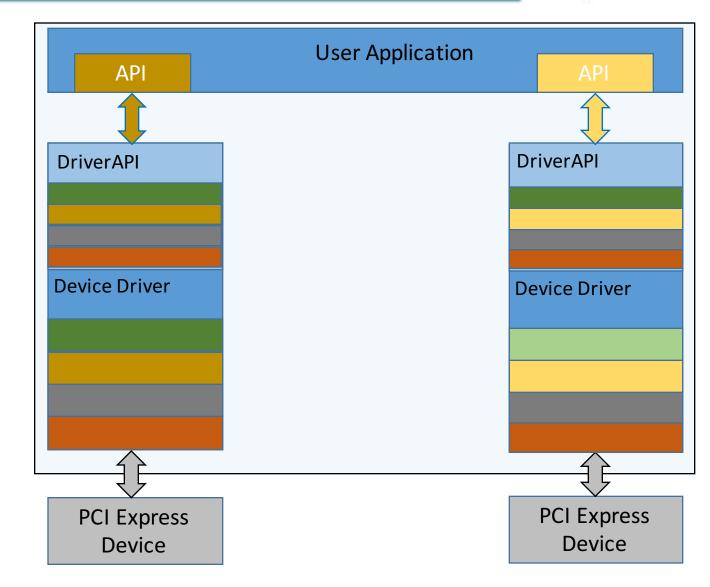
# The universal PCI Express Device Driver for MTCA.4

L.Petrosyan





- 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

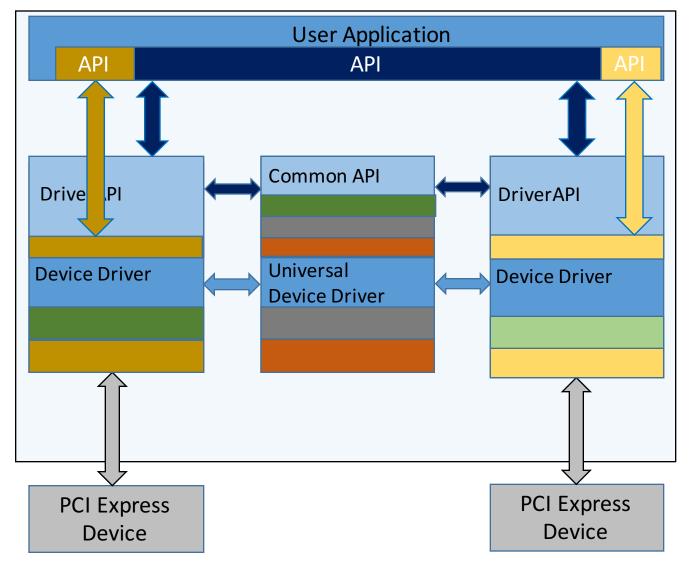








- Split Device Driver into two parts follow the Linux Device Driver stacking Model
- Add all common functionality and API into universal part
  - Basic PCI Express functionality
  - Standards or Guidlines functionalty
- Add Common API for Device specific functionality into universal part but keep functionality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





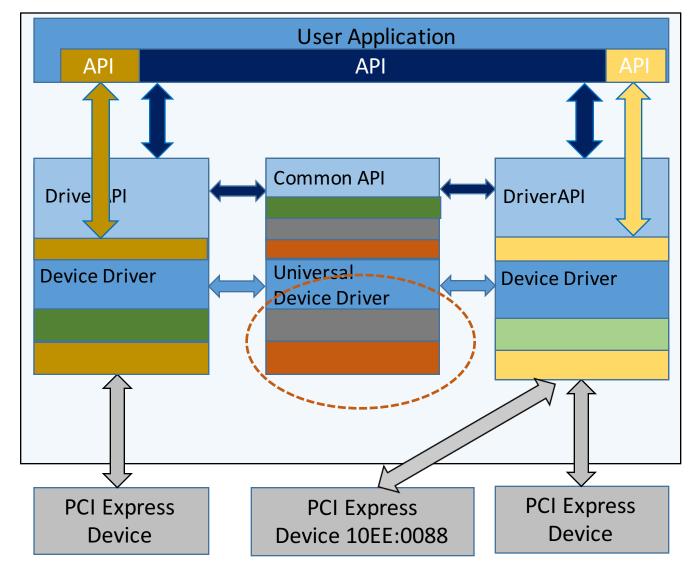




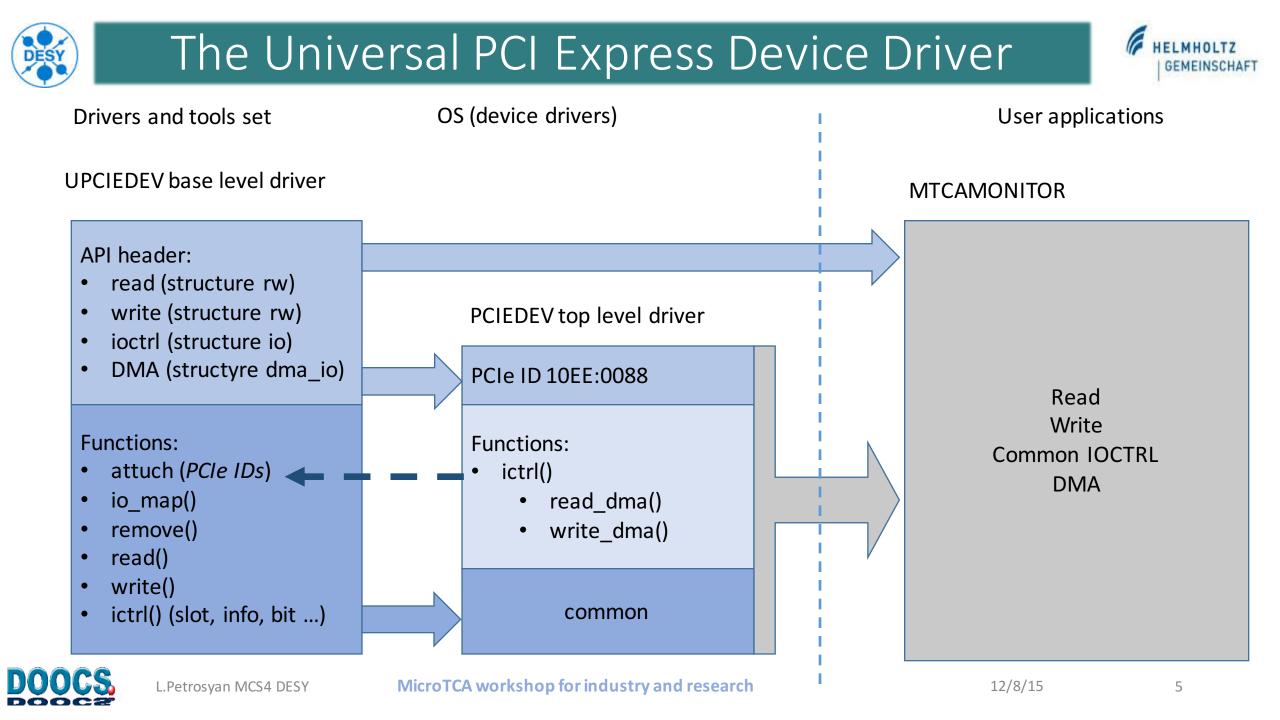
- this approach facilitates creation of new drivers and user applications
- The Device Driver created on the top of *universal* driver has all necessary PCI Express functionalty
- It could be binded to any PCI Express Device

