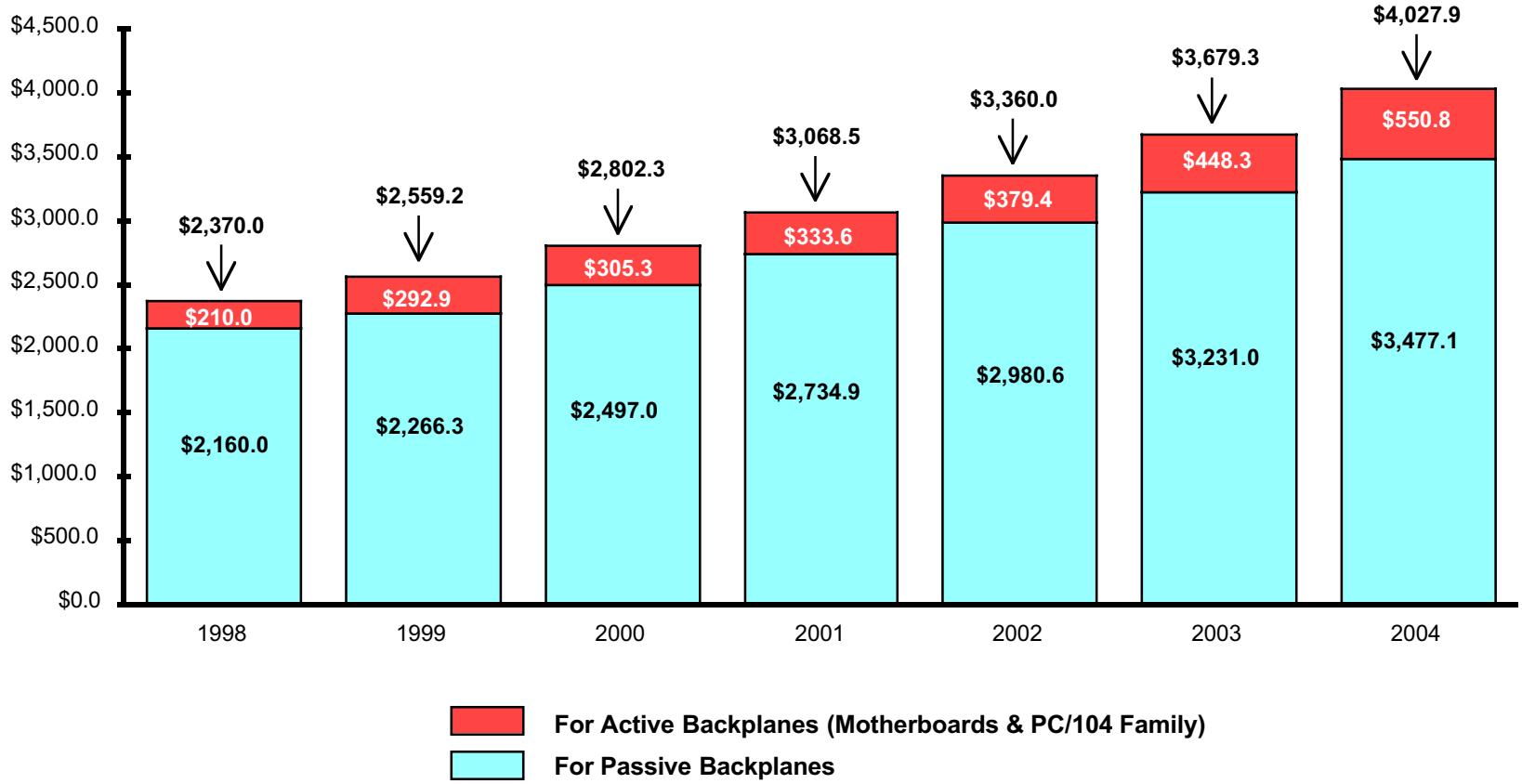
Real-Time / Embedded Computer Boards: Market Trends

J. Eric Gulliksen, Analyst
Venture Development Corporation
One Apple Hill
Natick, MA 01760
Phone: 508-653-9000
Fax: 508-653-9836
ericg@vdc-corp.com
www.vdc-corp.com

