

# MPD (GEM Electronics) CODA Porting / Status

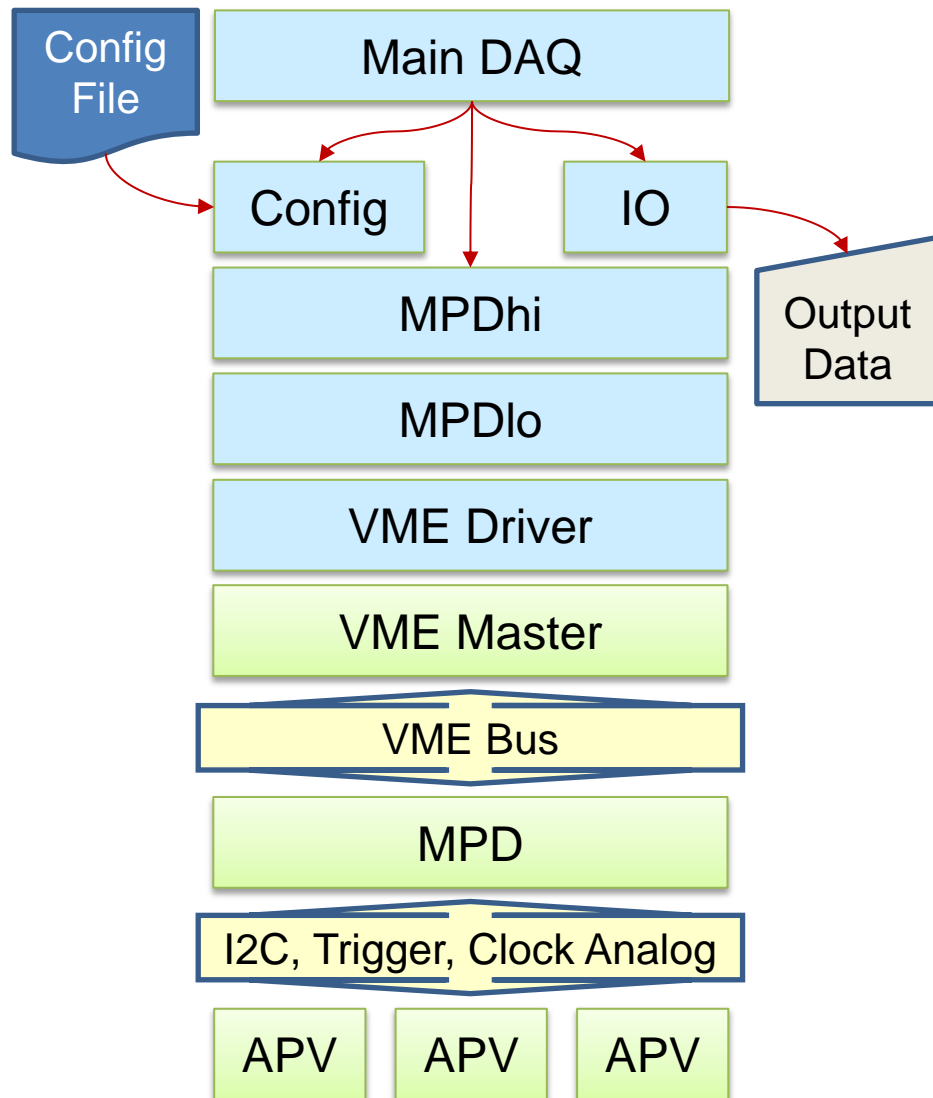
People involved:

