Understanding your HA and DR Options

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Brian Nordland
PowerHA Architect
HelpSystems
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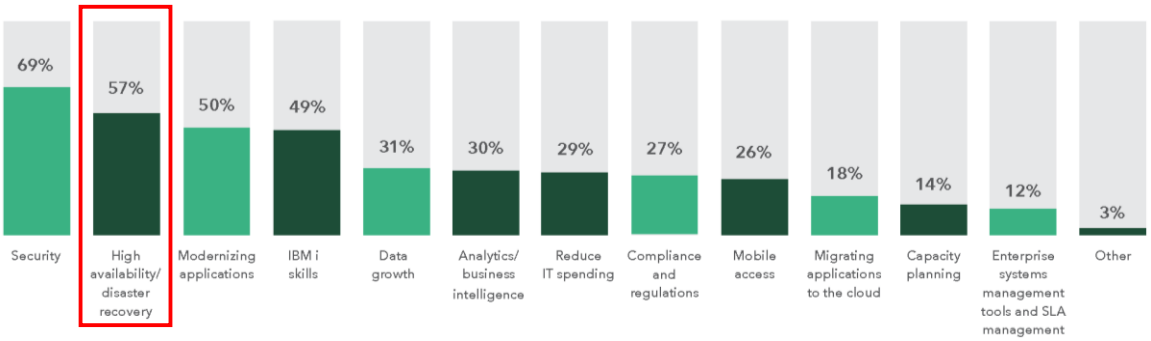
Top IT Concerns r 2019



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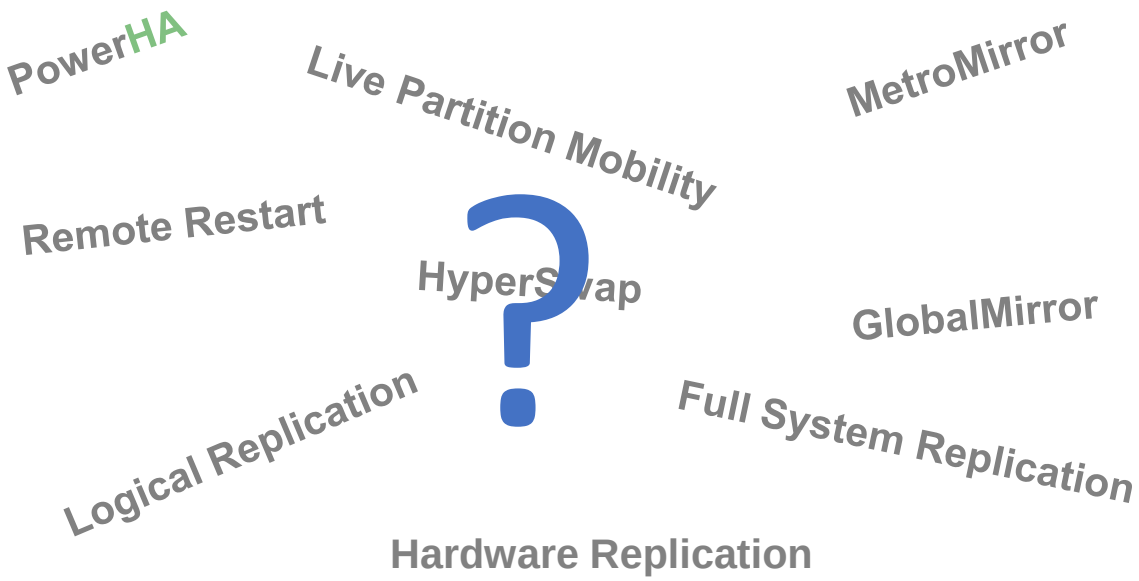

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Which is the best?

It depends…

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Computer network outage forces Sutter Health to delay care to some patients

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The IRS website for filing tax returns is experiencing technical issues as Tax Day deadline looms

BUSINESS INSIDER | BOB BRYAN

Apr 17th 2018 1:28PM

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Statewide school system outage affecting grades, homework, student lunch accounts

POSTED 7:29 AM, APRIL 24, 2018, BY Q13 NEWS STAFF

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How long can you be down for?

Recovery Time Objective

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Student data lost after Washington County Public Schools server outage

CJ Lovelace May 9, 2018 Updated May 9, 2018

Washington County Public Schools is trying to recover student data — including grades and attendance records — that was apparently not properly backed up and permanently lost following a minor fire that downed multiple servers more than a week ago

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How much data can you afford to lose?

Recovery Point Objective

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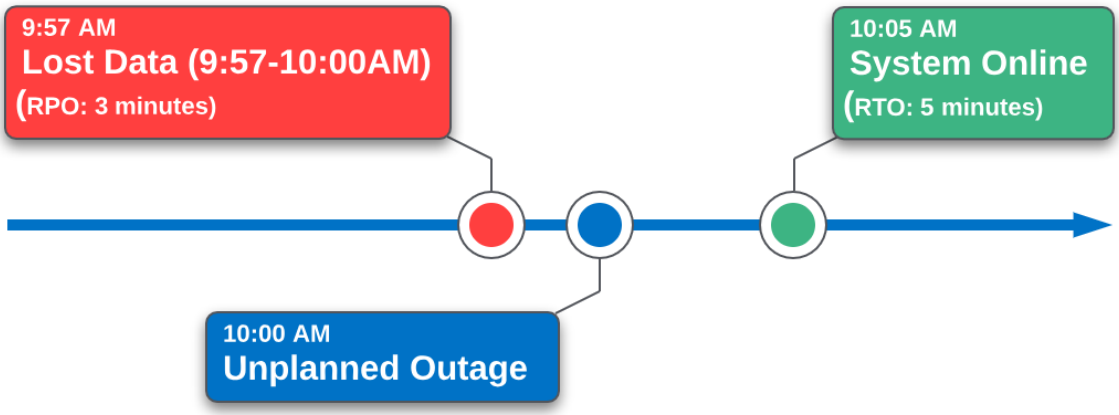

Recovery Time Objective: 5 minutes
Recovery Point Objective: 3 minutes (lost data)

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Which solution gives me the best RPO and RTO?