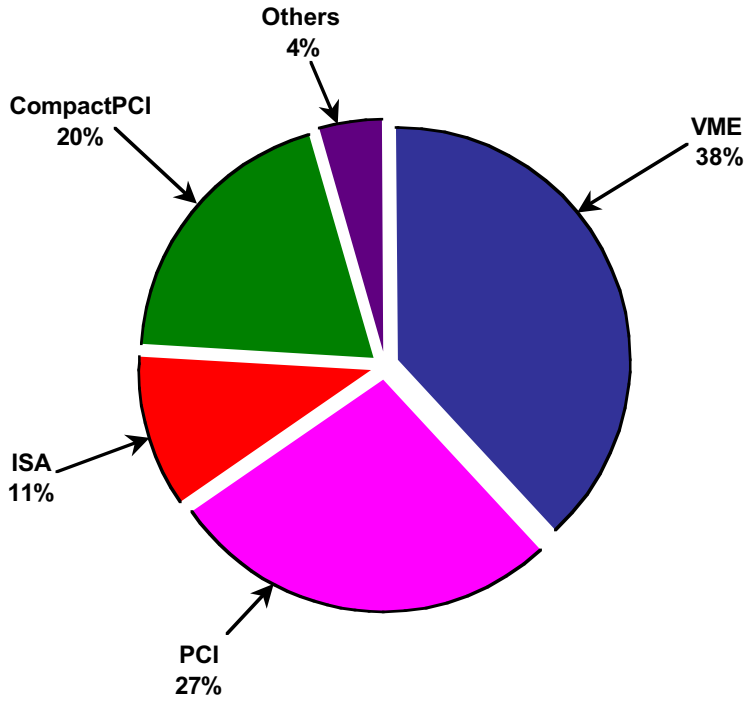
January 15, 2001

BUS & BOARD™

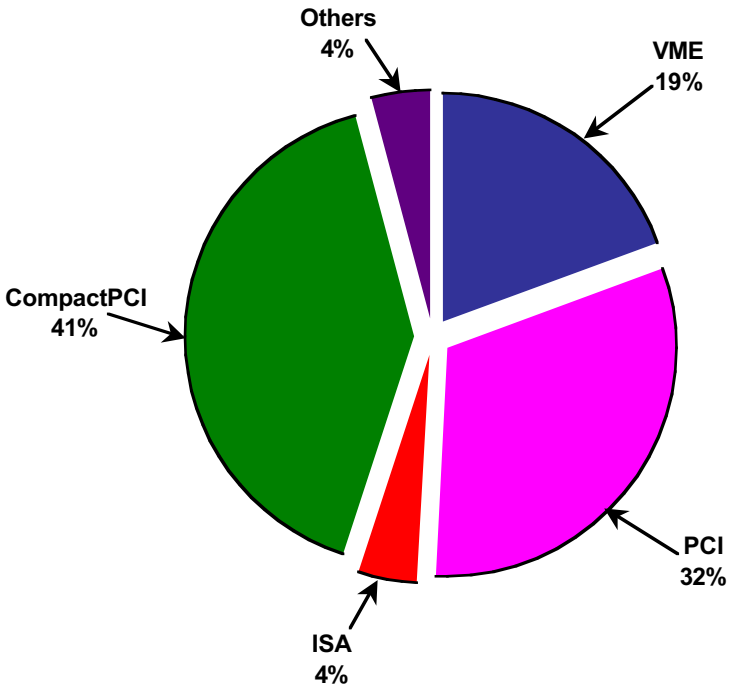
Projected Global Market for Real-Time and Embedded Merchant Computer Boards with Industry Standard Bus/Form Factor Architectures (US$ in Millions)