Alexandre Camsonne  
Evaristo Cisbani  
Danning Di  
Bryan Moffit  
Paolo Musico



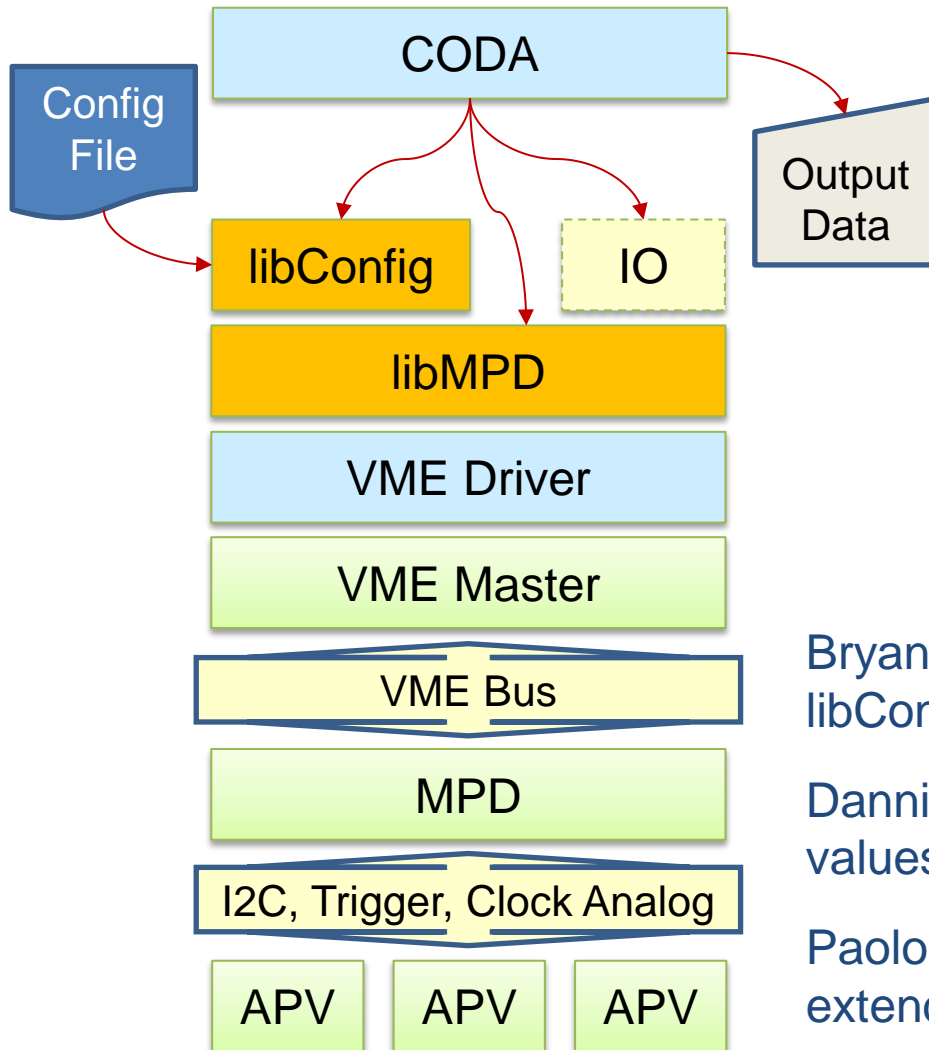
Goal: have the MPD system integrated into CODA for GEM testing at JLab/UVa

# C++ MPD Library Model



- ❖ MPDlo: single MPD driver; all MPD functionality encapsulated in a single C++ class; this class interface to the low level VME driver
- ❖ MPDhi: multiple MPD drivers; class with high level methods such as: Discover, Initialize, Configure, ... Read
- ❖ Config: read config files and fill MPD parameters; interface to MPDhi
- ❖ IO: write output file, interface to MPDhi
- ❖ The Main instantiate Config, IO and MPDhi  
(working as standalone system on Struck and CAEN VME controllers)

# C MPD-CODA Library Model



- ❖ libMPD: porting of MPDhi + MPDlo into C, interface to low level VME calls
- ❖ libConfig: read config file and fill libMPD variables
- ❖ IO: largely in CODA, some piece of code to be written
- ❖ CODA interface to libConfig and libMPD

Bryan Moffit ported MPDhi/lo into libMPD and wrote libConfig

Dannin Di and E.C. extended libConfig to include default values (from file) to all parameters