#### echo "10EE:0088" > /sys/bus/devices/xxx/driver/new\_id

 facilitates integration of new devices into the existing software









**mTCA-MONITOR** 



#### MTCAMONITOR

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

| × _ □ [      |               |              |              |                  | MICA-MO      | NITOR        |              |              |              |              | Attached       | AIVIC(PCIe) bo            | ards   |
|--------------|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|---------------------------|--------|
|              | Scan PCIe Bus |              | R            | Run PCIe-Monitor |              |              | Rescan Bus   |              | Quit         |              |                | des read/write            |        |
| 10<br>Dev:   | 11<br>Dev:    | 12<br>Dev:   | 2<br>Dev:    | 3<br>Dev:        | 4<br>Dev:    | 5<br>Dev:    | 6<br>Dev:    | 7<br>Dev:    | 8<br>Dev:    | 9<br>Dev:    |                |                           |        |
| 0000:04:10.0 | 0000:04:0a.0  | 0000:04:0b.0 |              | 0000:04:01.0     | 0000:04:00.0 | 0000:04:08.0 | 0000:04:09.0 | 0000:04:13.0 |              | 0000:04:11.0 |                |                           |        |
| 10b5:8748    |               | 10b5:8748    | 10b5:8748    | 10b5:8748        | 10b5:8748    | 10b5:8748    | 10b5:8748    |              | 10b5:8748    |              |                |                           |        |
|              | 10b5:8748     |              |              |                  |              | 1            |              | 10b5:8748    |              | 10b5:8748    |                |                           |        |
| SWITCH ON    | SWITCH OFF    | SWITCH OFF   | SWITCH ON    | SWITCH ON        | SWITCH OFF   | SWITCH OFF   | SWITCH ON    | SWITCH OFF   | SWITCH ON    | SWITCH ON    |                |                           |        |
| DEV:         | DEV:          | DEV:         | DEV:         | DEV:             | DEV:         | DEV:         | DEV:         | DEV:         | DEV:         | PCIe Monit   | or v2.0        |                           | 00     |
|              | 0000:0a:00.0  | 0000:0c:04.0 |              |                  | 0000:05:00.0 | 0000:08:00.0 |              | 0000:10:00.0 |              |              |                |                           |        |
| IDs:         | IDs:          | IDs:         | IDs:         | IDs:             | IDs:         | IDs:         | IDs:         | IDs:         | IDs:         | Address map: |                |                           | Browse |
|              | 10ee:0020     | 10b5:9056    |              |                  | 1796:0018    | 10ee:0088    |              | 10ee:0088    |              | Device:      | /dev/damcbpms6 |                           | Browse |
|              | 3300:0020     | 12fe:0600    |              |                  | 1796:0018    | 3300:0088    |              | 3300:0088    |              |              | Bar:           | 0                         |        |
| Driver:      | Driver:       | Driver:      | Driver:      | Driver:          | Driver:      | Driver:      | Driver:      | Driver:      | Driver:      |              | Data Mode      | 32                        |        |
|              | x1timer       | NO DRIVER    |              |                  | sis8300      | pciedev      |              | pciedev      |              |              | Offset:        | 0 Size:                   | 4      |
|              | 1.8.0         |              |              |                  | 1.4.0        | 1.6.0        |              | 1.6.0        |              |              | Mask:          | 0xFFFFFFFF Shift:         | 0      |
| BARs:        | BARs:         | BARs:        | BARs:        | BARs:            | BARs:        | BARs:        | BARs:        | BARs:        | BARs:        |              | Address:       |                           | 1      |
|              | 16777215      | 511          |              |                  | 16383        | 67108863     |              | 67108863     |              |              | Data:          | 0×0                       |        |
|              | 0             | 255          |              |                  | 0            | 67108863     |              | 67108863     |              |              | Radix:         | 🔶 Hex 💠 Dec 💠 Bin 💠 Ascii |        |
|              | 0             | 65535        |              |                  | 0            | 16777215     |              | 16777215     |              |              | 1/0:           | Read Write Plot L         | ist    |
|              | 0             | 0            |              |                  | 0            | 0            |              | 0            |              |              |                |                           |        |
|              | 0             | 0            |              |                  | 0            | 0            |              | 0            |              |              | DMA:           | Write Plot List Mb/s      |        |
| PCIe-monitor | PCIe-monitor  | PCIe-monitor | PCIe-monitor | PCle-monitor     | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | P            |                |                           |        |
| Bind pciedev | Bind pciedev  | Bind pciedev | Bind pciedev | Bind pciedev     | Bind pciedev | Bind pciedev | Bind pciedev | Bind pciedev | Bind pciedev | Status: OK   |                |                           | Quit   |
| INFO         | INFO          | INFO         | INFO         | INFO             | INFO         | INFO         | INFO         | INFO         | INFO         |              |                |                           |        |
|              |               |              |              |                  |              |              |              |              |              |              |                |                           |        |





**X2TIMER MODULE** 

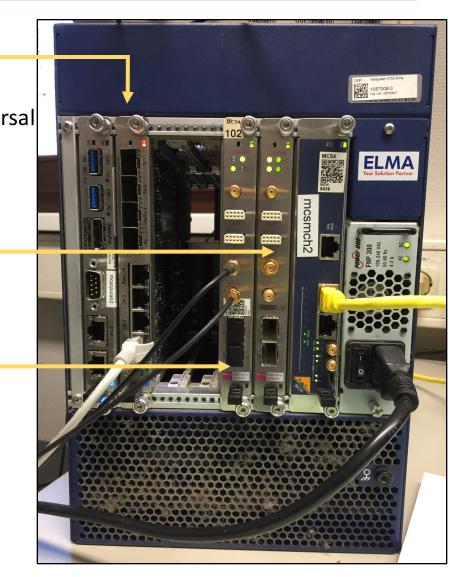
#### The Universal PCI Express Device Driver



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









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

|   | • mTCA-M             | ONITOR-pcieh | P            |              |                      |              |              |                      |                      |              |              |              |             |
|---|----------------------|--------------|--------------|--------------|----------------------|--------------|--------------|----------------------|----------------------|--------------|--------------|--------------|-------------|
|   |                      | Scan PCIe B  | us           |              | Run PC               | Cle-Monitor  |              |                      | Rescan Bus           |              |              | Quit         |             |
|   | 1<br>Dev:            | 10<br>Dev:   | 11<br>Dev:   | 12<br>Dev:   | 2<br>Dev:            | 3<br>Dev:    | 4<br>Dev:    | 5<br>Dev:            | 6<br>Dev:            | 7<br>Dev:    | 8<br>Dev:    | 9<br>Dev:    | 9-1<br>Dev: |
|   | 0000:02:01.0         | 0000:04:10.0 | 0000:04:0a.0 | 0000:04:0b.0 | 0000:04:02.0         | 0000:04:01.0 | 0000:04:00.0 | 0000:04:08.0         | 0000:04:09.0         | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 0000:04:1   |
|   | 10b5:8717            | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748            | 10b5:8748    | 10b5:8748    | 10b5:8748            | 10b5:8748            | 10b5:8748    | 10b5:8748    | 10b5:8717    | 10b5:874    |
| Μ | SWITCH ON            | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH OFF           | SWITCH ON    | SWITCH ON    | SWITCH OFF           | SWITCH OFF           | SWITCH ON    | SWITCH ON    | SWITCH ON    | WITCH ON    |
| v | LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI                | LSPCI        | LSPCI        | LSPCI                | LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI       |
| • | DEV:                 | DEV:         | DEV:         | DEV:         | DEV:                 | DEV:         | DEV:         | DEV:                 | DEV:                 | DEV:         | DEV:         | DEV:         | DEV:        |
|   | 0000:03:00.0<br>IDs: | IDs:         | IDs:         | IDs:         | 0000:07:00.0<br>IDs: | IDs:         | IDs:         | 0000:08:00.0<br>IDs: | 0000:09:00.0<br>IDs: | IDs:         | IDs:         | IDs:         | IDs:        |
|   | 00:00                | iDs:         | IDS:         | IDS:         | 10ee:0020            | iDs:         | iDs:         | 1796:0018            | 10ee:0088            | TDS:         | IDS:         | IDS:         | IDS:        |
|   | 00:00                |              |              |              | 3300:0020            |              |              | 1796:0018            | 3300:0088            |              |              |              |             |
|   | Driver:              | Driver:      | Driver:      | Driver:      | Driver:              | Driver:      | Driver:      | Driver:              | Driver:              | Driver:      | Driver:      | Driver:      | Driver:     |
|   | NO DRIVER            |              |              |              | NO DRIVER            |              |              | NO DRIVER            | pciedev              |              |              |              |             |
|   |                      |              |              |              |                      |              |              |                      | 4.0.0                |              |              |              |             |
|   | DevFile:             | DevFile:     | DevFile:     | DevFile:     | DevFile:             | DevFile:     | DevFile:     | DevFile:             | DevFile:             | DevFile:     | DevFile:     | DevFile:     | DevFile:    |
|   |                      |              |              |              |                      |              |              |                      | pciedevs6            |              |              |              |             |
|   | BARs:                | BARs:        | BARs:        | BARs:        | BARs:                | BARs:        | BARs:        | BARs:                | BARs:                | BARs:        | BARs:        | BARs:        | BARs:       |
|   |                      |              |              |              | 1048575              |              |              | 16383<br>0           | 67108863<br>67108863 |              |              |              |             |
|   |                      |              |              |              | 0                    |              |              | 0                    | 16777215             |              |              |              |             |
|   |                      |              |              |              | 0                    |              |              | 0                    | 0                    |              |              |              |             |
| h | ·                    |              |              |              | 0                    |              | ·            | 0                    | 0                    |              |              |              |             |
|   |                      |              |              |              | 0                    |              |              | 0                    | 0                    |              |              |              |             |
|   | PCIe-R/W             | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PCIe-R/W             | PCIe-R/W     | PCIe-R/W     | PCIe-R/W             | PCIe-R/W             | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PCIe-R/W    |
|   | PCIe-monitor         | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor         | PCIe-monitor | PCIe-monitor | PCIe-monitor         | PCIe-monitor         | PCIe-monitor | PCIe-monitor | PCIe-monitor | Cle-monito  |
| C | Bind pciedev         | Bind pciedev | Bind pciedev | Bind pciedev | Bind pciedev         | Bind pciedev | Bind pciedev | Bind pciedev         | Bind pciedev         | Bind pciedev | Bind pciedev | Bind pciedev | ind pciede  |
|   | INFO                 | INFO         | INFO         | INFO         | INFO                 | INFO         | INFO         | INFO                 | INFO                 | INFO         | INFO         | INFO         | INFO        |
|   | LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI                | LSPCI        | LSPCI        | LSPCI                | LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI       |