Segmentation of Passive Backplane Boards



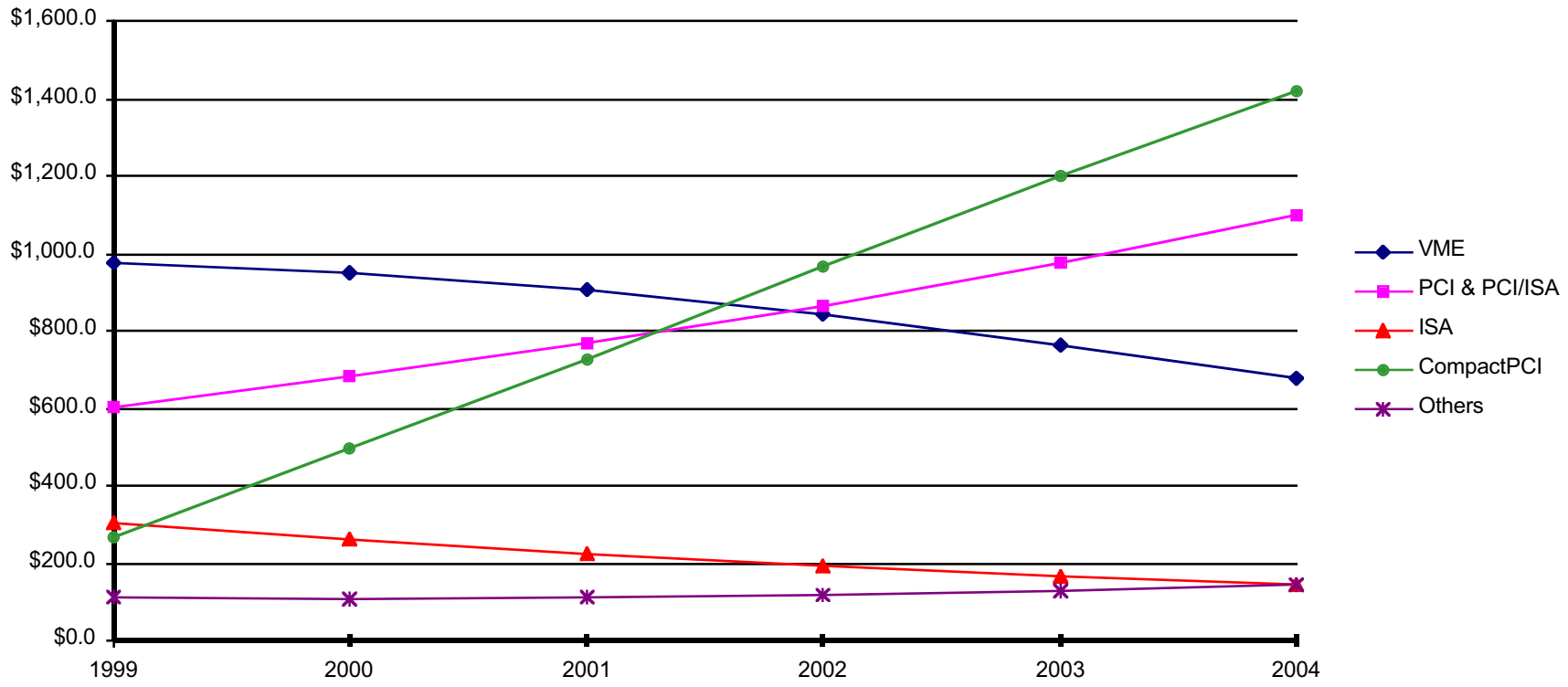
2000 Total: US$ 2,497.0 Million



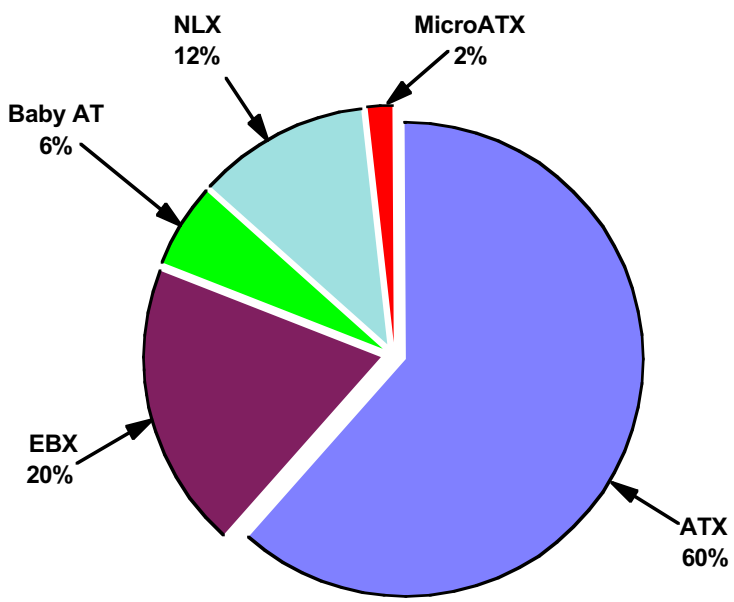
2004 Total: US$ 3,477.1 Million

Note: "PCI" includes PCI/ISA hybrids

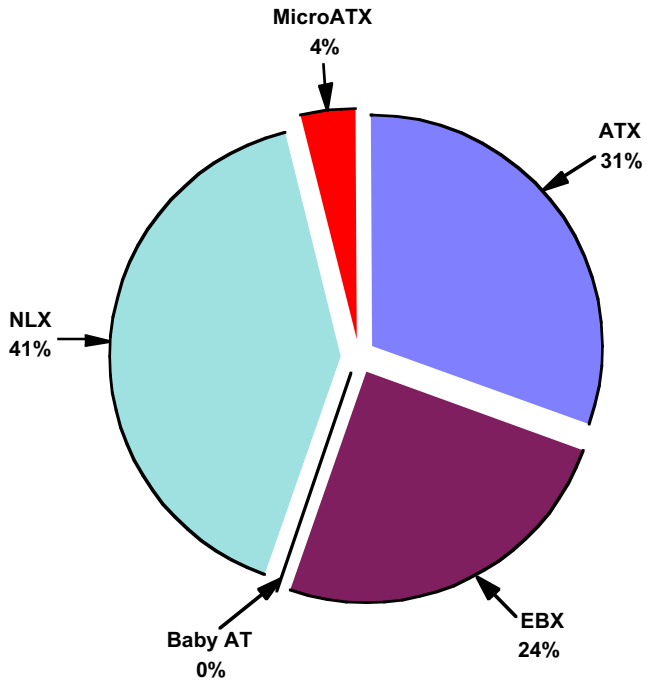
Projected Global Market for Standard Bus Architecture Passive Backplane Merchant Computer Boards (US$ in Millions)



Segmentation of Standard Form Factor Motherboards for Embedded and Real-Time Applications