Paolo Musico, Alexandre and E.C. debugged and extended libMPD to get MPD working

# CODA Test Program: VME mapping and input configuration

## MPD Library Tests

-----  
Opening A32 Window (opened at [0xb7f93000,0xb7fa3000])  
Opening A32Blt Window (opened at [0x87f93000,0xb7f93000])  
Opening A24 Window (opened at [0x86f93000,0x87f93000])  
Opening A16 Window (opened at [0x86f83000,0x86f93000])  
jlabgefMapTsi: Tempe Chip Userspace map successful  
VME Bus Error IRQ Disabled  
vmeBusCreateLockShm: vmeBus shared memory mutex created

mpdConfigInit: cfg/config\_apv.txt: Version = 0.3  
Number of MPDs in config file = 1  
mpdConfigLoad: Loading MPD settings = 0 rotary = 5  
mpdSetTriggerMode: Calib Latency = 0, Trigger Mode = 0x2  
mpdSetAcqMode: Acquisition Mode = 0x1 (event)  
mpdConfigLoad: 5 APV elements in given MPD 5  
mpdAddApv: APV 0 added to list of FECs  
mpdAddApv: APV 1 added to list of FECs  
mpdAddApv: APV 2 added to list of FECs  
mpdAddApv: APV 3 added to list of FECs  
mpdAddApv: APV 4 added to list of FECs  
mpdConfigLoad: 5 APV loaded in Slot=5 MPD settings

## VME Memory mapping

Mapping restriction prevent to  
Allocate memory for all MPDs

Bryan is working on that

Configuration file load,  
parsing and variable filling

Works

# CODA Test Program: MPD discovery and memory test

```
MPD Slot 0 - Firmware Revision ID = 0x4003
MPD Slot 0 - Firmware Revision Time: 352230 (s)
-- MPD in slot 0 is NOT in config file, drop it
jlabgefMemProbe: Clearing VME BERR/2eST (0x800cf900) at VME address 0x10001c
mpdlnit: WARN: No addressable board at VME addr=0x100000 (local 0x87093000)
MPD Slot 2 - Firmware Revision ID = 0x4003
MPD Slot 2 - Firmware Revision Time: 359290 (s)
-- MPD in slot 2 is NOT in config file, drop it
MPD Slot 3 - Firmware Revision ID = 0x4003
MPD Slot 3 - Firmware Revision Time: 359290 (s)
-- MPD in slot 3 is NOT in config file, drop it
MPD Slot 4 - Firmware Revision ID = 0x4003
MPD Slot 4 - Firmware Revision Time: 359290 (s)
-- MPD in slot 4 is NOT in config file, drop it
MPD Slot 5 - Firmware Revision ID = 0x4003
MPD Slot 5 - Firmware Revision Time: 359290 (s)
++ MPD in slot 5 is in config file, INIT IT
Initialized MPD 0 Slot # 5 at VME address 0x30000000 (local 0xaff93000)
jlabgefMemProbe: Clearing VME BERR/2eST (0x800cf900) at VME address 0x38001c
mpdlnit: WARN: No addressable board at VME addr=0x380000 (local 0x87313000)
mpdlnit: 1 MPD(s) initialized, 5 discovered
mpdlnit: WARN: Unable to initialize all requested MPD Modules (1)
```

```
test mpd 5 histo memory
HISTO Read/Write test SUCCESS on MPD slot 5
```

MPD discovery and  
initialization

Works

MPD memory Read/Write  
test

Works

# CODA Test Program: I2C init. and APV discovery

try initialize mpd in slot 5

mpdI2C\_Init: i2c low prescaler register set/read : 176 / 176

mpdI2C\_Init: i2c high prescaler register set/read : 4 / 4

mpdI2C\_Init: i2c speed prescale = 1200, (period = 120.000000 us, frequency = 8.333333 kHz)

Board temperatures: core=128.87 air=128.87 (dec celsius)

MPD I2C initialization

Works (except temperature reading)

