The universal PCI Express Device Driver for MTCA.4

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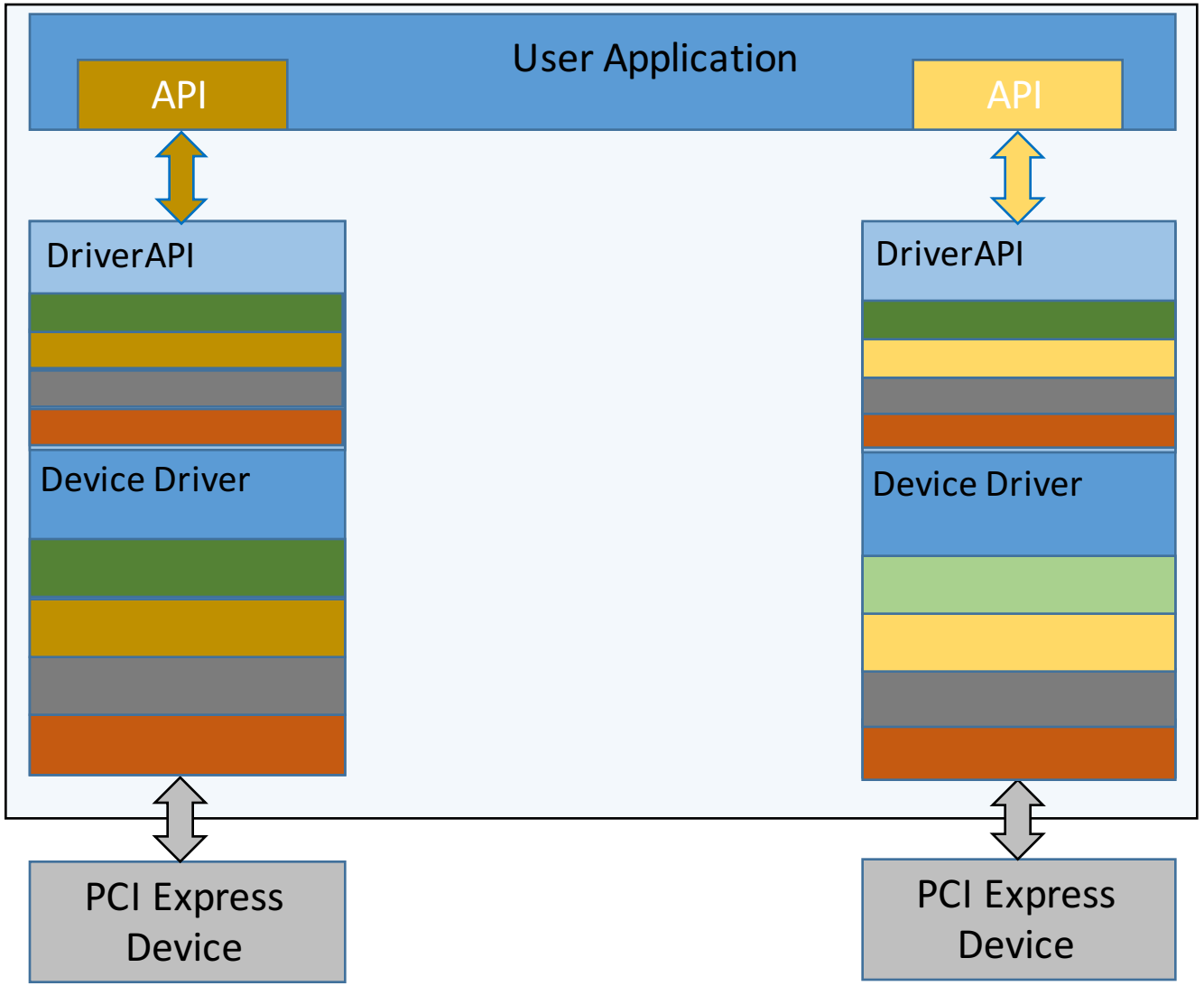
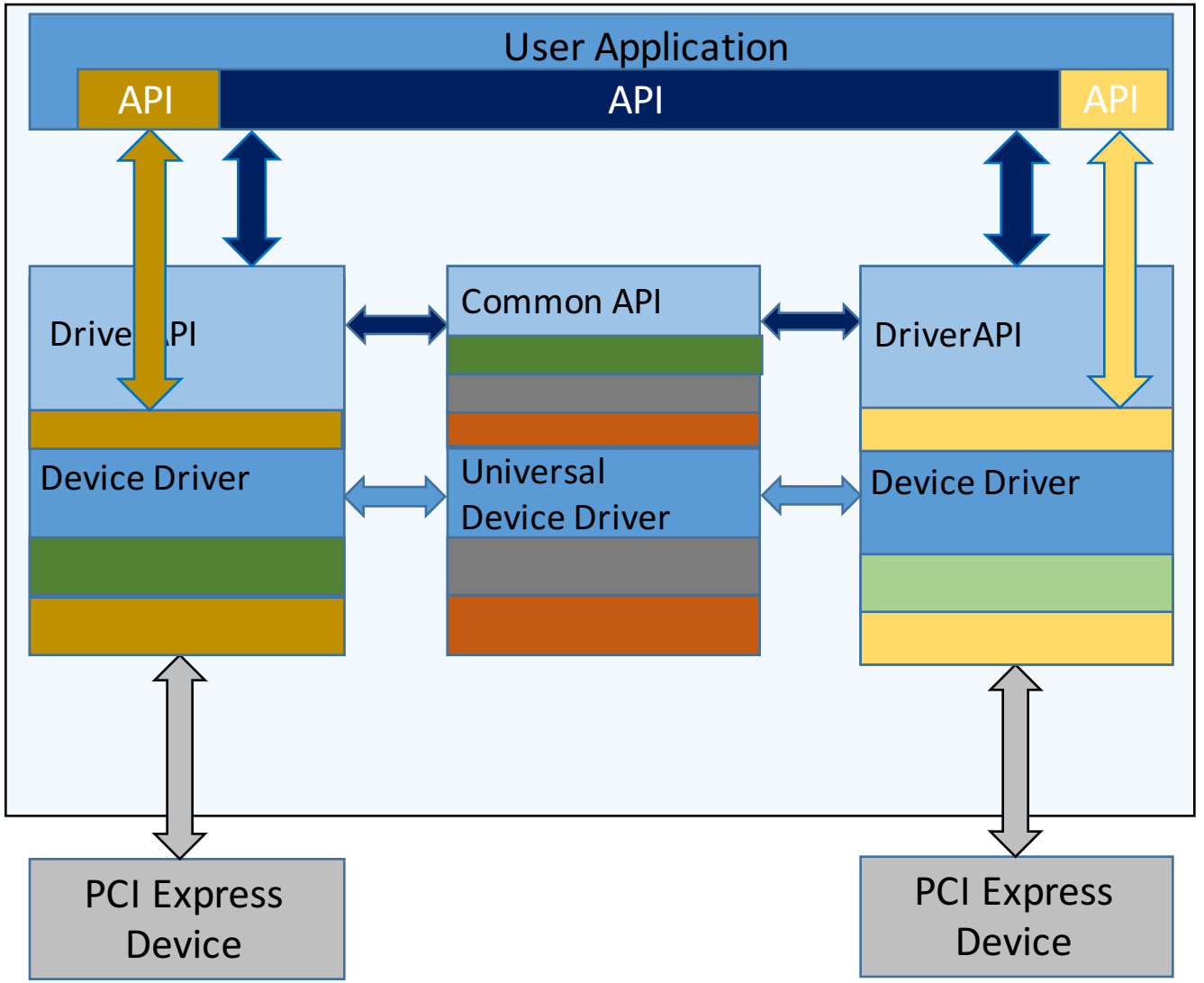
The Universal PCI Express Device Driver

