White Paper

AIC

The **BENEFITS** of a **Storage Bridge Bay** Solution

What is a Storage Bridge Bay (SBB) solution?

SBB is a workgroup made up of industry leaders in the server and storage technologies that essentially has defined a standard specification for the electro-mechanical requirements of an external controller slot, along with low-level enclosure managements that would support any SBB compliant controller from an independent hardware vendor. The most current SBB standard is revision 2.0.

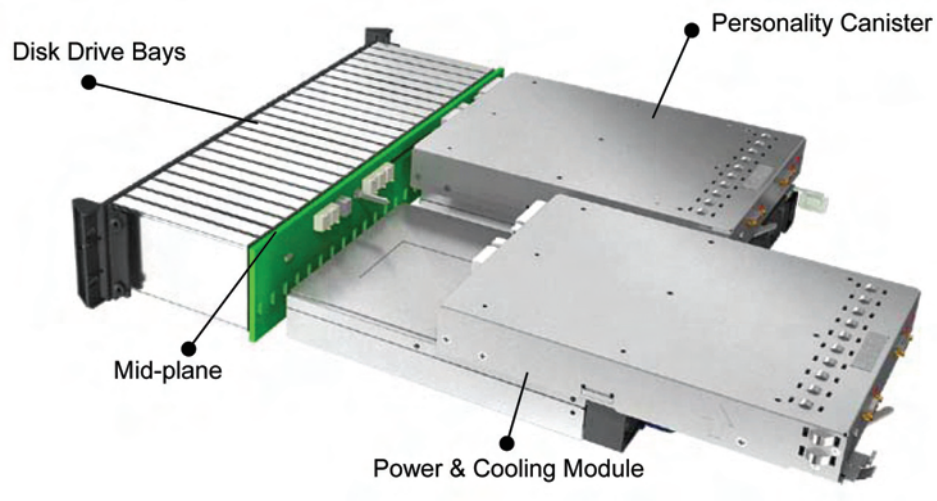
Why is being SBB compliant so significant?

Because prior to the formation of this workgroup there has never been any attempt to standardize an external storage controller. Every storage controller vendor has its own proprietary electro-mechanical design, making it impossible for the users to freely substitute one with another in the same enclosure, unlike host-based controllers used on a server motherboard. This limits the flexibility and often locks in the user to stay with one controller whether it meets all the requirements and/or offers the best value or not. This is the known most-beneficial strategy of the storage controller vendors, but not necessarily beneficial to the storage customers.

Before deep-dive into additional benefits of a SBB solution,
let's first review the basic components of a SBB 2.0 compliant enclosure.

- The enclosure itself, which consists of a pair of redundant power supplies, cooling modules, and two or more canister slots
- The dual personality canisters, which defines the different usage models supported by this SBB system
- SBB mid-plane, which connects the disks with the rest of the components in the enclosure, i.e. controller canisters, power supply modules, fans, etc.

