avoid a front door on the chassis by placing card mount handles outside the metal frame of the system. By providing a front door, the teraforce-50 provides additional shock resistance and EMI protection. Power supplies can be swapped out through the rear panel, while all boards plug in easily from the front.

At the same time, the teraforce-50 uses 30 percent less power than Ultra-SPARC I implementations, so systems stay cooler and embedded applications run more reliably. VME provides tremendous thermal management advantages over the conventional desktop PCs fre-quently used in embedded applications. The standard desktop design provides the inherent reliability problems of irregular airflow paths that can result in overheating. VME overcomes these problems by providing a clear, even passage of airflow over all active, heat producing cards.

The new teraforce-50 combines the high performance and low power consumption of the UltraSPARC IIi processor with Force Computers' embedded computing expertise to deliver a flexible, reliable, space-saving solution for high-end embedded control applications, and to move the teraforce platform into the telecommunications applications arena. The flexibility of the teraforce-50 opens up a wealth of possibilities for both systems designers and for Force Computers. From an inexpensive platform for drafting or running telecommunications applications to a highly reliable UltraSPARC IIi workstation for industrial applications to a powerful Solaris-based graphics workstation— the teraforce-50 covers a lot of computing territory.

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VMEbus FAQ
Frequently Asked Questions for the Beginning VMEbus User

John Rynearson, Technical Director, VITA

Question: What are the issues surrounding live insertion for VME64x?

First we need to understand what live insertion means and in what context it is being defined. Live insertion usually means that an electronic module can be removed and then reinserted into a system while the system remains under power. Another popular term for "live insertion" is "hot swap". The assumption is that removal of the module and reinsertion will cause no electrical harm to the system. Why is this capability desirable? Systems are usually powered down for either repair or reconfiguration. However some systems are configured in such a manner that it is not acceptable to power down all or part of the system. Telecommunications system fall into this category. Other systems may control industrial equipment such as robots, sorters, etc. that must remain powered up. Whatever the reason live insertion is becoming a desirable feature for many systems.

A Design Issue

Live insertion is really a system design issue. What are the application requirements that make live insertion a desired feature? Including live insertion support in a system costs money. If your application doesn't require live insertion, then save money and don't put it in. If your application does require live insertion, then a careful analysis must follow.

System Operation

First, must your system continue to function during live insertion? If the only requirement is that the system remain powered, but that its functions may cease temporarily, then a simple method for "safeing" the software and the hardware that it controls is all that is required.

On the other hand if the system must continue to function then a careful analysis of the system at a modular level is required. Each module must be examined to determine how its possible failure and replacement can be handled.

Conventional, High Availability, and Fault Tolerance

A conventional computer system will have many single points of failure. That is, a failure in a specific component will cause the entire system to cease functioning. Systems that fall into this category cannot really maintain functionality when a component fails. At the other end of the spectrum are fault tolerant systems. A system is fault tolerant if it is defined to have no single point of failure. Fault tolerant systems are constructed with redundant components so that if one component fails another is available to take its place. However, fault tolerant systems are expensive and may not always be necessary. A less expensive approach is a "high availability" system. High availability systems don't meet the definition of fault tolerant systems in that they may have one or more single points of failure. However, they can be used in applications where certain functions need to be redundant and others don't.

Repair, Reconfigure, or Both

Is the purpose of supporting live insertion for repair, reconfiguration, or both? Supporting live insertion for repair assumes that when a module goes bad the system can detect the failure, take the affected module off-line, and notify the system operator. When the module is replaced the system must detect the replacement, qualify the new module for system operation, and then bring the module smoothly back on-line. Reconfiguration, on the other hand, can be done as either replacement, enhancement, or both. For example, a trivial case would be to install additional memory into a system. When the module is installed, the system must be notified that a new resource has been added. The system must then qualify the

new resource and incorporate it into system operation. On the other hand, imagine a multiprocessing system that is to be upgraded with new enhanced processor boards. If the system is dynamically reconfigurable, then the older module can be removed and replaced with a newer module with perhaps more memory, a faster processor, or additional I/O ports.

VITA 1.4, VME64x Live Insertion System Requirements

The VITA 1.4 proposed American National Standard for VME64x live insertion provides a basic framework for supporting live insertion. For example, the sequences that a board must go through when it is removed is shown in the list below.

Typical Board De-allocation Process
1. System administration software disables new connections to board's device driver.
2. System waits for all connections to terminate or forces existing connections to terminate.

Extraction Process
3. BREQ* and INTn* are inhibited.
4. Board drives LI/O* high. Daisy-chain switch on backplane is enabled.
5. VMEbus interface ASICs and ETL transceivers are disabled.
6. Board waits for LI/I* to go high or ejector handle switch to open.
7. Craft Person grasps ejector handle and is discharged through the front panel to FRAME ground.
8. Craft Person unseats the ejector handles and the ejector handle switches open.
9. Board's logic power is removed.
10. Blue LED is turned ON.
11. VMEbus and primary power pins break contact with the backplane.
12. Ground and Vpc pins break contact with the backplane.
13. Board front panel low resistance contact with FRAME ground disconnects.
14. Bleed resistor B makes contact with FRAME ground.
15. Bleed resistor A makes contact with FRAME ground.
16. Board is removed from the guide rail and breaks contact with the ESD contact.

A similar set of sequences are involved when a module is reinserted.

Summary

Live insertion or "hot swap" is becoming a desired feature on many new embedded systems. The spectrum of live insertability ranges from simple systems that require only that power remain on to more complex systems that require that the system continue to function. Thrown into all this may be the requirement to carry out failure detection on a dynamic basis. On the surface live insertion may seem like just a board extraction/insertion issue, but it is not. A comprehensive system design must be done if live insertion is to operate properly. VITA 1.4, VME64x Live Insertion System Requirements, provides a basic framework for live insertion in VME based systems. It is currently in task group ballot within the VITA Standards Organization (VSO) and should be submitted to ANSI canvass later this year. A copy of VITA 1.4 is available in pdf format on VITA's web site at: http://www.vita.com/vso/draftstd/vita_1.4 d0.4.pdf.

Syscomms Conference A Success

Bob Squirrell, Director, VITA Europe

SysComms '98, held at CERN - the world famous high-energy physics laboratory - by kind permission of the CERN management - provided nearly 200 delegates one of the most informative and up-to-the-minute conferences ever to be held in Europe on the subjects of real-time and embedded systems design and application.

Organised by ESONE with help from VITA Europe, ESOFTA, GroupIPC, and PICMG Europe, the conference offered 8 Tutorials, 4 Plenary sessions and 56 Parallel presentations covering Research and Implementation, accompanied by table top exhibits from 53 companies. In addition there were 4 user group meetings: ESONE, PICMG, GroupIPC, VITA and CANopen as well as a meeting of the VITA Standards Organisation (VSO) and VMEbus in Physics Workshop (VIPA) held alongside the main conference. In all, some 500 people gathered to present, hear and exchange views and business cards over the 3 day event.

For the benefit of anyone who was unable to attend SysComms, the organisers have arranged for a complete summary of the main conference as presented by CERN's Dave Francis, as well as selected abstracts of the papers, speaker's presentations and the presentation material from the VIPA Workshop

to be available on the World Wide Web at URL: http://www.cern.ch/ESONE/Syscomms98/

Copies of the full Proceedings as well as details of VITA membership benefits, publications and other European activities can be obtained by contacting VITA Europe on +44 (0)1329 846166 or by fax on +44 (0)1329 512063 or Email at lyndseyc@ggh-net.demon.co.uk.