It depends…

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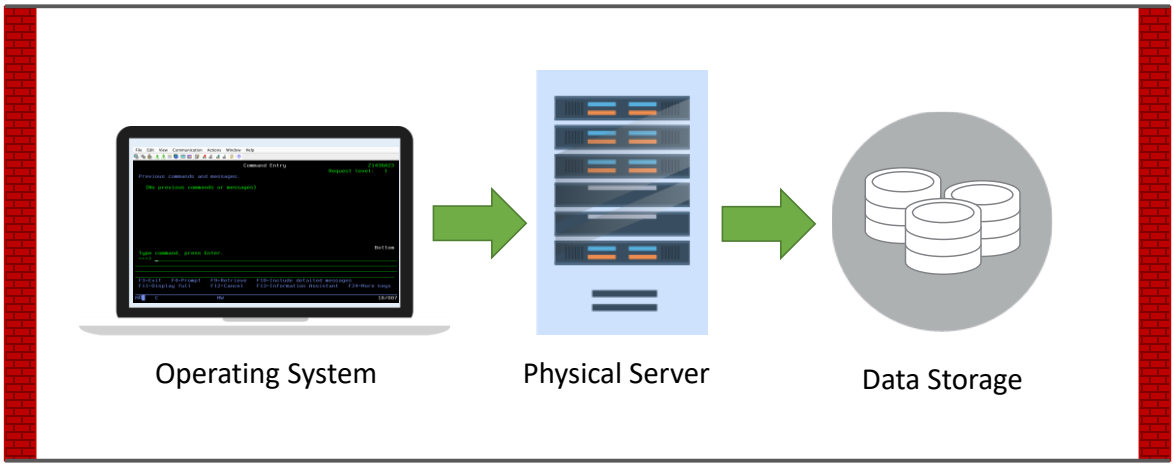
Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



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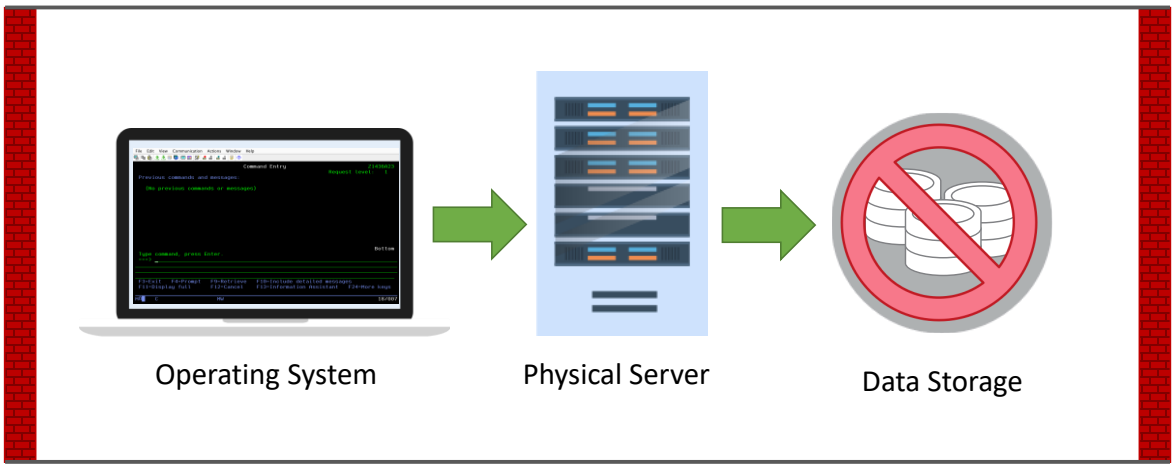

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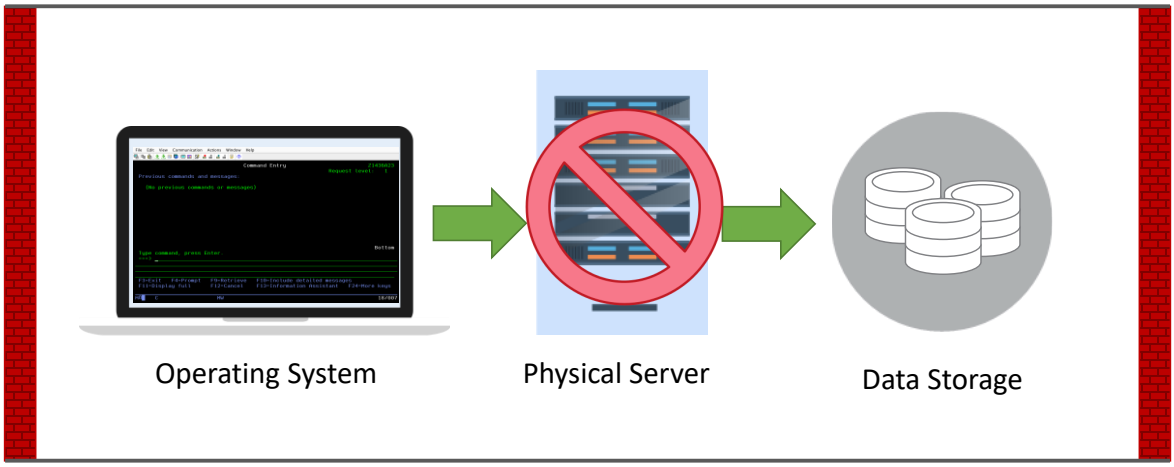

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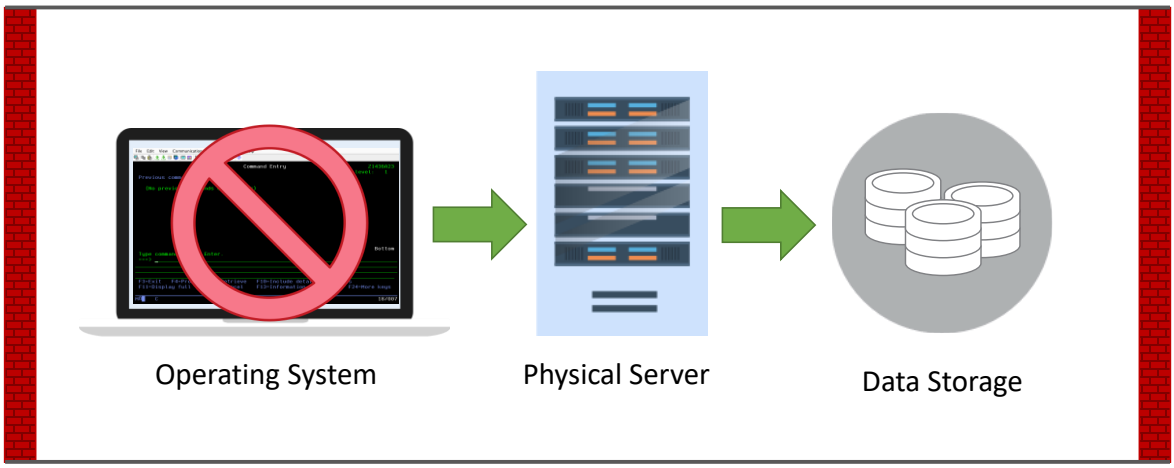

