

Evolving Storage Technology

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Bringing Legacy
Embedded Systems
into the Modern World



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Background:

- Both SCSI and IDE (PATA) hard drives are rapidly being displaced in the marketplace by SATA drive technology.
- Many systems must stay in place for years to support applications with entrenched and outdated storage interfaces – yet drive technology evolves.
- In critical embedded storage applications, the system architecture can be pervasive.
- In systems where a storage interface is in place, the legacy drive technology will need to be upgraded.



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The Objectives:

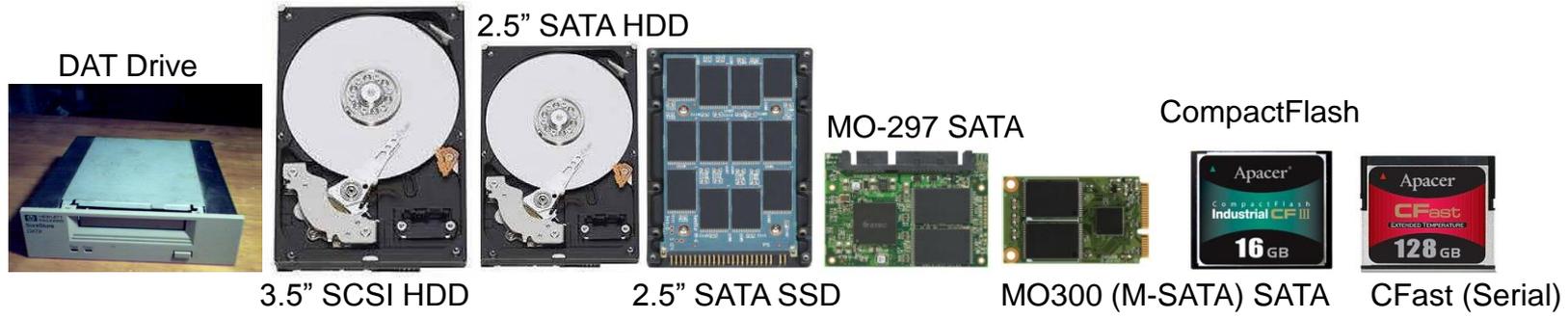
- Maintaining backwards compatibility between the new storage subsystem and the original host system
- Modernizing and updating older storage modules while maintaining form, fit and functional compatibility with the original host system:
 - Host interface: SCSI, PATA, SATA
 - Board form factor: VME, cPCI, Others
 - Operating systems: RTOS, Linux, Unix, Windows



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Design Considerations

- Dealing with changing form factors, changing interfaces



Design Considerations

- Interface
- Mechanics
- Removability
- Operating System
- Drive type and features



Embedded Systems can represent thousands of disk drives or sub-systems that require upgrade

Storage systems are subject to attrition

The Operating System Software and Drive interface can be an obstacle to Tech Refresh



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The Challenges:

- Identify suitable SATA drives to replace the old PATA or SCSI drives
- Maintain the legacy interface to the host system
- Maintain the legacy board form factor – VME, cPCI etc. – on which the drive(s) are mounted
- Maintain the legacy operating system
- Support removability where necessary
- Insert new capabilities



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A Solution:

- Implementing I/O conversion technology and replacing SCSI and PATA drives with cutting edge SATA / SAS drives can extend the lifetime of the storage system by 5-7, or more years.



Legacy Conversion Examples



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- Providing SCSI to SATA conversion for systems utilizing both front and rear connectivity.