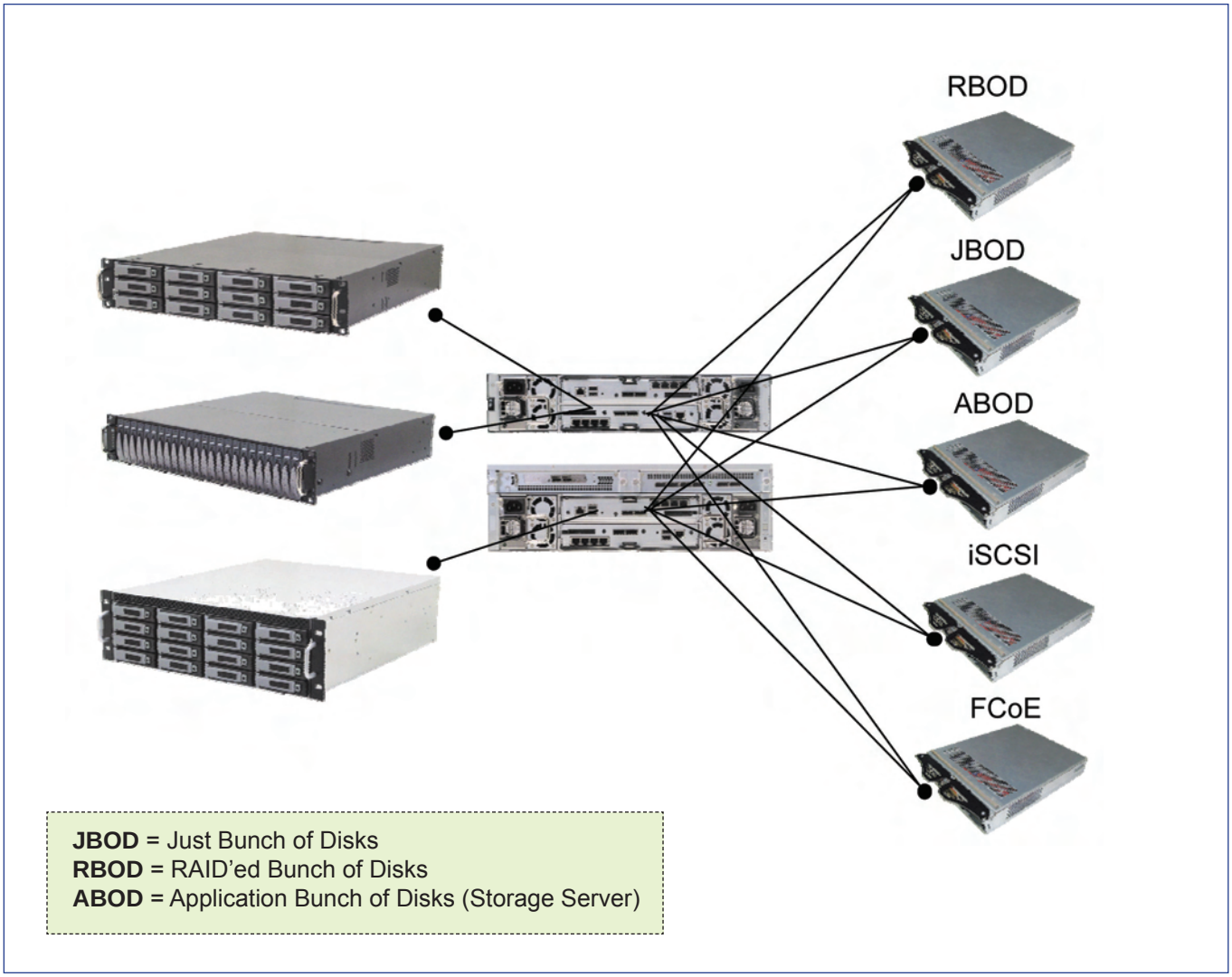
Below is a typical SBB enclosure showing the necessary components.



Advantages of a SBB system

There are some obvious advantages a SBB system can bring to the User or System Integrator

- ► All Field Replacement Units (FRU) are hot-swappable, making maintenance cost a minimum
- ► Cable-less design enhancing system reliability
- ► Fully redundant system (Dual Controller and dual Power & Cooling modules) provides high-availability
- ► Multiple configurations can share the same enclosure coupled with different personality canisters
- ► Freedom to choose different controller vendors for different solutions
- ► Minimize compliance certification costs
- ► Minimize design qualification assurance efforts
- ► Minimum system integration costs due to modular design



JBOD = Just Bunch of Disks
RBOD = RAID'ed Bunch of Disks
ABOD = Application Bunch of Disks (Storage Server)

