

IPStor Disaster Recovery Solutions facilitate the replication of mission-critical information between data centers, or between remote offices and data centers, via innovative remote replication, asynchronous mirroring, or synchronous mirroring over IP

Key Benefits

- Delivers rapid resumption with minimal data loss
- Addresses both sudden outages and rolling disasters
- Offers host/OS and storage hardware independence

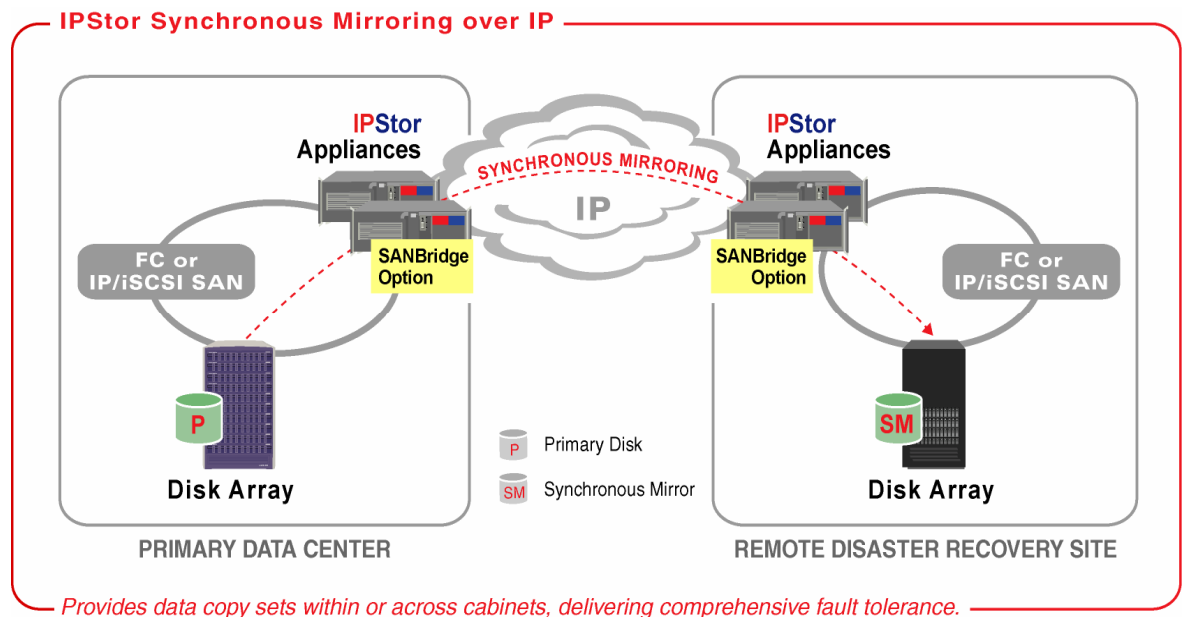
In today's corporate 24x7xForever uptime environment, a practical Disaster Recovery (DR) solution must fulfill the following objectives:

- Address all potential disasters including sudden outages and rolling disasters
- Achieve established recovery time objectives (RTO) and recovery point objectives (RPO)
- Protect your entire data network – from branch offices to the enterprise
- Provide effective data protection during each phase of DR: pre-, during, and post-disaster

Power failures, fire, flood, etc., can cause sudden unplanned outages that wreak havoc on day-to-day operations. Moreover, a rolling disaster, which is defined as "gradual data corruption that happens over a prolonged period of time, undetected until a catastrophic failure finally occurs," is particularly difficult to recover from, because by the time it is detected, it can be too late to recover – the data at the DR site could already be corrupted.

There is a solution: IPStor Disaster Recovery Solutions – comprised of **Synchronous Mirroring** over IP, **Asynchronous Mirroring**, and database-aware, transaction-based **Remote Replication** for SAN-based systems; and **FileSafe** and **DiskSafe** for direct attached storage (DAS) systems. These software tools defend against a comprehensive range of disasters without the expense or integration of specialized storage arrays.

