

SC SysComms '98



Conference Summary *by* *David Francis, CERN*

Disclaimer:
Personal, biased & non-complete

Comparison with previous events

	Days	Where	Tutorials	Plenary	Parallel	Vendor/ Exhibits	Attendees
SysComms '98	2	Geneva	7	4	56	53	> 162
VITA Europe congress '96	3	Brussels	2	5	51	~30	102
OBS '95	3	Zurich	3	2	55	~30	
VMEbus in Research '88	3	Zurich	0	5	50	~30	

In addition at SysComms'98 ~5 user group meetings:
PICMG, GroupIP, VITA, VSO, CANopen

Overall Health

Two OpenBuses at this conference:

VMEbus & CompactPCI

Each supported by significant manufacturer group: VITA & PICMG

“Develop and promote standards for VMEbus and CompactPCI systems and boards for use in industry, research & telecommunications”

Reasons for standards clearly spelt out by several speakers

Reduction of effort, long term viability, cost, availability etc.

... “Application Development” by G. Heyes

We heard the status of ongoing standards:

- VMEbus:
 - VITA 1.1-1997 (VME64x) ... currently at ANSI balloting phase,
 - VITA 23-199x (VME64xP) ... ready for ANSI balloting,
 - VITA 1.5-199x (2eSST) ... ready for ANSI balloting

Using VME320 enabling backplane 2eSST gets you upto 320 MB/s

Talk over beer & tea that 1 GB/s now within sights !!

- CompactPCI
 - Extensions for Test and measurement
 - Hot swap
 - System management
 - Telephony Specification (H.110)

Both:

“have chosen the same well defined, rugged IEEE 1101 Standard series for mechanical core specifications for microcomputers ...” ... Eike Waltz

And:

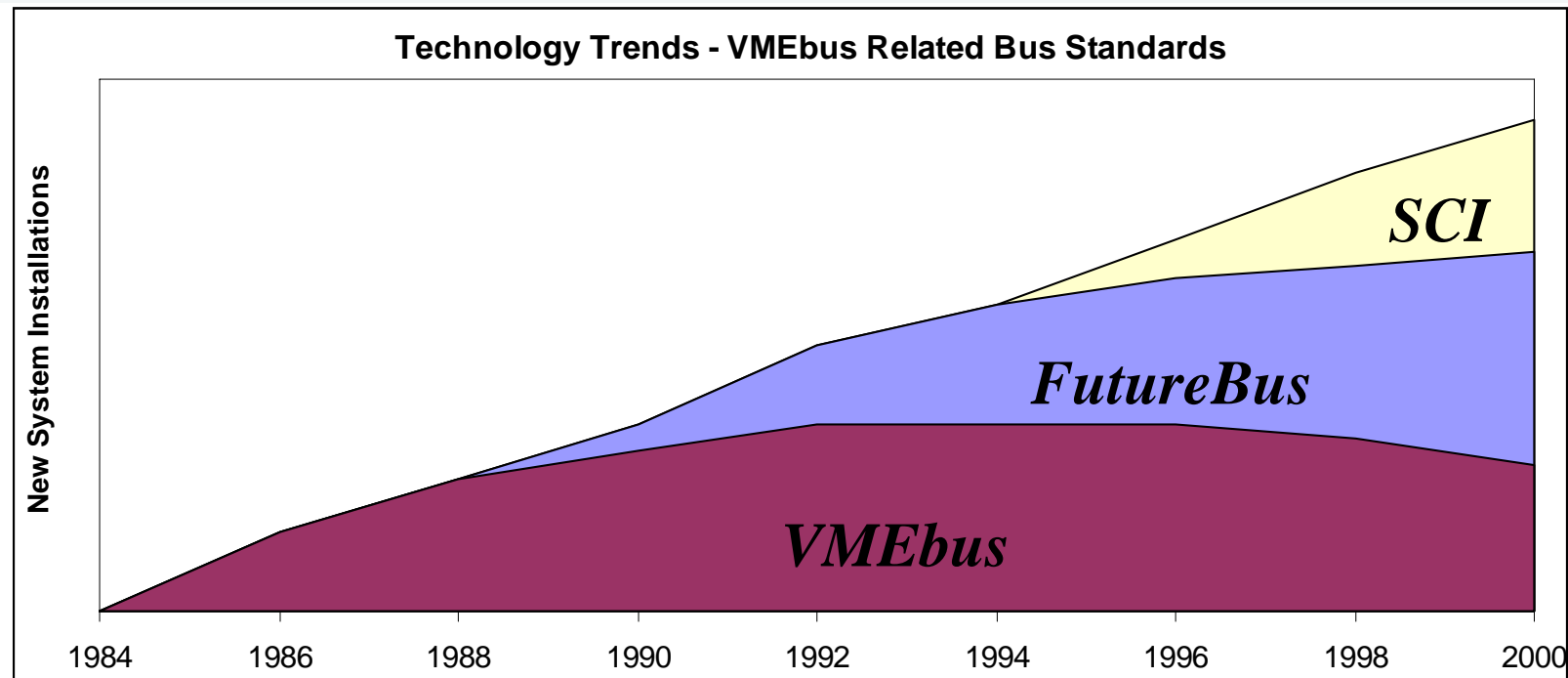
In terms of functionality, both VMEbus and CompactPCI are working on the same issues, namely: Hot-swap, High-Availability, EMC, ESD.

