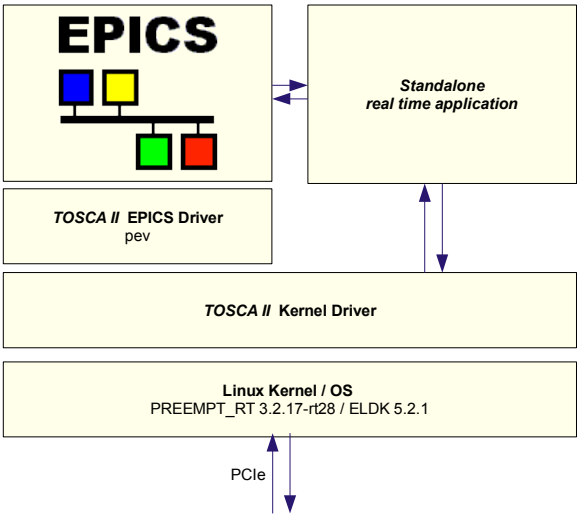
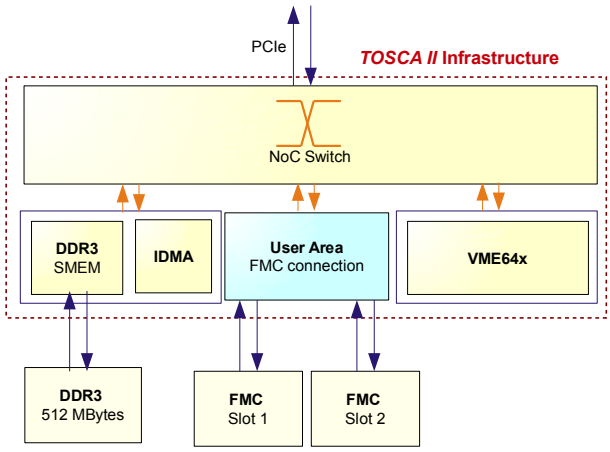
EPICS Driver for *TOSCA II* Infrastructure Data Sheet
IFC_1210 IFC_1210_DS_EPICS_A0





Key Features

- EPICS record-level access to IFC_1210 on-board hardware
  - ✔ P2020 ELB bus
  - ✔ on-board I2C devices
  - ✔ *TOSCA II* TCSR resources (IO-Bus)
  - ✔ *TOSCA II* TMEM resources
  - ✔ VME64x interface (master/slave)
- Support for a wide variety of record types
  - ✔ longin, ai, aai, stringin, bi, mbbi
  - ✔ longout, ao, aao, stringout, bo, mbbo
- Based on PSI's standard memory mapped driver regDev on device layer
  - ✔ synchronous record processing
  - ✔ asynchronous record preocessing
- Supports EPICS devLib2 for VME access
  - ✔ Therefore supporting e.g. the MRF Event Generator and Receiver hw
- Configuration on EPICS startup.script level
  - ✔ specify targeted *TOSCA II* resource
  - ✔ transfer types (single access or DMA)
  - ✔ swapping (no, auto, user defined)
  - ✔ VME protocol
  - ✔ VME slave configuration
  - ✔ DMA packet size and mode
  - ✔ Interrupt registration for all *TOSCA II* resources, e.g. from USR area
- Built-in Hardware Monitoring and Failure Detection Mechanisms with IFCMON
  - ✔ Power supplies monitoring
  - ✔ Temperatures monitoring

Overview

IOxOS Technologies introduces in collaboration with the Paul Scherrer Institut (PSI) a software and driver framework for the *TOSCA II* FPGA Design Kit on the IFC_1210 single board computer which allows easy integration of *TOSCA II* hardware resources into EPICS control system toolbox.

The software framework is based solely on free- or open-source software, where the central component is the “Embedded Linux Development Kit” (ELKD), which acts as cross tool chain and embedded Linux distribution (root file system). ELDK allows easily to use mainline versions of different Linux kernel variants, as here the PREEMPT_RT patched one. Support is available from either the community over mail lists or on commercial base from company Denx. The IOxOS *TOSCA II* kernel driver will be loaded as Kernel module at system startup and allows over its API easy configuration and operation of *TOSCA II* e.g. for stand alone real time enabled applications.

Based on the IOxOS *TOSCA II* kernel driver and the PSI EPICS register-Device memory mapped driver, an easy-to-use environment is available for the user for accessing data over *TOSCA II* infrastructure from EPICS control system toolbox.