Whether it's to achieve established recovery point objectives or recovery time objectives, IPStor DR Solutions provide rapid resumption of business in the event of a sudden unplanned outage with minimal data loss, by delivering the functionality required to comprehensively address all phases of a disaster: pre-, during, and post disaster.



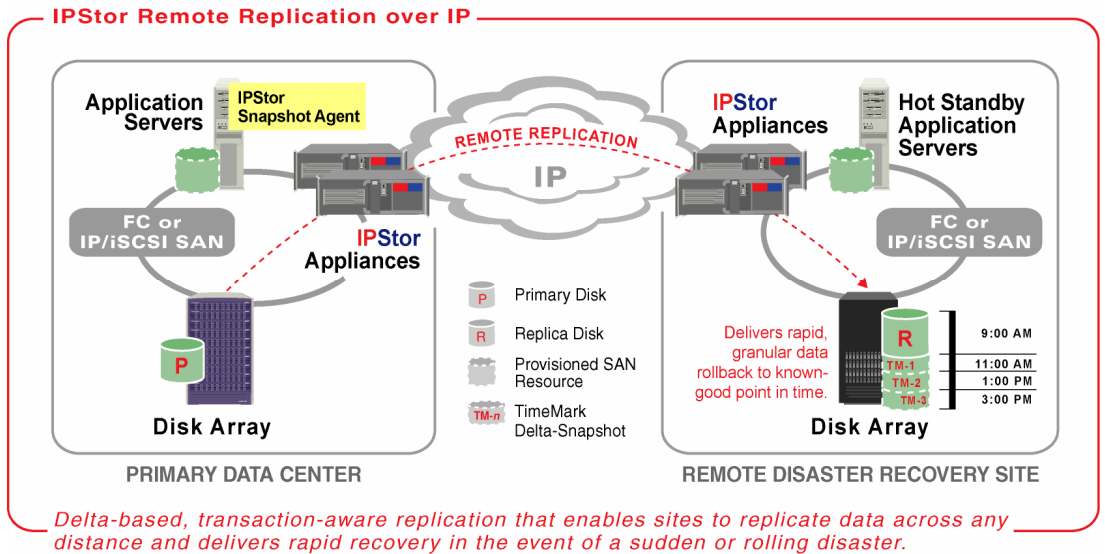
Phase 1: Pre-Disaster

LUN Pre-assignment Prevents Chaos When a Disaster Strikes – IPStor Remote Replication software allows a replica disk to be pre-assigned to hot standby machines at the DR site. If a disaster strikes, the replica is promoted to primary status, and the LUN assignment operates automatically.

This prevents the chaos usually caused when administrators are not sure which replica should be assigned to which standby host during an emergency.