Driven by Telecommunications market

*These specifications clearly aim to standardise and establish CompactPCI
&
for VMEbus they are consolidating its position as THE systems bus*

VMEbus is getting a mid-life kick which will take it well into the 21st century
Not bad for a bus which is now 18 years old and was predicted to run out of
steam in the early 1990s !

“VMEbus - The Next 5 Years”, VMEbus IN RESEARCH, ETH, Zurich ‘88.



“At the risk being called a heretic, it is inevitable that the VMEbus will eventually be overtaken by technologies which can meet the needs for new facilities and greater performance than the VMEbus is capable of supporting. ... the VITA community should embrace a vision of related interconnection structures, with the VMEbus as the foundation, ... Futurebus as the second tier, and perhaps the resulting design from the IEEE Study Group on SCI, as a third tier ...”

CompactPCI:

- Limited number of slots

Not an issue if Bandwidth loss across PCI-to-PCI bridges acceptable

- Lack of multiprocessor support

In a multiprocessor system a single processor is the “Systems Manager”

- limited interrupt functionality

True, but given VMEbus boards based on PCI ... the same problem (?)

However:

- does provide a basis for plug-and-play
- alot of Software support ... leverages the PCI desk top market.

CompactPCI aiming at the Telecom market

*Will find its piece of the market due to difference in entry cost
... besides a choice is healthy*

Board Architectures

Common board architecture:

CPU, PCI & PMC

PCI well established as the I/O bus.

Will be around for a few more years

It has is also been the catalyst for mezzanines *i.e.* PMC.

They are now respectable:

Modular, application specific and plug-and-play

... See VITA product directory

Difficult to see how we survived without a standard !

However, beware the “Christmas tree syndrome” !

“Some Aspects of VMEbus Integration & Testing”, VMEbus IN RESEARCH, ETH, Zurich ‘88.

“In the otherwise admirable endeavour to offer the customer more functionality, some manufacturers are beginning to take the modularity of their boards to another, and wholly incompatible level. The use of “plug-on” or “piggy-back” boards is, in many cases, essential in order to implement sufficient functionality on the relatively small VMEbus dual-height board (we will not re-open that particular bone of contention), or to build-in some necessary flexibility. In some cases, however, the user loses manufacturer independence, which the original choice of VMEbus gave him, and impractical mechanical layouts may be introduced (piggy-backs on piggy-backs, with additional plug-ons or -ins). An addition to the standard is required for such plug-on boards in the VMEbus context.”

... 1998 VITA personality of the year !
... i.e. Chris Parkman

PMC & IP 16% and 18 % of the world market
PMC expected to outsell IP ... Ray Alderman

We have heard about a new mezzanine standard, PC-MIP:

- PCI electrical specification
- based on experience from M-modules and Industry Packs
- Address' the requirements for smaller mezzanines
- Should start to appear in the next 12 months

Should NOT be seen as a replacement for PMC

Secondary buses

As usual secondary buses well represented:

PVIC, Raceway and Myrinet

In addition we have heard about P2PCI (PCI on P2)

& CT Bus for CompactPCI

What is it they offer ? Typically:

- Extra bandwidth
- concurrent transfers
- specific functionality (*e.g.* broadcast, TDM buses)

P2 left available for application/vendor specific I/O

The menagerie of secondary buses seems to indicate that it was a good idea.