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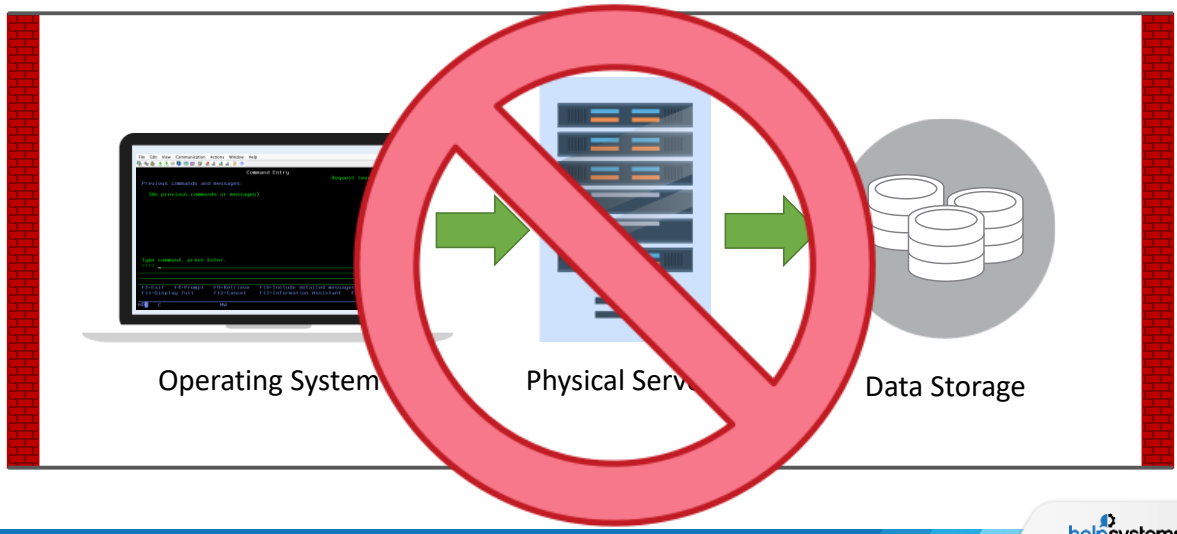

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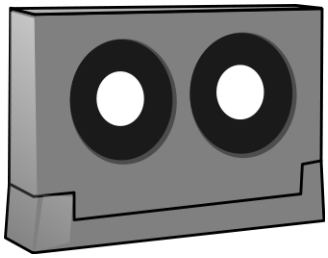

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Outage Type Scorecard					
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Tips for Success in HA and DR

- You need an RTO and RPO for every type of outage
- Think about an RTO and RPO for both planned and unplanned outages
- Every company has different needs

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The Technologies

Focusing on which types of outages they protect against

UP NEXT

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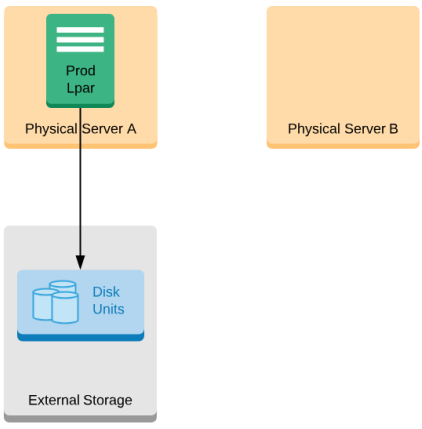
Live Partition Mobility (LPM)



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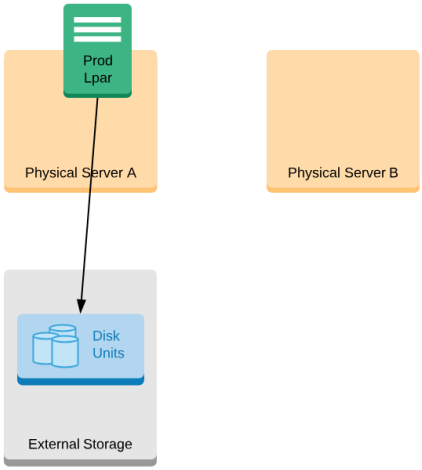

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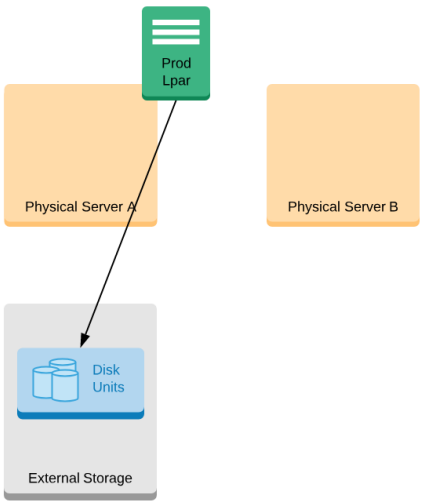

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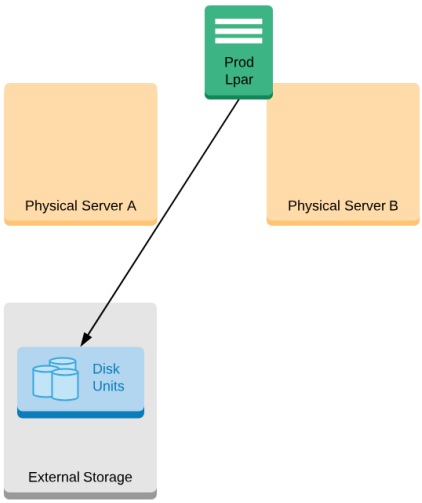

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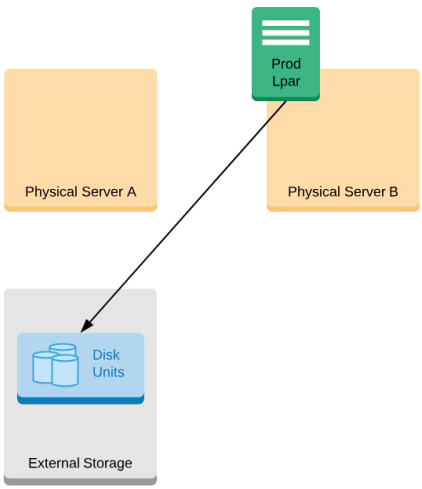

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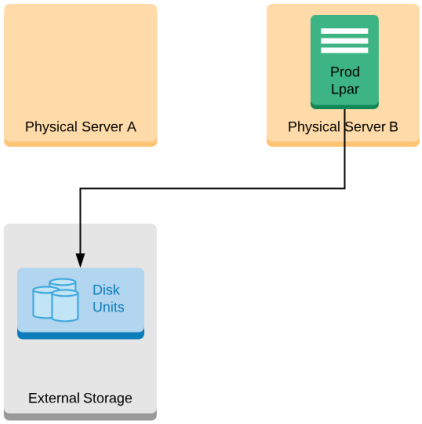

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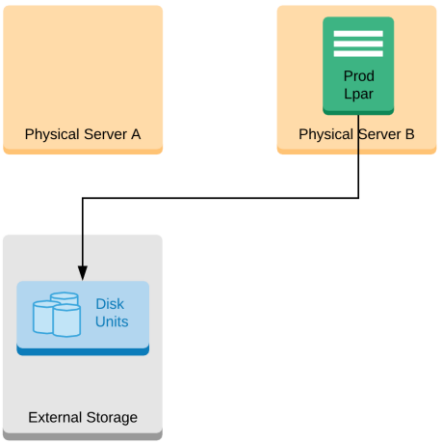
Live Partition Mobility (LPM)

