



PENTTEK

The top section of the slide features the Penttek logo in a bold, 3D-style font. The background consists of a grayscale world map with a grid overlay. On the left side, two circuit boards are shown: one is a mezzanine card with multiple integrated circuits and connectors, and the other is a larger board, possibly a DSP or a system board, with various components and a large heat sink.

VIM: Harnessing 'C6x Power



Velocity Interface Mezzanine

The middle section of the slide features a stylized graphic of a mezzanine card. The card is represented by a series of black and white diagonal stripes, with the text "Velocity Interface Mezzanine" written across it in a white, italicized font. The background of this section is white.

***Texas
Instruments
DSPS Fest '99***

VIM: Harnessing 'C6x Power

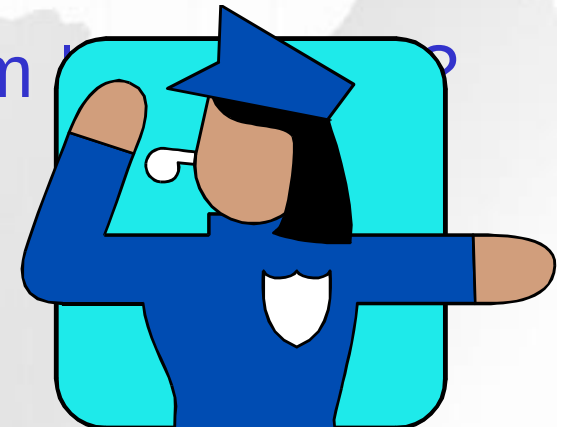
- I/O Demands of the C6x Processor
- Embedded System Bottlenecks
- Mezzanine Busses
- Quad 'C6x Processor Board
- VIM Mezzanine Basics
 - Mechanical
 - Electrical
- Baseboard and Module Product Examples
- VIM Specification

'C6x External Bus Speeds

	'C6201	'C6202	'C6203	'C6701
No. of Busses	1	2	2	1
Addr Width (bits)	32	32 / 32	32 / 32	24
Data Width (bits)	32	32 / 32	32 / 32	32
Bus Clock (MHz)	200	250 / 125	300 / 150	167
Bus Cycle (nsec)	5	4 / 8	3.3 / 6.7	6
I/O Rate (MB/sec)	800	1000 / 500	1200 / 600	667

The I/O Bottleneck !

- How can open architecture embedded systems take advantage of the incredible I/O speeds of these new C6x DSPs?
- How can multi-processor boards support dedicated I/O for each processor?
- How can we handle system
 - High speed peripherals
 - Inter processor comms
 - Inter board comms
 - Inter system comms

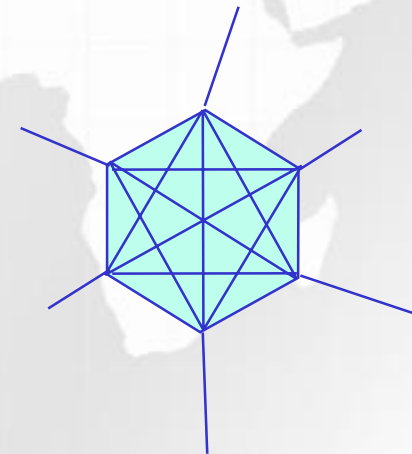
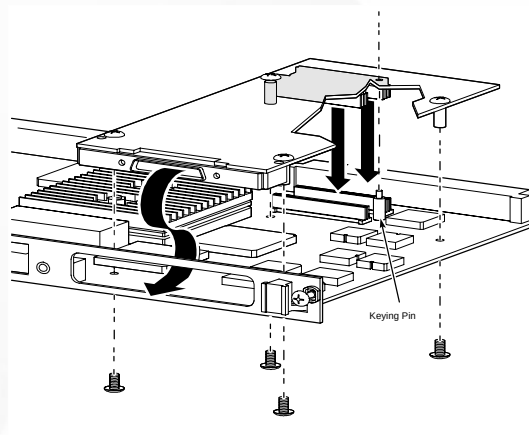


Backplane Bottleneck

- High speed real-time transfers should not rely on the backplane bus
 - Backplane bus is a shared resource subject to arbitration and contention
 - Backplane bus should be reserved for:
 - Status and Control
 - Program Loading
 - Task Management
 - Signaling
 - Software Development
 - Develop alternate data paths for high-speed real-time streams

Backplane Alternatives

- Mezzanine Cards
- Front Panel I/O
- Auxiliary Backplane I/O



Models 4290 and 4291

■ Model 4290

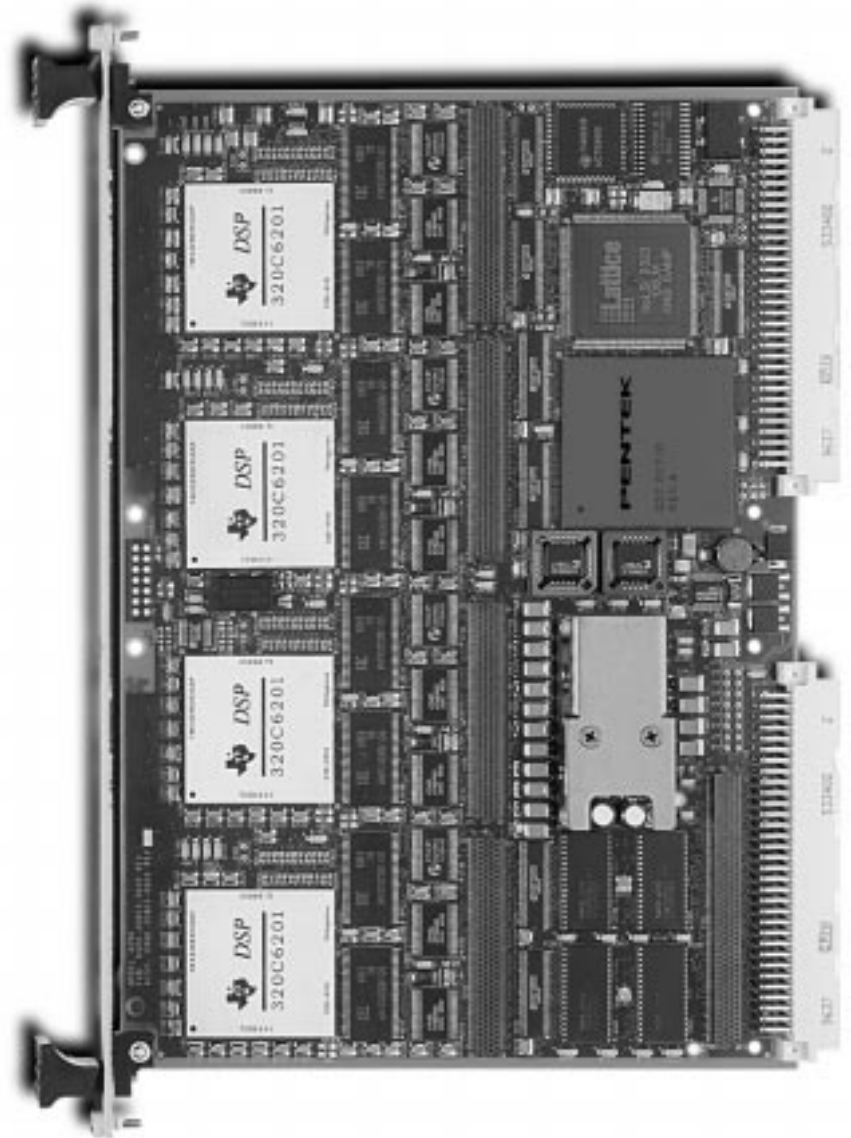
- Four 'C6201's
- Fixed Point
- 6400 MIPS

