Application Note

Disaster Recovery with IPStor

Unprecedented reliability, flexibility, and speed

FalconStor's IPStor storage infrastructure software delivers unprecedented flexibility in creating reliable and efficient disaster recovery environments. This application note explains how IPStor's **high-speed Replication Option** delivers **fast remote data synchronization** across either Fibre Channel or IP/iSCSI, so that high performance disaster recovery environments can be created across campus, across the street, cross-town, cross-country—or across the globe![1] Moreover, replication of active databases with transactional integrity and point-in-time consistency is enabled through the implementation of IPStor's **application-aware Snapshot Agents**, available for a wide variety of database and messaging applications.

Disaster recovery is business continuity on a grander scale

The disaster recovery (DR) perspective on business continuity goes beyond individual storage or network components failing or files being corrupted or accidentally deleted. Disaster recovery (DR) planning deals with massive site failure. Site failure, whether complete or partial, is typically the permanent consequence of broadly destructive forces – such as fires, floods, or earthquakes – that devastate an entire building or geographical location. In this day and age, there are also the threats of terrorism to consider. Furthermore, a massive site failure, temporary or otherwise, could also be precipitated by yet other means, e.g., a high-level hacker attack, a biological threat, or something else not physically destructive to the storage itself but which would necessitate backup storage or a backup site.

Fact

IPStor saved AnexTEK $1.5 million dollars in lost data when the company's global headquarters were destroyed in a major fire. Thanks to IPStor's remote replication solution, AnexTEK was able to quickly recover all of its remotely replicated data.

As world governments have been warning, is not wise to take chances. Catastrophes do happen, and scores of businesses each year are ruined because of inadequate disaster prevention and recovery. IPStor enables enterprises to heed and surpass the governments' recommendations to maintain near-real-time backups off-site, have a plan for restoring operations in the event of a disaster, and have redundant paths for communications.

Backup tapes may no longer be enough

The main issue in choosing a DR solution, apart from its ability and reliability in implementing DR measures, is speed. In the past, 48+ hours was acceptable to get backup tapes loaded, update application servers, and be up-and-running again. Today, every uptime moment qualifies as mission critical. An online brokerage, for instance, loses millions for every hour of lost uptime. As more enterprises rely on the Internet and require immediate access to their data to function, they are less tolerant of lost uptime. End-to-end business continuity is mandated, even in the face of disaster.

While backup to removable media such as tape and optical disks is still a vital part of keeping data safe, simply backing up critical business data to such media no longer provides enough protection. While it is theoretically conceivable to build a new location from scratch with a similar computing environment and restore the data from backup tapes, it is quite inconceivable in practice. Few businesses could survive long enough waiting for a new data center to be built and operational. Why? Most enterprises today depend on their systems for day-to-day business activities, and this trend will only continue to intensify.

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[1] IPStor's advanced backup-enabling technology also allows third party backup applications to use IPStor as the facilitator for remote high-speed zero-impact backup across FC or IP. For info, see http://www.falconstor.com/backupconsol.htm and FalconStor's white paper Strategies for Accelerated Backup and Immediate Recovery: Going Beyond Traditional Backup Methods (PDF).

Each day more organizations realize the only way to minimize downtime associated with disasters, natural or otherwise, is to implement an alternate data processing site that can be operational in a very short time.

Data replication, which can be used in conjunction with tape backup for data archiving purposes, provides reliable protection against data loss with the crucial benefit of minimizing time to recovery. Data replication involves periodically copying a volume's data onto a secondary storage device, which can be located any distance from the original, preferably far away. If the main storage device fails, data on the secondary storage device can immediately be promoted to primary status and brought online.

IPStor's fast remote Replication functionality makes it the perfect solution for enterprises currently planning to implement disaster recovery capability as they build or upgrade their data centers.

Current challenges

One of the major technical challenges in maintaining a backup data center is keeping the data at the backup data center synchronized with the data in the primary data center. Ideally, the data at both the primary site and the backup site ought to be exactly the same. However, the reality up until now—before the advent of IPStor—has demonstrated this ideal to be cost-prohibitive in practice.