Try APV discovery and init on MPD slot 5

mpdAPV\_Scan: MPD 5 Blind scan on 31 apvs:

mpdAPV\_Try: timeout 20 : 32 ret = -20

mpdAPV\_Try: timeout 20 : 33 ret = -20

mpdAPV\_Try: timeout 20 : 34 ret = -20

mpdAPV\_Try: timeout 20 : 35 ret = -20

mpdAPV\_Try: timeout 20 : 36 ret = -20

mpdAPV\_Try: timeout 20 : 37 ret = -20

mpdAPV\_Try: timeout 20 : 38 ret = -20

mpdAPV\_Try: timeout 20 : 39 ret = -20

mpdAPV\_Try: timeout 20 : 40 ret = -20

mpdAPV\_Try: timeout 20 : 41 ret = -20

mpdAPV\_Try: timeout 20 : 42 ret = -20

mpdAPV\_Try: timeout 20 : 43 ret = -20

mpdAPV\_Try: timeout 20 : 44 ret = -20

mpdAPV\_Try: timeout 20 : 45 ret = -20

mpdAPV\_Try: timeout 20 : 46 ret = -20

mpdAPV\_Scan: MPD 5 Blind scan done

APV discovery

Does not work; not blocking, APV can be configured



# CODA Test Program: APV and ADC configuration

```
mpdAPV_Scan: Try 0 0 : mpdAPV_Try: timeout 20 : 32 ret = -20
mpdAPV_Scan: 0 matched in MPD in slot 5
mpdAPV_Scan: APV enable mask 0x0001
mpdAPV_Scan: Try 1 1 : mpdAPV_Try: timeout 20 : 33 ret = -20
mpdAPV_Scan: 1 matched in MPD in slot 5
mpdAPV_Scan: APV enable mask 0x0003
mpdAPV_Scan: Try 2 2 : mpdAPV_Try: timeout 20 : 33 ret = -20
mpdAPV_Scan: 2 matched in MPD in slot 5
mpdAPV_Scan: APV enable mask 0x0007
mpdAPV_Scan: Try 3 3 : mpdAPV_Try: timeout 20 : 33 ret = -20
mpdAPV_Scan: 3 matched in MPD in slot 5
mpdAPV_Scan: APV enable mask 0x000f
mpdAPV_Scan: Try 4 4 : mpdAPV_Try: timeout 20 : 33 ret = -20
mpdAPV_Scan: 4 matched in MPD in slot 5
mpdAPV_Scan: APV enable mask 0x001f
mpdAPV_Scan: 5 APV found matching settings
Do DELAY setting on MPD slot 5
mpdDELAY25_Set: start
mpdDELAY25_Set: end
Do APV reset on MPD slot 5
Configure single APV on MPD slot 5
APV card i2c=0 to ADC (fifo)=0 (from config file)
APV card i2c=1 to ADC (fifo)=1 (from config file)
APV card i2c=2 to ADC (fifo)=2 (from config file)
APV card i2c=3 to ADC (fifo)=3 (from config file)
APV card i2c=4 to ADC (fifo)=4 (from config file)
```

Configure ADC on MPD slot 5

```
mpdADS5281_Normal: Board= 0 ADC= 0 No Pattern (Normal Acq)
mpdADS5281_InvertChannels: Board= 0 ADC= 0 Inverted Polarity
mpdADS5281_SetGain: Board= 0 ADC= 0 Set Gain 5 5 5 5 5 5 5 5
mpdADS5281_Normal: Board= 0 ADC= 1 No Pattern (Normal Acq)
mpdADS5281_InvertChannels: Board= 0 ADC= 1 Inverted Polarity
mpdADS5281_SetGain: Board= 0 ADC= 1 Set Gain 5 5 5 5 5 5 5 5
```

Do 101 Reset on MPD slot 5

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MPD CODA Porting

APV configuration

Works (tested output from APV with different configuration)