| Ma cap gat board                       | • mTCA-M     | mTCA-MONITOR-pciehp |              |              |              |              |              |              |                   |              |              |              | •••        |
|--|--------------|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------|--------------|--------------|--------------|------------|
| We can get board                       |              | Scan PCIe B         | us           |              | Run P        | Cle-Monitor  |              |              | Rescan Bus        |              |              | Quit         |            |
| information pushing "INFC              | 1            | 10                  | 11           | 12           | 2            | 3            | 4            | 5            | 6                 | 7            | 8            | 9            | 9-1        |
|  | Dev:         | Dev:                | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:              | Dev:         | Dev:         | Dev:         | Dev:       |
|  | 0000:02:01.0 | 0000:04:10.0        | 0000:04:0a.0 | 0000:04:0b.0 | 0000:04:02.0 | 0000:04:01.0 | 0000:04:00.0 | 0000:04:08.0 | 0000:04:09.0      | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 0000:04:1  |
|  | 10b5:8717    | 10b5:8748           | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748         | 10b5:8748    | 10b5:8748    | 10b5:8717    | 10b5:874   |
|  | SWITCH ON    | SWITCH ON           | SWITCH ON    | SWITCH ON    | SWITCH OFF   | SWITCH ON    | SWITCH ON    | SWITCH OFF   | SWITCH OFF        | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH ON  |
|  | I SPCI       | L SPCI              | I SPCI       | I SPCI       | LSPCI        | LSPCI        | LSPCI        | LSPCI        | LSPCI             | LSPCI        | LSPCI        | LSPCI        | LSPCI      |
| • LSPCI                                |              |                     |              |              |              |              | DEV:         | DEV:         | DEV:              | DEV:         | DEV:         | DEV:         | DEV:       |
| Command cat /proc/pciedevs6            |              |                     |              |              | Run it       | Quit         |              | 0000:08:00.0 | 0000:09:00.0      |              |              |              |            |
| command cat/proc/peledevid             |              |                     |              |              | Nullic       | Quit         | IDs:         | IDs:         | IDs:              | IDs:         | IDs:         | IDs:         | IDs:       |
| cat /proc/pciedevs6                    |              |                     |              |              |              | A            |              | 1796:0018    | 10ee:0088         |              |              |              |            |
| UPCIEDEV Driver Version: 5.1           |              |                     |              |              |              |              |              | 1796:0018    | 3300:0088         |              |              |              |            |
| Driver Version: 4.0                    |              |                     |              |              |              |              | Driver:      | Driver:      | Driver:           | Driver:      | Driver:      | Driver:      | Driver:    |
| Board NUM: 0                           |              |                     |              |              |              | -            |              | NO DRIVER    | pciedev           |              |              |              |            |
| Slot NUM: 6                            |              |                     |              |              |              |              | DevFile:     | DevFile:     | 4.0.0<br>DevFile: | DevFile:     | DevFile:     | DevFile:     | DevFile:   |
| Board ID: 2                            |              |                     |              |              |              |              | Devrile.     | Devrile.     | pciedevs6         | Devrile.     | Devrie.      | Devrile.     | Devrile.   |
| Board Version; 1000000                 |              |                     |              |              |              |              | BARs:        | BARs:        | BARs:             | BARs:        | BARs:        | BARs:        | BARs:      |
| Board Date: 20120224                   |              |                     |              |              |              | -            |              | 16383        | 67108863          |              |              |              |            |
| Board HW Ver: 1<br>Board Next Prj: 0   |              |                     |              |              |              |              |              | 0            | 67108863          |              |              |              |            |
| Board Reserved: 0                      |              |                     |              |              |              |              |              | 0            | 16777215          |              |              |              |            |
| Number of Proj: 1                      |              |                     |              |              |              |              |              | 0            | 0                 |              |              |              |            |
| Project ID: 1                          |              |                     |              |              |              |              |              | 0            | 0                 |              |              |              |            |
| Project ID: 1                          |              |                     |              |              |              |              |              | 0            | 0                 |              |              |              |            |
| Project Version: 1000000               |              |                     |              |              |              |              | PCto-R/W     | PCIe-R/W     | PCIe-R/W          | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PCle-R/W   |
| Project Date: 20120224                 |              |                     |              |              |              |              | PCIe-monitor | PCIe-monitor | PCIe-monitor      | PCIe-monitor | PCIe-monitor | PCIe-monitor | Cle-monito |
| Project Reserver: O<br>Project Next: O |              |                     |              |              |              |              | Bind pciedev | Bind pciede  | Bind pciedev      | Bind pciedev | Bind pciedev | Bind pciedev | ind pciede |
| in oper nover o                        |              |                     |              |              |              |              | INFO         | INFO         | INFO              | INFO         | INFO         | INFO         | INFO       |
|  |              |                     |              |              |              | 7            | LSPCI        | LSPCI        | LSPCI             | LSPCI        | LSPCI        | LSPCI        | LSPCI      |