- Basic PCI Express functionality
  - Mapping memories
  - **Read**, **write** and some common **ioctl**
  - Error handling
  - Hot Plug
- Standards or Guidlines functionalty
  - Standard Registers Set
  - SHAPI Registers Set (PICMG)
  - PICMG Standard Device Model
  - PCIe HotPlug functionality
- Device specific but has common API
  - DMA
- Device specific functionality



The Universal PCI Express Device Driver

- Split Device Driver into two parts follow the Linux Device Driver stacking Model
- Add all common functionality and API into universal part
  - Basic PCI Express functionality
  - Standards or Guidlines functionalty
- Add Common API for Device specific functionality into universal part but keep functionality in Device Driver side
  - Device specific but has common API

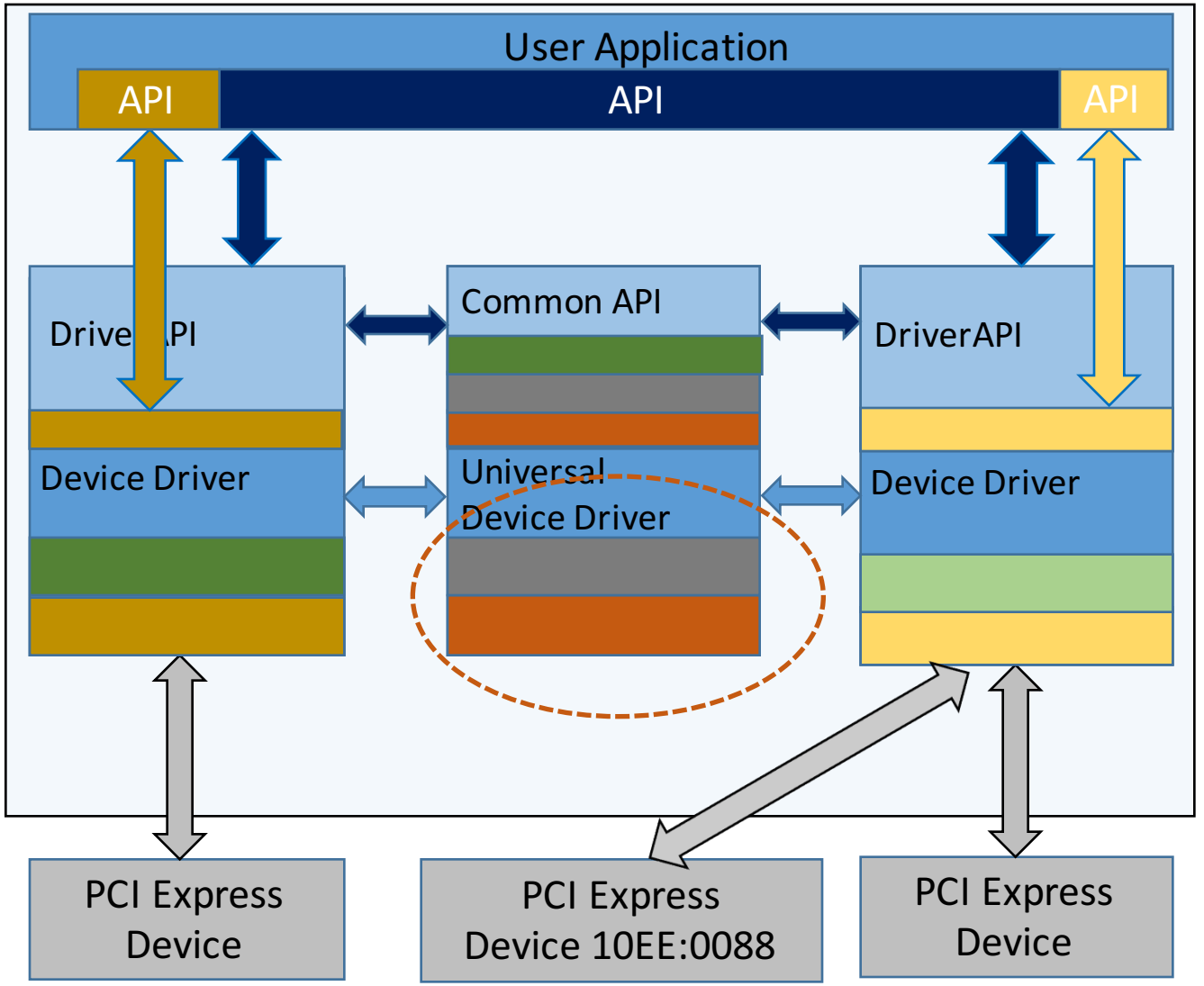


The Universal PCI Express Device Driver

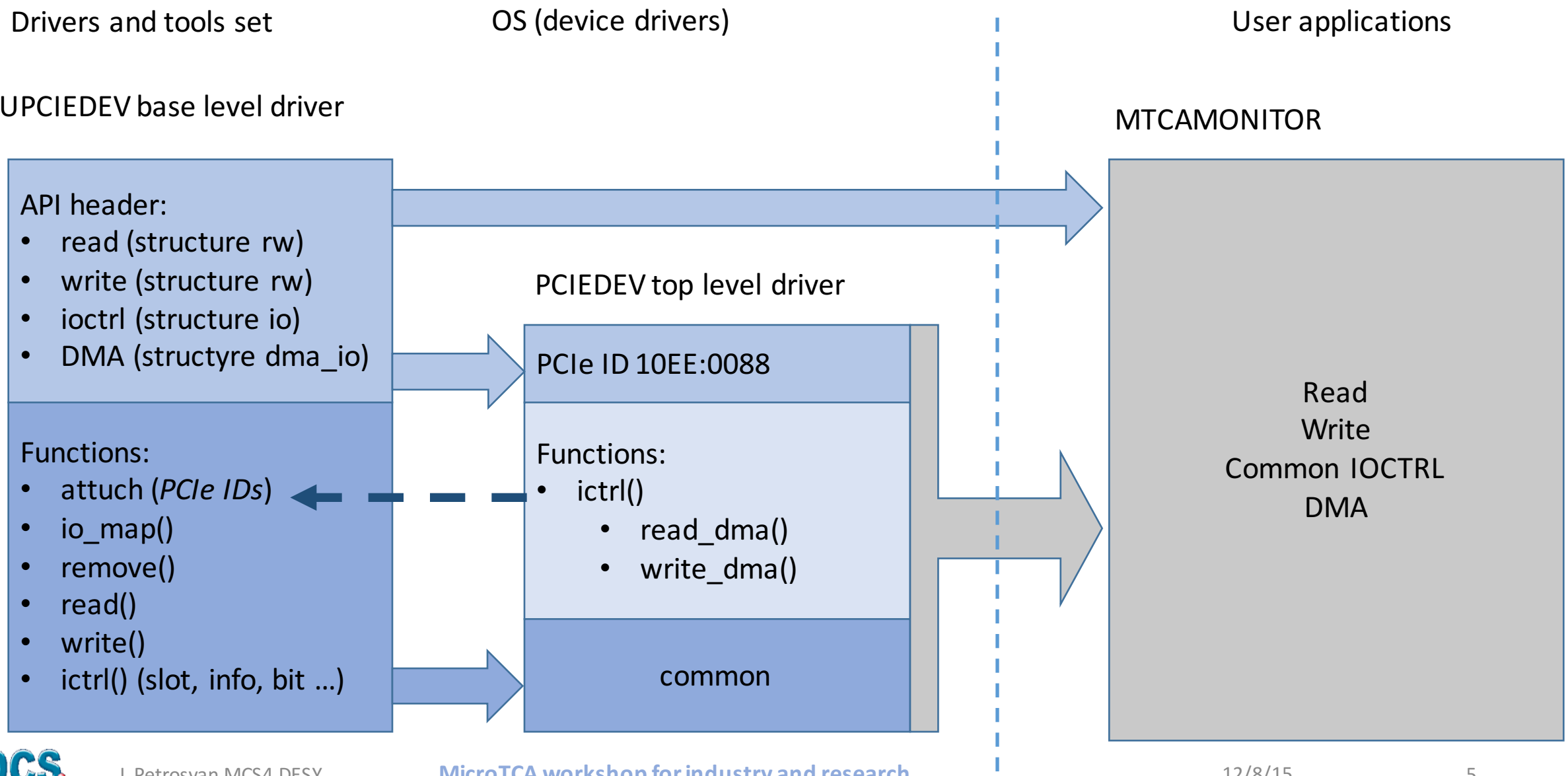
- this approach facilitates creation of new drivers and user applications
- The Device Driver created on the top of ***universal*** driver has all necessary PCI Express functionalty
- It could be binded to any PCI Express Device