■ Model 4291

- Four 'C6701's
- Floating Point
- 4 Giga-Flops

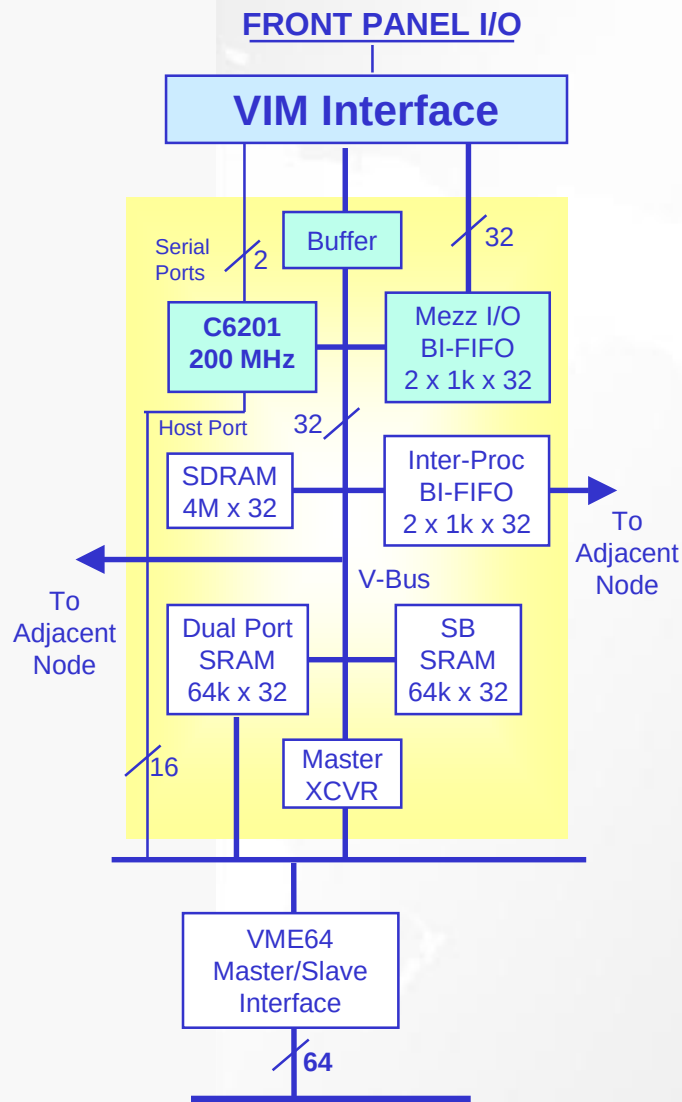
■ Flexible I/O

■ Flexible Memory





'C6x Processor Node Architecture

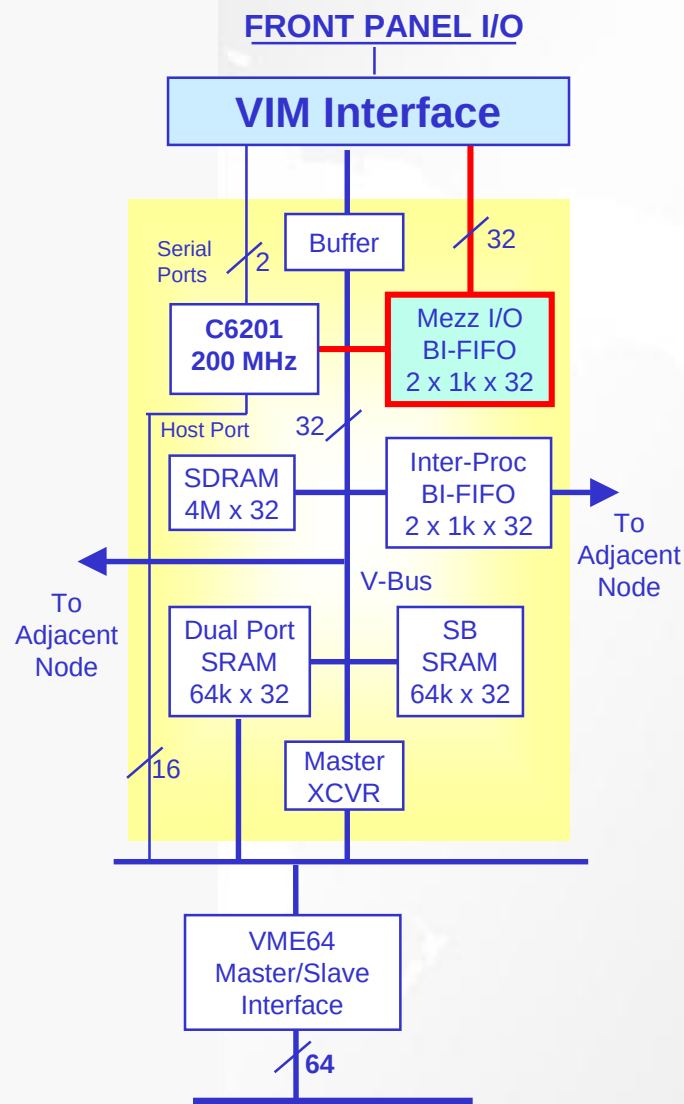


VIM 7/7/99

- VIM - Three Modes of I/O
 - ◆ Synchronous BI-FIFO for High-Speed Parallel I/O at Up to 400 MB/sec
 - ◆ Two Synchronous Serial Ports at Up to 50 Mbits/sec
 - ◆ 32-bit Microprocessor R/W Interface for Mezzanine Control and Status



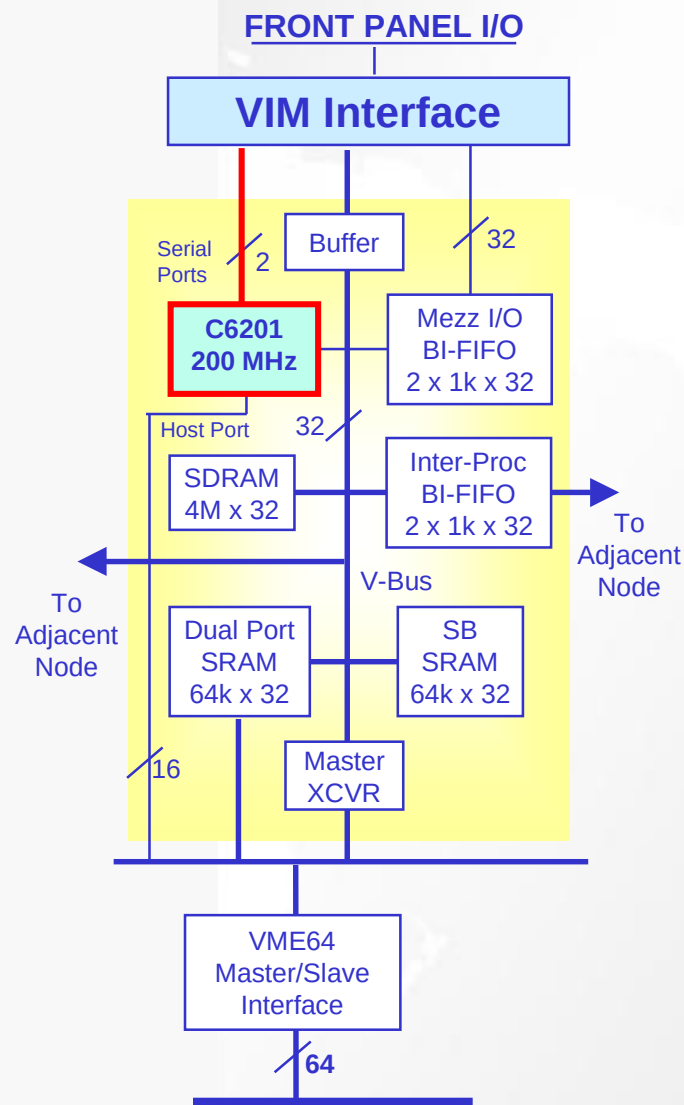
VIM - High Speed Parallel Interface



- 32-bit parallel input & output
- 100 MHz maximum transfer rates - 400 MB/sec
- Synchronous bi-directional FIFO buffers I/O data for efficient DMA transfers to DSP
- FIFO status flags connected to DSP interrupts to automate DMA transfers



VIM - Synchronous Serial I/O

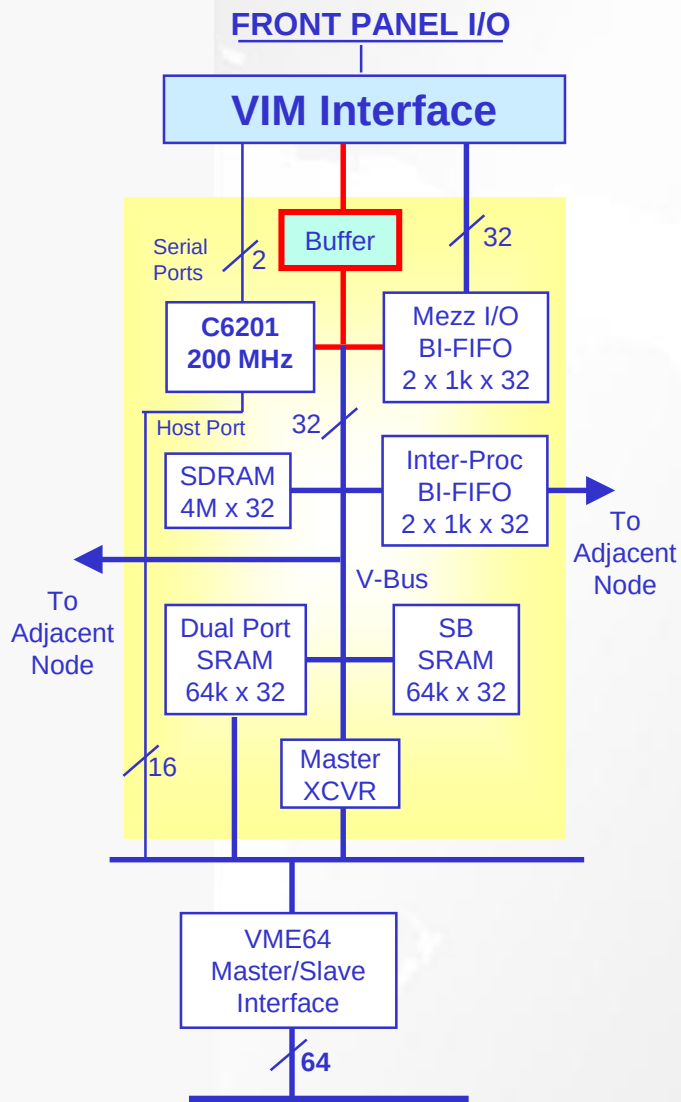


VIM 7/7/99

- Two, full-duplex synchronous serial ports
- Bit rates up to 50 Mbits/sec
- Fully compliant with C6x Multi-channel Buffered Serial Ports (McBSP)
- Low cost, direct interface for many serial devices - codecs, telecom interfaces, etc.



VIM - Control & Status Port

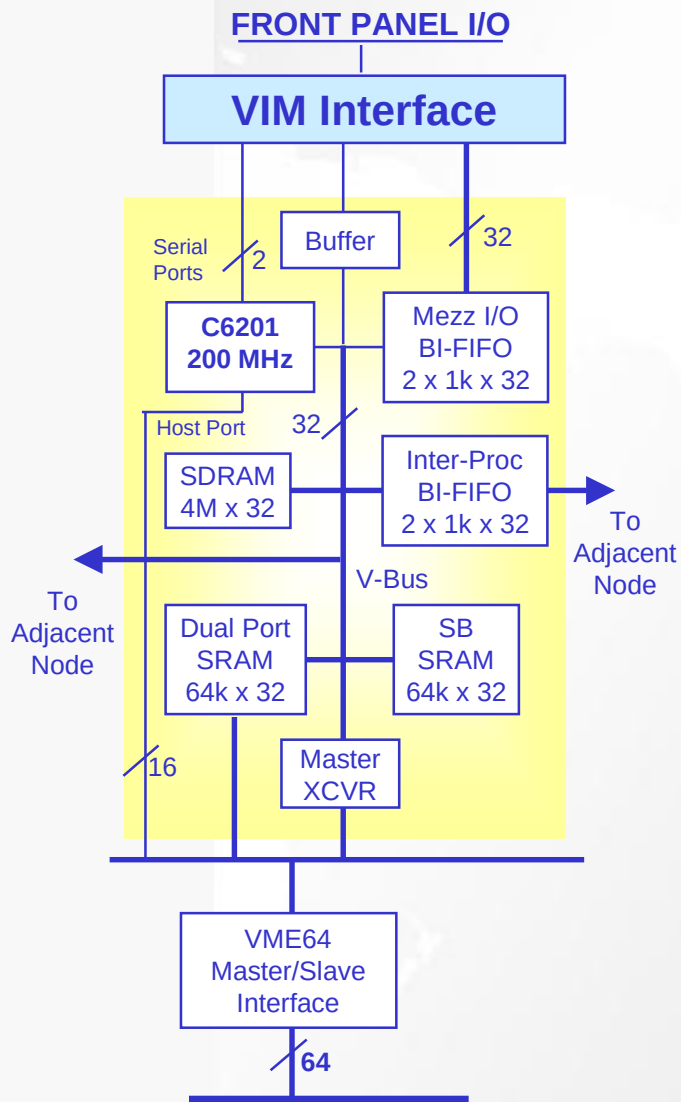


VIM 7/7/99

- Microprocessor-type interface for reading & writing to control and status registers or memory on module
- 32-bit data bus
- 16-bit address bus
- Interrupt lines