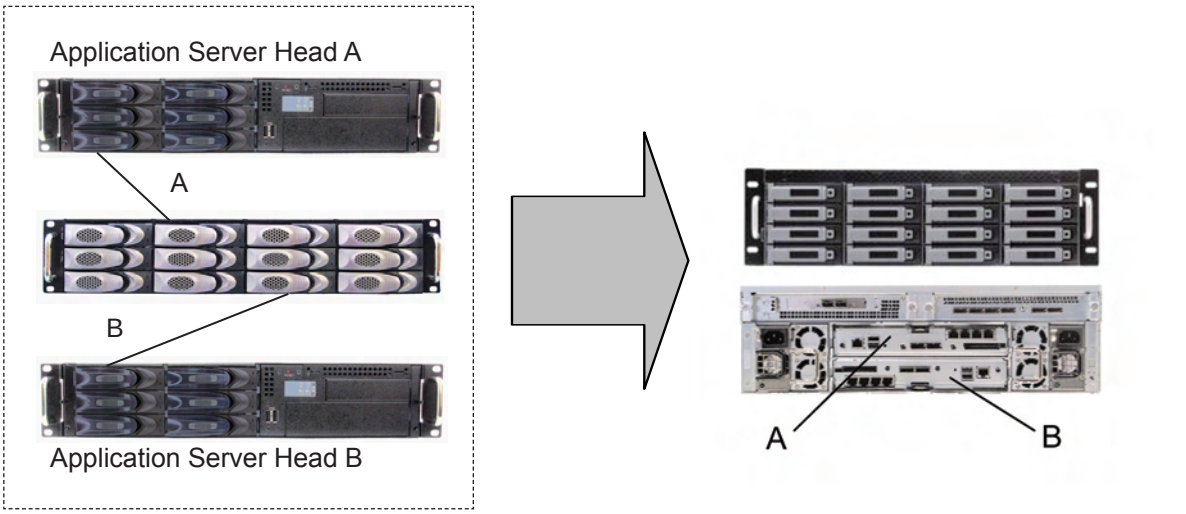
Multiple enclosures can share the same personality canister, and/or multiple personality canisters can share the same enclosure. This is the main SBB spirit.

Potential Disadvantages of a SBB Solution

The initial worries for a SBB solution are the followings:

- ► Cost of a modular system might be too high, like some of the Blade Servers out there in the market
- ► Compatibility issue between different vendors' canisters and enclosures

The cost concern is a legitimate one on the first look, but when you look at the Total Cost of Ownership including the costs to test, certify, and sustain multiple products for 3~5 years versus just multiple canisters in one enclosure you will find it not so, especially when you factor in the development costs associated with tooling each enclosure. Also, there are some upcoming future technologies in the pipeline from Intel that will eventually lead to Server and Storage convergence, and replace multiple server and storage enclosures with one single SBB enclosure. "The Unified Server Appliance" SBB solution will not only be less expensive on BOM it will be easier and less-costly to manage and maintain.