Outage Type Scorecard					
Storage Outage	**Server/Hardware Outage**	**OS/Software Outage**	**Data Center Outage**	**Regional Outage**	**Offline Backups**
	Planned Only				



- Minimal application impact
- Planned server hardware outages only
- Requires everything to be virtualized
- Requires External Storage

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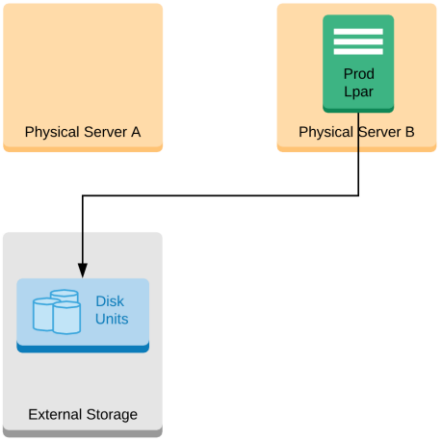
Remote Restart

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



- Restart of partition on another physical server
- For unplanned server hardware outages
- Requires everything to be virtualized
- Requires external storage

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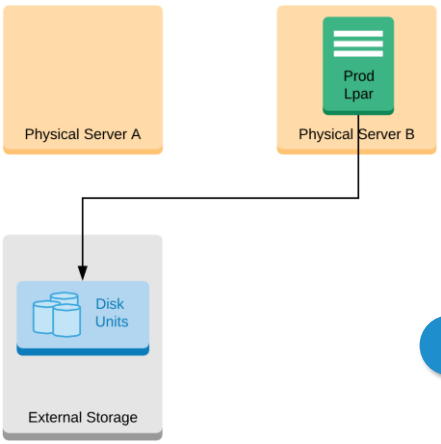
Remote Restart

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



- Restart of partition on another physical server
- For unplanned server hardware outages
- Requires everything to be virtualized
- Requires external storage

IBM VM Recovery Manager for HA
Product for Managing LPM and Remote Restart

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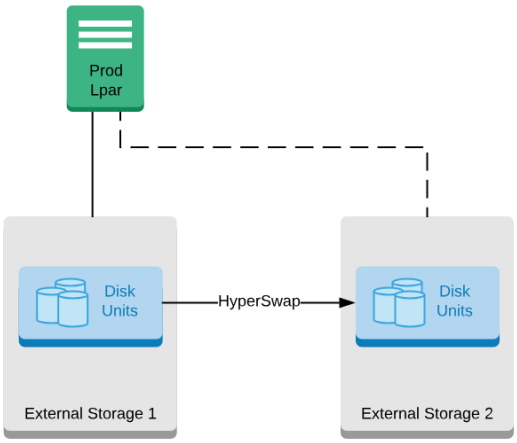
Full System HyperSwap



- Near-Zero application impact for planned storage outages

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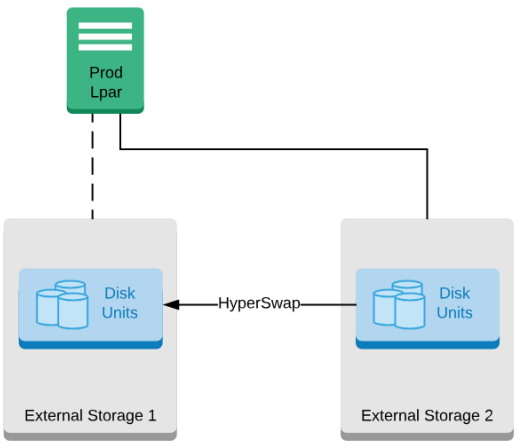
Full System HyperSwap



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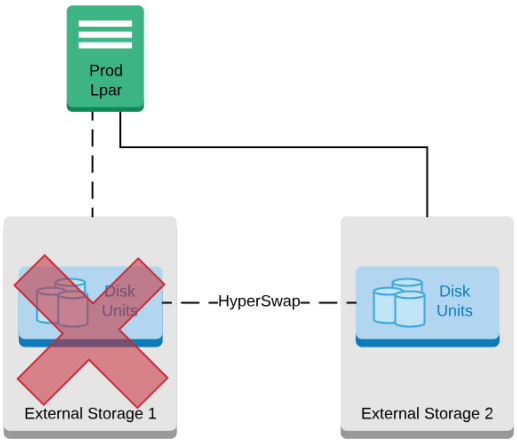
Full System HyperSwap



- Near-Zero application impact for planned storage outages
- Minimal application impact for unplanned storage outages

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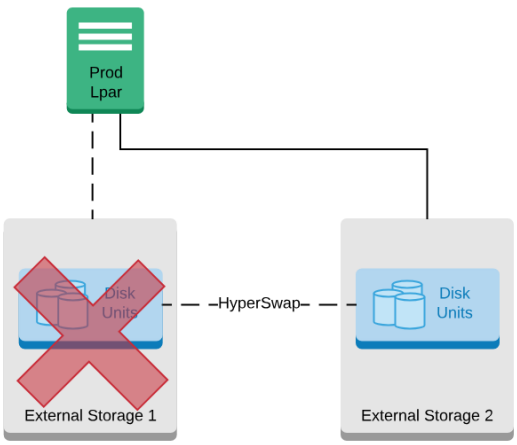
Full System HyperSwap



- Near-Zero application impact for planned storage outages
- Minimal application impact for unplanned storage outages
- Supported for IBM DS8000 (PowerHA express edition), or IBM SVC/Storwize

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Full System HyperSwap

Outage Type Scorecard					
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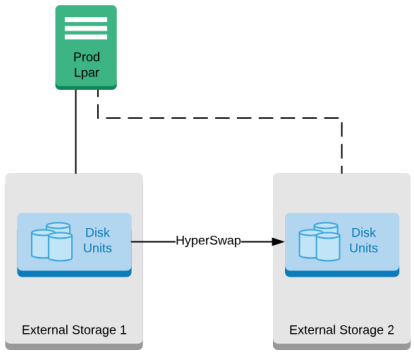

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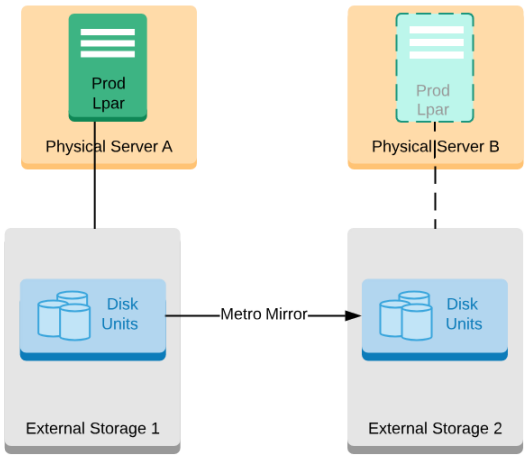
Full System Replication

Metro Mirror



- Synchronous replication – all data on disk identical for great RPO but limited in distance

