

IPAC for VME64x

Pete Owens

Daresbury Laboratory

- Geographical addressing
- Hot-swap capability
- Intelligent backplane
- First slot detection
- More backplane connectors/pins
- Rear plug in units
- ...

Hytec VICB8002

- IP carrier
- 6U VME64x board
- 4 single (or 2 double) size IP cards

Graham Cross

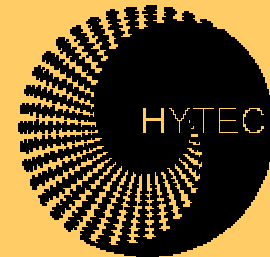
Hytec Electronics Ltd., UK.

Email: graham@hytec-electronics.co.uk

Web: <http://www.hytec-electronics.co.uk>

Tel: +44 (0) 118 975 7770

Fax: +44 (0) 118 975 7566



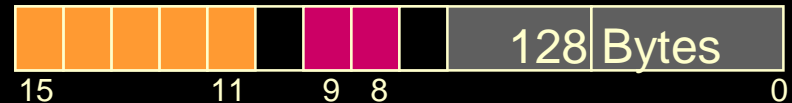
Geographical Addressing

- No need to mess around with jumpers
- Swapping cards is more straightforward
- No need to put VME addresses into st.cmd

- Address conflicts still possible

VME Address Map

- 5 bit geographical address (up to 31 slots)
- A16 - short address - bits 11-15



- A24 - standard address - bits 19-23



- A32 - extended address - bits 22-26



Hot Swap

- The ability to remove and insert boards from a running IOC at any time.
- VME64x provides the standards to ensure hardware protection. So long as the IP carrier is compliant the IP cards will be OK.
- Writing the software requires care.

Assumptions

Each VME slot must have functionally the same hardware before and after the swap.

Allowed

- Replacement of faulty IP card with functional equivalent
- Replacement of faulty IP carrier board
- Removal of several boards at any one time

Not Allowed

- Moving IP carrier to a different slot
- Adding an IP card to a spare socket on the carrier
- Adding a new IP carrier to the system

Software

- Written by Walter Scott (aka Scotty)
- Extends drvIpac by Andrew Johnson
- Based on work by Steve Hunt
- Board removal detection is the responsibility of the **IP carrier driver**

Extended IPAC Carrier Type

Original

```
typedef struct {  
    char    *carrierType;  
    ushort_t numberSlots;  
    int     (*initialise)( ... );  
    char *(*report)( ... );  
    void *(*baseAddr)( ... );  
    int     (*irqCmd)( ... );  
    int     (*intConnect)( ... );  
} ipac_carrier_t;
```

Extended

```
typedef struct {  
    char    *carrierType;  
    ushort_t numberSlots;  
    ushort_t funcnum;  
    int     (*initialise)( ... );  
    char *(*report)( ... );  
    void *(*baseAddr)( ... );  
    int     (*irqCmd)( ... );  
    int     (*intConnect)( ... );  
    int     (*carrierIsPresent)(...);  
} EXTipac_carrier_t;
```