Most companies with a warm backup site use the traditional method of backing up data from the primary site and physically delivering the backup tapes to the backup data center. While this approach is suitable for some applications such as data warehousing, other applications, such as an order processing system, are more vulnerable to suffer from data loss due to unsynchronized backups. Since the nature of such applications is that data is constantly being added and amended, if disaster strikes even soon after the backup is executed, the loss of data can be catastrophic. And we all know that data loss equals revenue loss.

All enterprises theoretically *need* their primary and backup data synchronized and in an ideal world this could be so. For those enterprises that have the financial means and the pressing business need to minimize the time-induced disparity between data at the backup site and the primary data processing centers, several storage vendors have developed costly proprietary solutions that provide data replication between two of their own specialized storage arrays.

However, there are major drawbacks to these kinds of proprietary solutions, particularly since the user is locked in to a single vendor. Because the method of implementing data replication at the storage level is vendor-specific in such solutions, users must buy the specific models from the same vendor that support data replication. Users can neither leverage their current IT infrastructure nor diversify their storage holdings in the future as other better and/or more cost-effective options become available from other vendors. As the storage devices become obsolete, moreover, it is also cost-prohibitive to keep investing in the original vendor's ever-newer hardware. Yes, data replication is vital for disaster recovery purposes, but price and performance are also crucial evaluation criteria for a replication solution. Until now, enterprises have had to pay a high premium for restrictive proprietary storage products from a handful of storage vendors so that they could deploy a DR site to which their data could be replicated.

Another offering from some companies is 'host-based' replication. The disadvantage here is that for each different OS platform at the primary site, the backup data center must have at least one host with the same OS. For example, if the primary site has five different platforms, the backup site must have the same five different OS platforms running there in order to receive the replicated data. In addition, if the primary site has a thousand servers, an enterprise would need to buy, deploy, manage, and maintain a thousand copies of the replication software, across different platforms!

Fact

FalconStor is the first company to achieve cross-country data replication over IP – and did so without any specialized conversion routers.

IPStor rises to the occasion

IPStor transports enterprises to the ideal world. Not only does IPStor software deliver lightning-fast data mirroring and replication technology that enables the creation of cutting edge backup data centers with no single point of failure, it makes the resulting fast remote data synchronization (FRDS) available across vendor lines and avoids the problems of host-based replication.

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IPStor Remote Replication Highlights

Remote replication of SAN and NAS IPStor-managed drives across LANs, MANs and WANs

Built-in Snapshot engine ensures that replication is performed as of a single instance in time

Achieves the highest possible level of data integrity

Provides administrators a very granular and flexible policy-driven mechanism for keeping an extra set of data offsite for disaster protection

Flexible replication settings:

- Specific time of day: for example, starts replication at 12:00am every day
- Elapsed time: for example, replicates every 15 minutes
- Amount of change: for example, replicates whenever there is more than 5 Megabytes of new data

In the event of a site failure, administrators can quickly promote the remote site data to primary data set status, thereby giving the application servers continued access to storage via IP or Fibre Channel.

Difficulties posed by host-based replication are sidestepped entirely because IPStor is an *in-band* solution supporting *any-to-any connectivity.* Since the replication functionality resides only on the IPStor Servers (where IPStor software is loaded), which lie *within the data stream* ('in-band') as seen in Figure 1, servers downstream do not need to have matching OS platforms at either the primary or secondary sites, nor does replication software need to be deployed at every server.

Since it is based on open industry standards – such as IP, Fibre Channel, SCSI, iSCSI, and Ethernet – IPStor software is hardware-, protocol-, platform-, and vendor-independent and it demonstrates unrivaled interoperability. This renders IPStor a cost-effective alternative to proprietary technologies, as users have the freedom to choose storage equipment, even mixing brands and types of storage. Enterprises can leverage their present infrastructure while having the freedom to acquire new storage from the full range of options at their disposal at any given time.

Moreover, since it's IPStor software that enables replication, not built-in intelligence of a hardware unit, obsolescence is a thing of the past. IPStor is already designed to accommodate many emerging technologies. As technology advances further, a simple IPStor software update will bring the system up to speed—a far more cost-effective investment compared to all-new hardware. It's yet another way that IPStor helps enterprises maximize return on current and future IT investments.