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Full System Replication

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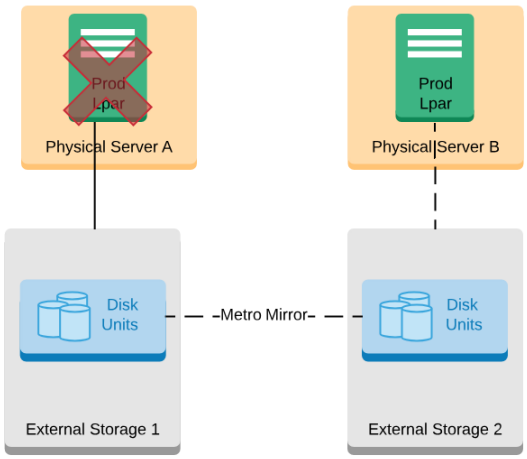

- Synchronous replication – all data on disk identical for great RPO but limited in distance
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Full System Replication

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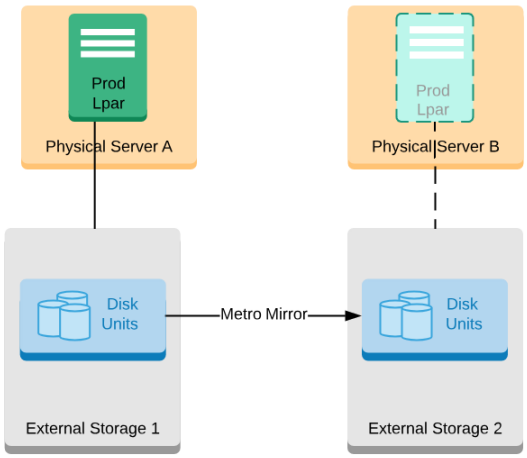

- Synchronous replication – all data on disk identical for great RPO but limited in distance
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Full System Replication

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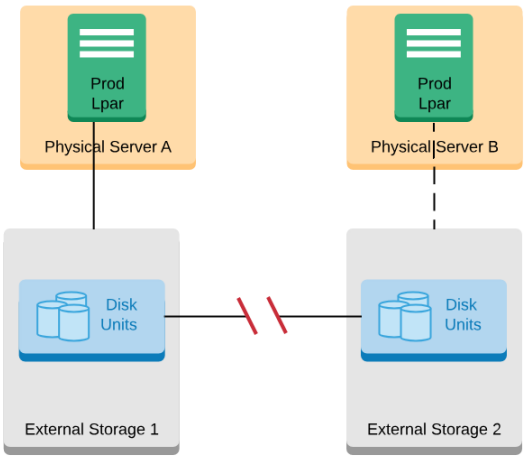

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- Stopping replication to "test" requires manual IP address fixup.
  - When done, pick one copy or the other

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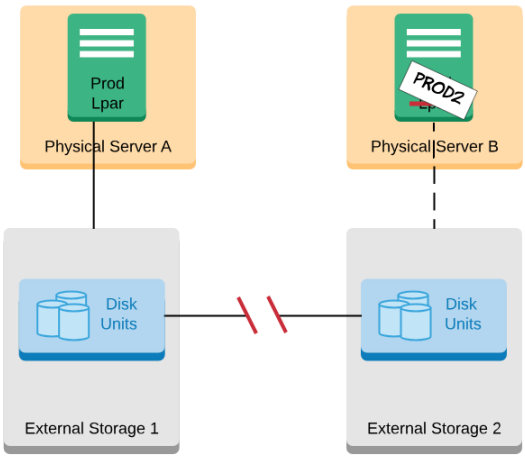
Full System Replication

Metro Mirror



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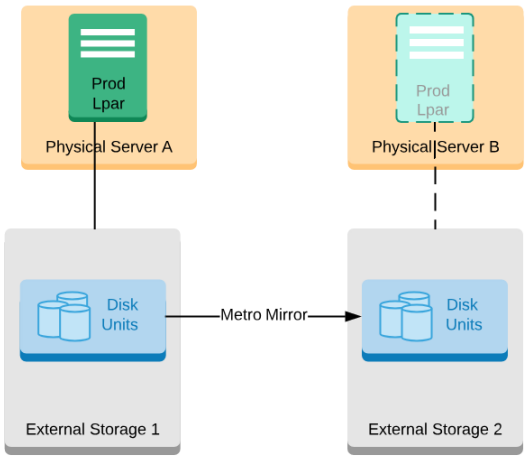

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  - When done, pick one copy or the other
- Easy to set up, easy to manage (tools/products)

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Full System Replication

Metro Mirror

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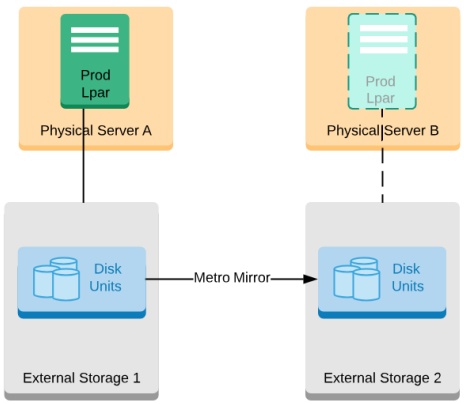

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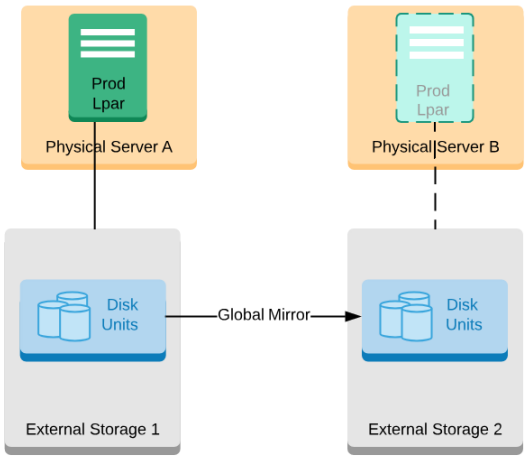
Full System Replication

Global Mirror



- **Asynchronous replication** – worse RPO than Metro Mirror, but allows for distances spanning the globe.
- Secondary server is not accessible, but ready to be started instead of the first
- Requires bandwidth for Application data, OS data, and temporary storage (due to IBM i's single level store)
- Stopping replication to "test" requires manual IP address fixup.
  - When done, pick one copy or the other
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Full System Replication

Global Mirror

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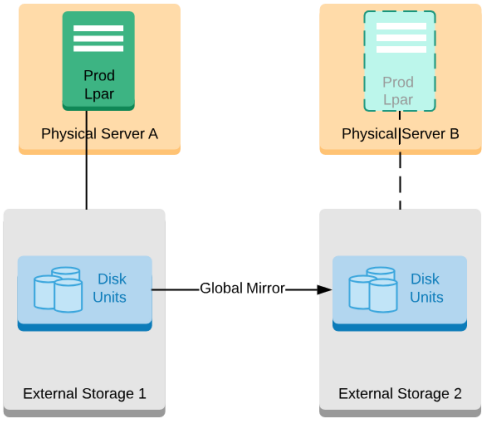

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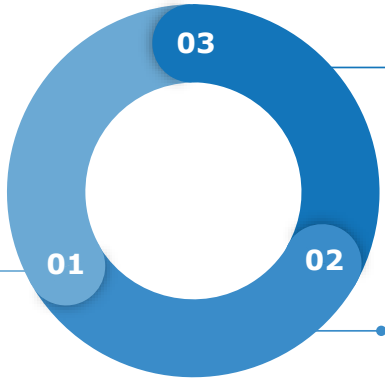
Full System Replication

Implementation Products/Options



IBM VM Recovery Manager for DR

Automates and manages replication and switching.

