/) and synApps from the BCDA website (http://www.aps.anl.gov/bcda/synApps/index.php). The EBRICK module is part of synApps
and can be acquired from the BCDA website as well. The Linux distribution employed is VectorLinux standard 5.1 and is a lightweight, fast distribution, that uses less than
2Gb of disk space. The kernel is 2.6.19 with a real-time patch from OSADL (Open Source Automation Development Lab) and the chosen windows display manager is IceWM (http://www.icewm.org) because it is small, fast, and lightweight.

Beginning with release R2-2-2, the EBRICK module can be built for RTEMS using the uCDIMM Coldfire processor (uC5282) from Arcturus Networks. At this time, the supported features include 6 10-bit AD channels, a CPU load monitor as provided by the MCF5282 module, and a serial console port and a second serial port supported through Asyn. The future configuration is to employ the uC5282 interface board from the AES Controls group (06PC012A) and mount it on the BC-071 Cyclone-II FPGA-based board. This will provide a cost effect solution that harnesses the power of an FPGA with an low cost EPICS interface.

The EBRICK can boot into various configurations as shown below. The default bootup is run level 5 (hdd-service) but can be changed by editing/etc/lilo.conf as root.

RUNLEVEL	MENU ID	DESCRIPTION
5	hdd-service	Logs in epicsioc at ttyS0 (COM1) with 9600 baud, 8bits, no parity, 1 stop bit.
7	hdd-epicsioc	Logs in epicsioc and runs EPICS at ttyS0 (COM1) with 9600 baud, 8bits, no parity, 1 stop bit.
5	nfs-service	Network boot. Logs in epicsioc at ttyS0 (COM1) with 9600 baud, 8bits, no parity, 1 stop bit.
7	nfs-epicsioc	Network boot. Logs in epicsioc and runs EPICS at ttyS0 (COM1) with 9600 baud, 8bits, no parity, 1 stop bit.

At run level 5 (hdd-service and nfs-service), the epicsioc account is automatically logged into at serial port ttyS0. At run level 7 (hdd-epicsioc and nfs-epicsioc), the epicsioc account is automatically logged in as well, but an IOC is ran under the screen application. The screen utility is employed to allow multiple logins to attach to the IOC either locally or remotely (refer to the screen documentation for details). During IOC startup, the epicsioc account runs the screen application and passes it a startup script
(start_epics_ioc). The startup script points to where the IOC application resides and runs it accordingly. Subsequent logons can be attached to the iocsh by the commands screen -x or screen -r.

The commercial hardware that is currently supported is listed below. As hardware is upgraded and user requirements change, additional support will be incorporated.

MANUFACTURE	WEBSITE	HARDWARE	PART NUMBER	DESCRIPTION
Diamond Systems	www.diamondsystems.com	Poseidon	PSDE10-512A	Processor module.
Diamond Systems		Ruby-MM-416	RMM-416-XT	4 channel 16bit DACs, 24bit digital IO
Diamond Systems		Onyx-MM-DIO	OMM-DIO-XT	48bit digital IO
Diamond Systems		Pearl-MM	PMM-S or PMM-P (S-screw terminals,P=Pins)	16bit relay output.
Sensoray	www.sensoray.com	Smart A/D	518	PC104 bus Smart A/D (8-channel)
Pro-dex (OMS)	www.prodex.com	Motion controller	PC68	multi-axis motion controller

Below lists some of the hardware that has worked with the EBRICK.

DESCRIPTION
APS-specific Generic digital IO board (BC-059,BC-063)
Love controllers
Mdrive
XIA Huber slits
Femto current amplifier
XIA PF4 filter
Kohzu monochromator
Piezo motors
Picomotor
SR570 Preamp

Driver Software

The distribution comes with asyn-based driver support for all of the components (i.s. DAC,ADC,digitial IO) that the Athena and Poseidon provide as well as for the hardware listed above. Most device support is provided by asyn.

Database / MEDM

EPICS databases and MEDM screens are provide to support the hardware as listed above. Refer to the directories ebrickApp/Db for the databases and ebrickApp/op/adl for the MEDM screens. In addtion, auto/save .req files are provided to save the record contents where appropriate, refer to iocBoot/iocebrick/autosave for these files.

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