The IPStor DR solution allows enterprises to recommence operations after a disaster in one of two main ways, depending on how an enterprise has chosen to set up its DR environment: If storage that existed at a location separate from the application servers has been totally wiped out, and application servers remain intact at their location, IPStor enables read/write operations to be rerouted instantly to a secondary storage site. If the primary site has been wiped out, and the enterprise has a fully operational backup site in place, complete with standby application servers, IPStor enables operations to resume immediately from that remote secondary site.

How IPStor performs super-fast remote data replication

IPStor's Replication Option was specifically engineered with DR purposes in mind. Since IPStor does not require any specialized hardware to replicate storage data, it can **replicate data over any existing LAN, MAN, or WAN network infrastructure**. IPStor data replication is configured and managed independently of application servers. Application servers that access data volumes through the in-band IPStor Servers are not aware of or affected by the replication of data to the backup site. Use of the Snapshot Agents allows active databases to be replicated with full transactional integrity and point-in-time consistency.

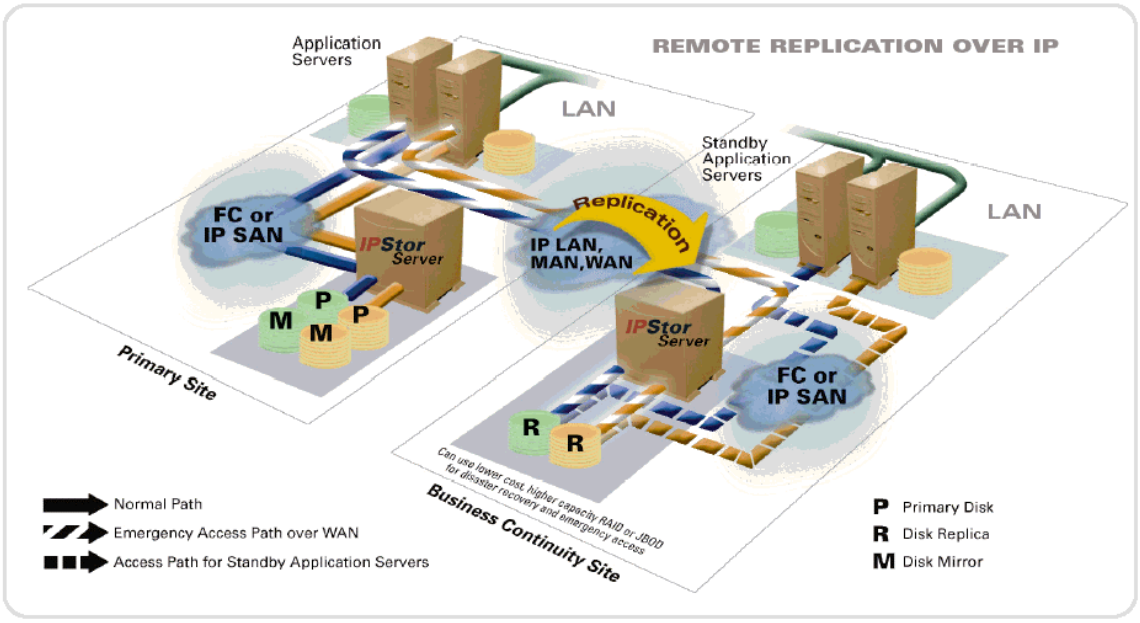

Figure 1. Remote replication with IPStor, with synchronous mirroring at the primary site for extra business continuity assurance

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The IPStor Replication option is a policy-based replication service. It allows systems administrators the flexibility of setting an individual replication policy for each IPStor data volume. Administrators have the ability to select from one to all of the following replication policies to create a custom replication policy for each data volume:

- Amount of Data Change (e.g., 1MB)
- Time of Day (e.g., 11:30 PM)
- Time interval (e.g., every 2 minutes)

For example, an administrator can set a replication policy for a particular volume to replicate at 10:00PM every day while the policy set for another data volume could replicate every five minutes. And yet for another volume, the policy could be set to begin replication whenever the amount of data changed on the volume since the last replication reaches a 1MB quantity threshold. After the desired replication policy is set for the data volumes, IPStor automatically follows the replication policy for each volume for data replication.

In case of a catastrophic failure at the primary site, the systems administrator can quickly redirect application servers to access data from replicas located in the backup data center.

With IPStor, enterprises can also choose to prepare for disaster in such a way that even in the event of *total* site failure they could remain operational by having standby application servers ready and waiting at the backup data center.