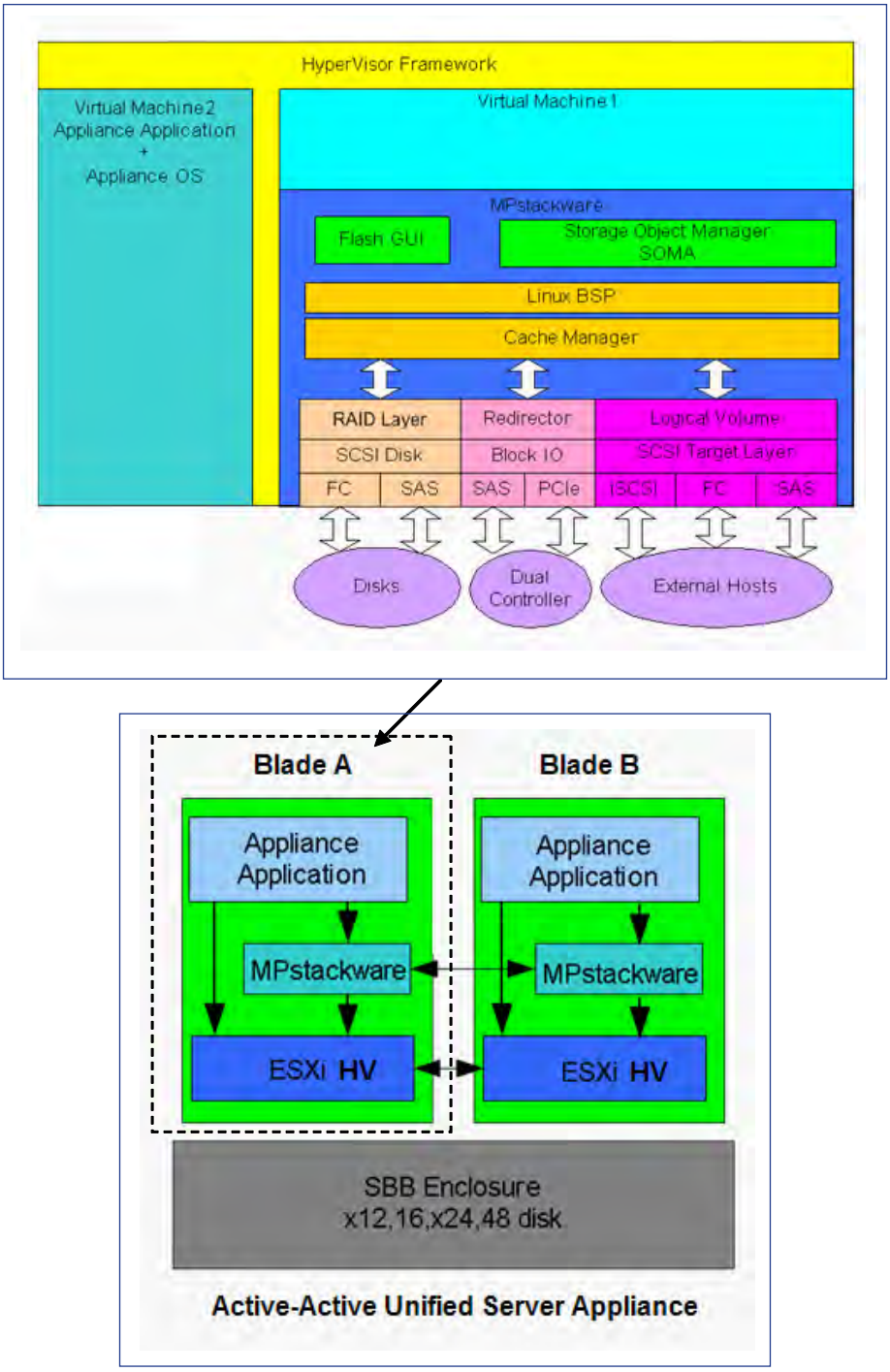


Redundant Systems connected to redundant Storage

Redundant Storage Server with internally redundant Server Modules "Unified Server Appliance"

As shown in the above, a typical Redundant Application Server scenario requires two servers attaching to a storage subsystem with redundant controllers. On top of these three systems an expensive switching fabric must be used to connect the two servers. On the contrary a Unified Server Appliance provides high-speed PCIe and SAS buses as the board-to-board communication fabrics via the mid-plane, as well as internal GbE ports as "heartbeats", so there is no expensive switching and cabling required. Therefore, the overall cost-savings from combining three systems into one can be very significant.

One may argue how can the RAID performance be comparable between the two and how can one system replace both Application and RAID functions. As briefly mentioned earlier, with some upcoming technologies from Intel, i.e. RAID 5/6 acceleration algorithms embedded in the CPU along with memory controllers and PCI Express hub, an multi-core Intel Xeon CPU together with a Virtualization Hypervisor can easily replace the dedicated storage processor on the RAID controllers plus the server board processors running the applications. Below diagrams illustrate such a configuration with a “middleware” provided by AIC, the MPStackware.



Now let's look at the potential incompatibilities between different vendors' enclosures and canisters. Since SBB 2.0 specifications define the electro-mechanical elements, i.e. the connectors and pin definitions, the form-factor of the canister, system power and cooling, and finally the latching location, every SBB 2.0 compliant canister is supposed to fit and function nicely in a SBB 2.0 compliant enclosure without concerns. How then, one may ask, does each canister/controller manage the enclosure and the SES devices it is in since this is a variable? SBB 2.0 specification also calls for an EEPROM on the enclosure mid-plan that stores what's called VPD, Vital Product Data. Each enclosure vendor is required to provide information in the VPD EEPROM such as Vendor and Product ID, as well as predefined SES devices provided in the enclosure, such as fans and power supplies. If all vendors follow the SBB 2.0 specifications closely, then there is no reason any canister would have compatibility issues in a 3rd-party enclosure and vice versa. However, there will always be vendors out there offering "Pseudo-SBB" products, meaning, they only follow parts of SBB 2.0 specifications and claim to be SBB-compliant, but their canister or enclosure will never fit any 3rd-party enclosures or canisters. These types of SBB designs really nullify the SBB advantages.

