

Db2 Mirror for i

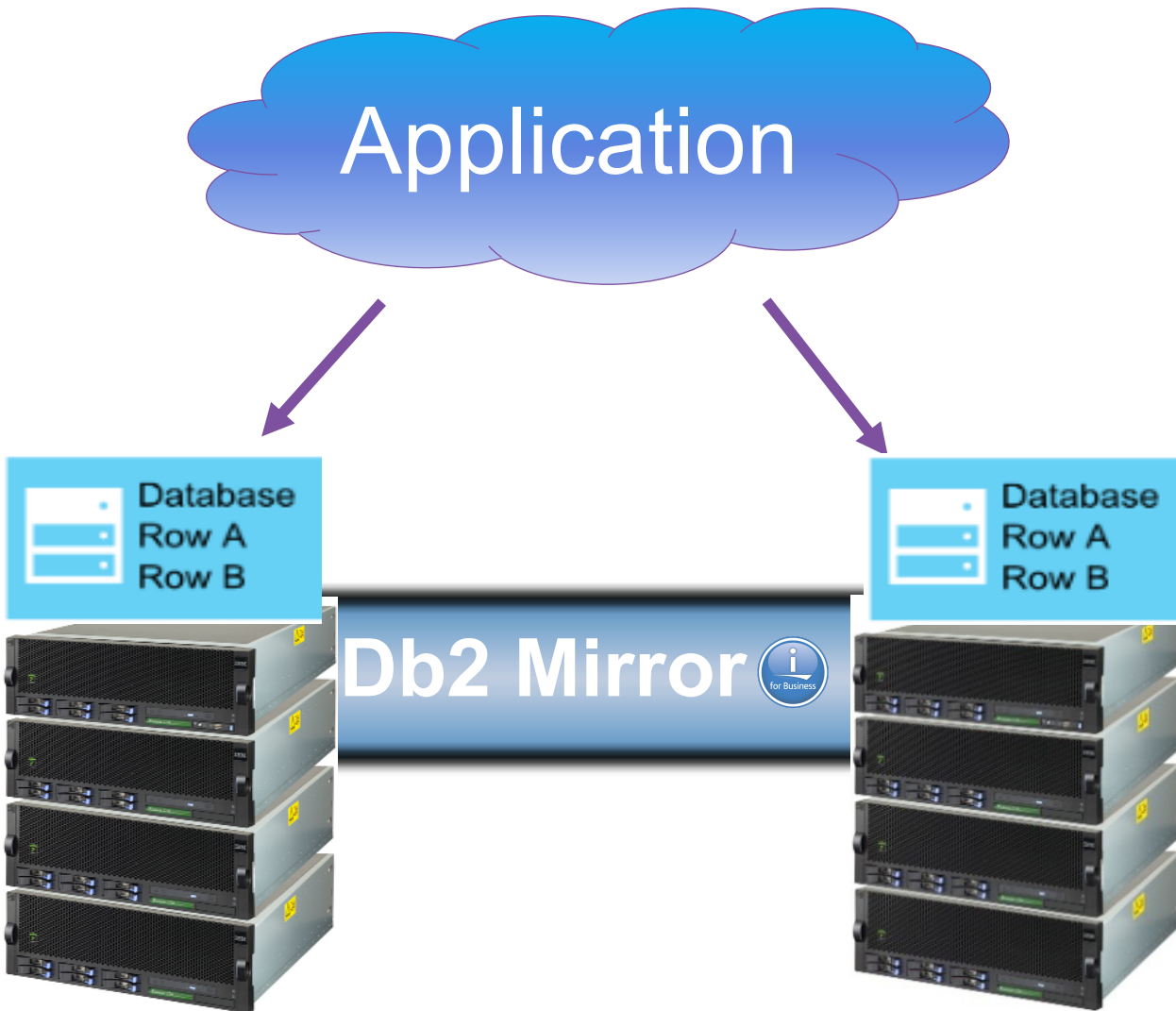
—

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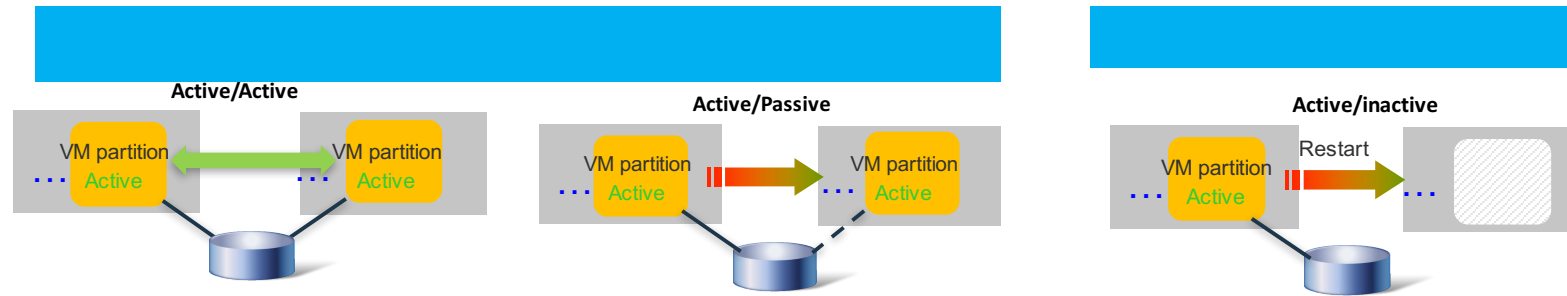
IBM Db2 Mirror for i



- **IBM Db2 Mirror for i: Enables Continuous Availability**
 - High speed synchronous replication of Db2 for i (Data Center Solution)
 - Access Db2 objects from either LPAR
- **Application Availability Enablement**
 - Two Nodes read and write to the same DB Files
 - Enables quickly moving all work to one node, for planned maintenance or node failure
- **Enables Business Continuity for Disruptive System Upgrades**
 - Nodes can be at different OS levels
 - Nodes can be on different Power Hardware Generations
 - Rolling upgrades for no downtime
 - Roll a node back a release with minimal impact if Active/Active applications are deployed