VIM - EEPROM ID



- EEPROM located on VIM module contains model number, manufacturer, serial and revision level
- Supports automatic detection, identification and software configuration

VIM Interface Lines

- 32-bit Parallel Bidirectional FIFO Interface lines:

- Data: 32 (in/out)
- Clock: 1 (out)
- FIFO status flags: 6 (in)
- FIFO reset/enable: 2 (out)
- FIFO read/write: 1 (out)
- Interrupt mailbox: 2 (in/out)

- Synchronous Serial Port lines

- Clock source: 2 (out)
- Receive data: 2 (out)
- Receive clock: 2 (in/out)
- Receive frame sync: 2 (out)
- Transmit data: 2 (in)
- Transmit clock: 2 (in/out)
- Transmit frame sync: 2 (out)

VIM Interface Lines

- Control / Status lines (random access μ P)

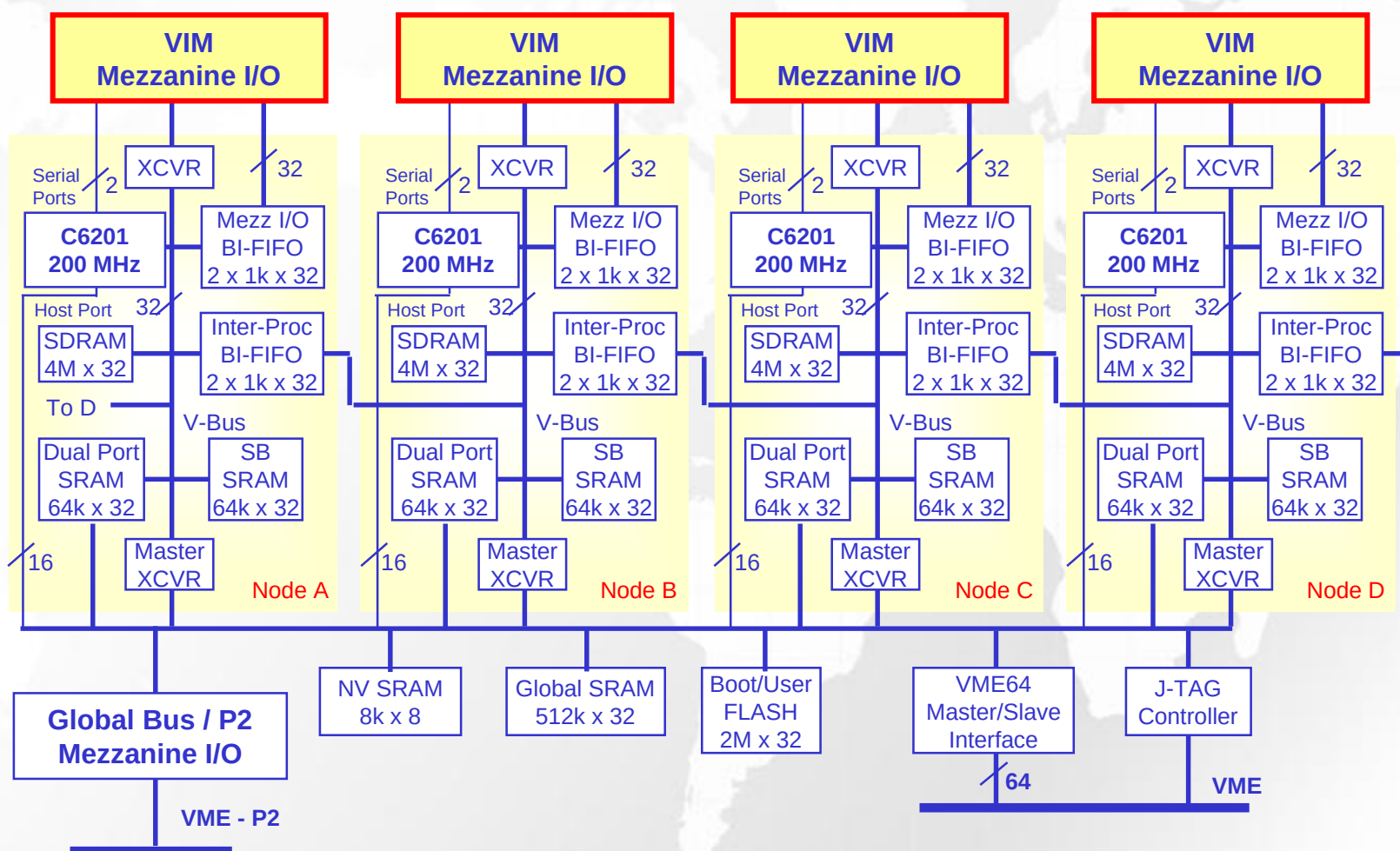
- Data: 32 (in/out)
- Address: 16 (in)
- Read/write enable: 2 (in)
- Read/write acknowledge: 2 (out)
- Module select / module present: 1 (in) / 1 (out)
- Processor clock: 1 (in)
- Interrupt: 1 (out)

- Power lines

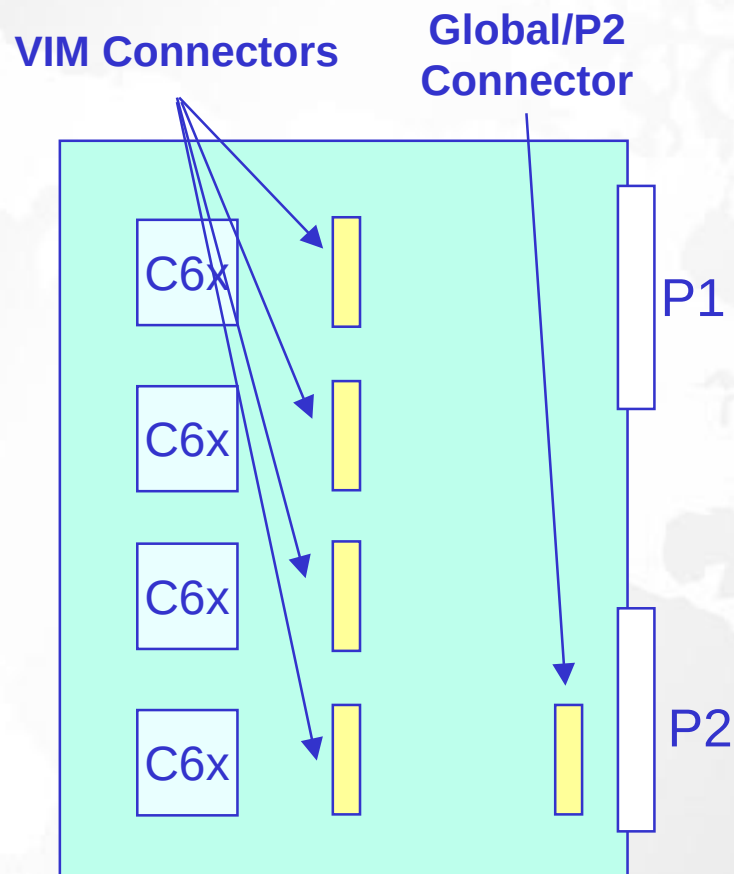
- +5V: 20 pins (1A max)
- +12V: 1 pin (0.5A max)
- -12V: 1 pin (0.5A max)
- Ground: 23 pins

VIM - Quad 'C6x DSP Board

- Four independent, dedicated VIM mezzanine interfaces



4290 VIM Connectors



■ Four VIM Connectors

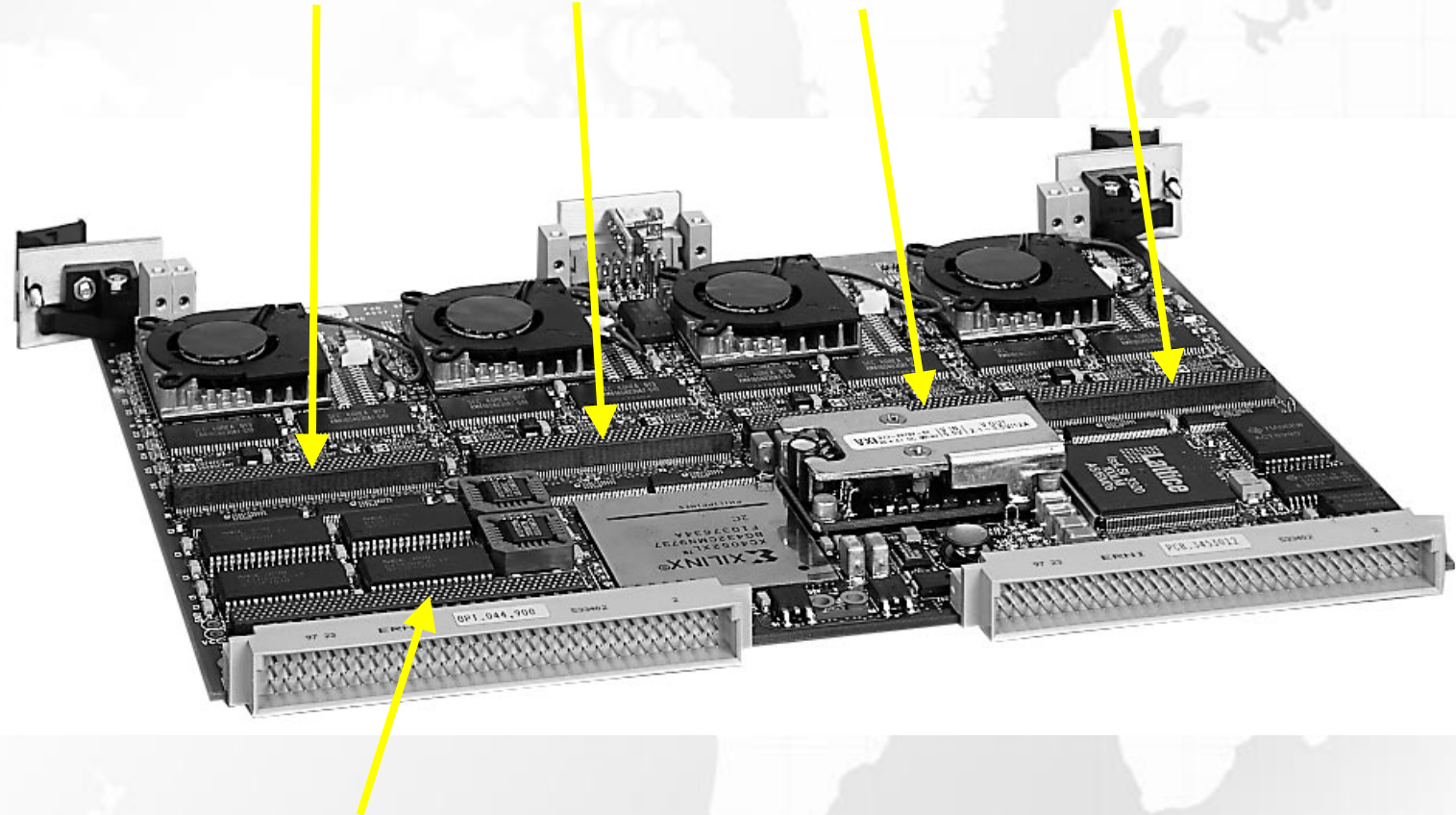
- 32-bit Parallel Bi-FIFO
- 2 McBSP Serial Ports
- V-Bus Status & Control