AIC SBB Offerings

AIC, known for its engineering innovations, is offering a full line of SBB 2.0 compliant enclosures and canister solutions.

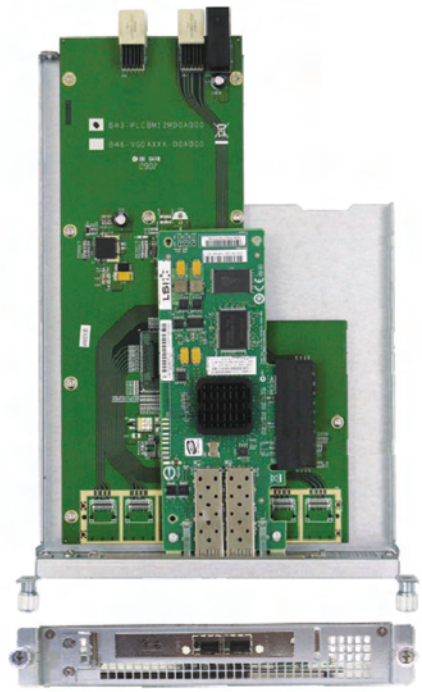
2U 12 x 3.5" bay	2U 24 x 3.5" bay (Dual-drive carrier)	2U 24 x 2.5" bay	3U 16 x 3.5" bay	4U 24 x 3.5" bay	4U 48 x 3.5" bay (Dual-drive carrier)
					

3G SAS/SATA RBOD	4GFC-SAS/SATA RBOD	4GbE iSCSI-SAS/SATA	3G SAS ABOD	6G SAS JBOD	6G SAS ABOD
				In Development	In Development

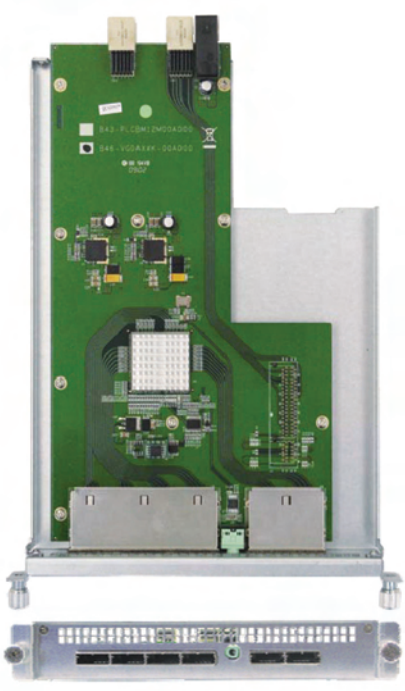
On top of being SBB 2.0 compliant to support 3rd-party SBB canisters, AIC has developed additional expansion options for some of its SBB enclosures. In the below 3U 16bay SBB enclosure there are two Auxiliary canisters to provide the following two options to enhance the scalability of a SBB solution.

1) A PCI Express X8 Expansion Module– allowing user to install an off-the-shelf full-height half-length add-on card for Host I/O connectivity such as Fiber-Channel or 10Gb HBAs.

2) A 3G SAS Fan-Out Switch Module – allowing user to expand to up to 4x SAS JBODs without daisy-chaining.



PCI Express Expansion Module



3G SAS Fan-Out Switch Module

Summary

A truly SBB 2.0 compliant solution will provide great benefits to System Integrators and OEM's due to it's great flexibility and high-availability features. Coupled with high-availability Middleware and upcoming IA (Intel Architecture) technologies, a SBB solution is definitely the best building-blocks for an All-in-One Unified Server Appliance.

For detailed product info please contact www.aicipc.com/SBB.