Fast Initial

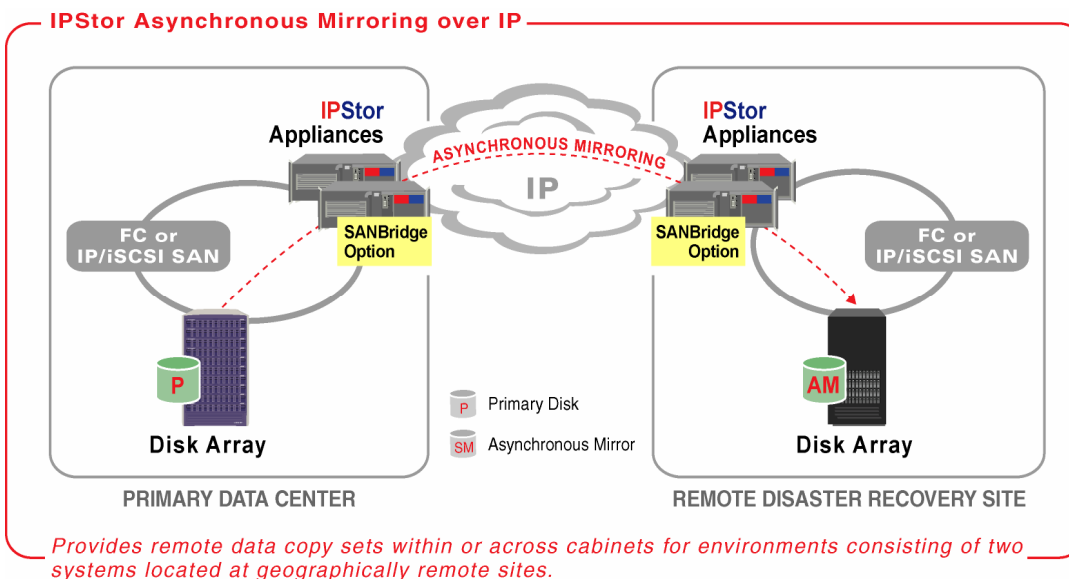
Synchronization – In the case where the primary disk is large (e.g. 1TB), it would take approximately 2 days to replicate 1TB over a DS3 (45Mb/s) line. To solve this dilemma, IPStor software allows bulk-transfer of the replica via either mirror-and-ship, or by image backup/restore via tape, so that the replica is in sync except for changes that may have occurred during the shipping or backup period. Then, IPStor uses a 'scan-for-differences' method to generate the initial delta-map, and rapidly syncs up the small amount of difference.



Phase 2: During Disaster

Sudden Disaster – If the primary site suddenly fails, it could be in the middle of a replication process. IPStor defends against replica corruption by storing the changes in a separate area, and does NOT write the changes to the replica unless the entire data set is received and confirmed.

Therefore, either a replication is successful or it has failed and will be retried. No partial changes are applied to the replica.



Rolling Disaster – If the primary site is gradually failing, this may lead to corruption that is not detected until it is too late. But when the IPStor point-in-time (PiT) imaging option (**TimeMark®**) is enabled at the replica, each individual change is journaled. When the disaster is finally recognized, the replica can be promoted, and the TimeMark PiT delta-snapshots can be used to go back in time until a good state is found.

IPStor can keep 256 PiT images, which can represent weeks of historical data for rollback purposes. Most legacy replication products (i.e. Veritas Volume or File Replicator, NSI Double-take, etc.) do NOT have the ability to keep track of historical replication data, and can therefore be vulnerable to a rolling disaster.

Minimum Data Loss – The **IPStor Asynchronous Mirroring** option can be used as part of a DR scheme to provide a low-loss mirror copy of the primary. Although this copy might take longer to start up (requiring Checkdisk, FSCK, database recovery, etc.), the advantage is that it is nearly in sync with the primary, so very few (if any) transactions are lost.

During a disaster, the replica is used for instant restart (enabling business to continue), while the mirror copy completes the recovery process. When completed, the mirror can be used to recover additional transactions not found in the replica.

Rapid Restart – FalconStor also offers **IPStor Snapshot Agents** for databases, filesystems, and message stores (Oracle, Informix, SQL, Sybase, DB2, Microsoft Exchange, Lotus Notes/Domino...) to ensure that the replica is always in a consistent state and ready to be promoted and mounted by the OS and the database/messaging application. IPStor Snapshot Agents help guarantee the replica’s data integrity, making it unnecessary to perform time-consuming Checkdisk, FSCK, and database recovery procedures before re-starting the application.

Emergency Access over IP – If the primary site loses only the storage, but the servers are still healthy, it is possible to use IPStor to access the promoted replica at the DR site.

Phase 3: After Disaster

Fast Reverse-Sync – To revive the primary site after the problem is fixed, it is necessary to reverse synchronize newer data from the DR site back to the primary site. IPStor facilitates role reversal and “scan-for-difference” operations to minimize the time necessary to re-establish the primary site.