echo „10EE:0088“ > /sys/bus/devices/xxx/driver/new_id

- facilitates integration of new devices into the existing software



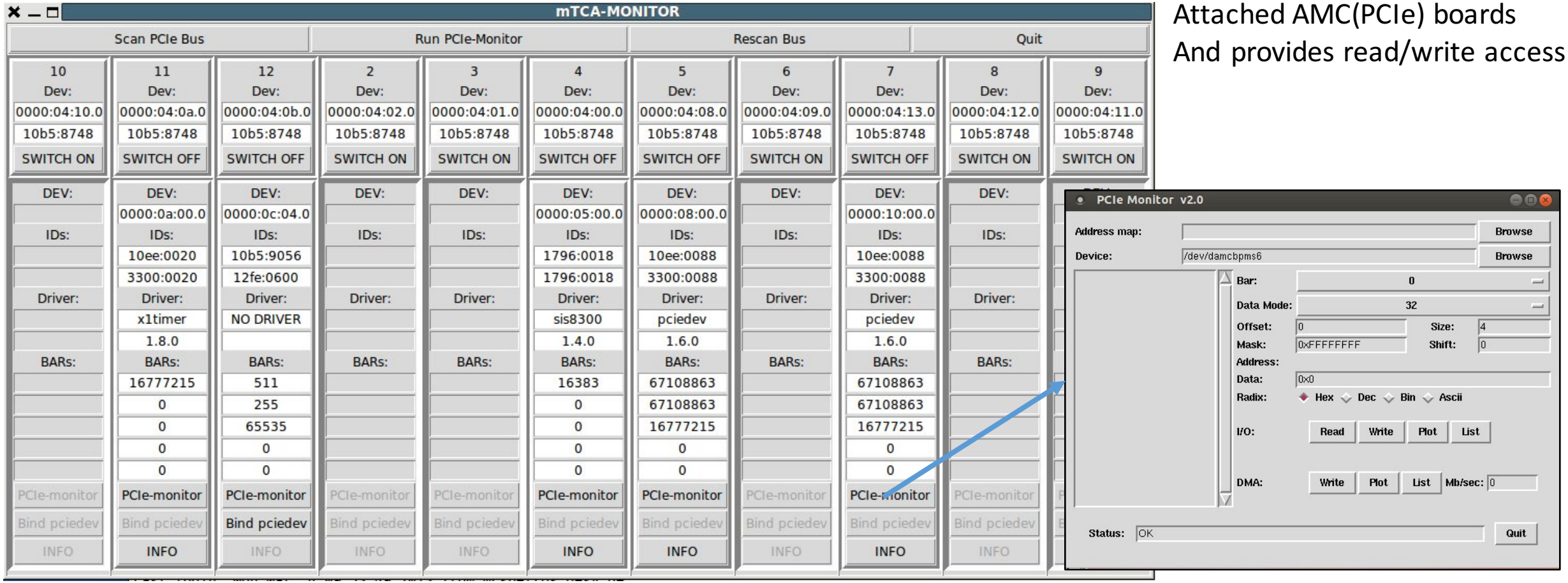
The Universal PCI Express Device Driver



The Universal PCI Express Device Driver

MTCAMONITOR

MTCAMONITOR shows all
Attached AMC(PCIe) boards
And provides read/write access



The Universal PCI Express Device Driver

X2TIMER MODULE

FPGA FW based on DESY START_UP PROJECT

Has separate device driver, but based on the universal driver API

PCIe ID 10EE:0020