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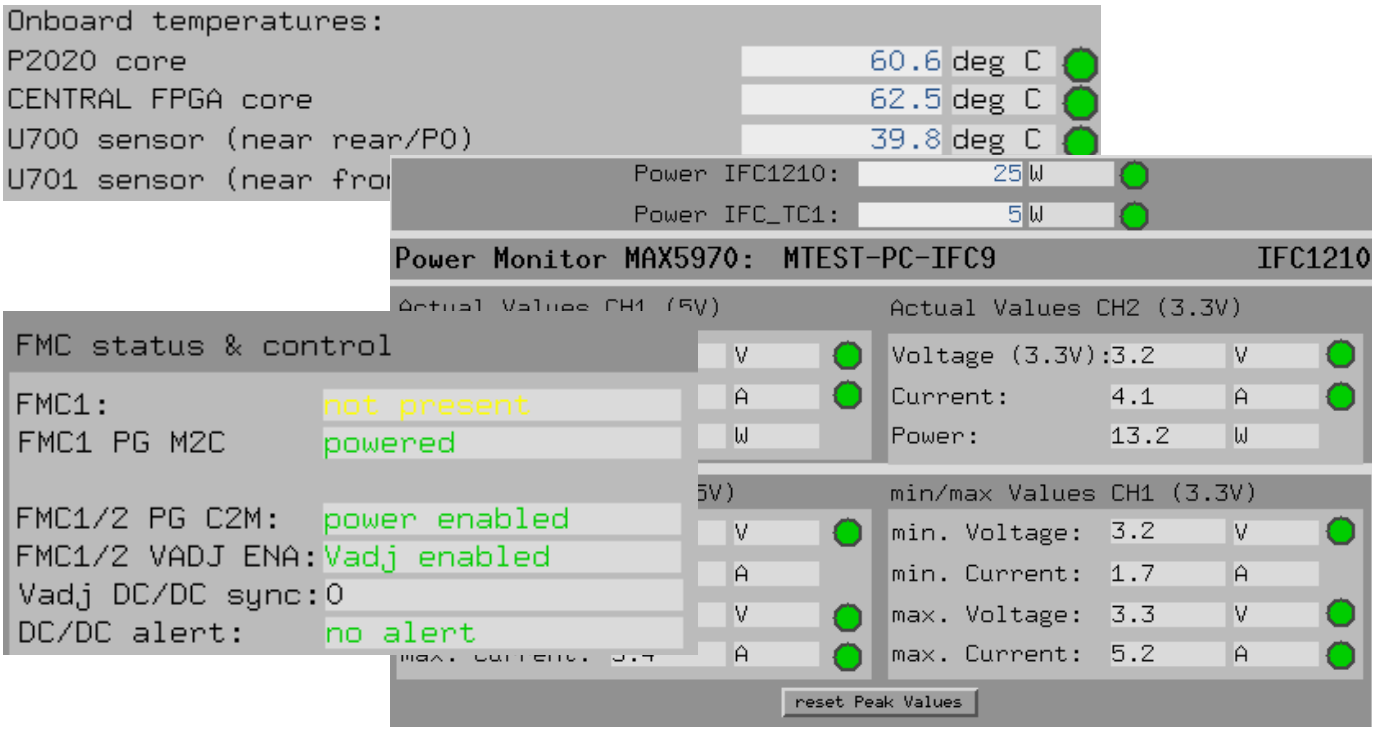

Introduction

This software framework is set-up in a very scalable way, since it has to fulfill requirements for PSI's large research facilities with hundreds of such boards used as EPICS IOC. IFC_1210 board hosts only UBOOT locally, then it fetches all other parts as FPGA bitfiles, Linux kernel, root file system, EPICS binaries and database definition over network (root-on-NFS).

Configuration for *TOSCA II* EPICS

The API of *TOSCA II* EPICS driver allows easily set-up and configuration.

With commands **pevConfigure** / **pevAsynConfigure** it is easily possible to link any interrupt coming from *TOSCA II* infrastructure such as user area or VME interrupts to EPICS records to be processed. As the configuration command name indicates, synchronous and asynchronous record processing are both supported.

For adjusting VME slave windows (VME A32 mode supported within EPICS driver) and define the MMU mappings to *TOSCA II* internal infrastructure, the commands **pevVmeSlaveMainConfig** and **pevVmeSlave TargetConfig** are available.

pevAsynI2cConfigure can be used to setup access towards I2C connected devices, e.g. on FMC boards.

DevLib2 Support

Due to integrated support of devLib2, a general purpose hardware access driver layer for VME devices, many existing VME hardware as e.g standard IO boards from Hytec or Micro Research Finland Event Generator / Receiver are supported with IFC_1210 board as EPICS IOC.

Licensing & Availability

For using the IOxOS Technologies proprietary *TOSCA II* FPGA Design Kit, a license is required. In contrast, all parts of the software infrastructures are available with Open-Source similar licenses.

Software	License / Availability
TOSCA II Kernel Driver	GPL IOxOS, only with FPGA Design Kit
ELDK	GPL / other www.denx.de
EPICS	EPICS Open License http://www.aps.anl.gov/epics
TOSCA II EPICS Driver	EPICS Open License https://controls.web.psi.ch/cgi-bin/twiki/view/Main/IFC1210PEV100Driver

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RELIABILITY BY DESIGN

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EPICS drivers for IFC_1210 were developed by PSI and provided as Open-Source on request.

http://controls.web.psi.ch