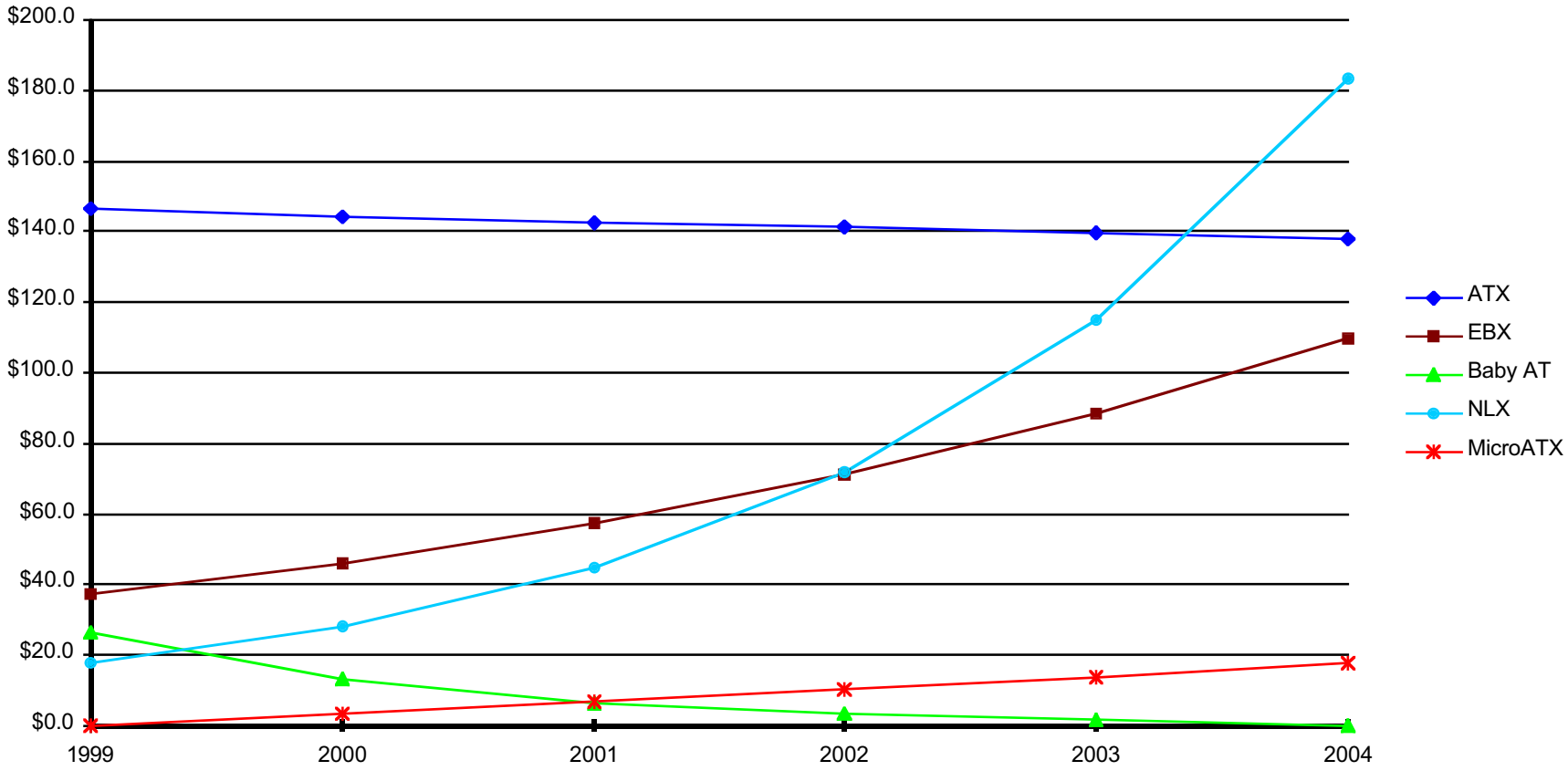
2000 Total: US$ 235.6 Million



2004 Total: US$ 449.0 Million

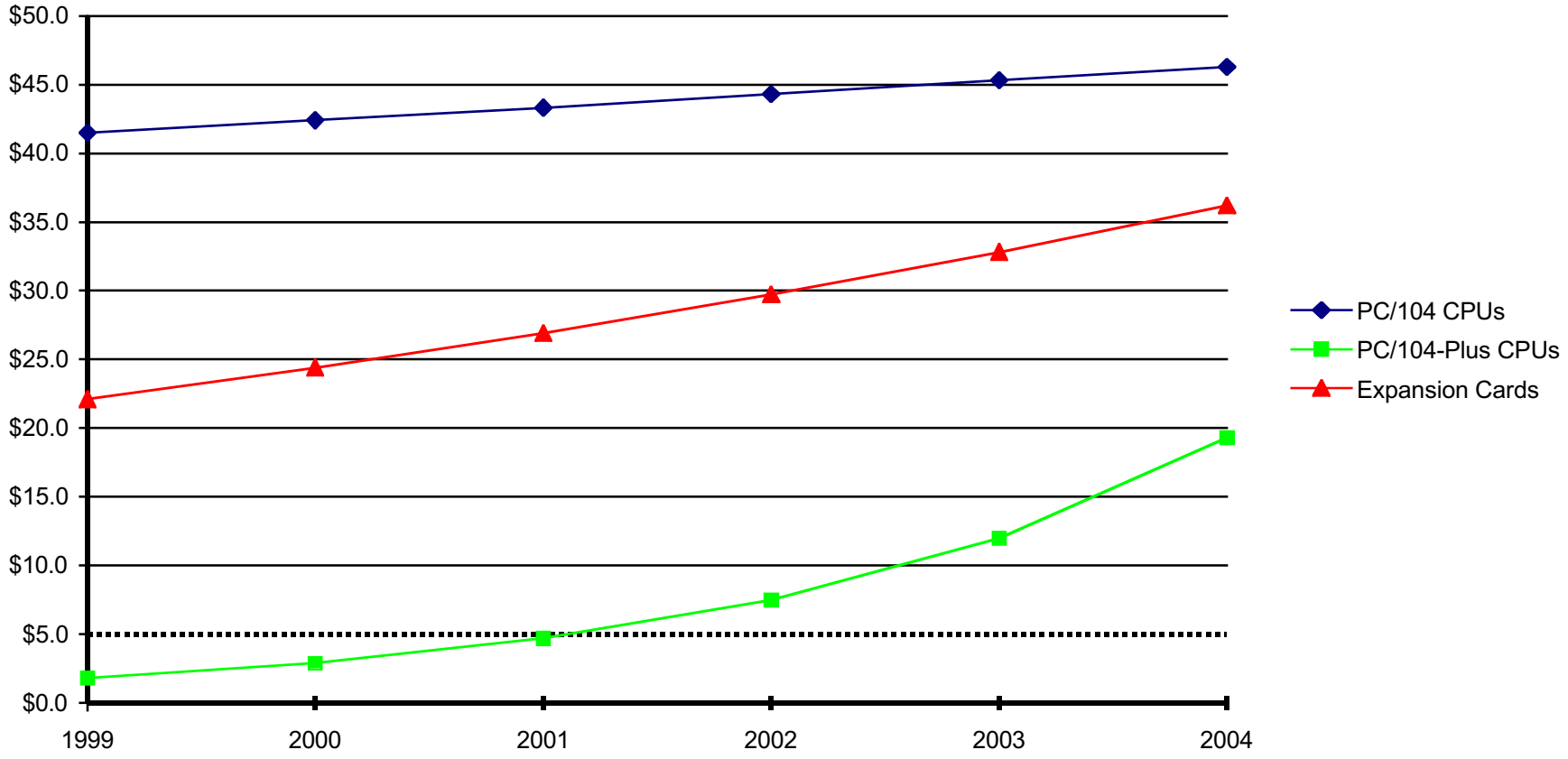
Exhibit 5

Projected Global Market for Standard Form Factor Merchant Motherboards for Embedded & Real-Time Applications (US$ in Millions)



BUS & BOARD™

Projected Global Market for PC/104 Family of Merchant Computer Boards (US$ in Millions)

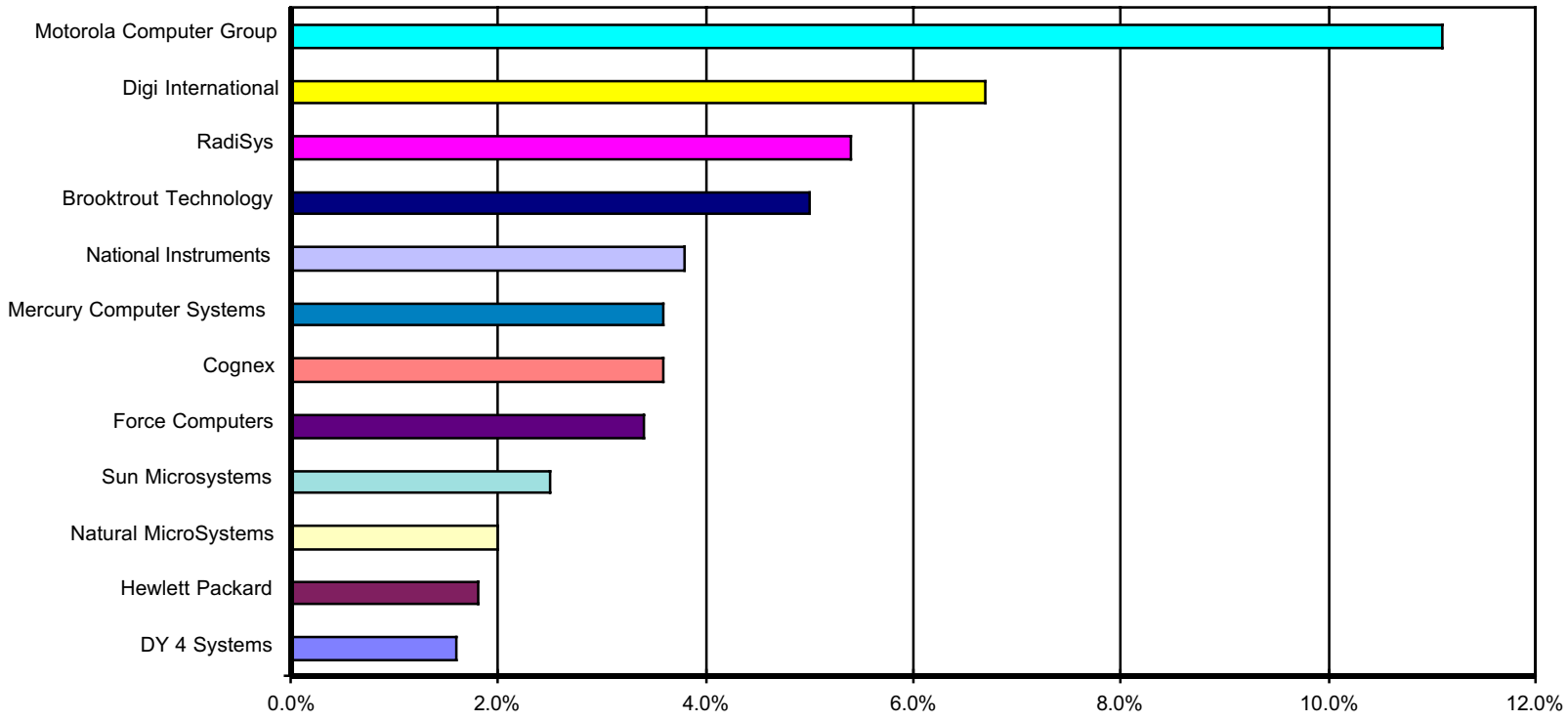


BUS & BOARD™

A Caveat:

The recent economic downturn, threat of recession, and poor earnings reports from the high-tech sector may reduce projected growth rates!

Top Vendors of Merchant Computer Boards with Industry Standard Bus/Form Factor Architectures, Ranked by Market Share (2000 Total: US$ 2,802.3 Million)



Note 1: Hewlett Packard plans to have exited the merchant board business by 2003.
Note 2: Intel has recently acquired Ziatech. The combined shares of the two companies would place the resultant entity just behind Sun Microsystems.