9





| can road fro   | m and write                      | • mTCA-      | MONITOR-pciel | hp         |              |           |              |              |                      |                      |              |              |              | Θ   |
|----------------|----------------------------------|--------------|---------------|------------|--------------|-----------|--------------|--------------|----------------------|----------------------|--------------|--------------|--------------|-----|
|                | II and write                     |              | Scan PCIe B   | Bus        |              | Run PCI   | e-Monitor    |              |                      | Rescan Bus           |              |              | Quit         |     |
| oard           |                                  | 1<br>Dev:    | 10<br>Dev:    | 11<br>Dev: | 12<br>Dev:   | 2<br>Dev: | 3<br>Dev:    | 4<br>Dev:    | 5<br>Dev:            | 6<br>Dev:            | 7<br>Dev:    | 8<br>Dev:    | 9<br>Dev:    |     |
|                |                                  | 0000:02:01.0 |               |            | 0000:04:0b.0 |           | 0000:04:01.0 | 0000:04:00.0 |                      | 0000:04:09.0         | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 000 |
| PCIe Monito    | or v2.0                          |              |               |            |              | 00(       | 5:8748       | 10b5:8748    | 10b5:8748            | 10b5:8748            | 10b5:8748    | 10b5:8748    | 10b5:8717    | 10  |
|                |                                  |              |               |            |              |           | ICH ON       | SWITCH ON    | SWITCH OFF           | SWITCH OFF           | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWI |
| Address map:   |                                  |              |               |            |              | Browse    | SPCI         | LSPCI        | LSPCI                | LSPCI                | LSPCI        | LSPCI        | LSPCI        | L   |
| Device:        | /dev/pciedevs6                   |              |               |            |              | Browse    | DEV:         | DEV:         | DEV:                 | DEV:                 | DEV:         | DEV:         | DEV:         |     |
|                |                                  |              |               |            |              |           | Ds:          | IDs:         | 0000:08:00.0<br>IDs: | 0000:09:00.0<br>IDs: | IDs:         | IDs:         | IDs:         |     |
|                | Ba                               | ir:          |               | 0          | <i>k</i>     |           |              |              | 1796:0018            | 10ee:0088            | 103.         | 105.         | 105.         |     |
|                | Da                               | ata Mode:    |               | 32         | 2            | _         | (   ·        |              | 1796:0018            | 3300:0088            |              |              |              |     |
|                |                                  |              |               | 4          | -river:      | Driver:   | Driver:      | Driver:      | Driver:              | Driver:              | Driver:      | C            |              |     |
|                |                                  |              |               |            |              |           |              | NO DRIVER    | pciedev              |                      |              |              | _            |     |
|                | Ma                               | ask:         | 0xFFFFFFFF    |            | Shift:       | 0         | vFile:       | DevFile:     | DevFile:             | 4.0.0<br>DevFile:    | DevFile:     | DevFile:     | DevFile:     | De  |
|                | Ad                               | dress:       | 0x0           |            |              |           | -            | Devrae.      | Devr ne.             | pciedevs6            | Devrie.      | Devrine.     | Devrie.      |     |
|                | Da                               | ata:         | 0x626F726     | 4          |              |           | ARs:         | BARs:        | BARs:                | BARs:                | BARs:        | BARs:        | BARs:        | E   |
|                | Ra                               | dix:         | • Hex         | Dec O Bir  | Ascii        |           |              |              | 16383                | 67108863             |              |              |              |     |
|                |                                  |              |               |            |              |           |              |              | 0                    | 67108863             |              |              |              |     |
|                |                                  |              | Deed          | 14fuites   | 0            |           |              |              | 0                    | 16777215<br>0        |              |              |              | -   |
|                | 1/0                              | ):           | Read          | Write      | Plot List    |           |              |              | 0                    | 0                    |              |              |              | -   |
|                |                                  |              |               |            |              |           |              |              | 0                    | 0                    |              |              |              |     |
|                |                                  |              |               | [ [ .      |              | -         | e-R/W        | PCIe-R/W     | PCIe-R/W             | Fcie-R/W             | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PC  |
|                | DN                               | MA:          | Write         | Plot L     | ist Mb/sec   | : 0       | monitor      | PCie-monitor | PCIe-monitor         | PCIe-monitor         | PCIe-monitor | PCIe-monitor | PCIe-monitor | Cle |
|                | N.I.                             |              |               |            |              |           | pciedev      | Bind pciedev | Bind pciedev         | Bind pciedev         | Bind pciedev | Bind pciedev | Bind pciedev | ind |
|                |                                  |              |               |            |              |           | NFO          | INFO         | INFO                 | INFO                 | INFO         | INFO         | INFO         | 1   |
| Status: READ F | Status: READ FROM /dev/pciedevs6 |              |               |            | Quit         | SPCI      | LSPCI        | LSPCI        | LSPCI                | LSPCI                | LSPCI        | LSPCI        | L            |     |



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mTCA-MONITOR-prieho



#### pciedev driver attached to X2TIMER and SIS8300 boards

|                      | Scan PCIe B  | us           |              | Run PC             | Cle-Monitor  |              |                    | Rescan Bus         |              |              | Quit         |           |
|----------------------|--------------|--------------|--------------|--------------------|--------------|--------------|--------------------|--------------------|--------------|--------------|--------------|-----------|
| 1                    | 10           | 11           | 12           | 2                  | 3            | 4            | 5                  | 6                  | 7            | 8            | 9            | 9-1       |
| Dev:                 | Dev:         | Dev:         | Dev:         | Dev:               | Dev:         | Dev:         | Dev:               | Dev:               | Dev:         | Dev:         | Dev:         | Dev:      |
| 0000:02:01.0         | 0000:04:10.0 | 0000:04:0a.0 | 0000:04:0b.0 | 0000:04:02.0       | 0000:04:01.0 | 0000:04:00.0 | 0000:04:08.0       | 0000:04:09.0       | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 0000:04:  |
| 10b5:8717            | 10b5:8748    | 10b5:8748    | 10b5:8748    | 10b5:8748          | 10b5:8748    | 10b5:8748    | 10b5:8748          | 10b5:8748          | 10b5:8748    | 10b5:8748    | 10b5:8717    | 10b5:874  |
| SWITCH ON            | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH OFF         | SWITCH ON    | SWITCH ON    | SWITCH OFF         | SWITCH OFF         | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH O  |
| LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI              | LSPCI        | LSPCI        | LSPCI              | LSPCI              | LSPCI        | LSPCI        | LSPCI        | LSPCI     |
| DEV:                 | DEV:         | DEV:         | DEV:         | DEV:               | DEV:         | DEV:         | DEV:               | DEV:               | DEV:         | DEV:         | DEV:         | DEV:      |
| 0000:03:00.0         |              |              |              | 0000:07:00.0       |              |              | 0000:08:00.0       | 0000:09:00.0       |              |              |              |           |
| IDs:                 | IDs:         | IDs:         | IDs:         | IDs:               | IDs:         | IDs:         | IDs:               | IDs:               | IDs:         | IDs:         | IDs:         | IDs:      |
| 00:00                |              |              |              | 10ee:0020          |              |              | 1796:0018          | 10ee:0088          |              |              |              |           |
| 00:00                | Driver       | Driver       | Driver       | 3300:0020          | Driver       | D. i         | 1796:0018          | 3300:0088          | Driver       | Driver       | Driver       | Driver    |
| Driver:<br>NO DRIVER | Driver:      | Driver:      | Driver:      | Driver:<br>pciedev | Driver:      | Driver:      | Driver:<br>pciedev | Driver:<br>pciedev | Driver:      | Driver:      | Driver:      | Driver:   |
| NO DRIVER            |              |              |              | 4.0.0              |              |              | 4.0.0              | 4.0.0              |              |              |              |           |
| DevFile:             | DevFile:     | DevFile:     | DevFile:     | DevFile:           | DevFile:     | DevFile:     | DevFile:           | DevFile:           | DevFile:     | DevFile:     | DevFile:     | DevFile:  |
|                      |              |              |              | pciedevs2          |              |              | pciedevs5          | pciedevs6          |              |              |              |           |
| BARs:                | BARs:        | BARs:        | BARs:        | BARs:              | BARs:        | BARs:        | BARs:              | BARs:              | BARs:        | BARs:        | BARs:        | BARs:     |
|                      |              |              |              | 1048575            |              |              | 16383              | 67108863           |              |              |              |           |
|                      |              |              |              | 0                  |              |              | 0                  | 67108863           |              |              |              |           |
|                      |              |              |              | 0                  |              |              | 0                  | 16777215           |              |              |              |           |
|                      |              |              |              | 0                  |              |              | 0                  | 0                  |              |              |              |           |
|                      |              |              |              | 0                  |              |              | 0                  | 0                  |              |              |              |           |
|                      |              |              |              | 0                  |              |              | 0                  | 0                  |              |              |              |           |
| PCIe-R/W             | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PCIe-R/W           | PCIe-R/W     | PCIe-R/W     | PCIe-R/W           | PCIe-R/W           | PCIe-R/W     | PCIe-R/W     | PCIe-R/W     | PCIe-R/W  |
| PCIe-monitor         | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor       | PCIe-monitor | PCIe-monitor | PCIe-monitor       | PCIe-monitor       | PCIe-monitor | PCIe-monitor | PCIe-monitor | Cle-monit |
| Bind pciedev         | Bind pciedev | Bind pciedev | Bind pciedev | Bind pciedev       | Bind pciedev | Bind pciedev | Bind pciedev       | Bind pciedev       | Bind pciedev | Bind pciedev | Bind pciedev | ind pcied |
| INFO                 | INFO         | INFO         | INFO         | INFO               | INFO         | INFO         | INFO               | INFO               | INFO         | INFO         | INFO         | INFO      |
| LSPCI                | LSPCI        | LSPCI        | LSPCI        | LSPCI              | LSPCI        | LSPCI        | LSPCI              | LSPCI              | LSPCI        | LSPCI        | LSPCI        | LSPCI     |