IPStor supports end-to-end redundancy for maximum disaster protection. To ensure that there is no single point of failure, the solution supports host- and NIC-level multi-pathing on Ethernet or Fibre Channel. Not only can local volumes be synchronously mirrored, two IPStor Servers can also be locally set up in Active-Active Failover mode to monitor each other's health; if one should fail, its partner automatically takes over all I/O operations until the primary is back online. In this way, IPStor integrates high availability and DR capability for 24x7xForever business continuity.

Get right back to business after a disaster

Most discussions about disaster recovery end at the notion of having systems available *during* a disaster. However, those who have ever been through a disaster know that while having systems up and running during a disaster is already a major accomplishment, the real challenge is actually the long and tedious process of restoring all the systems at the primary site—or *new* primary site—back to normal *afterwards*.

The architects of IPStor understand what it means to have a complete disaster recovery solution. They have incorporated a **Re-synchronize** function as part of IPStor's replication services to help IT administrators transfer data back to the primary site for normal operations. After all, just as a spare tire is for temporary use, a backup data center is not a permanent replacement.

The IPStor Replication Option provides enterprises with a high-performance, easy-to-use, cost-effective, customizable, flexible, secure solution to minimize system downtime during a disaster, as well as during the recovery process. Plus, because of IPStor's neutrality towards connectivity, hardware, interface, protocol, and platform specifications, enterprises are free to choose the storage vendor that offers the best value to meet their specific business requirements. IPStor software is the superior solution for businesses to implement a DR plan, including a backup data center with fast remote data synchronization capability.

The IPStor Advantage: Total Freedom of Choice in DR

- 24x7x365 business continuity in case of a site-level disaster. Fast recovery using immediately mountable replica volumes.
- Fast Remote Data Synchronization to alternate data center/hot site located anywhere for cross-town/country/world remote replication and backup.

Fact

Since May 2001, Bell Microproducts Corp., a Fortune 500 company, has been deploying the IPStor solution to transfer data back and forth between its data center in Montgomery, Alabama and its backup and development center in San Jose, California. This deployment is a real-world, fully operational, cross-country installation of our solution, and it has been responsible for maintaining continuity of the company's operations on several occasions.

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- Ultra-high availability when Replication is combined with Synchronous Mirroring and dynamic multipathing (DynaPath, NIC Express…).
- Snapshot Agents enable replication of active databases and messaging systems with transactional integrity and point-in-time consistency. Snapshot-based source data and staged target data prevent data corruption to ensure fast recovery.
- Replicates block level changes only, for lower bandwidth requirements and reduced exposure to data loss.
- Replication occurs continuously over shared or private IP-based LAN, WAN, or SAN connections, over any transport (ATM, Frame Relay, private line, etc.).
- Re-synchronize function enables transfer of data back to primary site with ease.
- Ease of use and granular control. Replication policies are set per volume, allowing for detailed control of bandwidth utilization.
- Enables electronic vaulting.
- Enables multiple sites to replicate to a central location.
- Integrates with IPStor's Zero-Impact Backup enablers.
- Storage device independent. Any-to-any storage connectivity (Fibre Channel, IP/iSCSI, Ethernet, SCSI, & soon: InfiniBand). Based on open standards, so you don't have to lock into a specific vendor.
- Enables deployment of lower cost storage (e.g. simple JBODs) for DR site.
- Uses standard network hardware. Supports any IP connection. Does not require new network infrastructure or special Fibre Channel-to-IP conversion routers.
- Unparalleled flexibility in creating DR environments – customizable to exact DR needs of each enterprise.
- Immediate, seamless deployment. Ability to synchronize existing data sets dramatically reduces bandwidth needs during initial setup. Optional Storage Service Enabler feature allows quick setup without data migration.
- Integrates with higher-level enterprise management platforms, such as HP®OpenView, Tivoli® NetView, CA® Unicenter, BMC® Patrol, etc.
- Future-proof – extremely scalable DR solution to meet future needs and means as enterprise evolves; easy & cost-effective to keep software solution up-to-date.
- Dramatically lower acquisition cost of DR solution.
- Dramatically lower total cost of ownership over other DR solutions on the market today; huge ROI.

FalconStor Software

125 Baylis Road
Melville, NY 11747
631.777.5188
www.falconstor.com

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