SIS8300 BOARD LCBPM

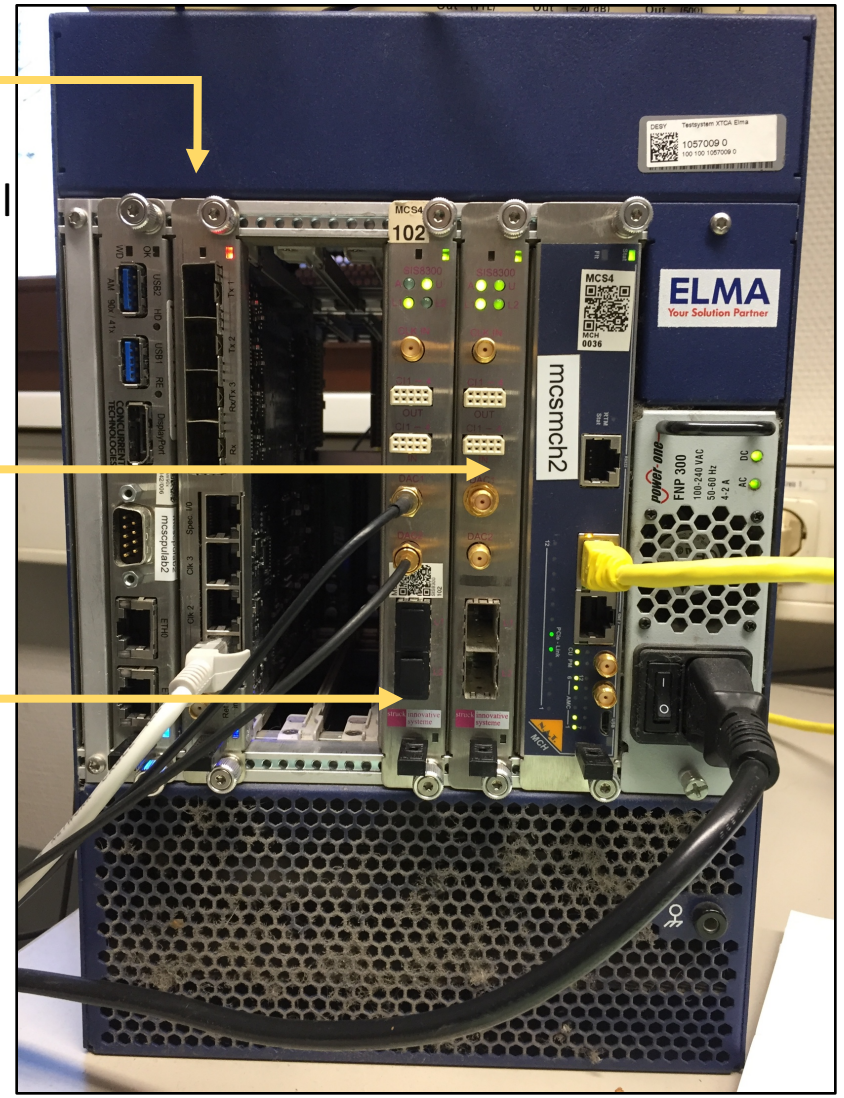
FPGA FW based on DESY START_UP PROJECT

PCIe ID 10EE:0088

SIS8300 DIGITIZER

STRUCK FW with DMA R/W

PCIe ID 1796:0018, 1796:0019



The Universal PCI Express Device Driver

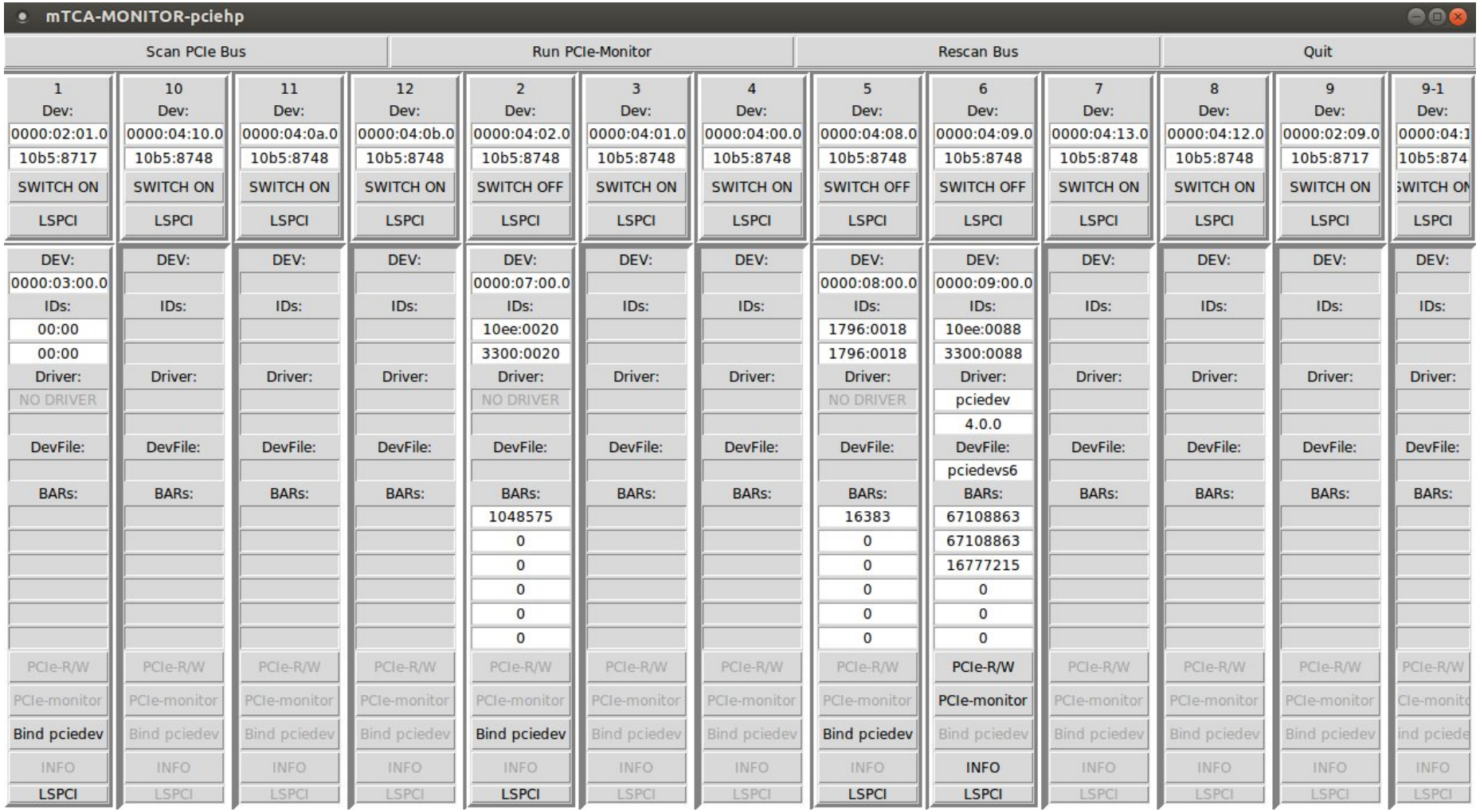
Switch ON the crate

SIS8300 board with the LCBPM project was binded to pciedev driver.

No drivers for X2TIMER and SIS8300 with the STRUCK FM boards

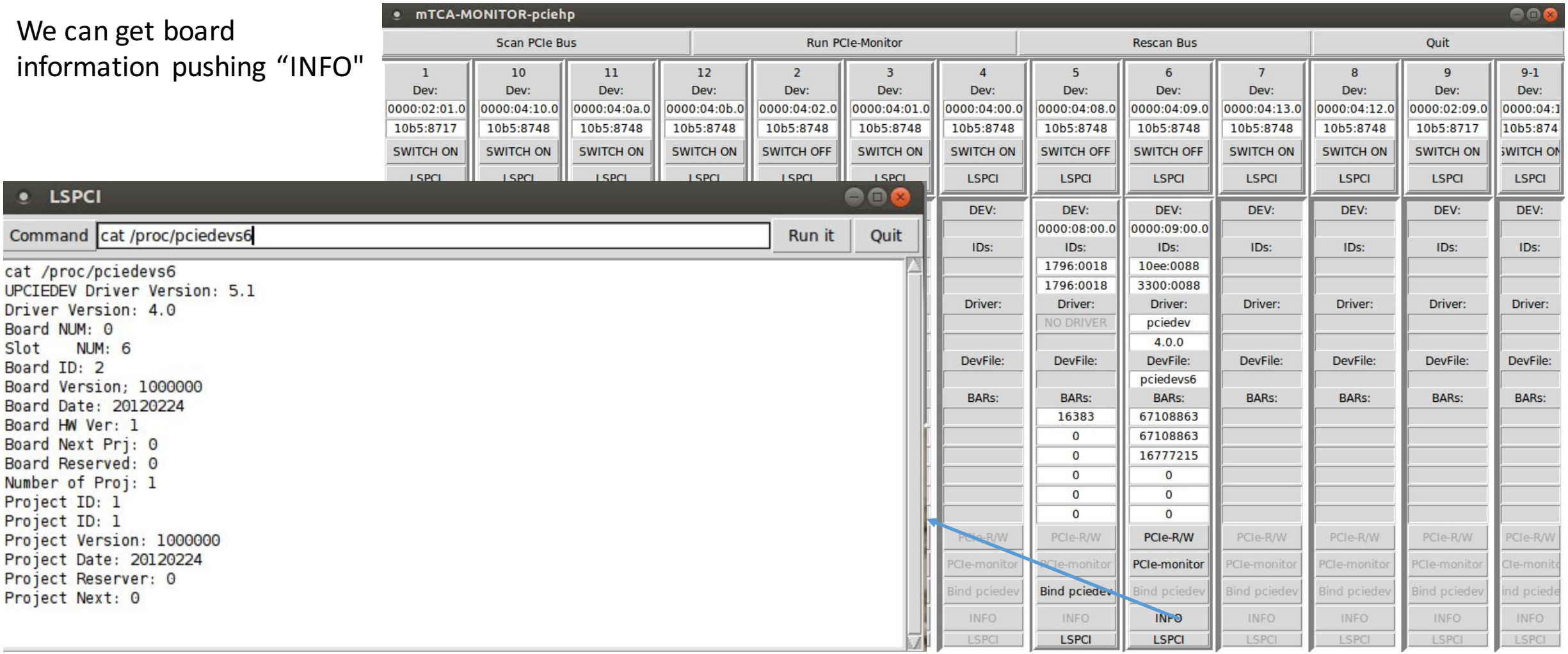
The “Bind pciedev” button activated for the boards which has no driver binded