Requires POWER8 or later and IBM i 7.4
New IBM i LPP 5770DBM

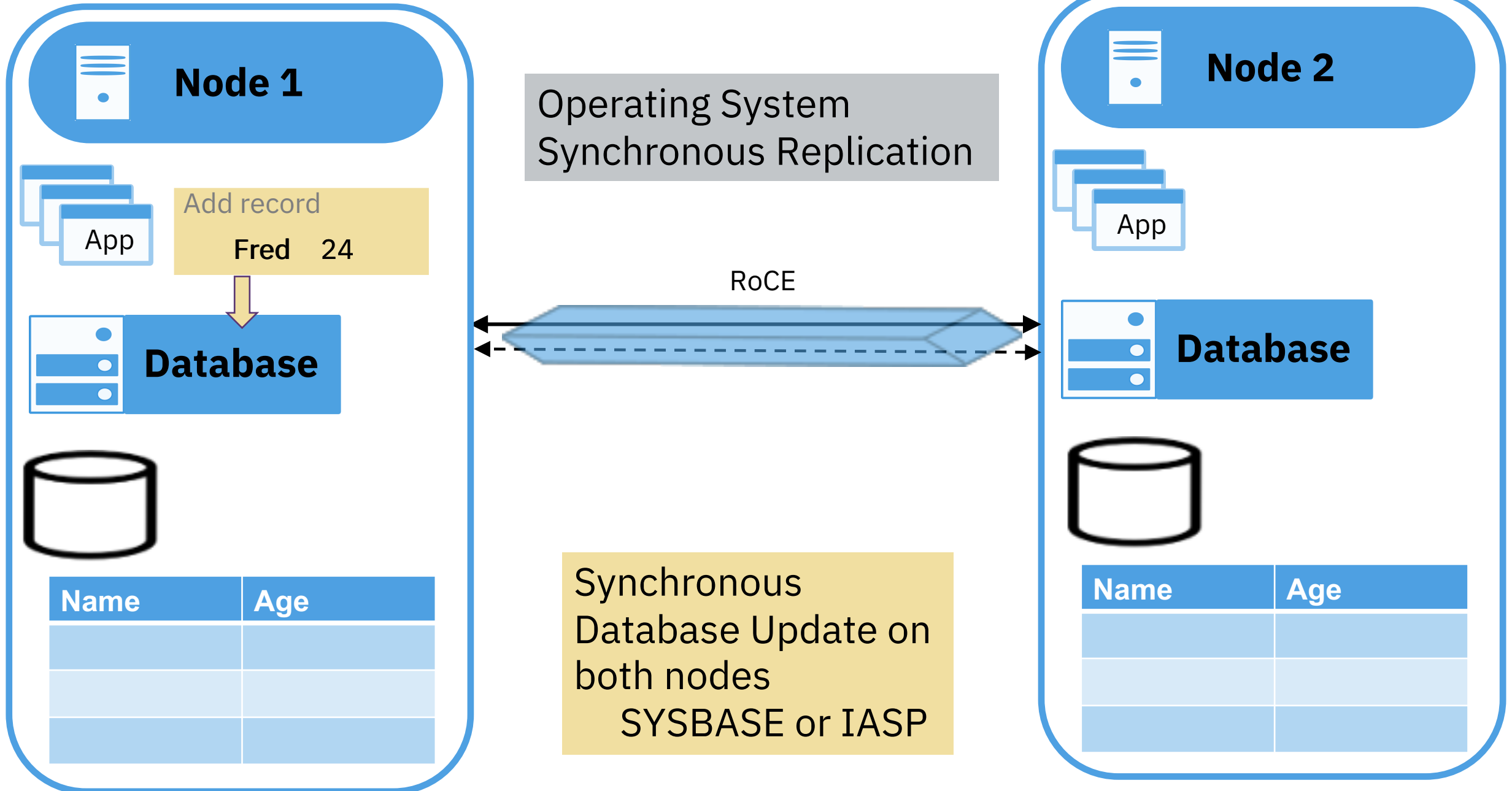
High Availability topology classification & positioning



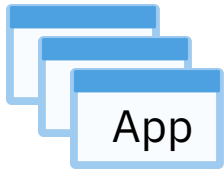
Technology	Active/Active Clustering	Active/Passive Clustering	Active/Inactive
Definition	Application level clustering; applications in the cluster have simultaneous access to the production data therefore no app restart upon an app node outage. Certain types enable read-only access from secondary nodes	OS level clustering; one OS in the cluster has access to the production data, multiple active OS instances on all nodes in the cluster. Application is restarted on a secondary node upon outage of a production node.	VM level clustering, One VM in a cluster pair has access to the data, one logical OS, one or two physical copies. OS and applications must be restarted on a secondary node upon a primary node outage event. LPM enables the VM to be moved non-disruptively for a planned outage event.
Outage Types	SW,HW,HA, planned, unplanned RTO 0, limited distance	SW,HW,HA,DR, planned, unplanned, RTO>0, multi-site	HW,HA,DR, planned, unplanned, RTO>0, multi-site
OS integration	Inside the OS	Inside the OS	OS agnostic
RPO	Sync mode only	Sync/Async	Sync/Async
RTO	0	Fast (minutes)	Fast Enough (VM Reboot)
Licensing*	N+N licensing	N+1 licensing	N+0 licensing
Industry Examples	Oracle RAC, Db2 Mirror , pureScale	PowerHA, Redhat HA, Linux HA	VMware, VMR HA, LPM,

- N = number of licensed processor cores on each system in the cluster
- Illustrations represent two-node shared-storage configurations for conceptual simplicity. There are many other topologies and data resiliency combinations

Db2 Mirror – Active Active



Node 1



Add record

Fred 24



Database



Name

Age

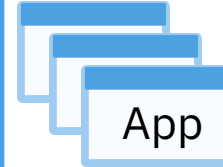
Operating System
Synchronous Replication