- Orchestration/GUI partitions run AIX
- Requires everything to be virtualized
- Can switch AIX, Linux, IBM i
- Great for Managed Service Providers

Roll your own

You are responsible for ensuring things are done correctly and in a correct order to prevent data loss or corruption.

IBM Lab Services Full System Replication Manager

Automates and manages replication and switching.

- Management partition runs IBM i.
- Does not require virtualization.
- Handles any "IP address fix-up"

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What about OS/Software Outages?

Two primary flavors of technologies:

- Logical/Software Replication
- Hardware Replication with PowerHA

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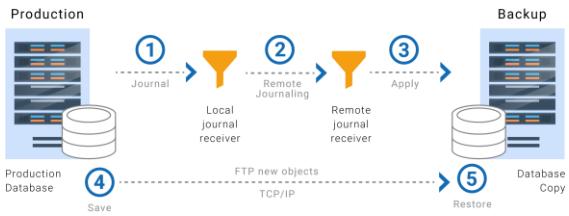
Software-Based (Logical) Replication



- Remote Journaling
  - PF, data queues, data areas, IFS
  - Sync and Async
- User Profiles and Spool files
  - Many solutions use QAUDJRN
- All instances are active

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Advantages of Logical Replication

- Source and target are both active (target can be used for BI, reporting or test purposes)
- Perform offsite backups on target system without impacting RPO
- Ability to distribute data to multiple target systems
- Less bandwidth used (only journals are sent)

Considerations for Logical Replication

- Requires more daily care/feeding/monitoring than hardware replication
- Can have a bigger impact on system performance than hardware replication

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Software-Based (Logical) Replication

Outage Type Scorecard					
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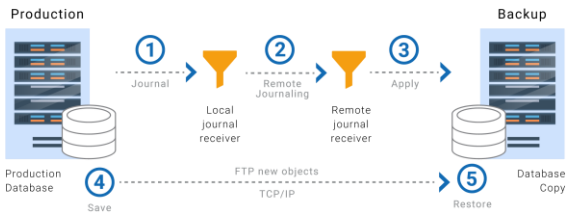
			Synchronous	Asynchronous	



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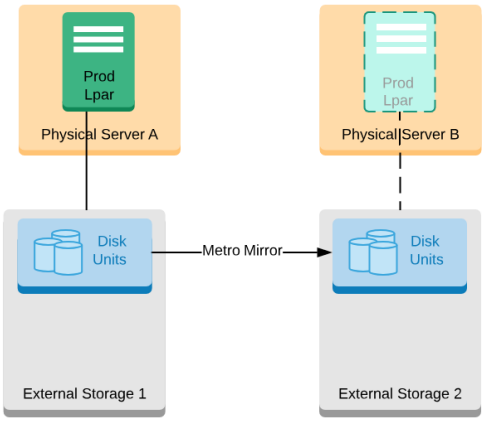
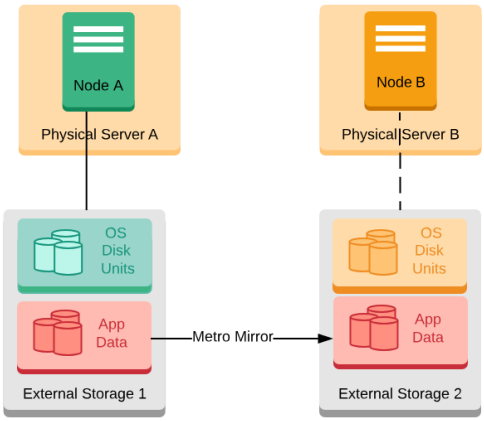
PowerHA

Hardware Replication with IASPs



PowerHA

Hardware Replication with IASPs



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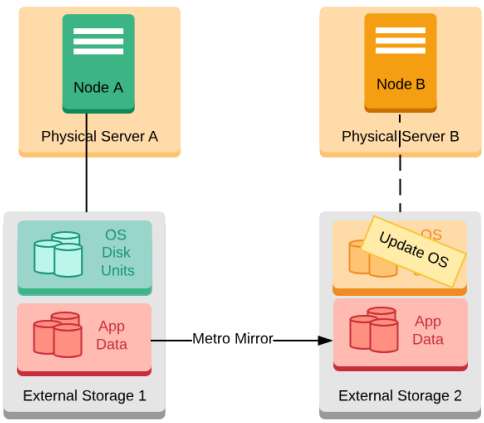
Hardware Replication with IASPs



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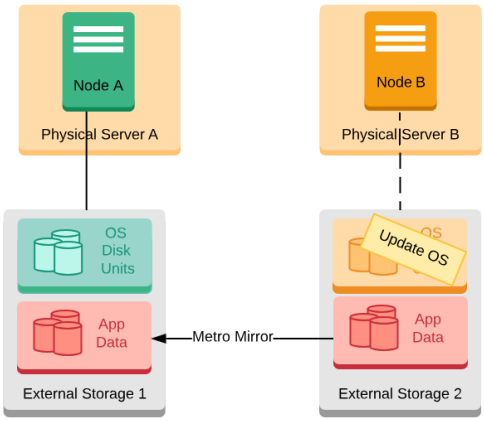
Hardware Replication with IASPs



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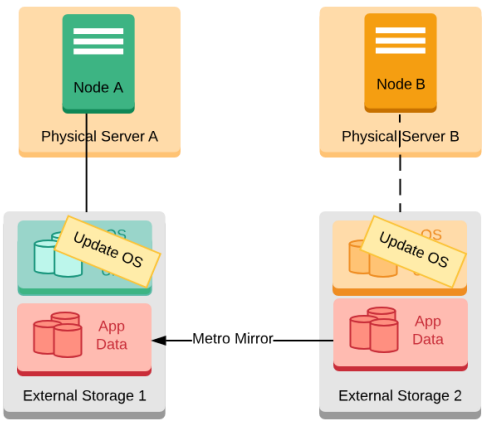
Hardware Replication with IASPs



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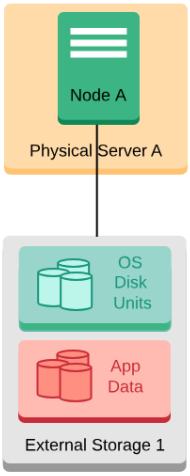
Independent Auxiliary Storage Pools (IASPs)