We can bind pciedev driver to X2TIMER and SIS8300 boards



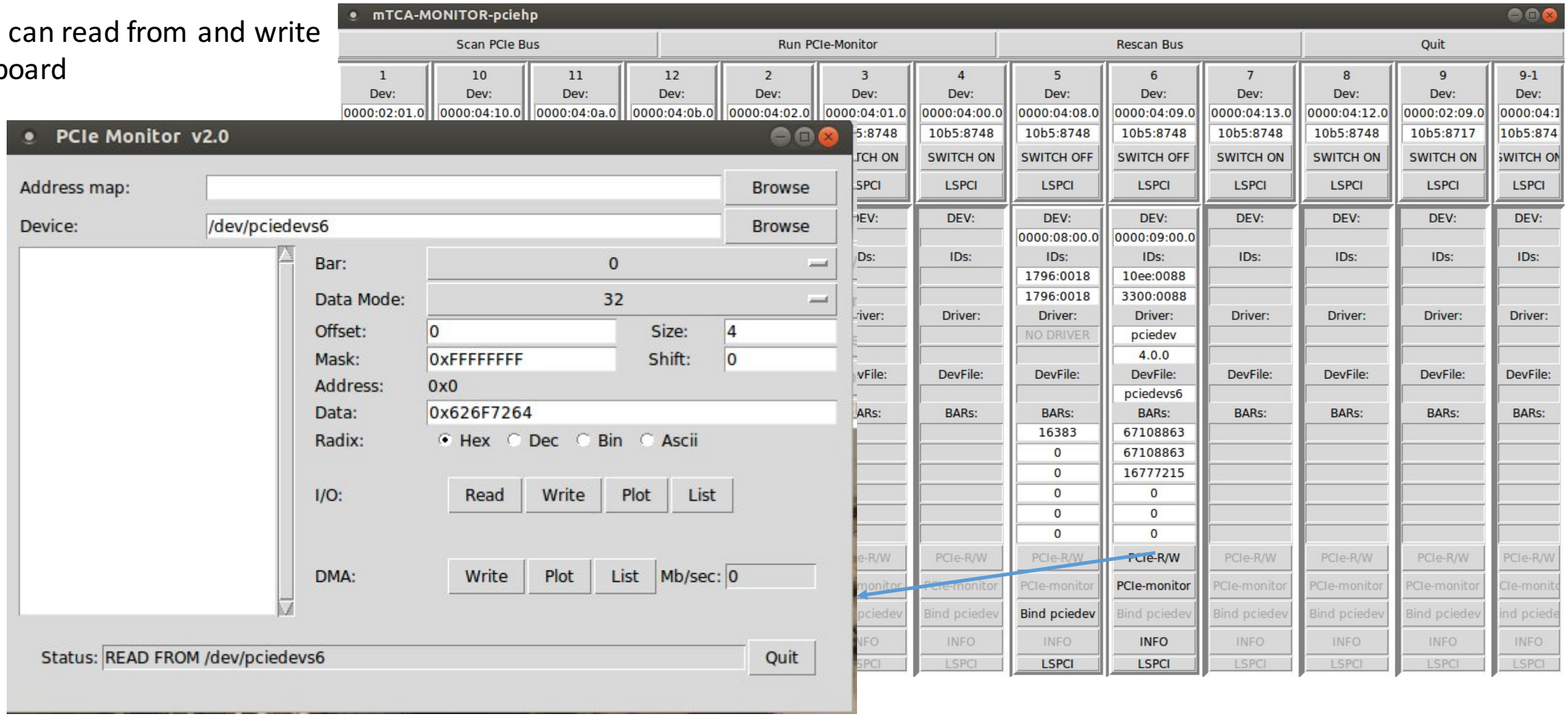
The Universal PCI Express Device Driver

We can get board information pushing “INFO"