RoCE

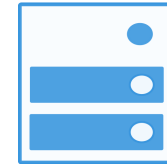
Synchronous
Database Update on
both nodes
SYSBASE or IASP



Node 2



App



Database



Name

Age

Db2 Mirror – Database Supported Objects

Database replication eligible objects

Native:

- Database Physical & Logical File

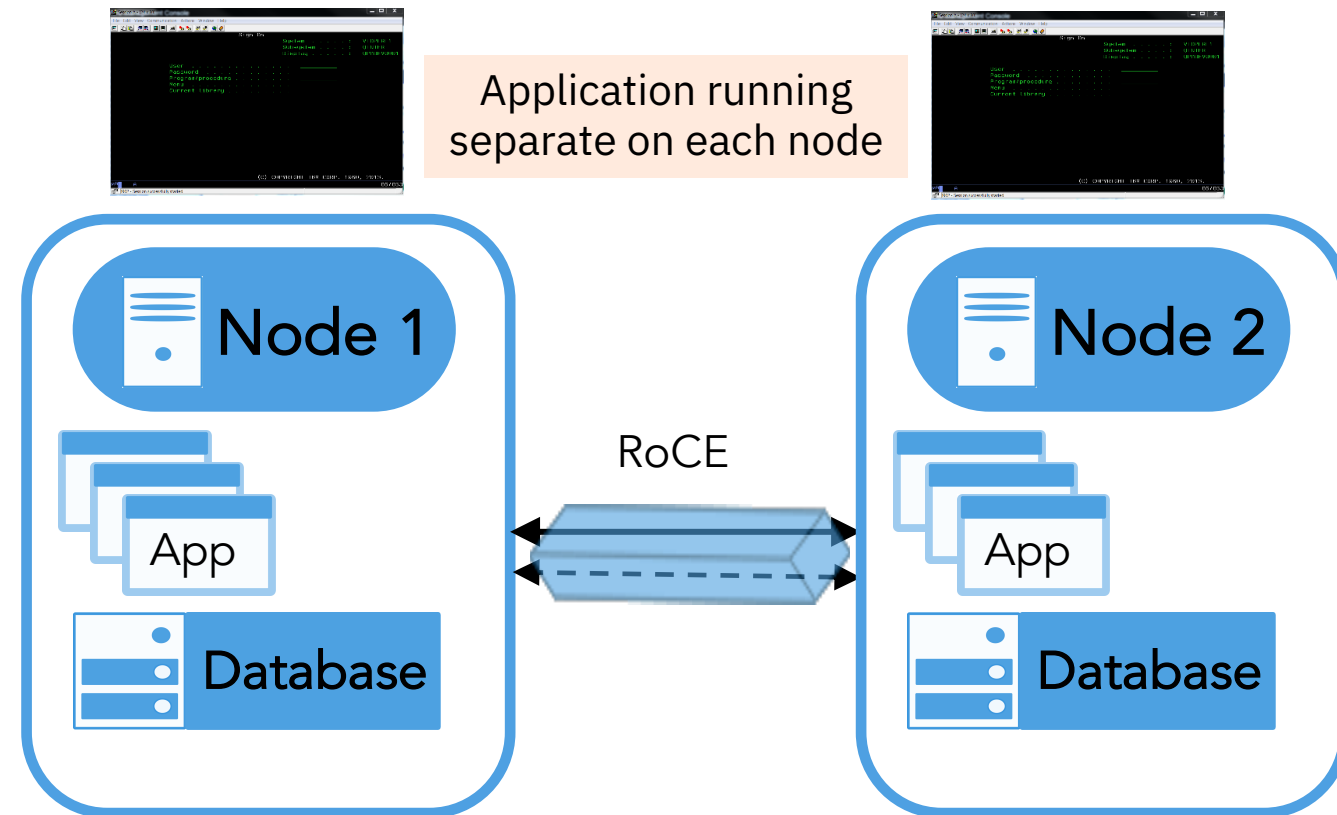
SQL:

- Alias
- Function
- Global Variable
- Index
- Procedure
- Schema
- Sequence
- SQL Package
- Table
- Trigger
- User Defined Type
- View
- XML Schema Repository

Included with File support:

- Row Permission
- Column Mask
- Temporal Table
- Constraint
- Etc...