■ Global & VME P2 Connector

- Specific to 4290 & 4291 Processor Boards
- Direct Connect to Rows A&C of VME P2
- RACEway Connection

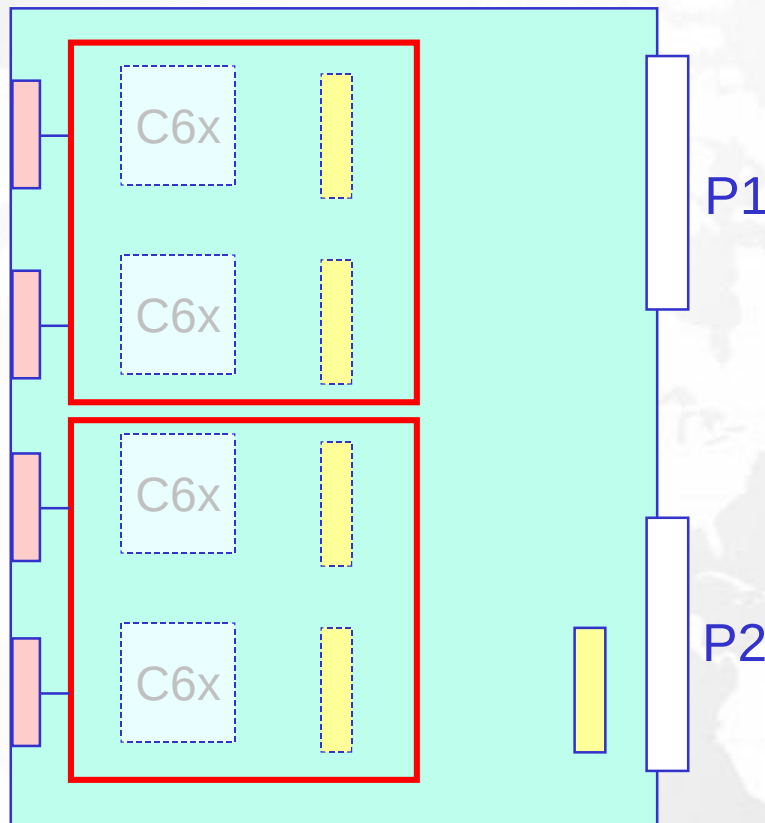
4290 Rear View

■ Four Processor Node VIM Connectors



■ VME P2 and Global Bus Connector

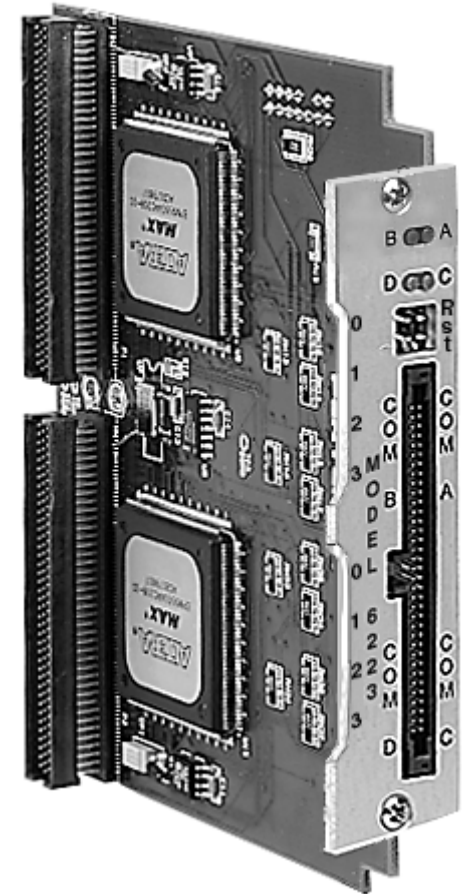
VIM-2 Dual Site Module



- Allows Two Different Mezzanine Functions on Single Quad 'C6x
- Interprocessor Bi-FIFO's on 'C6x Board Support Streaming I/O Applications

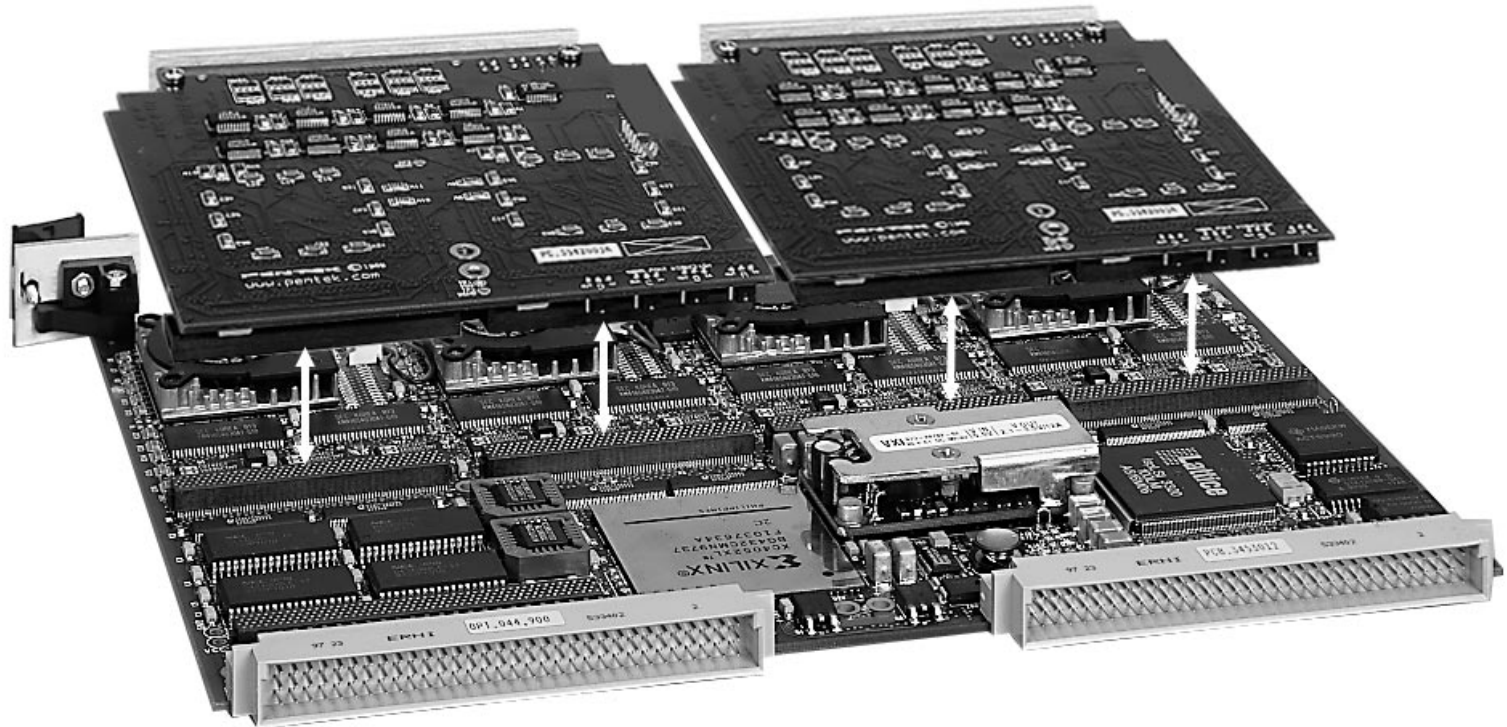
Typical VIM-2 Module

- Front panel of VIM modules replace a section of the front panel of VME or Compact PCI boards
- VIM modules nest in the same slot as the carrier board