IPSTOR DISASTER RECOVERY SOLUTIONS FOR SAN-BASED SYSTEMS:

Remote Replication Highlights

Point-in-time copy for rapid data recovery

- Zero performance impact on product servers at the primary site
- Improves performance and utilization of existing communications link via flexible policy to trigger replication
- Database transactional integrity and versioning maintained at secondary site
 - Minimal failover time
 - Up to 256 versions maintained per replica
 - Current/prior version of replica can be mounted for read/write access over IP/FC
- Applies *changed blocks* to the database at the primary site
 - Minimal fail-back time
- Data compression to maximize network bandwidth
- Data encryption for end-to-end security
- Automatically recovers from network failure without restarting the replication session

Synchronous Mirroring Highlights

Realtime availability of data

- Primary and online copy of data are identical and concurrent
- Provides redundancy and automatic failover at disk, LUN, channel, and cabinet level
 - Redundant copy of data is always current
- No CPU impact to application servers
 - Application servers do not need to process two write commands
- Uses mirror-and-swap technique
 - Eliminates downtime during disk upgrade and/or replacement
 - Enables efficient data migration from old to new storage
 - Creates multiple sets of current data without downtime or impact to servers
- Fast and easy point-and-click mirror creation and definition of disk mirrors via IPStor Console
 - Maintains access during initial mirror creation of mirrored disks

Asynchronous Mirroring Highlights

Near realtime availability of data

- Online standby of data (mirror) at secondary location is a few seconds behind primary data set (based on overall geographic distance)
- Provides redundancy and automatic failover at disk, LUN, channel, and cabinet level
- No CPU impact to application servers
 - Application servers do not need to process two write commands
- Provides benefits of mirroring with no performance impact at the primary site
 - Enables writes to reach mirror over long distances between data centers
- Fast and easy point-and-click mirror creation and definition of disk mirrors via IPStor Console
- Maintains constant access to applications during initial mirror creation of mirrored disks

**IPSTOR DISASTER RECOVERY SOLUTIONS FOR DAS-BASED SYSTEMS:
(Remote offices, laptops, workstations, application or file servers)**

FileSafe Highlights

Near realtime high availability of files and directories on DAS

- File level replication from DAS systems to IPStor-managed disk
- Scheduled replication of data over LAN, WAN, or Fibre Channel connection
- Business continuity in the event of lost or damaged files/directories
- Quick recovery by end users of their own files, maintaining high level of workflow and productivity
- Uninterrupted workflow during tape backups: by replicating data to a centralized location where tape backups are performed, production machines are unaffected during backups and users can continue to work without interruption
 - Provides the ability to create archived versions of the data while the workstations, laptops, application servers operate in 24x7 mode
- Nonstop access to applications during replication process
- Saves multiple point-in-time versions of data enabling end users to quickly go back to an earlier version (when used in conjunction with IPStor TimeMark option)
- Minimizes network overhead since only the changes made to a file are replicated, rather than the entire file
 - Efficient, even across low-bandwidth links
- Integrates with IPStor's application-specific Snapshot Agents to ensure transactional integrity and point-in-time consistency of databases and filesystems

DiskSafe Highlights

Disaster recovery protection for DAS disks

- Block level replication of DAS disk to IPStor-managed disk
- Continuous or scheduled replication of data over LAN, WAN, or Fibre Channel connection
- Rapid recovery in the event of disk failure
- Replica is current due to continuous nature of replication
- Uninterrupted workflow during tape backups: by mirroring data to a centralized location where tape backups are performed, production machines are unaffected during backups and users can continue to work without interruption
 - Provides the ability to create archived versions of the data while the workstations, laptops, application servers operate in 24x7 mode
- Nonstop access to applications during replication process
- Saves multiple point-in-time images of each disk so end user can quickly go back to an earlier version (when used in conjunction with IPStor TimeMark option)
- Minimizes network overhead since only the changes are sent over the wire
 - Efficient, even across low-bandwidth links



FalconStor has sales and support offices worldwide. Please contact us for more information about FalconStor and our IPStor solutions.

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