- Separates the OS from Applications/Data
- Separate namespace and database
- Can be taken online and offline without a system restart
- Foundation for PowerHA technologies
- Some objects do not make sense in an IASP, for this, there is the administrative domain

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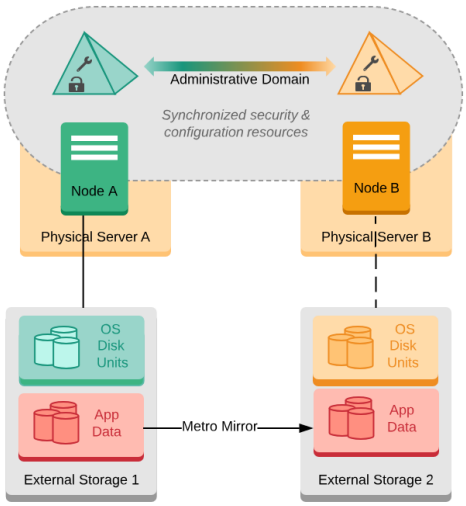
Administrative Domain



- Synchronizes objects that do not make sense in an IASP
  - Security
  - Configuration
- Examples
  - User Profiles
  - Printer Device Descriptions
  - System Values
  - And more…

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Advantages of PowerHA

- Any object in the IASP is replicated
- Faster/easier role swaps
- Less monitoring
- Often times less expensive than logical replication
- Uses less bandwidth than Full System Replication (no OS or temporary data)

Considerations for PowerHA

- Up-front work to get into an IASP (pay me now, save in the long run)
- Uses more bandwidth than logical replication
- Target server cannot be accessed while replication is active
  - Replication can be detached
  - FlashCopy with external storage

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PowerHA - Solutions for every storage type

Internal Storage	DS8000	SVC/Storewize	IBM Copy Services Manager (DS8000)
Sync. Geographic Mirroring	LUN Level Switching	LUN Level Switching	Metro Mirror and Global Mirror
Async. Geographic Mirroring	Metro Mirror and Global Mirror	Metro Mirror and Global Mirror	HyperSwap with Global Mirror
	FlashCopy	FlashCopy	
	HyperSwap	HyperSwap	

New

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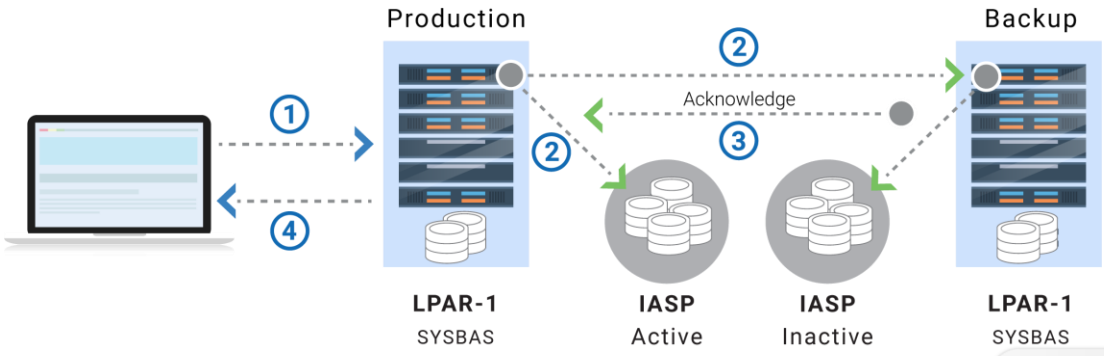
Geographic Mirroring

- Hardware replication done by the system
- Works with any storage – generally recommended only for under 4TB
- Synchronous and Asynchronous flavors



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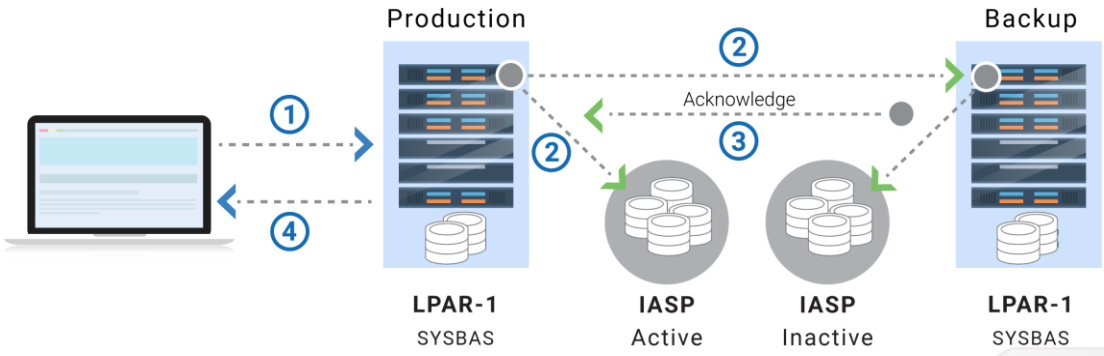
PowerHA Geographic Mirroring

Outage Type Scorecard					
Storage Outage	**Server/Hardware Outage**	**OS/Software Outage**	**Data Center Outage**	**Regional Outage**	**Offline Backups**
			Synchronous	Asynchronous	



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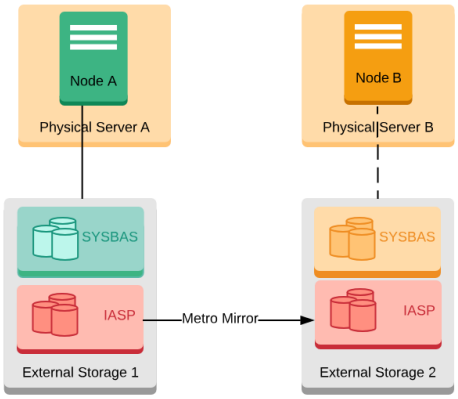
PowerHA Metro Mirror

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



- Synchronous replication – great RPO, but limited in distance
- Allows for detaching to stop replication and test on target system or perform backups

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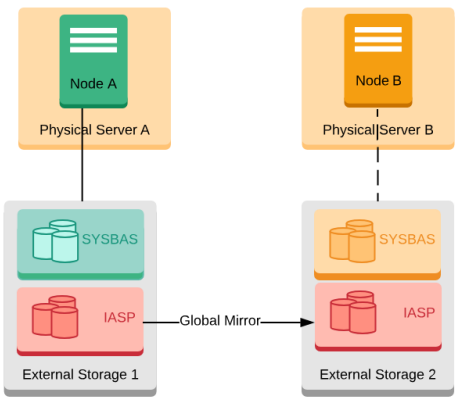
PowerHA Global Mirror

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



- Asynchronous replication – worse RPO than Metro Mirror, but allows for distances spanning the globe.
- Allows for detaching to stop replication and test on target system or perform backups