Leading Vendors in Major Bus/Form Factor Categories

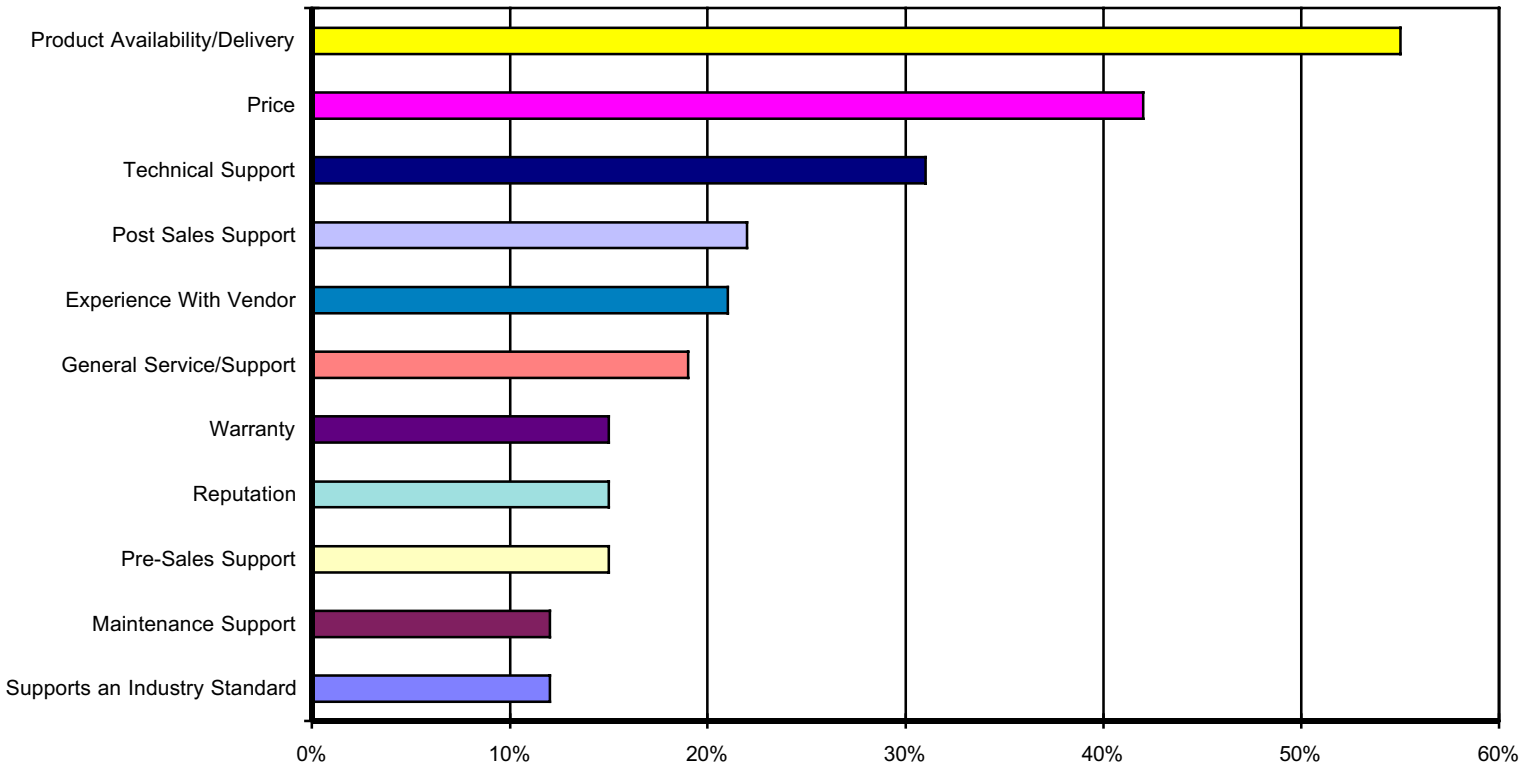
Passive Backplane Types:

CompactPCI	Force Computers
ISA	Digi International
PCI	Digi International
VME	Motorola Computer Group

Standard Form Factor Motherboards: Sun Microsystems

PC/104 Board Family: Ampro

Non-Product Vendor Selection Criteria
(Percentage of Respondents Citing)



Note: Percentages sum to more than 100% because of mulltiple responses

BUS & BOARD™

Industry Changes - 4th Quarter 1999 through 3rd Quarter 2000

JUMPTEC Industrielle Computertechnik AG acquired **Inside Technology**, **Adastra Systems**, **Dr. Berghaus GmbH & Co. KG**, and **CSS Industrie Computer GmbH**

Cetia, Inc. merged with **Matrix Corporation**

Digital-Logic AG acquired **MicroDesign**

Solectron acquired **Smart Modular Technologies**, which has been folded into **Force Computer**