However, do they have to be standardised ?

They invariably become standards supported by a single vendor !

- One of the pitfalls of adopting a “Standard”
- Debases standardisation:
“My bus is an ANSI/VITA standard” ... very good for sales !

*P2 buses are everything a standard should not be
and certainly go against the spirit which VMEbus is based upon*

In fact:

*“My bunch of **green bananas** are an ANSI/VITA standard”*

Is it too easy to standardise ?

... Discussion session in OBS '95 ... its still an issue

Field Buses

At Obs'95 it was commented "There are 190 standards"

Only two were represented here: Profibus & CANbus

CAN we read this as winners slowly emerging ?

Or will there be another one along on the minute ?

PICMG Systems management subcommittee looking at standardising a field bus for CompactPCI systems

Seem to be leaning towards SMBus (an implementation of I2C)

CANBus:

- Presentation on CERN's approach to adopting industry standards.
Recommends the use of Profibus, CANBus and WorldFIP.
- CANBus already adopted by a LARGE experiment at CERN (ATLAS)
 - Developing a standard CAN node for the experiment
 - they will also need radiation hard nodes
- Presentation on the CANopen standard
 - an implementation of the application layer of CANbus
One hopes it will further standardise CANbus

Profibus:

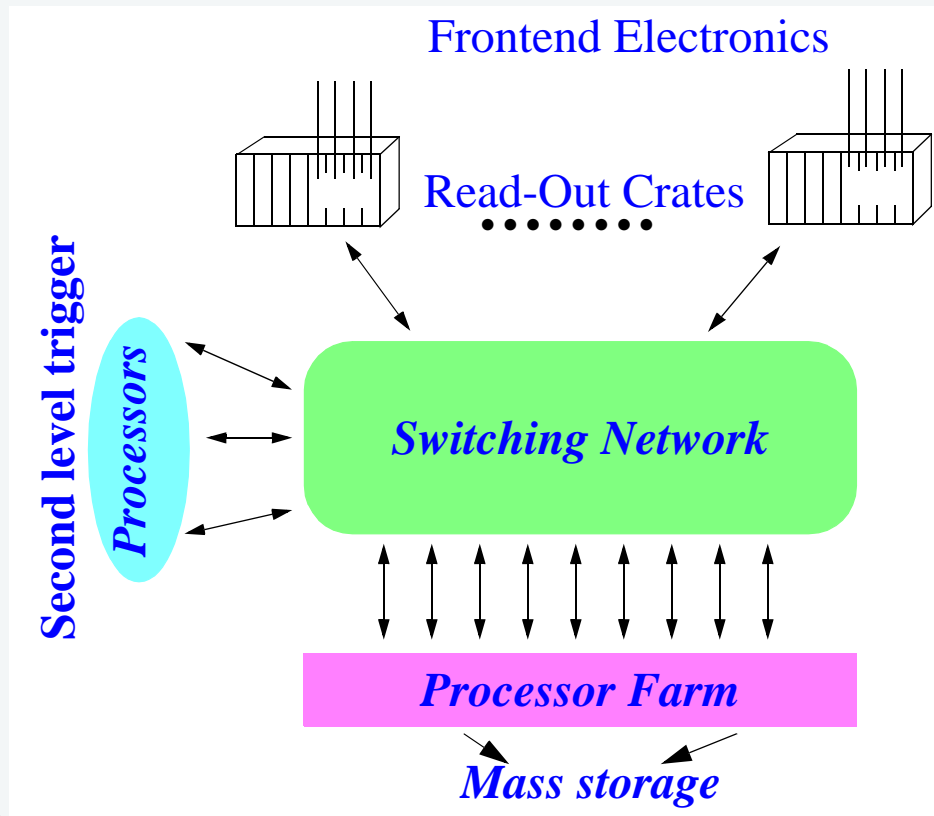
Interesting talk ... high-lighted the need to send/receive short messages
software overheads at the application layer dominate !
Sounds like a familiar problem !!!!!!!