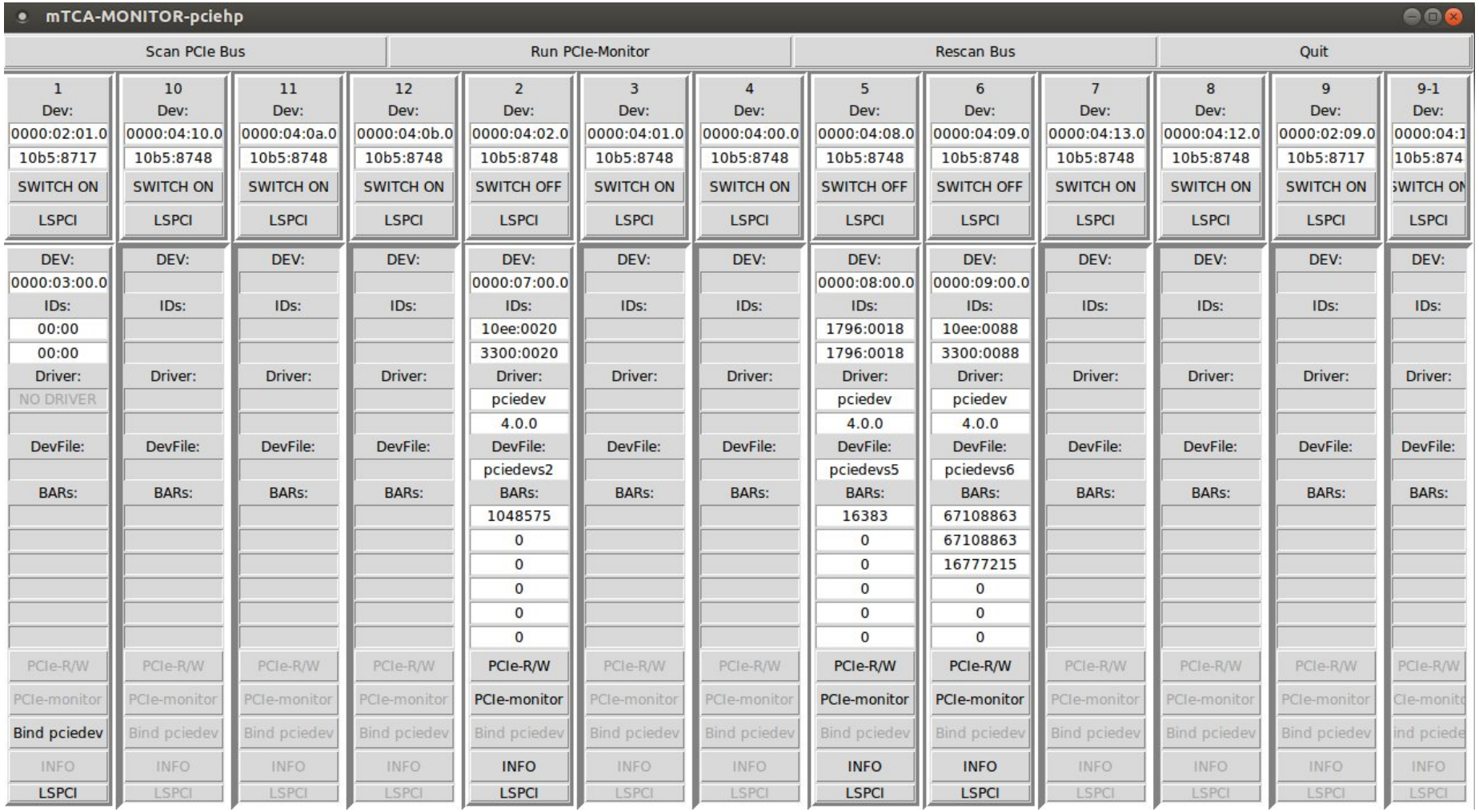
The Universal PCI Express Device Driver

We can read from and write to board

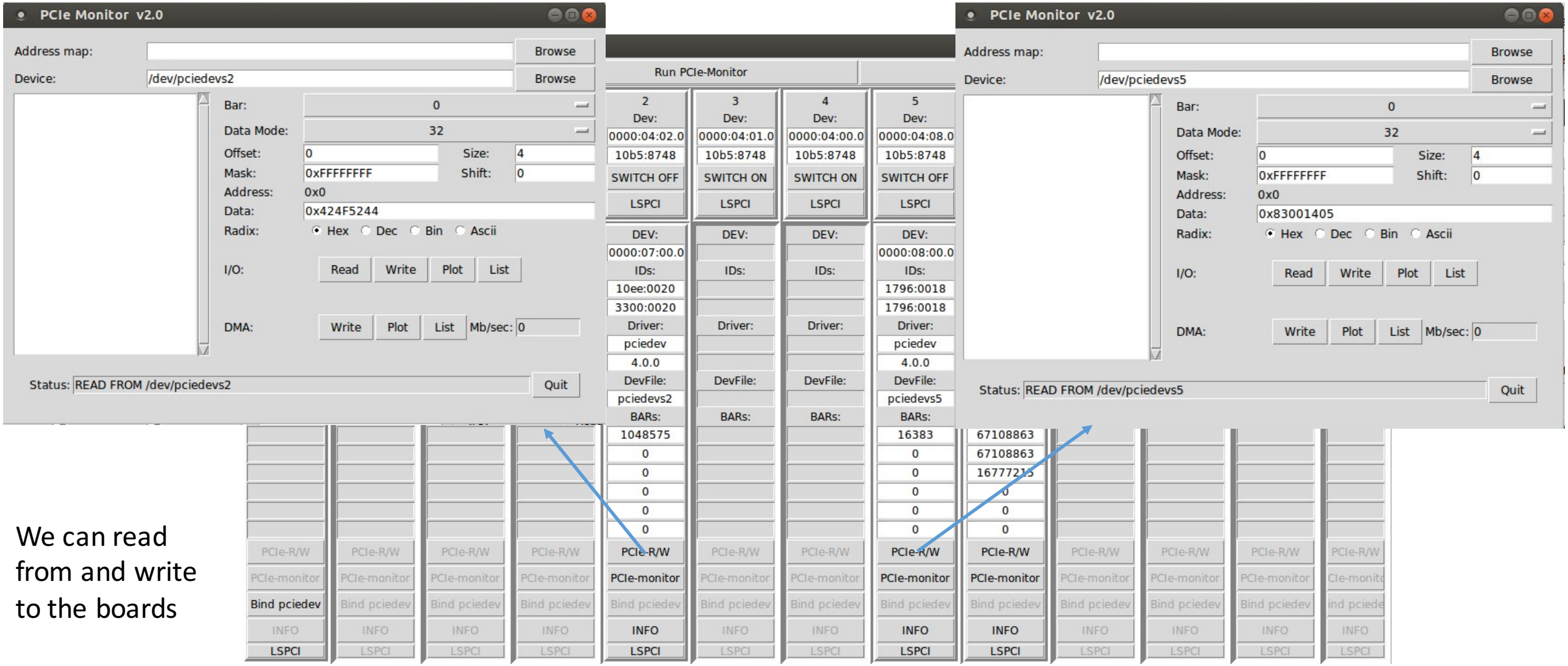


The Universal PCI Express Device Driver

pciedev driver attached to X2TIMER and SIS8300 boards



The Universal PCI Express Device Driver



We can read from and write to the boards

The Universal PCI Express Device Driver

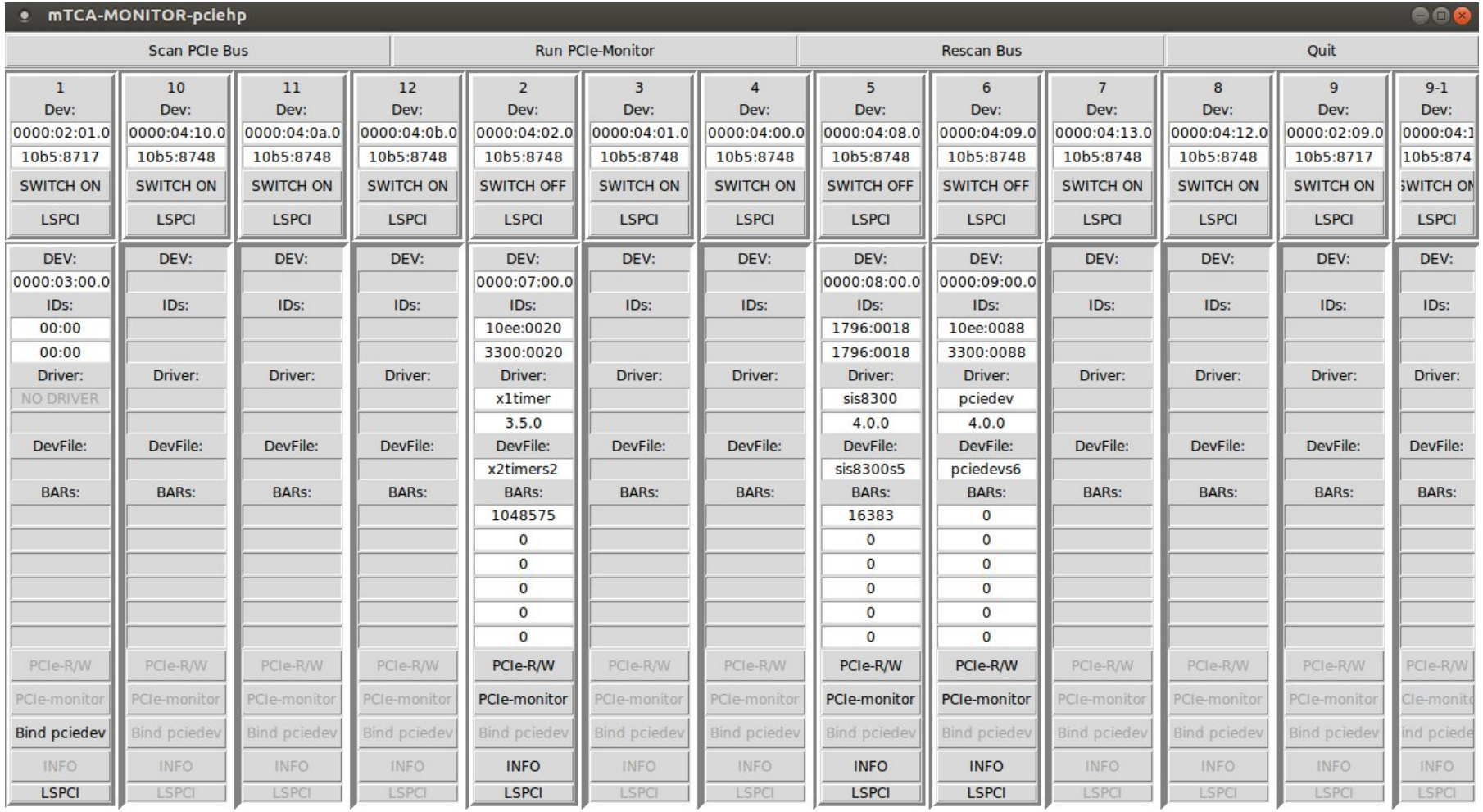
Custom drivers:

X1TIMER driver:
Separate driver created does not use the upciedev functionality but based on the upciedev API.

SIS8300 driver:
Based on the upciedev driver added only IOCTRL for DMA.

SIS8300 LCBPM project:
pciedev driver.

Three different boards, three Drivers one user application.