11





| • PCIe Monitor   | PCIe Monitor v2.0 |   |              |                  |              |                       |                      |                      |                      | PCIe Mo      | nitor v2.0     |                                       |              |            |             |        |
|------------------|-------------------|---|--------------|------------------|--------------|-----------------------|----------------------|----------------------|----------------------|--------------|----------------|---------------------------------------|--------------|------------|-------------|--------|
| Address map:     |                   |   |              |                  | Browse       |                       |                      |                      |                      | Address map: |                |                                       |              |            | -           | Browse |
| Device:          | /dev/pciedevs2    |   |              |                  | Browse       | Run P                 | Cle-Monitor          |                      |                      | Device:      | /dev/pd        | ciedevs5                              |              |            |             | Browse |
|                  | Ba                | r:  |              | 0                |              | 2                     | 3                    | 4                    | 5                    |              |                | Bar:                                  |              | 0          |             |        |
|                  | Da                | ta Mode:  |              | 32               | _            | Dev:<br>0000:04:02.0  | Dev:<br>0000:04:01.0 | Dev:<br>0000:04:00.0 | Dev:<br>0000:04:08.0 |              |                | Data Mod                              | e:           | 32         | 2           | -      |
|                  | Off               | fset: 0   |              | Size:            | 4            | 10b5:8748             | 10b5:8748            | 10b5:8748            | 10b5:8748            |              |                | Offset:                               | 0            |            | Size:       | 4      |
|                  | Ma                | la de la companya de  | FFFFFFF      | Shift:           | 0            | SWITCH OFF            | SWITCH ON            | SWITCH ON            | SWITCH OFF           |              |                | Mask:                                 | 0xFFFFFFF    | F          | Shift:      | 0      |
|                  |                   | dress: 0x0  |              |                  |              | LSPCI                 | LSPCI                | LSPCI                | LSPCI                |              |                | Address:                              | 0x0          |            |             |        |
|                  | Da                | and the second se | 424F5244     | <b>D</b> I- C •" |              |                       |                      |                      |                      |              |                | Data:                                 | 0x830014     |            |             |        |
|                  | Ra                | dix: •  | Hex O Dec O  | Bin C Ascii      |              | DEV:                  | DEV:                 | DEV:                 | DEV:                 |              |                | Radix:                                | • Hex        | Dec 🔿 Bir  | Ascii       |        |
|                  | 1/0               |   | Read Write   | Plot List        | 1            | 0000:07:00.0<br>IDs:  | IDs:                 | IDs:                 | 0000:08:00.0<br>IDs: |              |                | 10                                    | Band         |            |             | 1      |
|                  | .,.               | •   | White        |                  |              | 10ee:0020             | 103.                 | TDS.                 | 1796:0018            |              |                | I/O:                                  | Read         | Write      | Plot List   |        |
|                  |                   |   |              |                  |              | 3300:0020             |                      |                      | 1796:0018            |              |                |                                       |              |            |             |        |
|                  | DM                | 1A:   | Write Plot   | List Mb/sec      | : 0          | Driver:               | Driver:              | Driver:              | Driver:              |              |                | DMA:                                  | Write        | Plot L     | ist Mb/sec: | 0      |
|                  |                   | -   |              |                  |              | pciedev               |                      |                      | pciedev              |              |                |                                       |              |            |             |        |
|                  |                   |   |              |                  | -            | 4.0.0                 | DevFile:             | DevFile:             | 4.0.0<br>DevFile:    |              |                | p.e.                                  |              |            |             |        |
| Status: READ FRO | OM /dev/pciedevs2 |   |              |                  | Quit         | DevFile:<br>pciedevs2 | DevFile:             | DevFile:             | pciedevs5            | Status: REA  | D FROM /dev/pc | iedevs5                               |              |            |             | Quit   |
|                  |                   |   |              |                  |              | BARs:                 | BARs:                | BARs:                | BARs:                |              |                |                                       |              |            |             |        |
|                  |                   |   |              |                  |              | 1048575               |                      |                      | 16383                | 67108863     |                |                                       |              |            |             |        |
|                  |                   |   |              |                  |              | 0                     |                      |                      | 0                    | 67108863     |                |                                       |              |            |             |        |
|                  |                   |   |              |                  |              | 0                     |                      |                      | 0                    | 16777215     |                |                                       |              |            |             |        |
|                  |                   |   |              |                  |              | 0                     |                      | ļ                    | 0                    | 0            |                | · · · · · · · · · · · · · · · · · · · |              |            |             |        |
| \                |                   |   |              |                  |              | 0                     |                      |                      | 0                    | 0            |                |                                       |              |            |             |        |
| We can re        | ead               | PCIe-R/W  | PCIe-R/W     | PCIe-R/W         | PCIe-R/W     | PCIE-R/W              | PCIe-R/W             | PCIe-R/W             | PCIe-R/W             | PCIe-R/W     | PCIe-R/W       | PCIe-R/W                              | PCIe-R/W     | PCIe-R/W   |             |        |
| from and         | write             | PCIe-monitor  | PCIe-monitor | PCIe-monitor     | PCIe-monitor | PCIe-monitor          | PCIe-monitor         | PCIe-monitor         | PCIe-monitor         | PCIe-monitor | PCIe-monitor   | PCIe-monitor                          | PCIe-monitor | Cle-monito |             |        |
| to the boa       | arda              | Bind pciedev  | Bind pciedev | Bind pciedev     | Bind pciedev | Bind pciedev          | Bind pciedev         | Bind pciedev         | Bind pciedev         | Bind pciedev | Bind pciedev   | Bind pciedev                          | Bind pciedev | ind pciede |             |        |
|                  | arus              | INFO  | INFO         | INFO             | INFO         | INFO                  | INFO                 | INFO                 | INFO                 | INFO         | INFO           | INFO                                  | INFO         | INFO       |             |        |
|                  |                   | LSPCI   | LSPCI        | LSPCI            | LSPCI        | LSPCI                 | LSPCI                | LSPCI                | LSPCI                | LSPCI        | LSPCI          | LSPCI                                 | LSPCI        | LSPCI      |             |        |







#### 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.

|              | Scan PCIe B  | IS           |              | Run PC       | Cle-Monitor  |              |              | Rescan Bus   |              |              | Quit         |         |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|              |              | (            |              |              |              |              | 1            |              |              |              |              | T       |
| 1            | 10           | 11           | 12           | 2            | 3            | 4            | 5            | 6            | 7            | 8            | 9            | 9-1     |
| Dev:         | Dev:    |
| 0000:02:01.0 | 0000:04:10.0 | 0000:04:0a.0 | 0000:04:0b.0 | 0000:04:02.0 | 0000:04:01.0 | 0000:04:00.0 | 0000:04:08.0 | 0000:04:09.0 | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 0:0000  |
| 10b5:8717    | 10b5:8748    | 10b5:8717    | 10b5:8  |
| SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH OFF   | SWITCH ON    | SWITCH ON    | SWITCH OFF   | SWITCH OFF   | SWITCH ON    | SWITCH ON    | SWITCH ON    | SWITCH  |
| LSPCI        | LSPC    |
| DEV:         | DEV     |
| 0000:03:00.0 |              |              |              | 0000:07:00.0 |              |              | 0.00:08:00.0 | 0000:09:00.0 |              |              |              |         |
| IDs:         | IDs:    |
| 00:00        |              |              |              | 10ee:0020    |              |              | 1796:0018    | 10ee:0088    |              |              |              |         |
| 00:00        |              |              |              | 3300:0020    |              |              | 1796:0018    | 3300:0088    |              |              |              |         |
| Driver:      | Drive   |
| NO DRIVER    |              |              |              | x1timer      |              |              | sis8300      | pciedev      |              |              |              |         |
|              |              |              |              | 3.5.0        |              |              | 4.0.0        | 4.0.0        |              |              |              |         |
| DevFile:     | DevFi   |
|              |              |              |              | x2timers2    |              |              | sis8300s5    | pciedevs6    |              |              |              |         |
| BARs:        | BAR     |
|              |              |              |              | 1048575      |              |              | 16383        | 0            |              |              |              | -       |
|              |              |              |              | 0            |              |              | 0            | 0            |              |              |              |         |
|              |              |              |              | 0            |              |              | 0            | 0            |              |              |              |         |
|              |              |              |              | 0            |              |              | 0            | 0            |              |              |              | -       |
|              |              |              |              | 0            |              |              | 0            | 0            |              |              |              |         |
| PCIe-R/W     | PCIe-R  |
| PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCle-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | PCIe-monitor | Cle-mo  |
| Bind pciedev | ind pci |
| INFO         | INFO    |
| LSPCI        | LSPC    |