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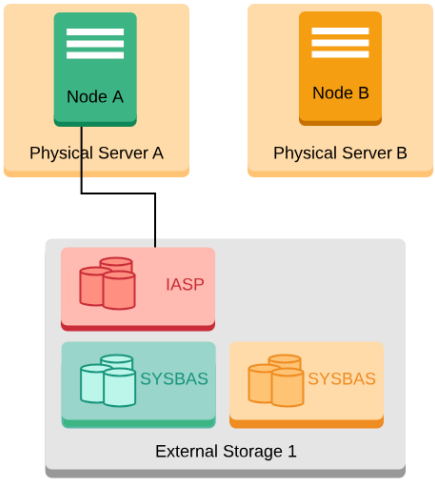
PowerHA LUN Level Switching



- Data is switched between servers
- Provides protection against OS/Software outages, and server hardware outages
- Frequently combined with Global Mirror

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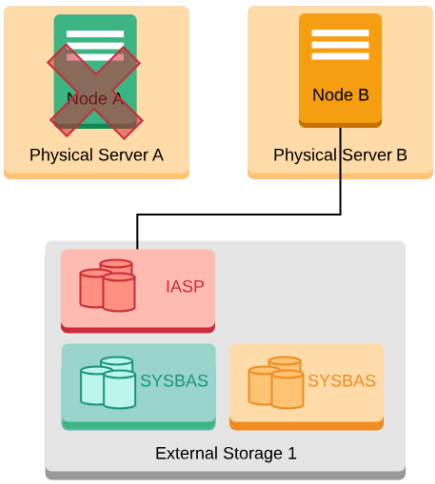
PowerHA LUN Level Switching



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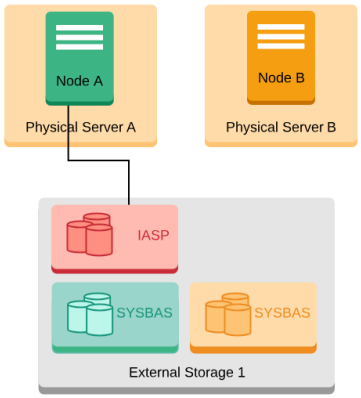
PowerHA LUN Level Switching

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



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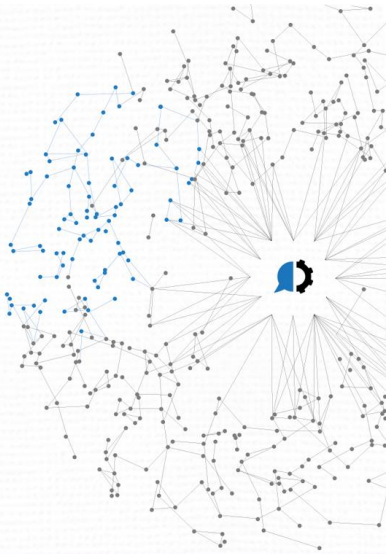
Combining Technologies



UP NEXT

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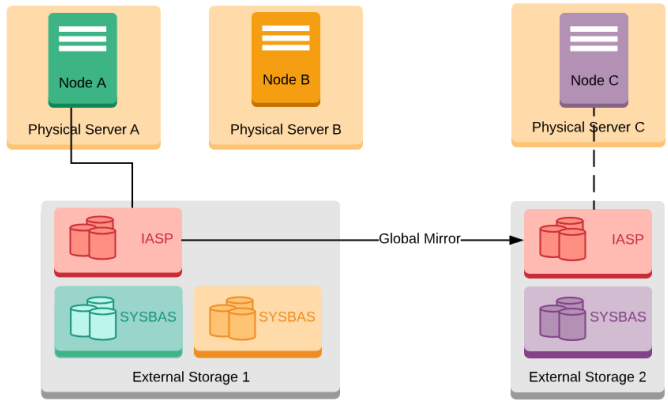
PowerHA LUN Level Switching+Global Mirror

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups



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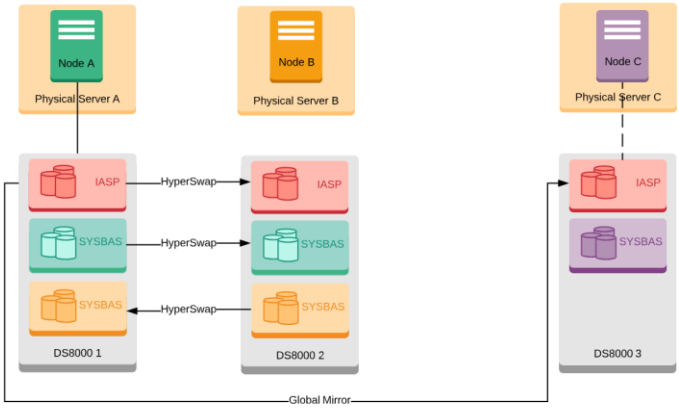
PowerHA DS8000 HyperSwap+Global Mirror

Outage Type Scorecard					
Storage Outage	Server/Hardware Outage	OS/Software Outage	Data Center Outage	Regional Outage	Offline Backups
			Great RPO		



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Today we talked about real-time replication and switching technologies

However…

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MySpace lost 12 years of user content

Photos, music and videos have all been affected.

Christine Fisher, @cfisherwrites
03.18.19 in AV

"As a result of a server migration project, any photos, videos, and audio files you uploaded more than three years ago may no longer be available on or from MySpace," the company announced last weekend. "We apologize for the inconvenience."

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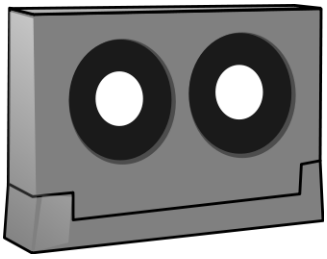
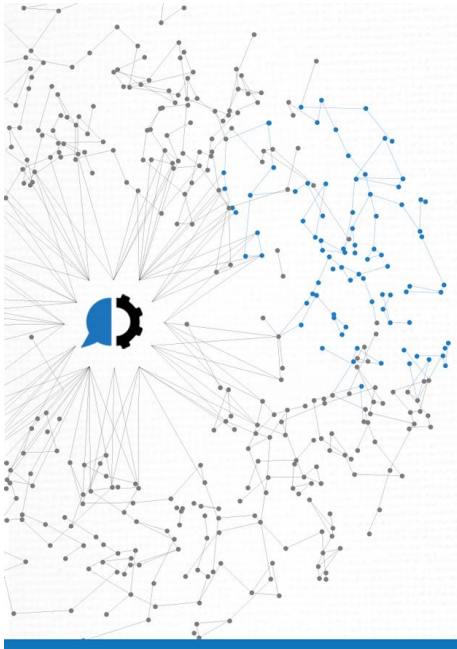
Real-time replication solutions for HA and DR are an addition to, not a replacement for point-in-time disaster recovery solutions



Summary

- When considering HA and DR solutions, you need to first look at your RPO and RTO requirements for every type of outage.
- There are solutions for every type of outage available. Many of these solutions can be combined.
- Real-time replication solutions are an addition to, not a replacement for, point-in-time disaster recovery options, such as tape backup.



Any Questions

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