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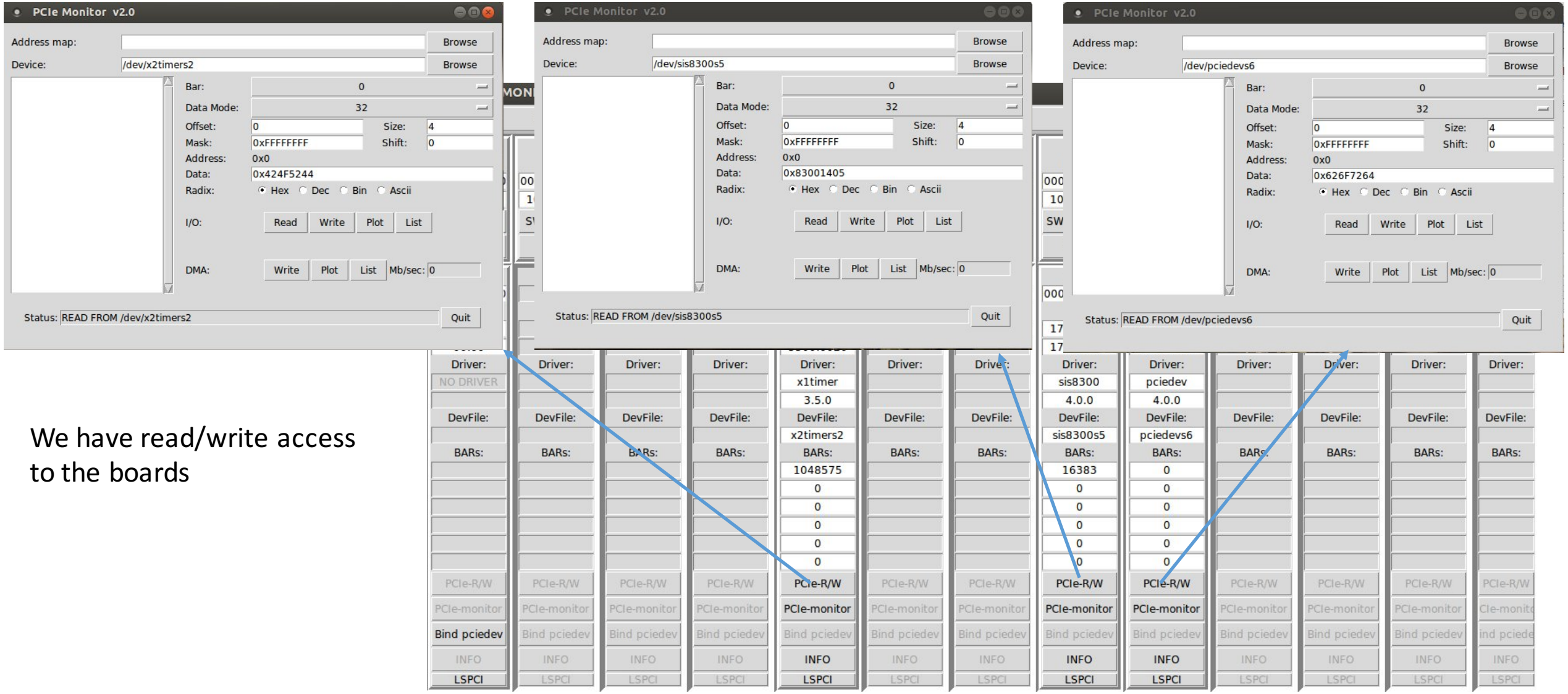
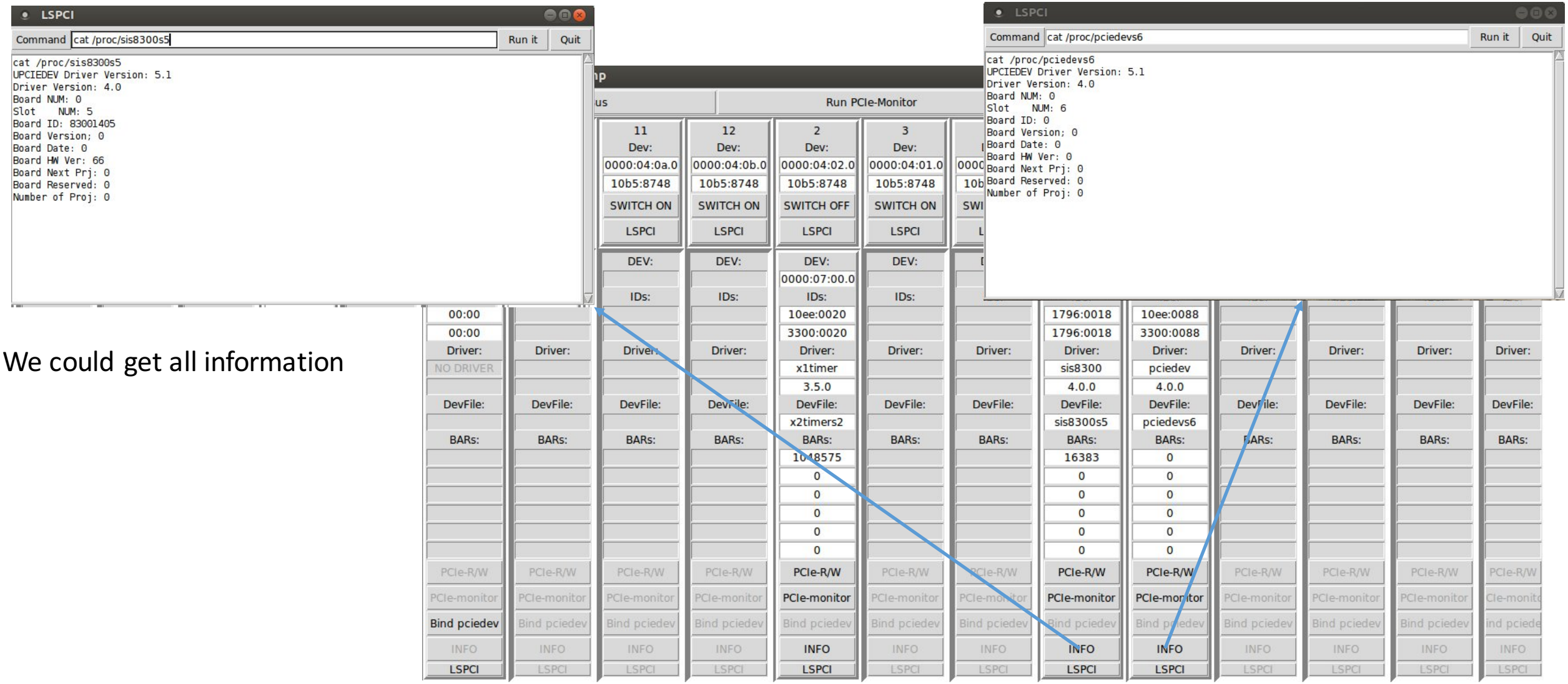