| PCIe Monitor      | v2.0              |                 |   | 008          | • PCle       | Monitor v2.0       |                 |                   |                | 008           | • PCIe            | Monitor v2.0      |              |              |                  | 000        |
|-------------------|-------------------|-----------------|---|--------------|--------------|--------------------|-----------------|-------------------|----------------|---------------|-------------------|-------------------|--------------|--------------|------------------|------------|
| Address map:      |                   |                 |   | Browse       | Address ma   | ap:                |                 |                   |                | Browse        | Address m         | iap:              |              |              |                  | Browse     |
| Device:           | /dev/x2timers     | 2               |   | Browse       | Device:      | /dev/si            | s8300s5         |                   |                | Browse        | Device:           |                   | pciedevs6    |              |                  | Browse     |
|                   | E                 | Bar:            | 0   | _            | ION          |                    | Bar:            |                   | 0              | -             |                   |                   | Bar:         |              | 0                |            |
|                   | 0                 | Data Mode:      | 32  | _            |              |                    | Data Mode:      |                   | 32             |               |                   |                   | Data Mode    | :            | 32               | _          |
|                   | 0                 | Offset:         | 0 Size:   | 4            |              |                    | Offset:         | 0                 | Size:          | 4             |                   |                   | Offset:      | 0            | Size:            | 4          |
|                   | S                 | Mask:           | And the second | 0            | Î 🗌          |                    | Mask:           | 0xFFFFFFFF        | Shift:         | 0             |                   |                   | Mask:        | 0xFFFFFFFF   | Shift:           | 0          |
|                   |                   | Address:        | 0x0   |              |              |                    | Address:        | 0x0               |                |               |                   |                   | Address:     | 0x0          |                  |            |
|                   |                   | Data:<br>Radix: | 0x424F5244  |              | 00           |                    | Data:<br>Radix: | 0x83001405        | C Bin C Ascii  |               | 000               |                   | Data:        | 0x626F7264   |                  |            |
|                   |                   | duix.           | Hex Dec Dill Asci   |              | 1            |                    | Naux.           | inex in Dec       | - Dill Asci    |               | 10                |                   | Radix:       | • Hex 🔿 De   | ec O Bin O Ascii |            |
|                   | 1,                | /O:             | Read Write Plot List  |              | 51           |                    | I/O:            | Read W            | rite Plot Lis  | t             | SW                |                   | I/O:         | Read         | Write Plot L     | ist        |
|                   |                   | DMA:            | Write Plot List Mb/sec  | : 0          |              |                    | DMA:            | Write Pl          | ot List Mb/see | ::   <b>0</b> | 000               |                   | DMA:         | Write        | Plot List Mb/s   | ec: 0      |
| Status: READ ERO  | OM /dev/x2timers2 | ,               |   | Quit         | Status:      | READ FROM /dev/sis | 58300s5         |                   |                | Quit          | Chatura           | READ FROM /dev/   | sideuse      |              |                  | Quit       |
| Status. news rite |                   |                 |   | Quit         |              |                    |                 |                   |                |               | 17                | READ FROM /dev/   | pciedevso    |              |                  | Quit       |
|                   |                   |                 |   |              |              |                    | -               |                   |                |               | 17                |                   |              |              |                  |            |
|                   |                   |                 |   | Driver:      | Driver:      | Driver:            | Driver:         | Driver:           | Driver:        | Drive:        | Driver:           | Driver:           | Driver:      | Driver:      | Driver:          | Driver:    |
|                   |                   |                 |   | NO DRIVER    |              |                    |                 | x1timer           |                |               | sis8300           | pciedev           |              |              |                  |            |
|                   |                   |                 |   | DevFile:     | DevFile:     | DevFile:           | DevFile:        | 3.5.0<br>DevFile: | DevFile:       | DevFile:      | 4.0.0<br>DevFile: | 4.0.0<br>DevFile: | DevFile:     | DevFile:     | DevFile:         | DevFile:   |
| W/o ha            | vo roac           | 1/writ          | te access   | Devrile.     | Devrile.     | Devrine.           | Devrine.        | x2timers2         | Devrine.       | Devrile.      | sis8300s5         | pciedevs6         | Devrine.     | Devrile.     | Devrile.         | Devrile.   |
| vvena             | vereau            | 1/ VV I I       | le alless   | BARs:        | BARs:        | BARs:              | BARs:           | BARs:             | BARs:          | BARs:         | BARs:             | BARs:             | BARs.        | BARs:        | BARs:            | BARs:      |
| to the            | boards            |                 |   |              |              |                    |                 | 1048575           |                |               | 16383             | 0                 |              |              |                  |            |
|                   | bounds            |                 |   |              |              |                    |                 | 0                 |                |               | 0                 | 0                 |              |              |                  |            |
|                   |                   |                 |   |              |              |                    |                 | 0                 |                |               | 0                 | 0                 |              |              |                  |            |
|                   |                   |                 |   |              |              |                    |                 | 0                 |                |               | 0                 | 0                 |              |              |                  |            |
|                   |                   |                 |   |              |              |                    |                 | 0                 |                |               | 0                 | 0                 |              |              |                  |            |
|                   |                   |                 |   |              |              |                    |                 | 0                 |                |               | 0                 | 0                 |              |              |                  |            |
|                   |                   |                 |   | PCIe-R/W     | PCIe-R/W     | PCIe-R/W           | PCIe-R/W        | PCie-R/W          | PCIe-R/W       | PCIe-R/W      | PCIe-R/W          | PCIe-R/W          | PCIe-R/W     | PCIe-R/W     | PCIe-R/W         | PCIe-R/W   |
|                   |                   |                 |   | PCIe-monitor | PCIe-monitor | PCIe-monitor       | PCIe-monitor    | PCIe-monitor      | PCIe-monitor   | PCIe-monitor  | PCIe-monitor      | PCIe-monitor      | PCIe-monitor | PCIe-monitor | PCIe-monitor     | Cle-monito |
|                   |                   |                 |   | Bind pciedev | Bind pciedev | Bind pciedev       | Bind pciedev    | Bind pciedev      | Bind pciedev   | Bind pciedev  | Bind pciedev      | Bind pciedev      | Bind pciedev | Bind pciedev | Bind pciedev     | ind pciede |
|                   |                   |                 |   | INFO         | INFO         | INFO               | INFO            | INFO              | INFO           | INFO          | INFO              | INFO              | INFO         | INFO         | INFO             | INFO       |
|                   |                   |                 |   | LSPCI        | LSPCI        | LSPCI              | LSPCI           | LSPCI             | LSPCI          | LSPCI         | LSPCI             | LSPCI             | LSPCI        | LSPCI        | LSPCI            | LSPCI      |







| LSPCI Command cat /proc/sis8300s5  |  | Run it Quit              |  |  |  |   | LSP Comman  | cat /proc/pciede                                | 2V56   |                          |                          |                          | Run it Quit       |
|--|--|--------------------------|--|--|--|---|---|---|--|--------------------------|--------------------------|--------------------------|-------------------|
| cat /proc/sis8300s5<br>UPCIEDEV Driver Version: 5.1<br>Driver Version: 4.0<br>Board NUM: 0<br>Slot NUM: 5                                  |  |                          | 1p<br>us   |  | Run P  | Cle-Monitor   | cat /proc<br>UPCIEDEV<br>Driver Ve<br>Board NUM                                       | c/pciedevs6<br>Driver Version:<br>ersion: 4.0   |  |                          |                          |                          |                   |
| Board ID: 83001405<br>Board Version; 0<br>Board Date: 0<br>Board HW Ver: 66<br>Board Next Prj: 0<br>Board Reserved: 0<br>Number of Proj: 0 |  |                          | 11<br>Dev:<br>0000:04:0a.0<br>10b5:8748<br>SWITCH ON | 12<br>Dev:<br>0000:04:0b.0<br>10b5:8748<br>SWITCH ON | 2<br>Dev:<br>0000:04:02.0<br>10b5:8748<br>SWITCH OFF | 3<br>Dev:<br>0000:04:01.0<br>10b5:8748<br>SWITCH ON | Board ID:<br>Board Ver<br>Board Dat<br>Board HW<br>0000<br>Board Nei<br>10b Board Res | : 0<br>rsion; 0<br>te: 0<br>Ver: 0<br>xt Pri: 0 |  |                          |                          |                          |                   |
|  |  |                          | LSPCI<br>DEV:  | LSPCI<br>DEV:<br>IDs:                                | LSPCI<br>DEV:<br>0000:07:00.0<br>IDs:                | LSPCI<br>DEV:<br>IDs:                               |   |   |  |                          |                          |                          |                   |
| We could get all information   | 00:00<br>00:00<br>Driver:<br>NO DRIVER | Driver:                  | Driver   | Driver:  | 10ee:0020<br>3300:0020<br>Driver:<br>x1timer         | Driver:   | Driver:   | 1796:0018<br>1796:0018<br>Driver:<br>sis8300    | 10ee:0088<br>3300:0088<br>Driver:<br>pciedev | Driver:                  | Driver:                  | Driver:                  | Driver:           |
| -  | DevFile:<br>BARs:                      | DevFile:                 | DevFile:   | Devi ile:<br>BARs:                                   | 3.5.0<br>DevFile:<br>x2timers2<br>BARs:              | DevFile:<br>BARs:                                   | DevFile:<br>BARs:   | 4.0.0<br>DevFile:<br>sis8300s5<br>BARs:         | 4.0.0<br>DevFile:<br>pciedevs6<br>BARs:      | Devrile:                 | DevFile:<br>BARs:        | DevFile:<br>BARs:        | DevFile:<br>BARs: |
|  |  |                          |  |  | 1048575<br>0<br>0<br>0                               |   |   | 16383<br>0<br>0<br>0                            | 0<br>0<br>0<br>0                             |                          |                          |                          |                   |
|  | PCIe-R/W<br>PCIe-monitor               | PCIe-R/W<br>PCIe-monitor | PCIe-R/W<br>PCIe-monitor                             | PCIe-R/W<br>PCIe-monitor                             | 0<br>0<br>PCIe-R/W<br>PCIe-monitor                   | PCIe-R/W<br>PCIe-monitor                            | PCIe-R/W<br>PCIe-monitor  | 0<br>0<br>PCIe-R/W<br>PCIe-monitor              | 0<br>0<br>PCIe-R/W<br>PCIe-monitor           | PCIe-R/W<br>PCIe-monitor | PCIe-R/W<br>PCIe-monitor | PCIe-R/W<br>PCIe-monitor | PCIe-R/W          |
|  | Bind pciedev                           | Bind pciedev             | -  | Bind pciedev   | Bind pciedev   | Bind pciedev  | Bind pciedev  | Bind pciedev                                    | Bind priedev                                 | Bind pciedev             | Bind pciedev             | Bind pciedev             | ind pciede        |
|  | INFO<br>LSPCI                          | INFO<br>LSPCI            | INFO<br>LSPCI  | INFO<br>LSPCI  | INFO<br>LSPCI  | INFO<br>LSPCI                                       | INFO<br>LSPCI   | INFO<br>LSPCI                                   | INFO<br>LSPCI                                | INFO<br>LSPCI            | INFO<br>LSPCI            | INFO<br>LSPCI            | INFO<br>LSPCI     |