✓ DDS / Record Level Access
✓ SQL / Set Based Access



Db2 Mirror – Other Supported Objects

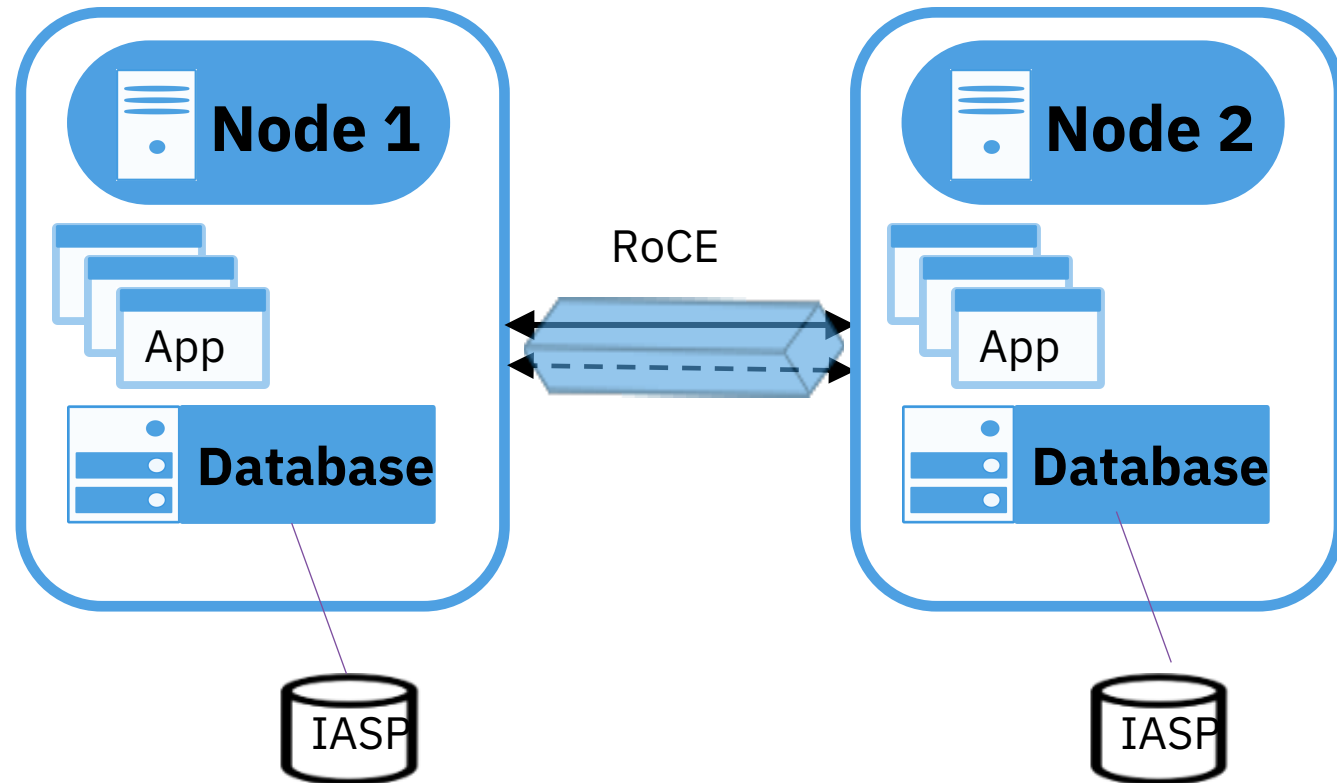
— Other Objects

- User profiles
- Authority
- Ownership
- Security
- PGM/SRVPGM
- Data Areas
- Data Queues (DDL Only)
- SYSVALs
- ENVARs
- LIB
- JOB D
- Journals
- Files (also has DDL Only option)