We have read/write access to the boards

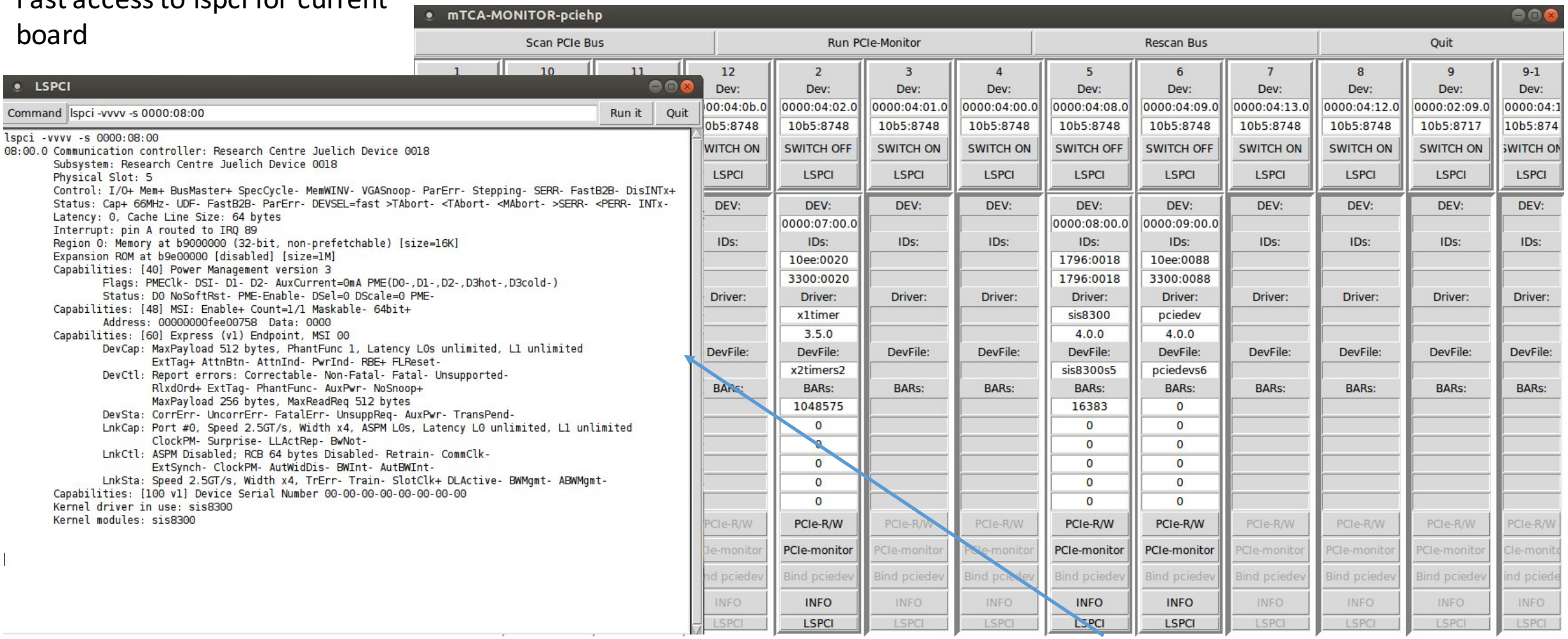
The Universal PCI Express Device Driver



We could get all information

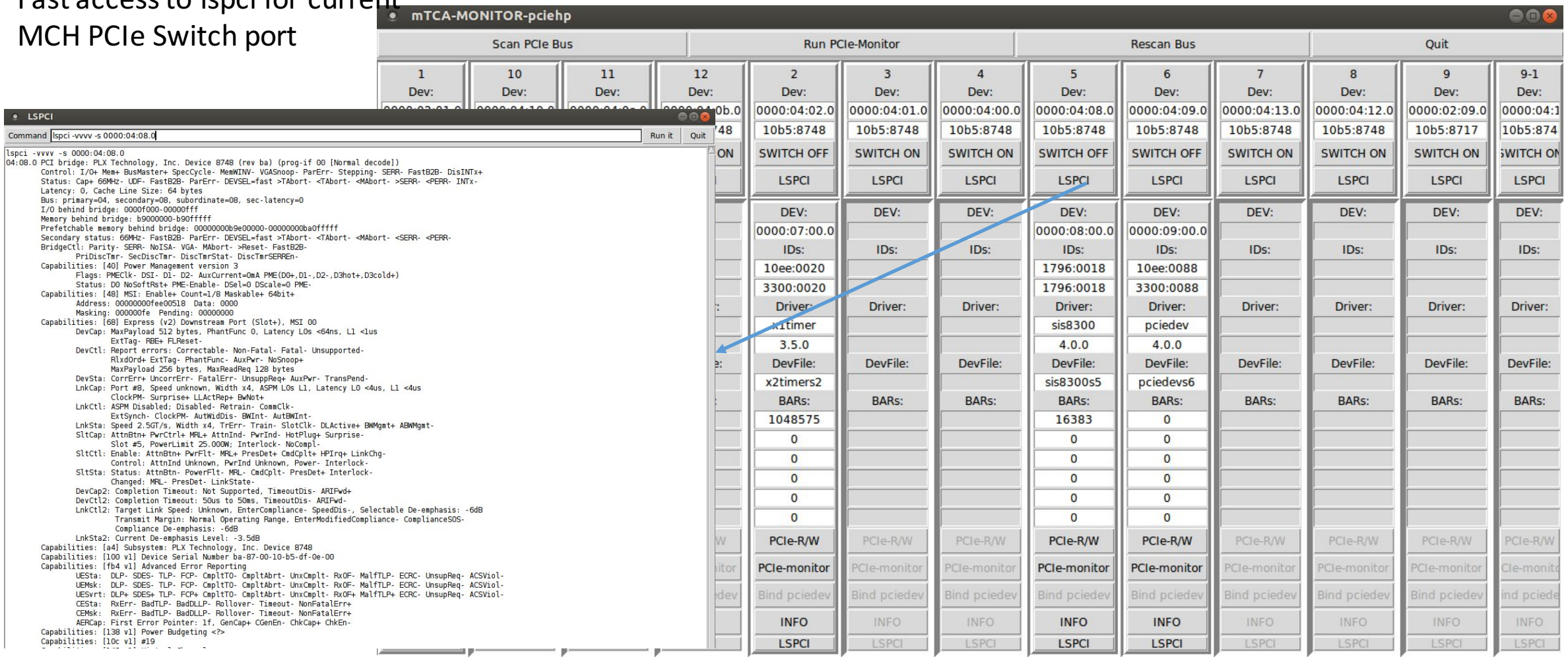
The Universal PCI Express Device Driver

Fast access to lspci for current board



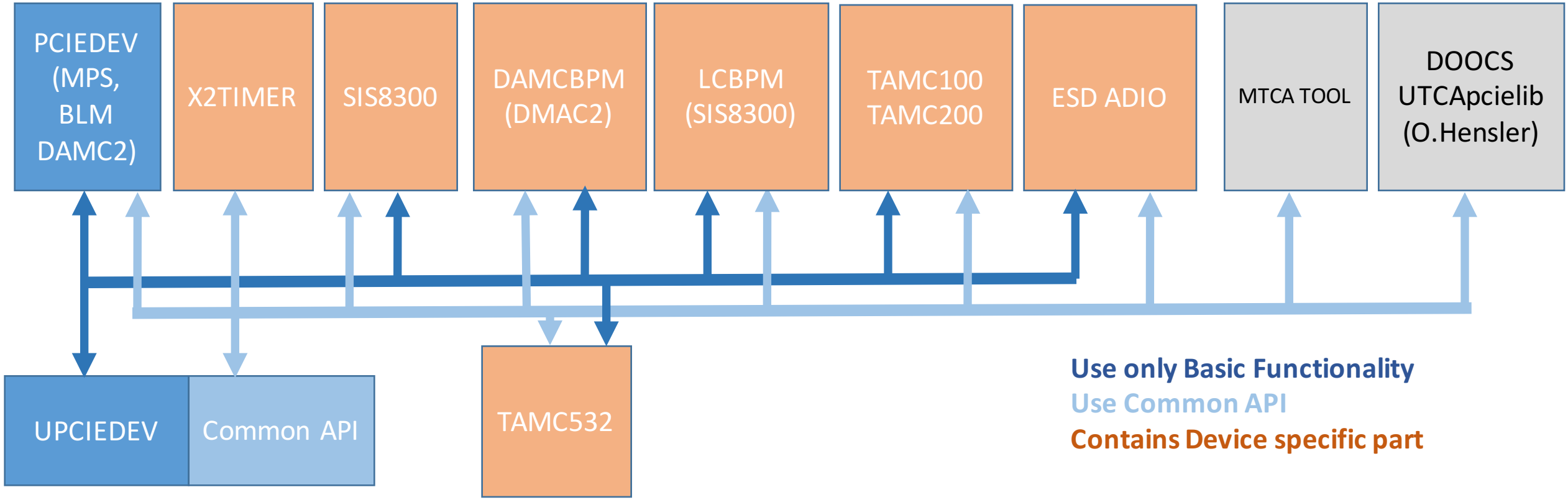
The Universal PCI Express Device Driver

Fast access to lspci for current MCH PCIe Switch port



Status

- this architecture was developed in DESY group MCS4 and till today with success is used
- the following drivers, tools and libraries are developed used



THANK YOU