#### Fast access to lspci for current mTCA-MONITOR-pciehp board Scan PCIe Bus **Run PCIe-Monitor Rescan Bus** Quit 10 11 12 2 3 9-1 4 5 6 7 8 9 LSPCI 000 Dev: 00:04:0b.0 0000:04:02.0 0000:04:01.0 0000:04:00.0 0000:04:08.0 0000:04:09.0 0000:04:13.0 0000:04:12.0 0000:02:09.0 0000:04:1 Command Ispci -vvvv -s 0000:08:00 Quit Run it 0b5:8748 10b5:8748 10b5:8748 10b5:8748 10b5:8748 10b5:8748 10b5:8748 10b5:8748 10b5:8717 10b5:874 lspci -vvvv -s 0000:08:00 WITCH ON SWITCH OFF SWITCH ON SWITCH OFF SWITCH OFF SWITCH ON SWITCH ON SWITCH ON WITCH ON SWITCH ON 08:00.0 Communication controller: Research Centre Juelich Device 0018 Subsystem: Research Centre Juelich Device 0018 LSPCI Physical Slot: 5 Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr- Stepping- SERR- FastB2B- DisINTx+ Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort- <TAbort- <MAbort- >SERR- <PERR- INTx-DEV: DEV: DEV: DEV: DEV: DEV: DEV: DEV: DEV: DEV: Latency: 0, Cache Line Size: 64 bytes 0000:07:00.0 0.00:08:00.0 0.00:09:00.0 Interrupt: pin A routed to IRO 89 Region 0: Memory at b9000000 (32-bit, non-prefetchable) [size=16K] IDs: Expansion ROM at b9e00000 [disabled] [size=1M] 10ee:0020 1796:0018 10ee:0088 Capabilities: [40] Power Management version 3 3300:0020 1796:0018 3300:0088 Flags: PMEClk- DSI- D1- D2- AuxCurrent=OmA PME(D0-, D1-, D2-, D3hot-, D3cold-) Status: DO NoSoftRst- PME-Enable- DSel=O DScale=O PME-Driver: Driver: Driver: Driver: Driver: Driver: Driver: Driver: Driver: Driver: Capabilities: [48] MSI: Enable+ Count=1/1 Maskable- 64bit+ x1timer sis8300 pciedev Address: 00000000fee00758 Data: 0000 3.5.0 4.0.0 4.0.0 Capabilities: [60] Express (v1) Endpoint, MSI 00 DevCap: MaxPayload 512 bytes, PhantFunc 1, Latency LOs unlimited, L1 unlimited DevFile: ExtTag+ AttnBtn- AttnInd- PwrInd- RBE+ FLResetx2timers2 sis8300s5 pciedevs6 DevCtl: Report errors: Correctable- Non-Fatal- Fatal- Unsupported-RlxdOrd+ ExtTag- PhantFunc- AuxPwr- NoSnoop+ BANS: BARs: BARs: BARs: BARs: BARs: BARs: BARs: BARs: BARs: MaxPayload 256 bytes, MaxReadReq 512 bytes 1048575 16383 0 DevSta: CorrErr- UncorrErr- FatalErr- UnsuppReg- AuxPwr- TransPend-LnkCap: Port #0, Speed 2.5GT/s, Width x4, ASPM LOs, Latency L0 unlimited, L1 unlimited 0 0 0 ClockPM- Surprise- LLActRep- BwNot-0 0 LnkCtl: ASPM Disabled; RCB 64 bytes Disabled- Retrain- CommClk-0 0 0 ExtSynch- ClockPM- AutWidDis- BWInt- AutBWInt-LnkSta: Speed 2.5GT/s, Width x4, TrErr- Train- SlotClk+ DLActive- BWMgmt- ABWMgmt-0 0 0 Capabilities: [100 vl] Device Serial Number 00-00-00-00-00-00-00-00 0 0 0 Kernel driver in use: sis8300 Kernel modules: sis8300 PCIe-R/W PCIe-R/W PCIe-R/W PCIe-monitor PCIe-monitor PCIe-monitor INFO INFO INFO