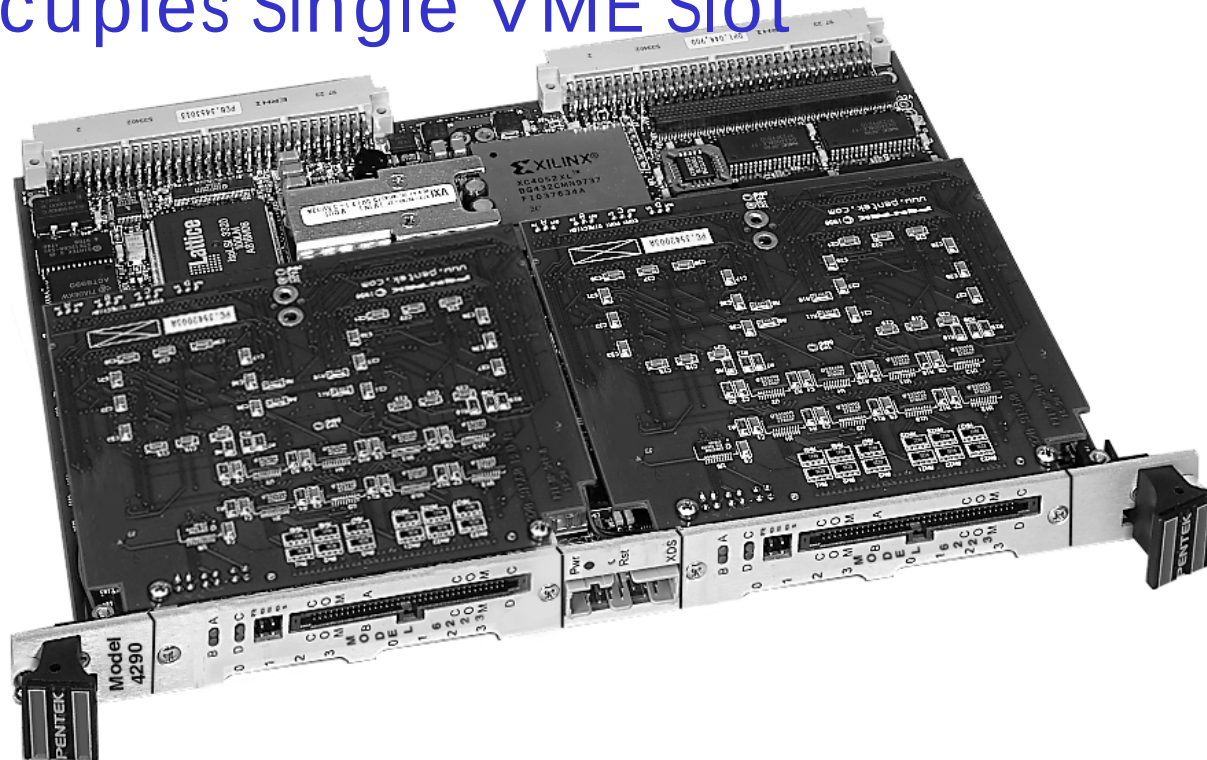
Attaching VIM Modules

- Two VIM-2 Modules Being Attached

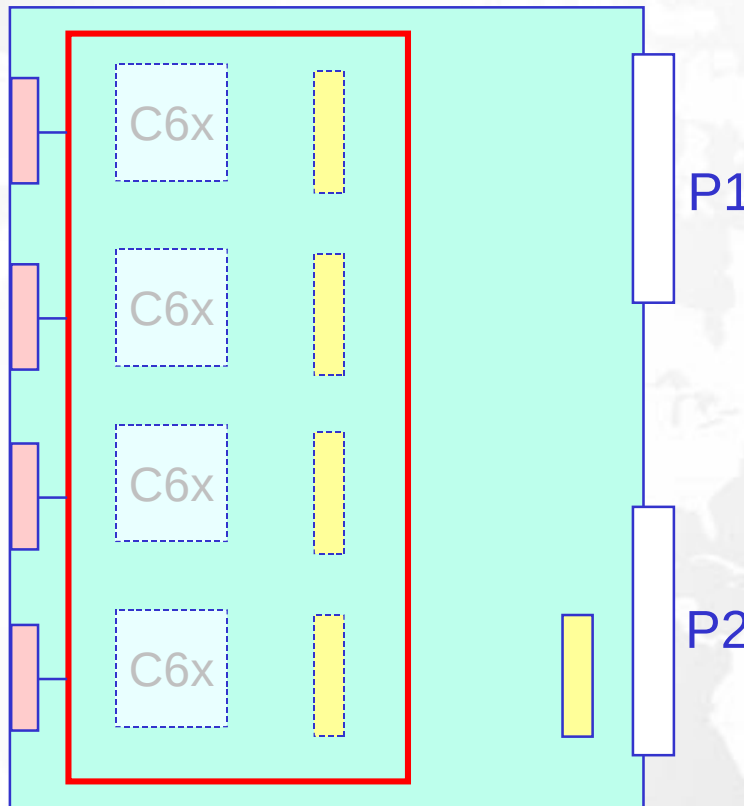


Completed Assembly

- Completed VIM Assembly with Two VIM-2 Modules Installed on Model 4290
- Occupies Single VME Slot

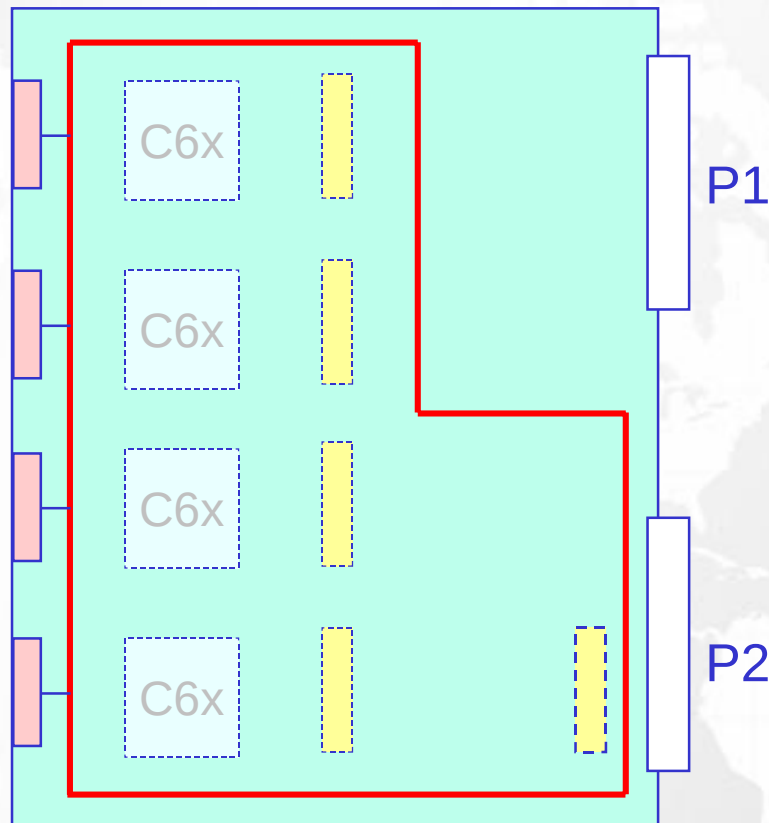


VIM-4 Quad Site Module



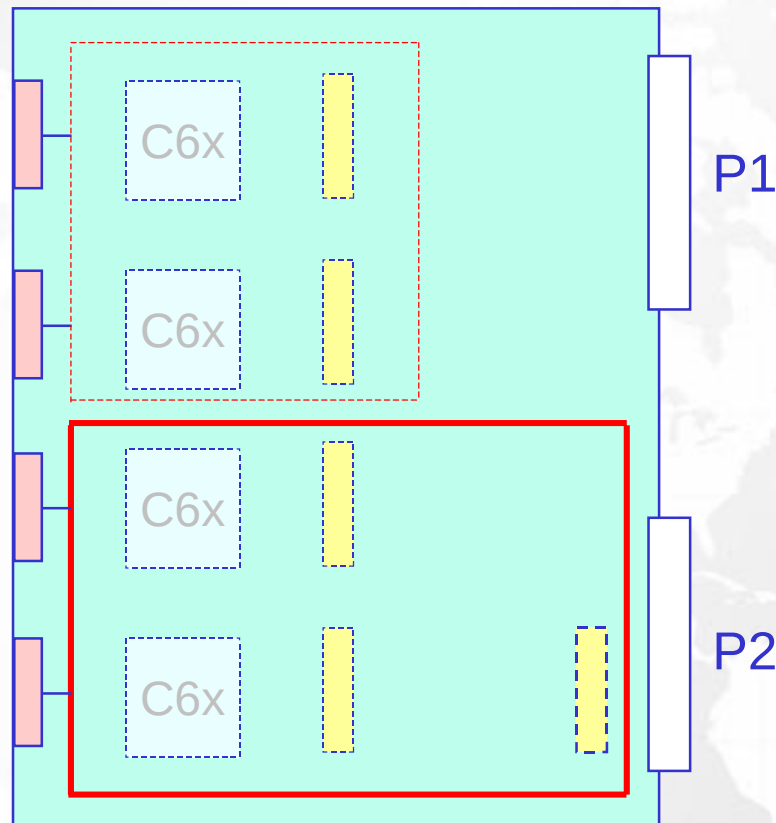
- Four 400 MB/sec Parallel Paths to 'C6x Nodes via BI-FIFO
- Eight 50 Mbit/sec Serial Paths to 'C6x
- Front Panel I/O with Application Specific Connectors

VIM-4R Quad Site Module



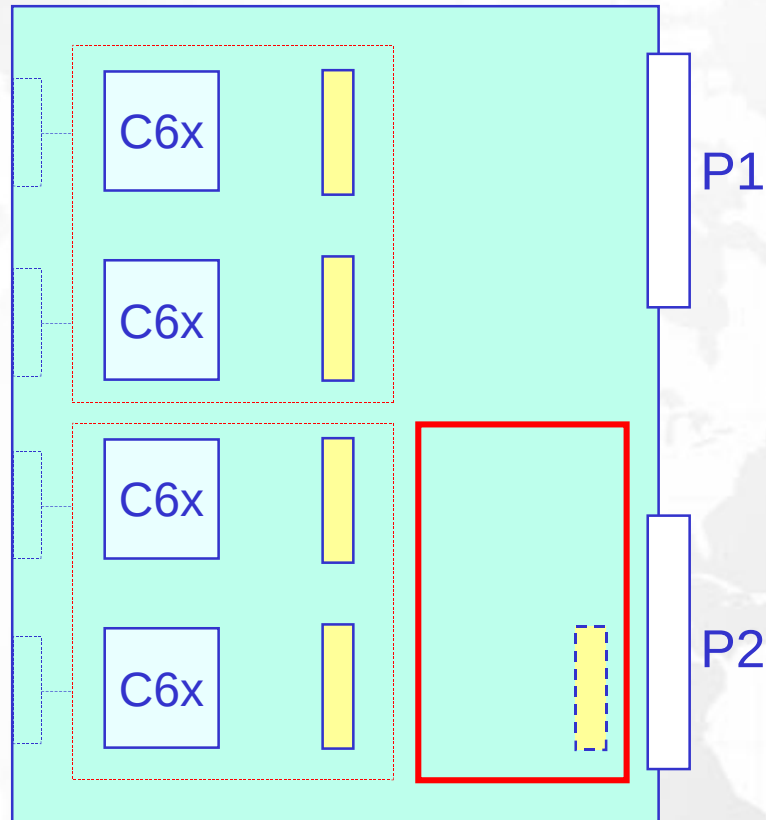
- VIM Extension for 4290 & 4291
- Rear Connector Supports Interfaces on VME P2
- RACEway
- VSB
- Custom I/O