Imaging Technology, Inc. was purchased by **Coreco, Inc.**

Natural MicroSystems acquired **QWES.com** and **InnoMediaLogic, Inc.**

Radstone Technology acquired **Kemitron Manufacturing**

Intel Corporation acquired **Ziatech, Inc.**

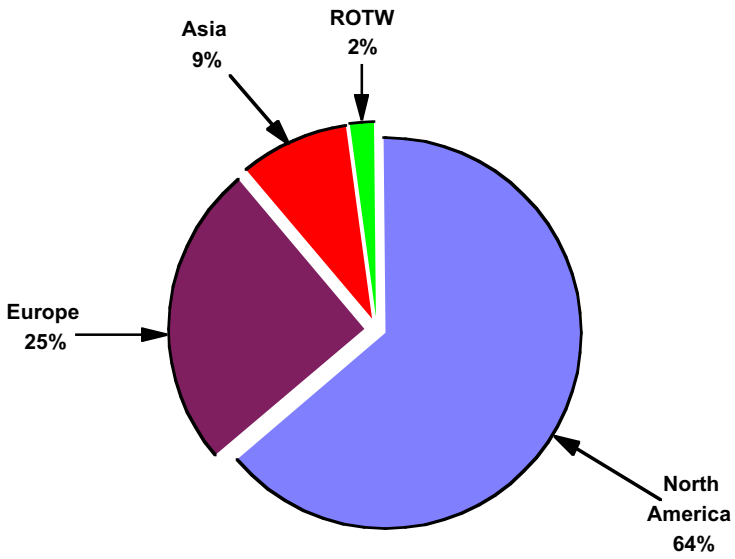
Motorola purchased an additional US$ 22.5 million of the stock of **Lineo, Inc.** (a Linux supplier)

ComputerBoards, Inc. changed their name to **Measurement Computing Corp.**

Kontron Embedded Computers AG acquired **PEP Modular Computer GmbH**

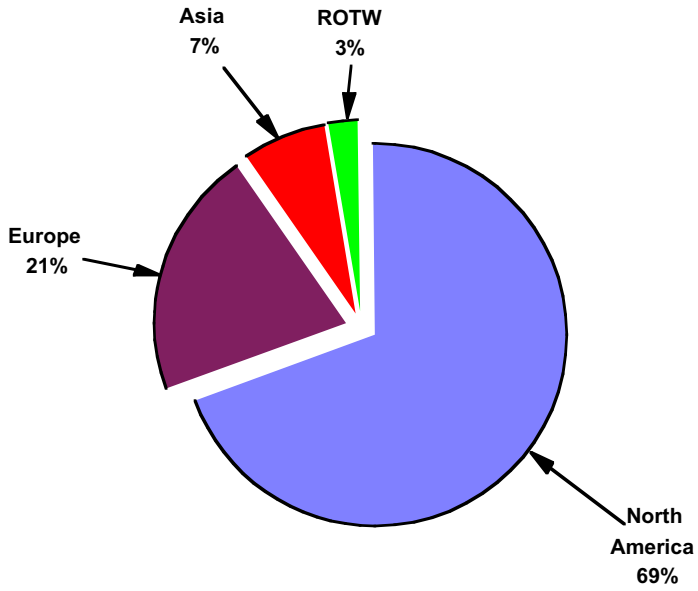
Geographic Distribution Shares of 2000 Merchant Computer Board Shipments

For Passive Backplane Systems



Total:
US$ 2,497.0 Million

For Active Backplane Systems



Total:
US$ 305.3 Million

Top Consuming Industries

Major Passive Backplane Bus Architectures

CompactPCI	ISA	PCI	VME
1. Telecom/Datacom	1. Telecom/Datacom	1. Telecom/Datacom	1. Military/Aerospace
2. Industrial Automation	2. Industrial Automation	2. Industrial Automation	2. Industrial Automation

Active Backplane Boards

Motherboards	PC/104 Family
1. General Business	1. Industrial Automation
2. Telecom/Datacom	2. Medical

Another Caveat:

One of CompactPCI's largest impacts on telecom/datacom has been in "core" internet applications. This segment is projected to remain relatively flat.

The largest growth area appears to be the "internet edge" segment (web hosting, routing, gateways, etc.). Indications are that this segment will be dominated by *appliances*, using sub-ATX motherboards with PCI-X architecture, interconnected by means of InfiniBand, StarGen, or other means.

All-optical backplanes and interconnection systems are on the horizon.

These factors may *SLOW* the growth of CompactPCI.

Top Merchant Board Types

Major Passive Backplane Bus Architectures

CompactPCI	ISA	PCI	VME
1. SBCs	1. Communications	1. Communications	1. SBCs
2. Communications	2. A/D I/O	2. SBCs	2. DSPs

Top Microprocessors

Major Passive Backplane Bus Architectures

CompactPCI	ISA	PCI	VME
1. Pentium	1. Pentium	1. Pentium	1. Motorola 68/88xxx
2. Sun SPARC Series	2. Celeron	2. Pentium III and Later	2. PowerPC 600

Active Backplane Boards

Motherboards	PC/104 Family
1. Sun SPARC Series	1. Intel 80486
2. Pentium	2. Pentium