MPD/ADC configuration

Works

# CODA Test Program: Data Readout

```
mpdSetAcqMode: Acquisition Mode = 0x1 (event)
mpdDAQ_Config : ReadoutConfig = 0x1
mpdTRIG_Enable: Control Addr = 0xff22001e
mpdTRIG_Enable: Trig Gen = 0x822231
mpdTRIG_Enable: Logic Threshold = 0x76c01f4
===== START ACQ =====
---- Event 0 occurred ----
EC: card 0 buffer size available = 11879
mpdApvGetBufferPointer: DEBUG: Fifo 1, retrieved pointer from position 0 , size is 11880
EC: nwords from fifo 1 0x38e0000
mpdFIFO_ReadSingle: number of words to be read 910
mpdFIFO_ReadSingle: DEBUG: fifo ch = 1, words in fifo= 910, retries= 1 (max 1)
mpdFIFO_ReadSingle: DEBUG: Read apv = 1, wrec = 910, success = 0
EC: card 0 readsingle done nread=910, err=0
...
EC: nwords from fifo 3 0x38e0000
mpdFIFO_ReadSingle: number of words to be read 910
mpdFIFO_ReadSingle: DEBUG: fifo ch = 3, words in fifo= 910, retries= 1 (max 1)
mpdFIFO_ReadSingle: DEBUG: Read apv = 3, wrec = 910, success = 0
EC: card 2 readsingle done nread=910, err=0
mpdApvGetBufferSample: DEBUG: Fifo = 3 has 7 samples (910 bytes) stored
mpdFIFO_ReadAll: DEBUG: FIFO= 3, word read= 910, event/sample read= 7, error=0
mpdApvGetBufferSample: DEBUG: Fifo = 3 has 7 samples (910 bytes) stored
mpdFIFO_ReadAll: DEBUG: Fifo= 2, total sample left= -3 (<0 means more samples than requested)
mpdFIFO_ReadAll: DEBUG: Fifo= 3, total sample left= -3 (<0 means more samples than requested)
Rdone/Tout/error = 1 0 0
mpdApvGetBufferSample: DEBUG: Fifo = 1 has 7 samples (910 bytes) stored
mpdApvGetBufferPointer: DEBUG: Fifo 1, retrieved pointer from position 0 , size is 11880
mpdApvShiftDataBuffer: DEBUG: Move block of 7 words from 903 to 0
```

## Data Readout

Partially works: we expect 6 samples, we got 7!



# CODA Test Program: Test Modes

```
mpdSetAcqMode: Acquisition Mode = 0x4 (histo)
mpdADS5281_SetGain: Board= 0 ADC= 0 Set Gain 5 5 5 5 5 5 5
### histo peaks integral MPD/ADCch = 0 / 0 (total Integral= 40022187)
first bin= 2042: 40022188 last bin= 2060
### histo peaks integral MPD/ADCch = 0 / 1 (total Integral= 40056405)
first bin= 109: 1144470 last bin= 124
first bin= 137: 33761827 last bin= 173
first bin= 184: 572235 last bin= 195
first bin= 231: 572235 last bin= 242
first bin= 247: 572235 last bin= 258
first bin= 265: 572234 last bin= 277
first bin= 292: 572234 last bin= 304
first bin= 322: 572234 last bin= 333
first bin= 454: 572234 last bin= 466
first bin= 2784: 572234 last bin= 2798
first bin= 2964: 572234 last bin= 2978
### histo peaks integral MPD/ADCch = 0 / 2 (total Integral= 40056252)
first bin= 97: 1144464 last bin= 108
first bin= 118: 33761701 last bin= 149
first bin= 157: 572232 last bin= 168
first bin= 203: 1144464 last bin= 228
first bin= 231: 572232 last bin= 243
first bin= 258: 572232 last bin= 269
first bin= 292: 572232 last bin= 303
first bin= 453: 572232 last bin= 466
first bin= 2720: 572232 last bin= 2734
first bin= 2922: 572232 last bin= 2936
### histo peaks integral MPD/ADCch = 0 / 3 (total Integral= 40022010)
```

HISTO and SYNC test  
modes implemented

Both work

# Summary

Two main issues left:

1. VME driver: large memory mapping windows allocation
2. Readout mode, we get data, but not what we asked for

... and one minor:

3. APV discovery procedure (related to the readout of the I2C bus) does not work

To do:

- a. Fix above; when Bryan has solved 1) we will try to fix 2 working from Rome
- b. Method for formatted binary data output (now everything is ASCII output); once 2 is fixed, we work on it
- c. ... in the meantime Paolo Musico and Ben Raydo are working on the MPD-SSP fiber optics interface