VIM-2R Dual Site Module



- VIM Extension for 4290 & 4291
- Dual Processor Mezzanine with P2 Connectivity
- Allows Additional VIM-2 Module for More Flexibility

VIM-R Global / P2 Module



- VIM Extension for 4290 & 4291
- Supports Global Bus I/O Options to VME P2
- Global Bus -to- RACEway
- Supports Two Additional VIM-2 Modules for More Flexibility



Mezzanine Bus Scorecard

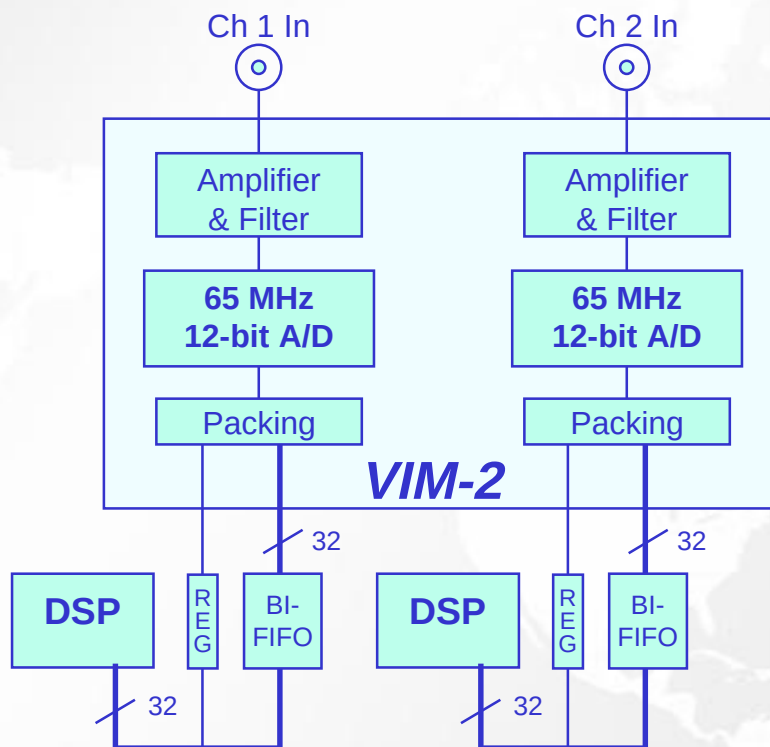
	Ind Pack	MIX	PMC	VIM
Data Bus Width (bits)	16	32	32 / 64	32
Bus Cycle Time (nsec)	250	100	30	10
Bus Cycle Rate (MHz)	4	10	33	100
I/O BW (MB/sec)	8	40	132 / 264	400
I/O Busses per VME Slot	4	1	1	4
I/O BW per Slot (MB/sec)	32	40	132 / 264	1600



VIM Module Lineup

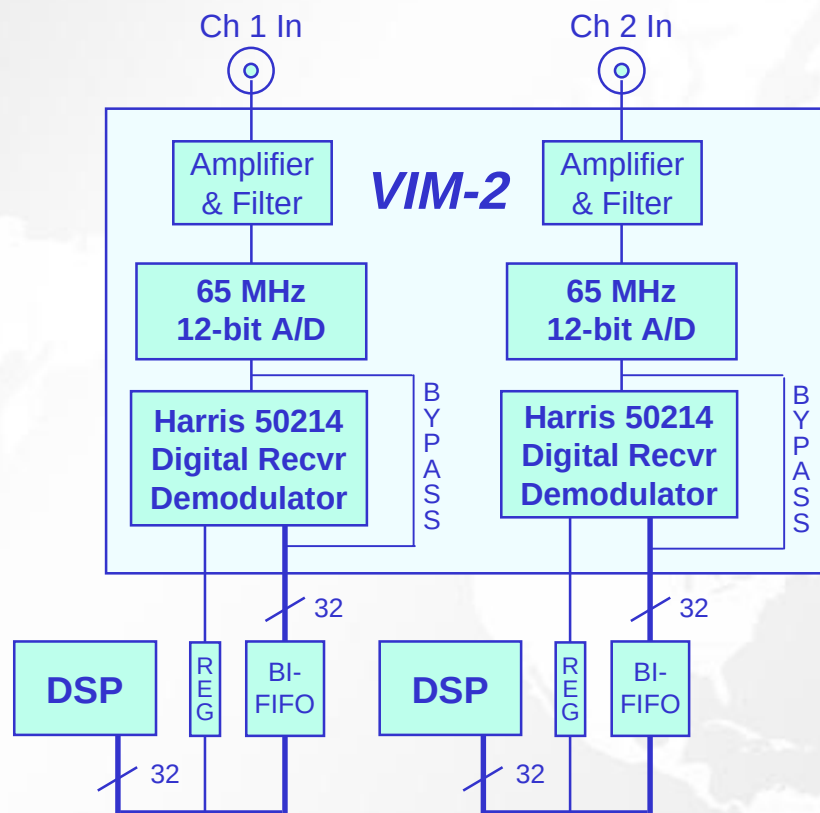
■ 6210	A/D + Narrowband DDR (50214)	VIM-2	NOW
■ 6211	65 MHz 12-bit A/D	VIM-2	NOW
■ 6215	250 kHz 16-bit A/D	VIM-2	NOW
■ 6216	A/D + Wideband Receiver	VIM-2	NOW
■ 6219	Dual RACEway Adapter	VIM-2R	NOW
■ 6220	Quad RACEway Adapter	VIM-4R	NOW
■ 6223	Comm Port Adapter	VIM-2	NOW
■ 6226	FPDP Adapter	VIM-2	NOW
■ 6227	Digital Parallel I/O	VIM-2	NOW

65 MHz 12-bit A/D - Model 6211



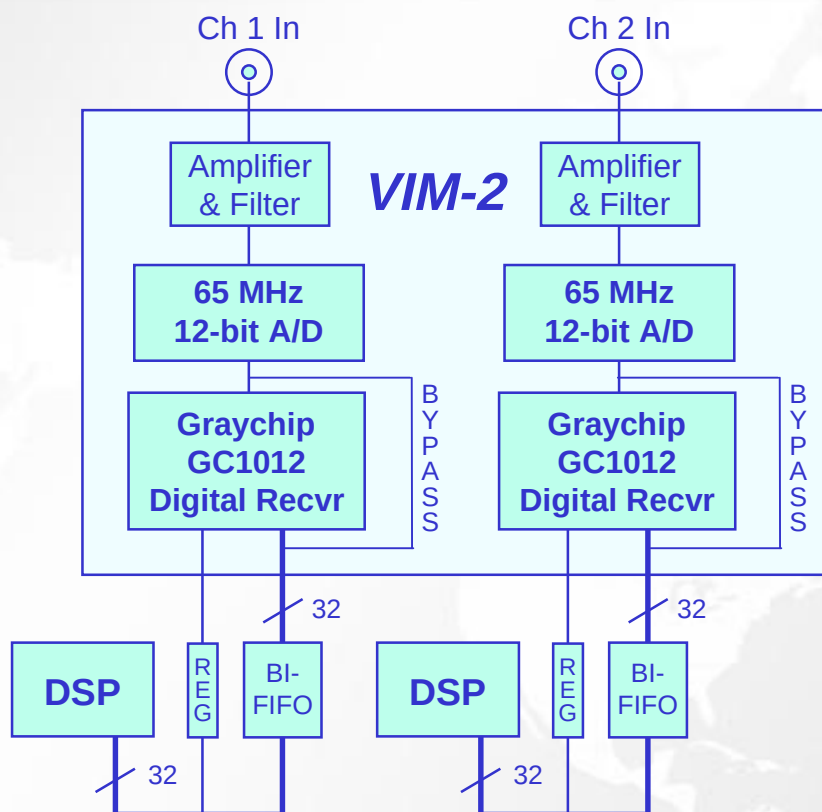
- Dual 65 MHz 12-bit A/D Converters
- Real Time Signal Analysis

Narrowband DDR + Demod - Model 6210



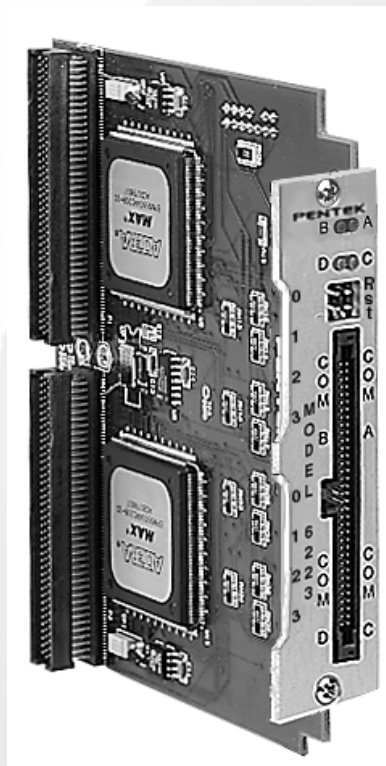
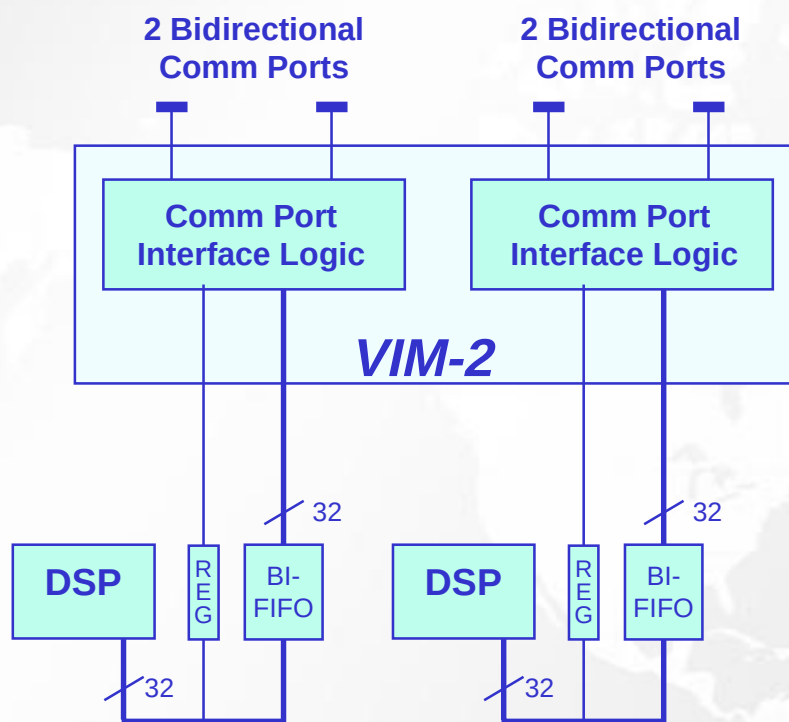
- Internal A/D Converter
- Digital Tuning and Bandwidth Control
- Hardware Demodulation - AM, FM, PSK