Ultra 320
SCSI Interface
to
SATA-II



Add Erase & WP
Options



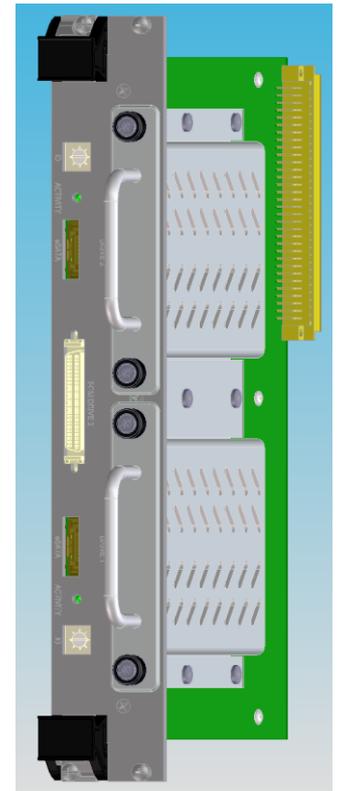
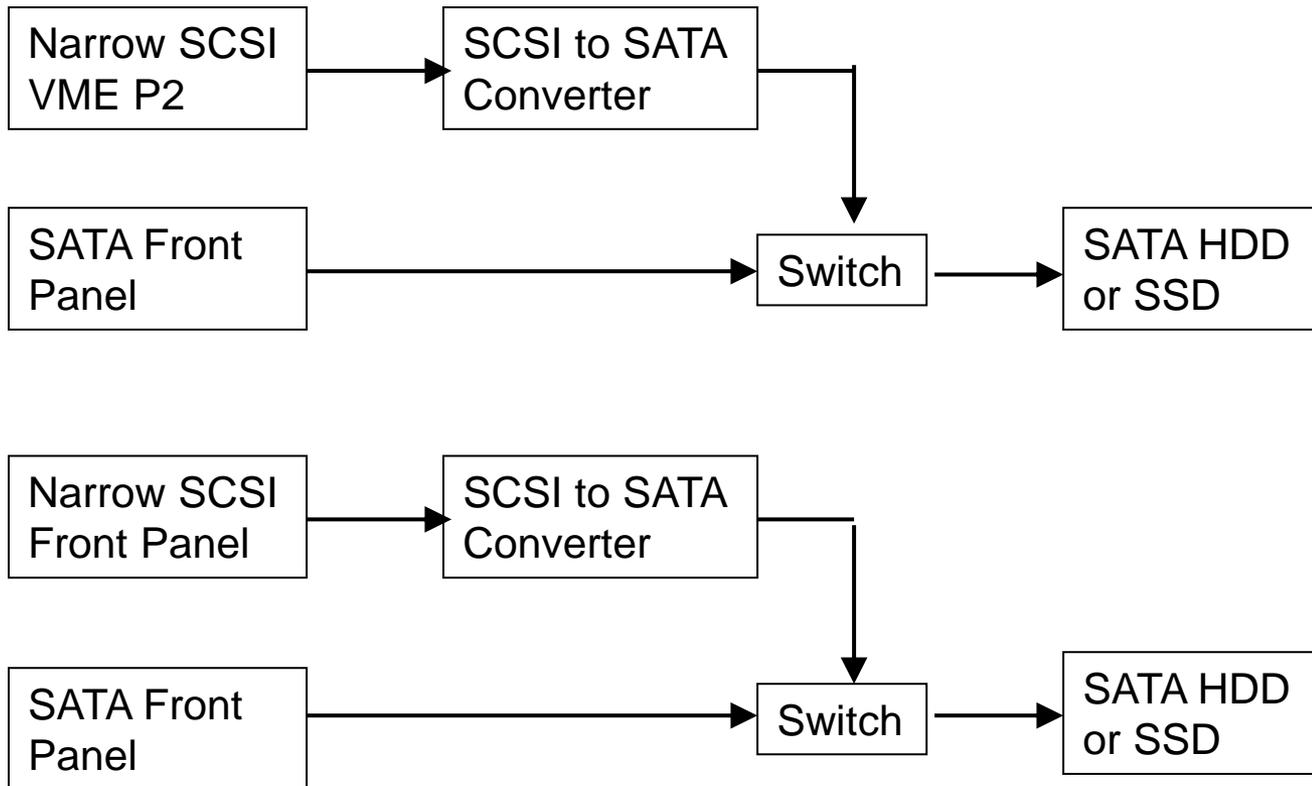
**Take it one step further:
Upgrade to Removable Modules**