BUS & BOARD™

Top Operating Systems

Major Passive Backplane Bus Architectures

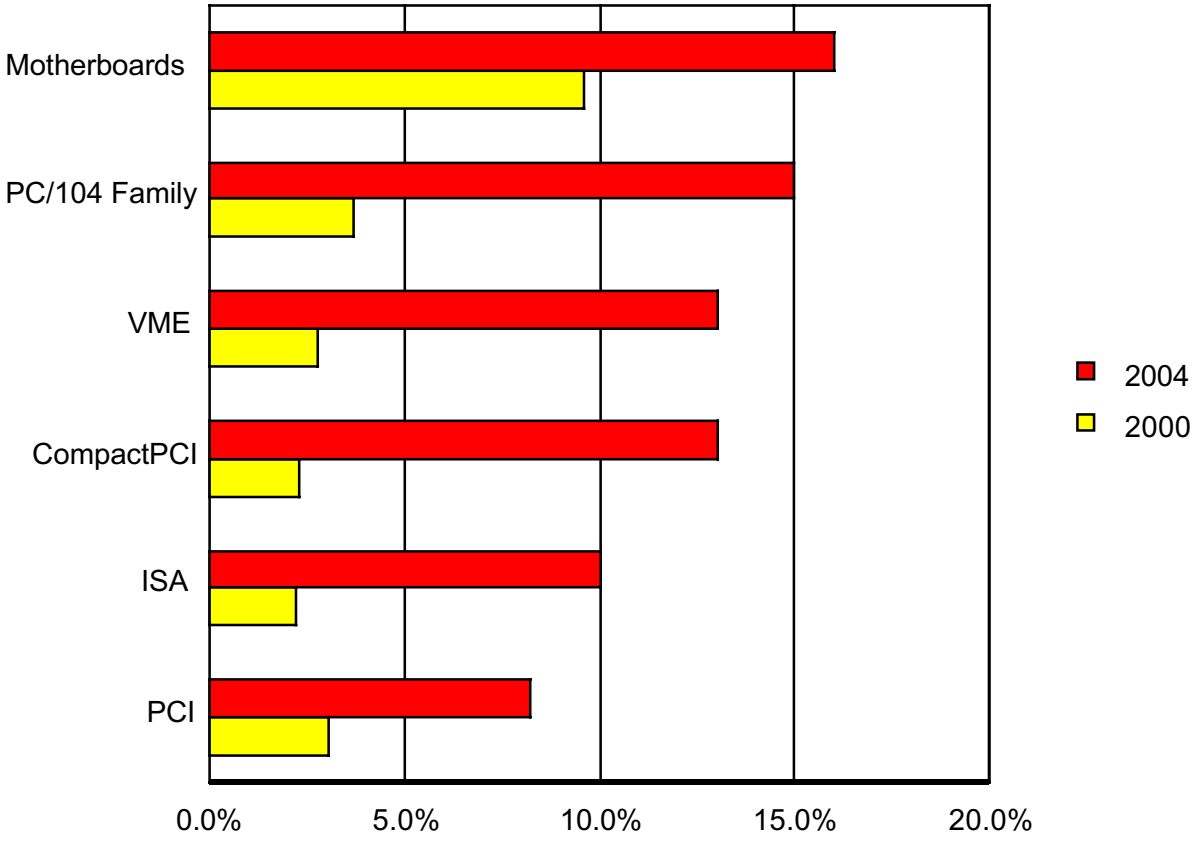
CompactPCI	ISA	PCI	VME
1. VxWorks	1. WinNT/2000 (s/w)	1. WinNT/2000 (s/w)	1. VxWorks
2. WinNT/2000 (s/w)	2. Win95/98/2000	2. Win95/98/2000	2. Proprietary

Active Backplane Boards

Motherboards	PC/104 Family
1. Solaris	1. Win95/98/2000
2. WinNT/2000 (s/w)	2. WinNT/2000 (s/w)

NOTE: “S/W” refers to the Server/Workstation version of Windows 2000

LINUX Usage: Percentage of Board Shipments by Dollar Volume



Q: What impact will InfiniBand and other high-speed bus or switching backplane developments have on the market, and on your firm's product offerings?

A: (ranked by number of merchant board vendors responding):

1. **"What's InfiniBand?"**
2. **No impact**
3. **Some impact in, maybe, 5 years**
4. **We're watching it, and will design for it if need be**

Q: What impact will InfiniBand and other high-speed bus or switching backplane developments have on the market, and on your firm's product offerings?

A: (ranked by number of suppliers of high-availability systems to telecom/datacom responding):

1. **We're designing for it now**
2. **Major impact, sooner rather than later**
3. **Major impact, assuming that the InfiniBand standard flies**
4. **We're watching it closely, and will design for it in the near future**

BUS & BOARD™

Implication:

Some Merchant Board Vendors may be missing the boat!

Things to Watch:

- LINUX
- PCI-X
- Appliances
- Hot Swap/Hot Plug
- InfiniBand
- StarGen
- Other switching backplanes
- Optical Backplanes
- PowerPC in VME space
- CompactPCI?

BUS & BOARD™

Decliners:

- DOS
- ISA
- VME
- Proprietary OSs
- Motorola 66xx/88xx

"Yawners":

- Windows CE

BUS & BOARD™

2001

VDC's Year 2000 Planning Service on Computers in Embedded and Real-Time Applications (CERTA)

Volume I: Merchant Computer Boards
(Market Analysis & Applications Analysis Reports)

Volume II: Redundant and High-Availability Industrial-Grade Computers
(Market Analysis & Applications Analysis Reports)

Volume III: Integrated Ruggedized/Industrial-Grade Computers
(Market Analysis & Applications Analysis Reports)

Contact Marc S. Regberg at VDC: 508-653-9000, x 111
msr@vdc-corp.com

VDC VENTURE DEVELOPMENT CORPORATION
TECHNOLOGY MARKET RESEARCHERS AND STRATEGISTS SINCE 1971