LSPCI



LSPCI

LSPCI

LSPCI





| Fast access to Ispci for curre  | nt<br>• mtca-m  | IONITOR-pcieł        | ιp   |              |              |              |              |              |              |              |              |              | <b>98</b>  |
|---|---|----------------------|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|
| MCH PCIe Switch port  |   | Scan PCIe B          |      |              | Run P        | Cle-Monitor  |              |              | Rescan Bus   |              |              | Quit         |            |
|   | 1   | 10                   | 11   | 12           | 2            | 3            | 4            | 5            | 6            | 7            | 8            | 9            | 9-1        |
|   | Dev:  | Dev:                 | Dev: | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:         | Dev:       |
| • LSPCI   | 00000000000   | 00000410.0           |      | 0b.0         | 0000:04:02.0 | 0000:04:01.0 | 0000:04:00.0 | 0000:04:08.0 | 0000:04:09.0 | 0000:04:13.0 | 0000:04:12.0 | 0000:02:09.0 | 0000:04:1  |
| Command Ispci -vvvv -s 0000:04:08.0   |   |                      | Rur  | n it Quit 48 | 10b5:8748    | 10b5:8717    | 10b5:874   |
| lspci -vvvv -s 0000:04:08.0   |   |                      |      | ON           | SWITCH OFF   | SWITCH ON    | SWITCH ON    | SWITCH OFF   | SWITCH OFF   | SWITCH ON    | SWITCH ON    | SWITCH ON    | WITCH ON   |
| 04:08.0 PCI bridge: PLX Technology, Inc. Device 8748 (rev ba) (prog-if 00 [Normal de<br>Control: I/O+ Mem+ BusMaster+ SpecCycle - MemMINV- VGASnoop- ParErr- Stepping<br>Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort- <tabort- <tabort-="" <tabort-<tabort-<tabort-<taboft="">Tabort- <tabort-<tabort-<tabort-<tabort-<tabort-<taboft>Tabort- <tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabott-<tabort-<tabott-<tabott-<tabort-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<t< td=""><td><ul> <li>SERR- FastB2B- DisI</li> </ul></td><td>NTx+<br/>Tx-</td><td></td><td></td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td><td>LSPCI</td></tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabort-<tabott-<tabort-<tabott-<tabott-<tabort-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<tabott-<t<></tabort-<tabort-<tabort-<tabort-<tabort-<taboft></tabort-> | <ul> <li>SERR- FastB2B- DisI</li> </ul>   | NTx+<br>Tx-          |      |              | LSPCI        | LSPCI      |
| Bus: primary=04, secondary=08, subordinate=08, sec-latency=0<br>I/O behind bridge: 0000f000-00000fff  |   |                      |      |              | DEV:         | DEV:       |
| Memory behind bridge: b9000000-b90fffff<br>Prefetchable memory behind bridge: 0000000b9e00000-0000000ba0fffff   |   |                      |      |              | 0000:07:00.0 | DEV.         | ULV.         | 0000:08:00.0 | 0000:09:00.0 | DEV.         | DEV.         | DEV.         | DEV.       |
| Secondary status: 66MHz- FastB2B- ParErr- DEVSEL=fast >TAbort- <tabort- <mab<br="">BridgeCtl: Parity- SERR- NoISA- VGA- MAbort- &gt;Reset- FastB2B-</tabort->   | ort- <serr- <perr-<="" td=""><td></td><td></td><td></td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td><td>IDs:</td></serr-> |                      |      |              | IDs:         | IDs:       |
| PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-<br>Capabilities: [40] Power Management version 3  |   |                      |      |              | 10ee:0020    |              |              | 1796:0018    | 10ee:0088    |              |              |              |            |
| Status: D0 NoSoftRst+ PME-Enable- DSel=0 DScale=0 PME-  | Flags: PMEClk- DSI- Dİ- D2- AuxCurrent=0mA PME(D0+,D1-,D2-,D3hot+,D3cold+)<br>Status: DO NoSoftRst+ PME-Enable- DSel=O DScale=O PME-  |                      |      |              |              |              |              |              | 3300:0088    |              |              |              |            |
| Capabilities: [48] MSI: Enable+ Count=1/8 Maskable+ 64bit+<br>Address: 00000000fee00518 Data: 0000<br>Masking: 000000fe Pending: 00000000   |   |                      |      | :            | Driver:      | Driver:    |
| Capabilities: [68] Express (v2) Downstream Port (Slot+), MSI 00<br>DevCap: MaxPayload 512 bytes, PhantFunc 0, Latency LOs <64ns, L1 <1u:  |   |                      |      |              | xitimer      |              |              | sis8300      | pciedev      |              |              |              |            |
| ExtTag. RBE+ FLReset-<br>DevCtl: Report errors: Correctable- Non-Fatal- Fatal- Unsupported-   | 5   |                      |      |              | 3.5.0        |              |              | 4.0.0        | 4.0.0        |              |              |              |            |
| RlxdOrd+ ExTag- PhantFunc- AuxPwr- NoSnoop+<br>MaxPayload 256 bytes, MaxReadReq 128 bytes   |   |                      |      | e:           | DevFile:     | DevFile:   |
| DevSta: CorrErr+ UncorrErr- FatalErr- UnsupPReq+ AuxPwr- TransPend-<br>LnkCap: Port #8, Speed unknown, Width x4, ASPM LOs L1, Latency L0 <4   | us. Ll <4us   |                      |      |              | x2timers2    |              |              | sis8300s5    | pciedevs6    |              |              |              |            |
| ClockPM- Surprise+ LLActRep+ BwNot+<br>LnkCtl: ASPM Disabled; Disabled- Retrain- CommClk-   |   |                      |      | :            | BARs:        | BARs:      |
| ExtSynch- ClockPM- AutWidDis- BWInt- AutBWInt-<br>LnkSta: Speed 2.5GT/s, Width x4, TrErr- Train- SlotClk- DLActive+ BW  | Mgmt+ ABWMgmt-  |                      |      |              | 1048575      |              |              | 16383        | 0            |              |              |              |            |
| SltCap: AttnBtn+ PwrCtrl+ MRL+ AttnInd- PwrInd- HotPlug+ Surprise-<br>Slot #5, PowerLimit 25.000W; Interlock- NoCompl-  |   |                      |      |              | 0            |              |              | 0            | 0            |              |              |              |            |
| SltCtl: Enable: AttnBtn+ PwrFlt- MRL+ PresDet+ CmdCplt+ HPIrq+ LinkCl<br>Control: AttnInd Unknown, PwrInd Unknown, Power- Interlock-  | hg-   |                      |      |              | 0            |              |              | 0            | 0            |              |              |              |            |
| SltSta: Status: AttnBtn- PowerFlt- MRL- CmdCplt- PresDet+ Interlock-<br>Changed: MRL- PresDet- LinkState-   |   |                      |      |              | 0            |              |              | 0            | 0            |              |              |              |            |
| DevCap2: Completion Timeout: Not Supported, TimeoutDis- ARIFwd+<br>DevCtl2: Completion Timeout: 50us to 50ms, TimeoutDis- ARIFwd-   |   |                      |      |              | 0            |              |              | 0            | 0            |              |              |              |            |
| LnkCtl2: Target Link Speed: Unknown, EnterCompliance- SpeedDis-, Sel<br>Transmit Margin: Normal Operating Range, EnterModifiedCompl:  |   | - 6dB                |      |              | 0            |              |              | 0            | 0            |              |              |              |            |
| Compliance De-emphasis: -6dB<br>LnkSta2: Current De-emphasis Level: -3.5dB<br>Capabilities: [a4] Subsystem: PLX Technology, Inc. Device 8748  |   |                      |      | VV           | PCIe-R/W     | PCIe-R/W   |
| Capabilities: [100 v1] Device Serial Number ba-87-00-10-b5-df-0e-00<br>Capabilities: [fb4 v1] Advanced Error Reporting<br>UESta: DLP- SDES-TLP- FOP- CmpltT0- CmpltAbrt- UnxCmplt- RxOF- Mal  | fTLP- ECRC- UnsupReq-   | ACSViol-             |      | itor         | PCIe-monitor | Cle-monito |
| UEMek: DLP- SDES-TLP-FCP-CmpltTO-CmpltAbrt-UnxCmplt-RoOF-Mal<br>UESvrt: DLP+SDES+TLP-FCP+CmpltTO-CmpltAbrt-UnxCmplt-RoOF+Mal<br>CESta: RxErr-BadTLP-BadDLLP-Rollover-Timeout-NonFatalErr+   | fTLP- ECRC- UnsupReq-<br>fTLP+ ECRC- UnsupReq-  | ACSViol-<br>ACSViol- |      | dev          | Bind pciedev | ind pciede |
| CEMsk: RxErr- BadTLP- BadDLLP- Rollover- Timeout- NonFatalErr+<br>AERCap: First Error Pointer: 1f, GenCap+ CGenEn- ChkCap+ ChkEn-<br>Capabilities: [138 v]] Power Budgeting   |   |                      |      |              | INFO         | INFO       |
| Capabilities: [lOc v1] #19  |   |                      |      |              | LSPCI        | LSPCI      |

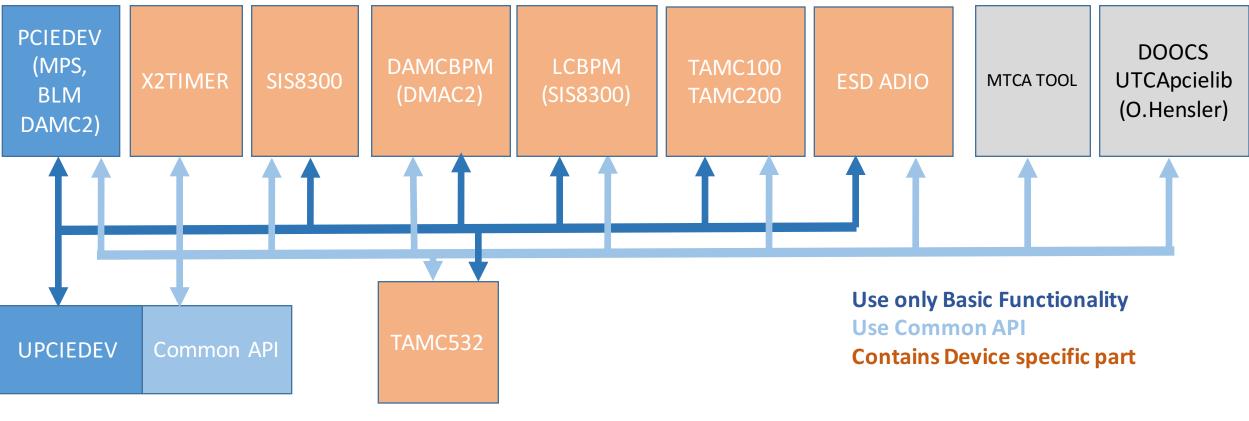






#### Status

- 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