Applications

Activities at CERN well represented:

still demanding the most in rate, Bandwidth, size and channels.

VERY LARGE networked Data acquisition & Control systems



- Rate into buffers: 100 kHz
- # of buffers: ~1500
- Switching network: ~1000 ports
- Switching bandwidth: ~32 Gbits/s
- Processing power: $2 \cdot 10^6$ MIPS
- # of controls channels: $5 \cdot 10^5$
- Controls data rate: ~ 2 MB/s
- Institutes: ~ 144
- People ~ 1700

Crate interconnects clearly important ... very topical in Physics

- Study Fast Ethernet & Gigabit Ethernet using PCs and Linux

Key issues identified:

- Network interface
 - Message passing overheads (require 5 - 10 μ s)
 - Scalability ... How to build large switches
-
- Also testbed implementation based on SCI
 - Interesting results
 - Interesting technology
 - But, still (after all these years) lacking an real industry support

- An example of designing & implementing a DAQ in short time
 - Understood their requirements:
Software environment, rate, bandwidth, real-time req., etc.
 - Chose standards: VMEbus, Ethernet and UNIX (plus a bit of legacy)
 - Benefited from existing internal and external to CERN

- Prototype implementation of the Read-Out Crate based on VMEbus
 - Demanding environment due to small messages & 100 kHz rate
 - Example of inter-operability: processor boards from two vendors in the same crate, doing the same job AND talking to each other.
 - Broadcast functionality helps their cause

Broadcast and multi-cast (based on geographical addressing) inherently possible over VMEbus with 2eSST

An agenda item in the next VSO meeting

Enormous number of applications possible.
However, very few presentations outside of HEP.
NOT due to lack of effort by the conference committee

How can people from other fields be encouraged to this type of conference ?

*It is in everyone's interest (PICMG, VITA, VIPA, Vendors & Physics)
to encourage more participation from other fields*

Personally I would like to here what the Telecoms industry is doing
clear overlap with Physics (networks, hot-swap)

How do chemical plants do their controls ? What can we learn ?
What are car manufacturers up to ?

Remember:

Industrial Automation and Communications are 23 % & 32 % of world market

Software

Two presentations related to the use of Java in (DAQ/Real-time systems)
Java benchmark programs compared to C benchmark programs

Benchmarks (On-going work): computation, IPC, thread switching, file I/O

Used:

Java interpreter, Java Just-In-Time compilers and a Java native code compiler
Interesting results i.e. JIT comparable to C for some specific benchmarks

However, still basic issues to be addressed (see OBS '95):

- determinism not really addressed
- Size,
- Garbage collection
- You still need a C/C++ interface

What about CASE Tools ?

“They appear to becoming useful”

... See tutorial on Application Deployment

Some CASE Tools presented:

e.g. PeakWare, Rapid Plus ... etc.

Are they useful ?

Not obvious they are going to be widely adopted.

Ques.: Are we basically Hackers ?

If NOT, what are we going to do ?

Do we need standards in VMEbus software ?

e.g. A standard to define how to exchange messages within & between crates

A criticism of VMEbus in '88 was:

... No support for message passing ... No standard for messages passing
Are the forthcoming ANSI/VITA standards Busnet & Vision a step in the direction to addressing this problem ?

This extract from Zurich in '88 seems to be as relevant today as then:

“The greatest problem now facing the VME community is the lack of system level standards to promote software compatibility across system implementations which use the VMEbus; I urge the manufacturers of VMEbus boards and systems to consider returning to the spirit of cooperation, which made the VMEbus so successful in the first place, to address and solve the problems for the benefit of not only the user community, but ultimately themselves too.”

Summary of Summary

Products stable: CPU, PCI & PMC(s)

Coming next: (2*) CPU + 2*PCI + back-side cache
+ VME64x + VME64xP
+ 2eSST @ 320 MB/s + *BROADCAST (at last)*

Things look set to change around 2001: Change of CPU and PCI++

What will be the impact of:

- WIntel
- Linux
- Java

If someone can afford the \$250 can they please say what the impact of I₂0 will be !