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Maintain SCSI Interconnect and Update to Removable SSDs

- Option for SCSI or direct SATA with removability

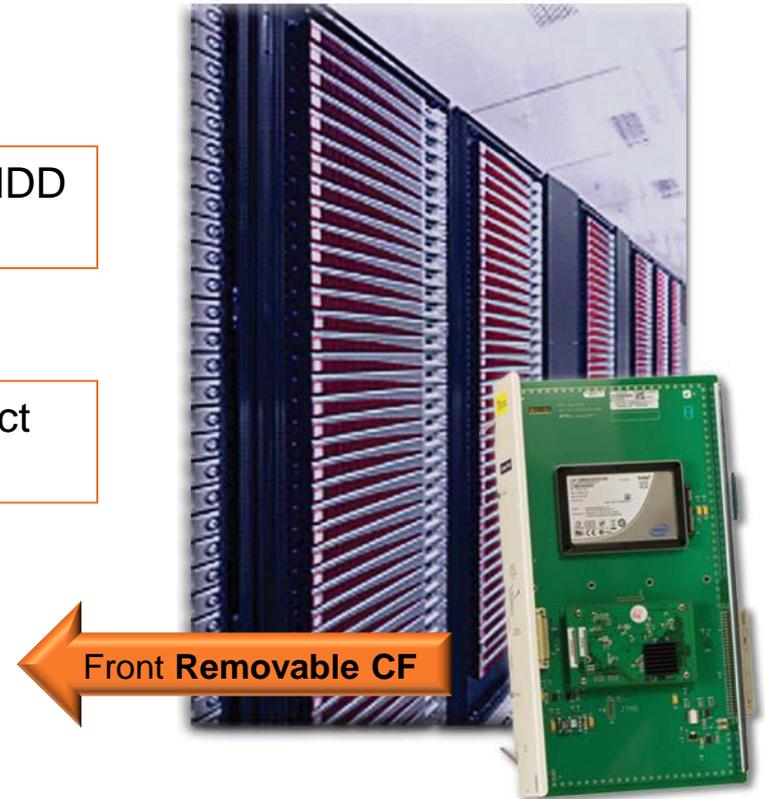
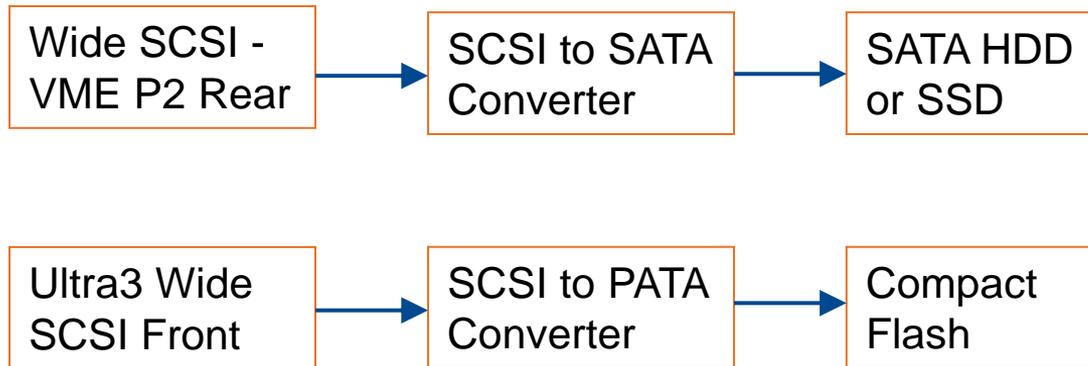


Provide
A Backwards Compatible Module
SCSI > SATA - II
and
SCSI > ATA/ATAPI
conversion on one board