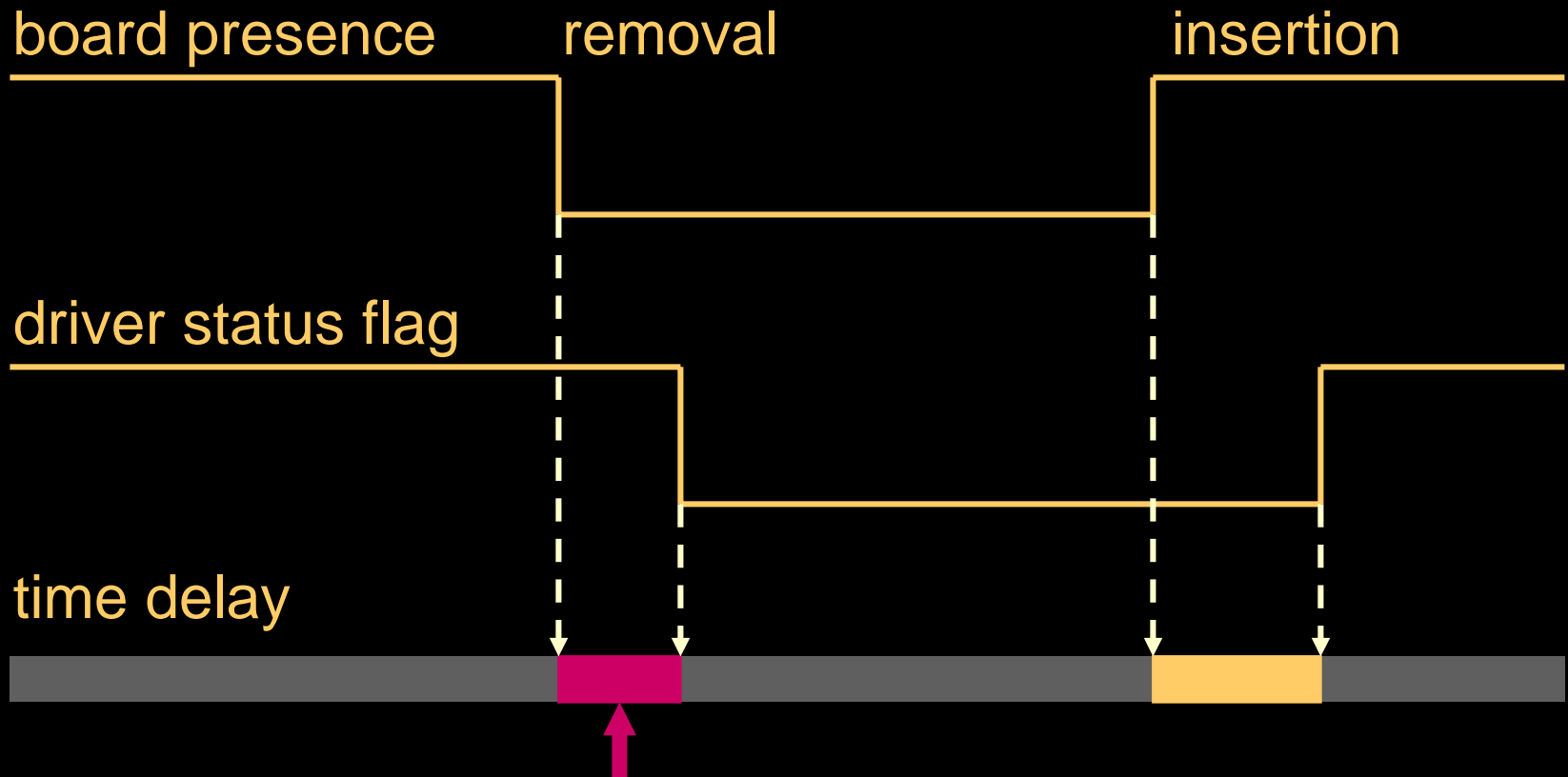
Extended Functionality

- `EXTipacAddCarrier ()`
 - Install the extended IP carrier driver.
- `ipmCarrierIsPresent ()`
 - Returns false if carrier has been removed.

Backwards Compatibility

- `ipacAddCarrier ()` still available
 - Constructs an extended `EXTipac_carrier_t` with `funcnum = 5`
 - Then calls `EXTipacAddCarrier ()`
- This should continue work as normal for existing IP carriers which do not support hot-swap.

Board Removal Event



system integrity potentially at risk

Detecting Card Removal

- Interrupt
 - Carrier should generate an interrupt when the handles are flipped before card is withdrawn.
 - Interrupt level should be higher than for IP card interrupts.
 - ISR sets the carrierIsPresent flag to false.
- Poll & probe *fallback if no interrupt*
 - Polling task runs at high priority
 - Checks for card by calling vxMemProbe ()

Detecting Board Insertion

- Polling task at carrier level
- Delay is not critical to system function

IP Drivers

- To Access IP registers
 - First call `ipmCarrierIsPresent ()`
 - Use `vxMemProbe ()` to access registers
 - Keep a local copy of hardware registers
- If card is removed
 - return status code to EPICS record
- When card is replaced
 - restore registers

Acknowledgements

- Walter Scott *aka Scotty* - Hytec
 - <http://www.hytec-electronics.co.uk>
- Documentation:
 - [Writing hotswap proof EPICS drivers for industry pack \(IP\) cards](#)
 - [Using the Hytec VICB8002 VME64x IP carrier board in EPICS](#)
 - [VICB8002 VME 64x industry pack carrier board users manual](#)

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The End