Wideband Digital Receiver - Model 6216



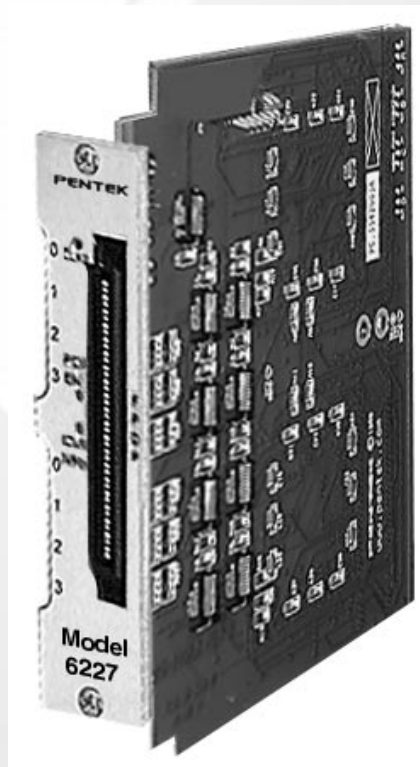
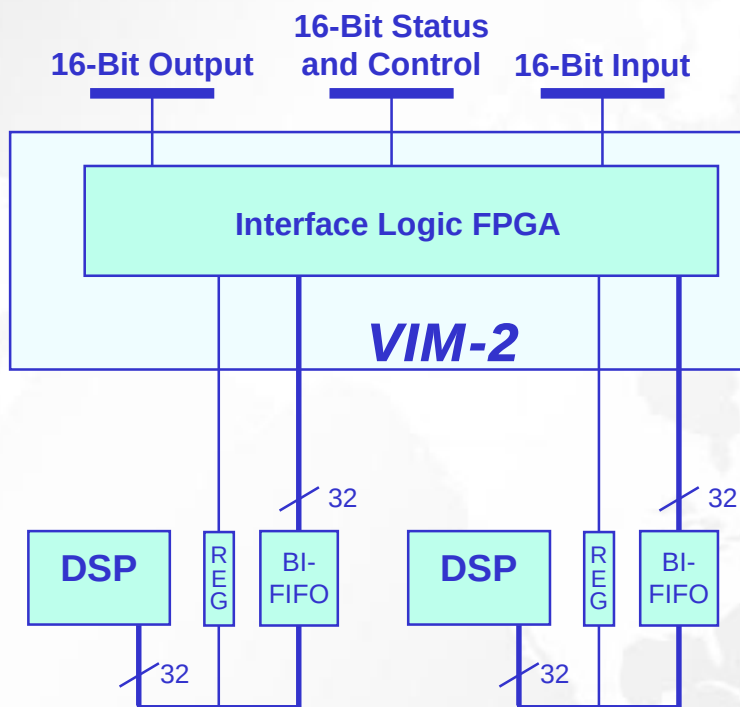
- Internal A/D Converter
- Digital Tuning and Bandwidth Control
- Decimation 2 to 64 - Bandwidths up to 26 MHz
- Programmable Receiver Bypass Switch

Comm Port Adapter - Model 6223



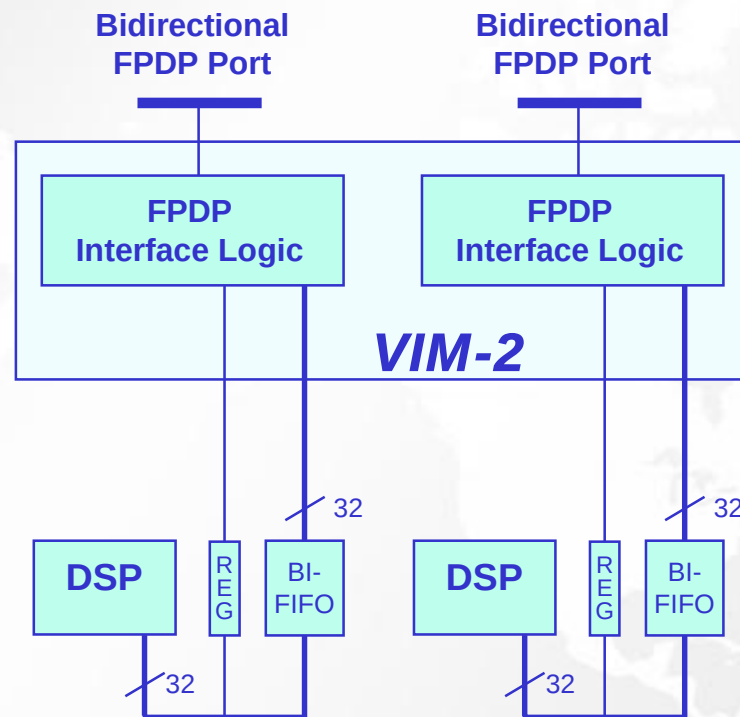
- Eight 20 MB/sec Front Panel Comm Ports
- Interfaces to Dozens of Comm Port Peripherals

Parallel Digital I/O - Model 6227



- 16-pin Parallel TTL Input & Output
- 50 MHz Clock Rates - 100 MB/sec
- 16-bit Control and Status Port
- Front Panel 100-pin Ribbon Cable

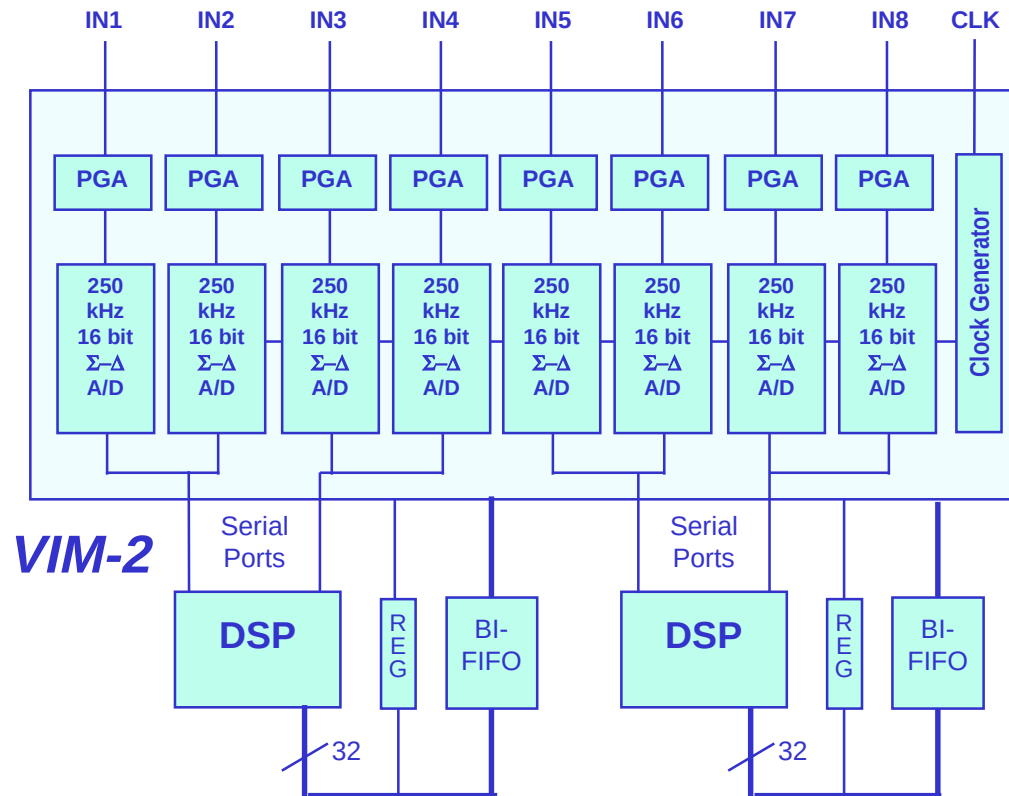
FPDP Interface - Model 6226



- Four 160 MB/sec Front Panel Data Ports (FPDP)
- Industry Standard High-Speed Ribbon Cable Bus