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- Maintain SCSI Interface, Update 2 ½" SSD to SATA-II, Convert Removable Media to CF, maintain Software Compatibility
- No Operating System Changes



Storage Architecture

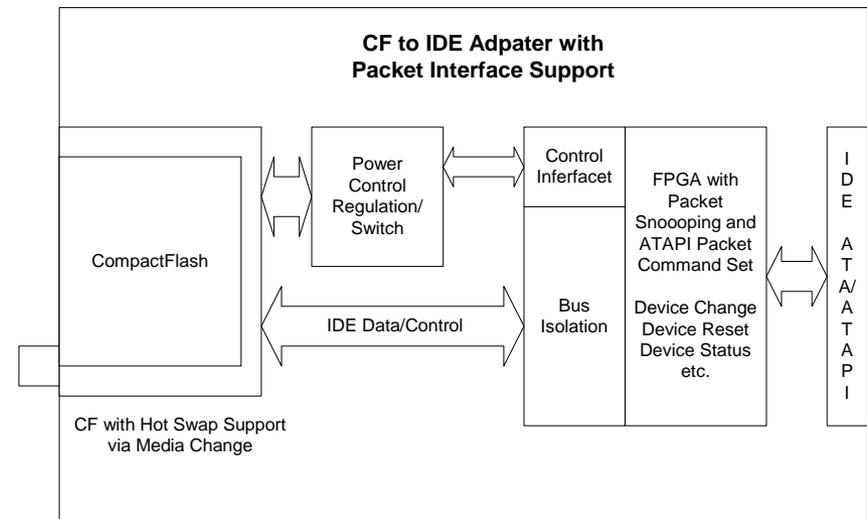
SCSI Ultra-3 Mezzanine

- Dual Channel Ultra-160
 - SCSI to SATA-II
 - SCSI to ATA/ATAPI



ATAPI CF Interface

- **Device Management**
 - Power Management
 - Isolation
 - Packet Interface implemented in FPGA



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Additional Upgrade Advantages

- Beyond resolving the immediate need to keep systems running into the future, there are benefits which you may take advantage of when upgrading:
 - Consider solid state drives
 - Higher initial cost but lower life time support costs
 - Improved environmental performance
 - Lower power consumption especially when considering 3.5" SCSI to 2.5" SATA solid state drives
 - Improved over all MTBF
 - Reduction in size and weight
 - Add security options
 - Secure erasure
 - Write protection
 - Encryption



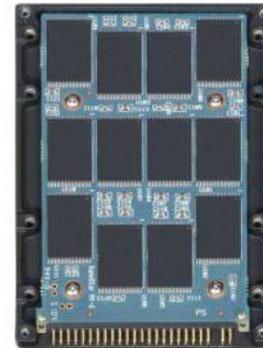
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Additional Upgrade Advantages

- HDD to SSD
- Legacy bridging provides the opportunity to move away from traditional hard drives to more robust solid state drives



Traditional hard disk drive



Solid state hard drive

- Replace rotating SCSI drives with solid state SATA drives



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Additional Upgrade Advantages

- SWaP improvements, with improved reliability



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Erasure Options

- Many newer solid state drives provide firmware options for multiple erasure options:
 - Clear
 - Sanitize per:
 - DOD NISPOM 5220.22-M
 - DOD NISPOM 5220.22-M Sup 1
 - NSA/CCS 130-2
 - Army AR 380-19
 - Navy NAVSO P-5239-26
 - Air Force AFSSI-5020
 - RCC-TG IRIG 106-07
 - NSA/CSS 9-12



- Drive Sub-Systems can be upgraded from SCSI to SATA
- HDDs can be improved by moving to SSDs
- HDDs can be replaced with pluggable modules.
 - MTBF can be improved with SSDs
 - Environmental performance can be enhanced
 - Shock and Vibe
- Removable media can be updated with CF, or CFAST
- Storage solutions can be replaced transparently with backwards compatible drivers
- Additional features such as WP and Secure Erase can be added