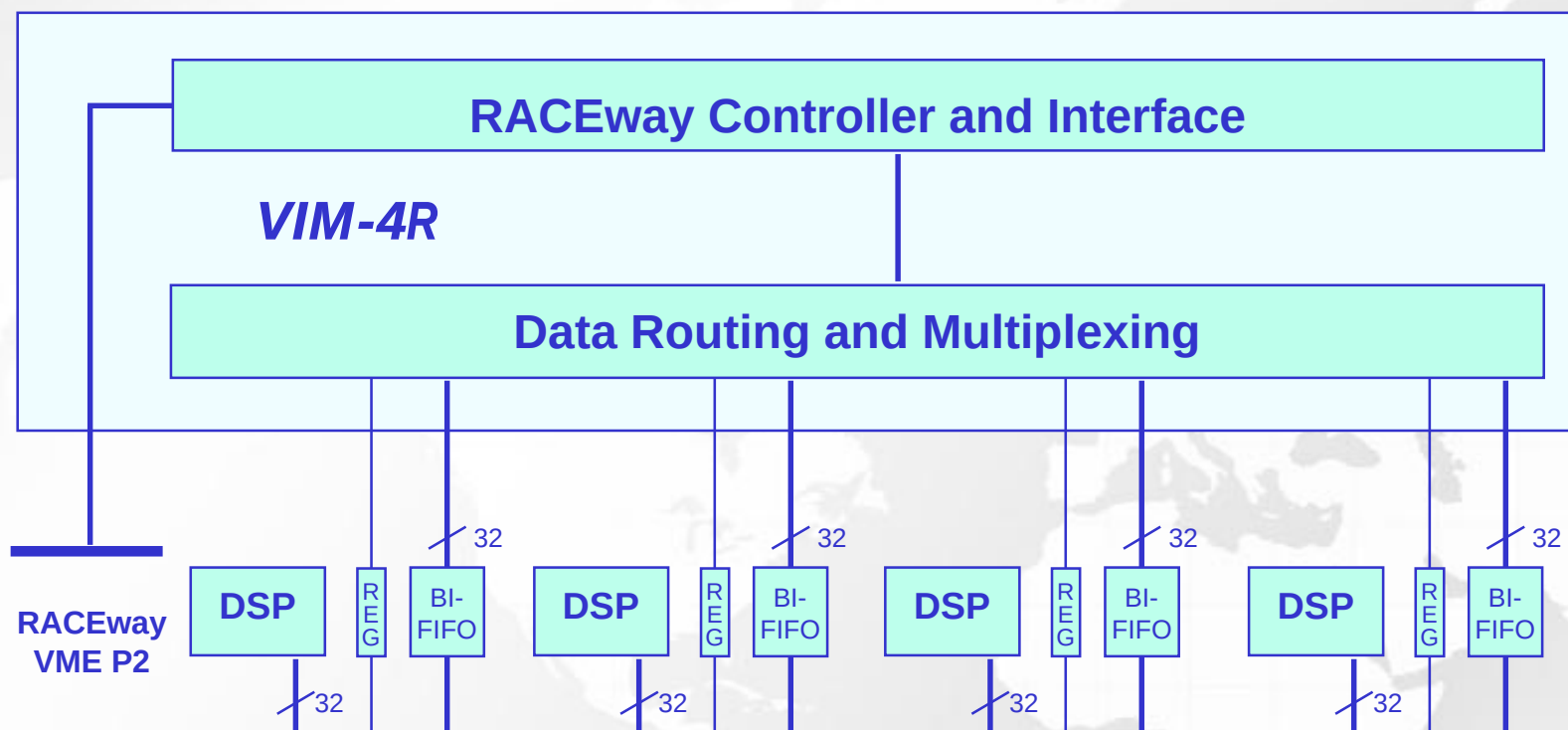


250 kHz 16-bit A/D Conv - Model 6215



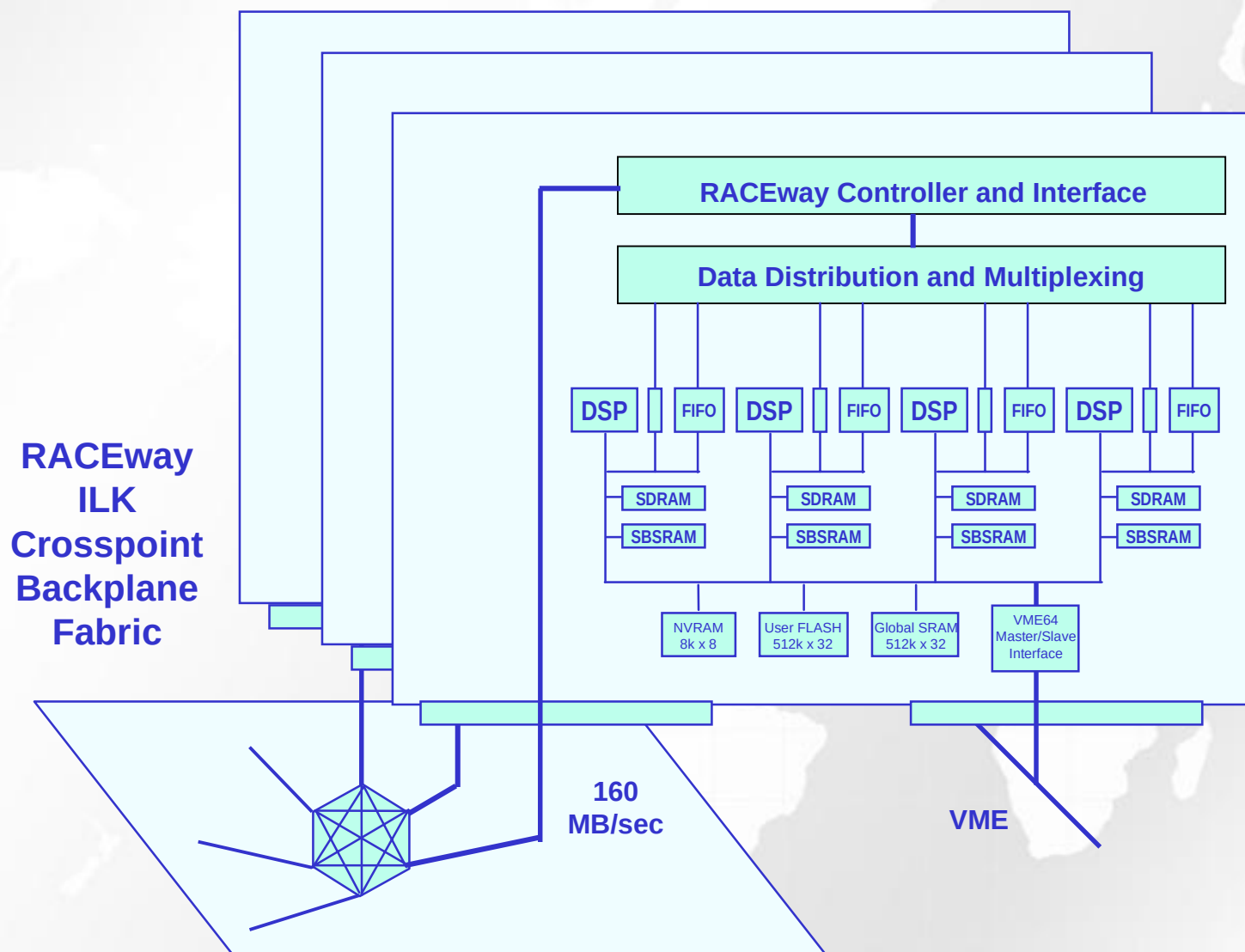
- Sigma Delta 250 kHz A/D's - Internal Anti-Aliasing
- 16-bit Accuracy, 110 kHz Bandwidth - Sample Clock Gen
- Programmable Gain - Serial and Parallel Interfaces

Quad RACEway Adapter - Model 6220



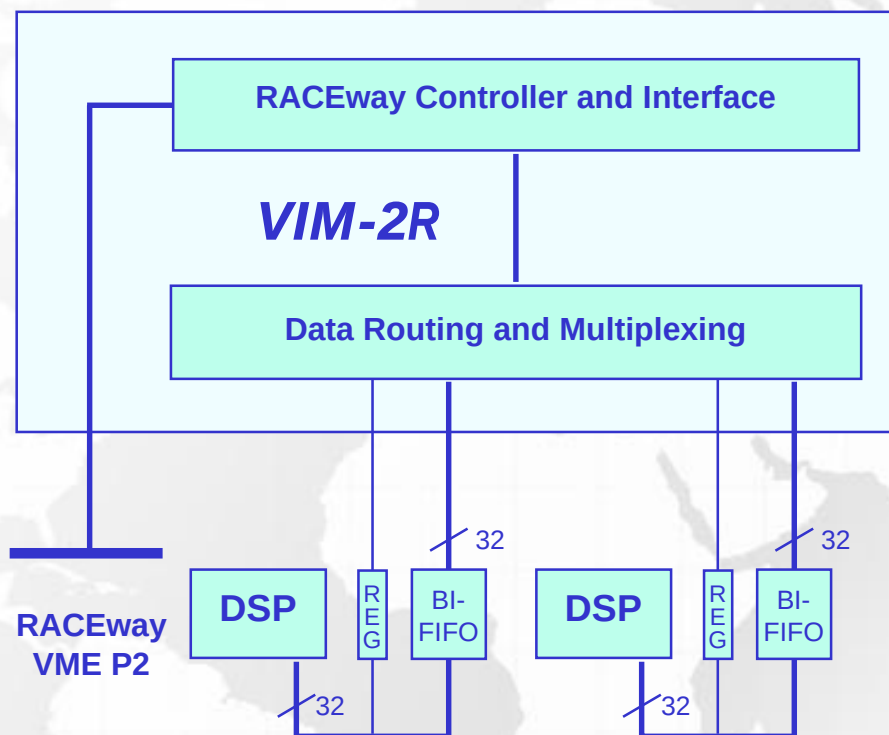
- 160 MB/sec To Backplane RACEway Fabric
- RACEway Data Packets Routed To/From 4 DSP's
- Private Bi-FIFO's for Each DSP

160 MB/sec Backplane with RACEway



Dual RACEway Adapter - Model 6219

- 160 MB/sec To Backplane RACEway Fabric
- RACEway Data Packets Routed To/From 2 DSP's
- Private Bi-FIFO's for Each DSP
- Supports second VIM-2 module for an I/O function



Next VIM Modules

- Dual Modulator + 12-bit D/A VIM-2
- Dual Modulator + 12-bit D/A VIM-2
- Dual Fibre Channel Interface VIM-2
- A/D + Narrowband DDR 6620 VIM-2
- Digital Transmitter/Receiver VIM-2
- E1/T1 Interface VIM-2
- 32 Channel Narrowband DDR VIM-4
- Multichannel $\Sigma\text{-}\Delta$ Codec VIM-2

Benefits of VIM

- Four Independent High-Speed I/O Channels
 - Rates up to 400 MB/sec for each channel
 - No contention for shared I/O resources
 - Eliminates I/O bottlenecks to DSP's
 - Outperforms all other mezzanine structures
- 3 Interfaces: parallel, serial, & control/status
- Bi-FIFO's maximize block transfer efficiencies
- VIM-2 Modules support mixed functions
- R Modules support direct RACEway connections
- High-density, single-slot VIM assemblies
 - Supports channelized system solutions
- Compatible with VME and Compact PCI

VIM Specification

- Open, non-proprietary standard currently in first published revision level
- Several major customers have successfully developed their own custom VIM modules
- No licensing or royalty fees
- Anticipated submission for standards committee within 1-2 years
- Available on the web at:
www.pentek.com/vimspec