— Special Handling

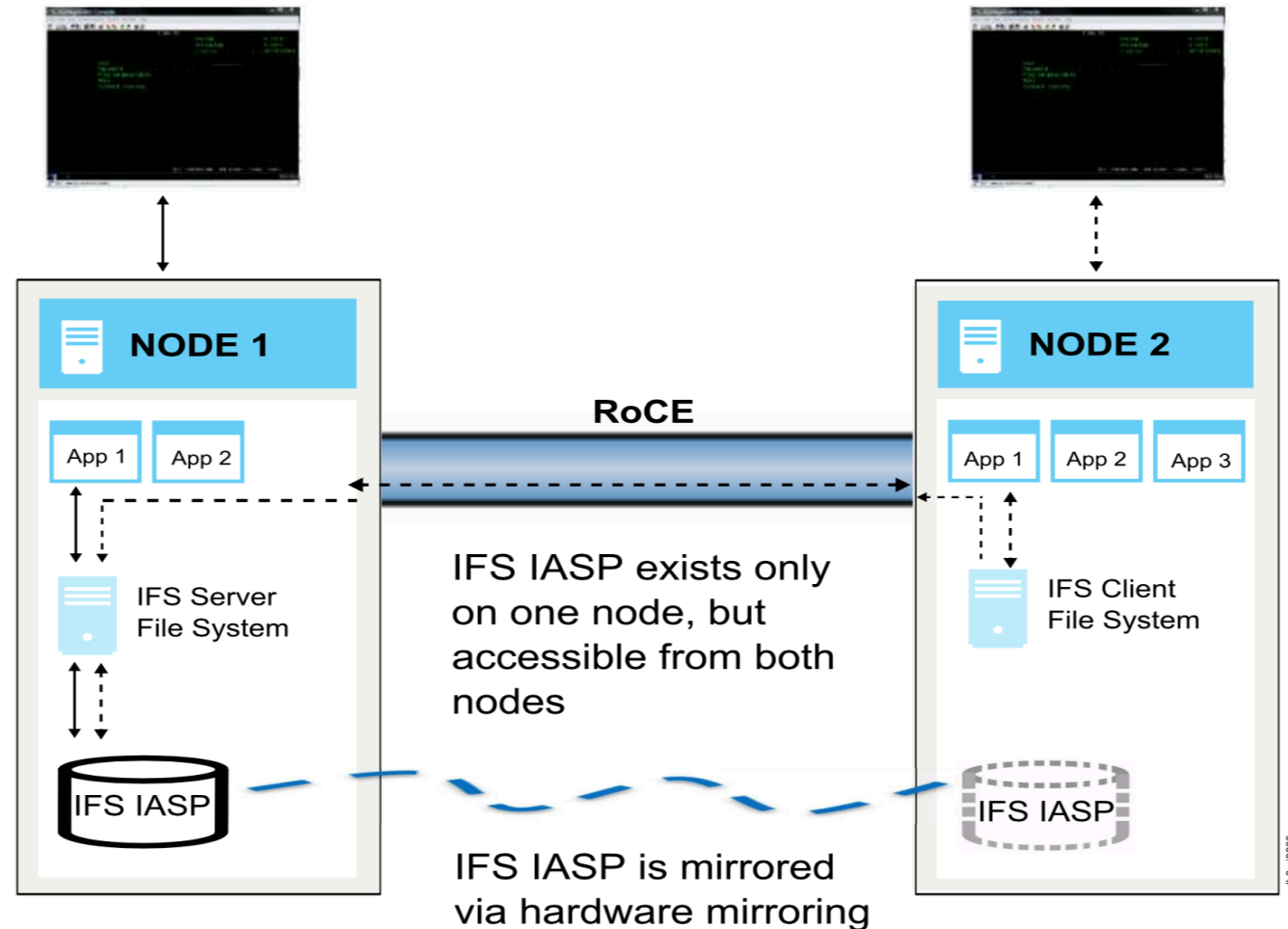
- OUTQ / Spool
- Job Queue

Objects can be in either **SYSBAS** or **IASPs**

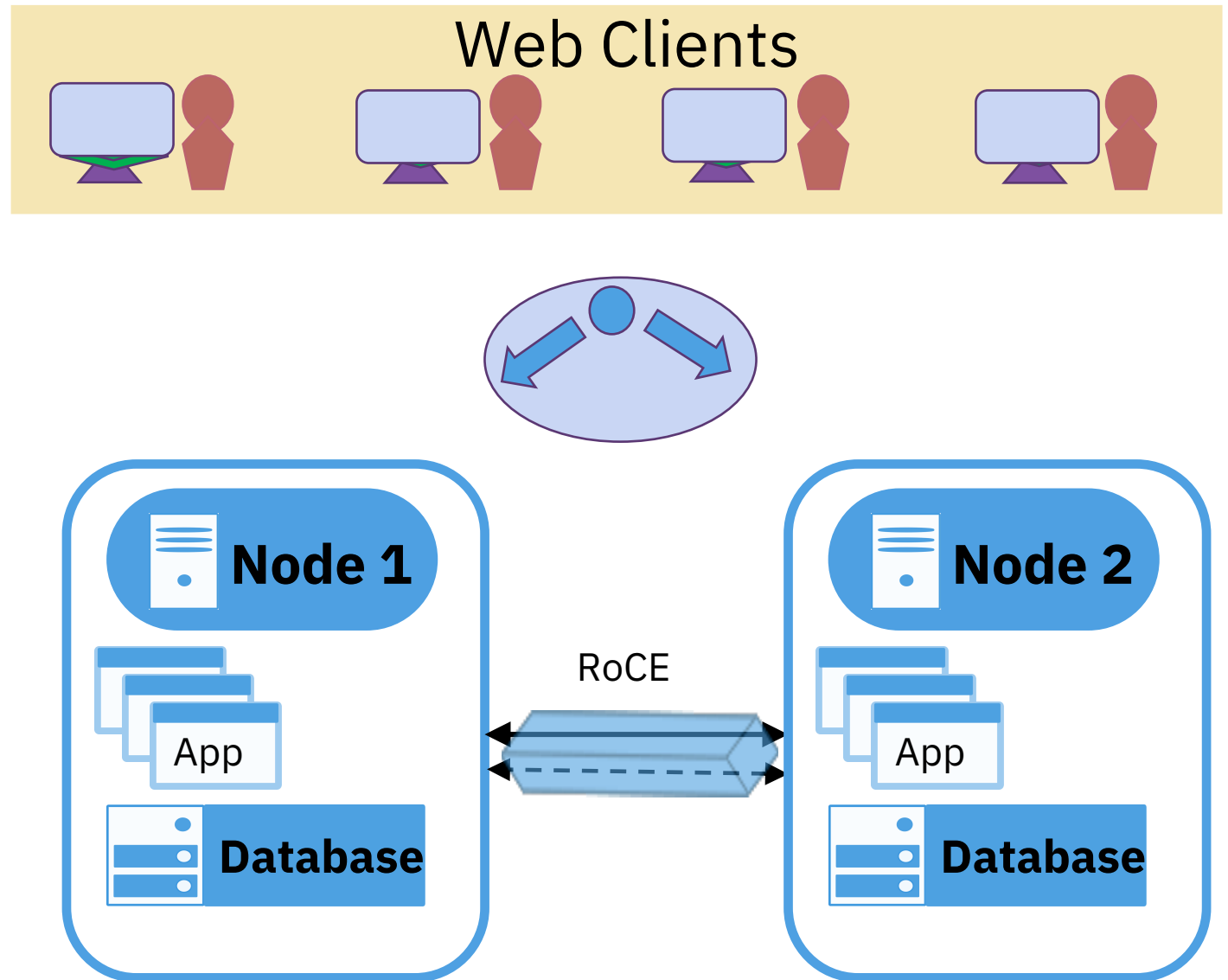


IFS Support

- Requires IASP
- IFS accessible on both Nodes (R/W)
- Requires PowerHA
 - Db2 Mirror provides the simultaneous access.
 - PowerHA switches the IASP
- Filesystem automatically 'mutates' when the storage is switched

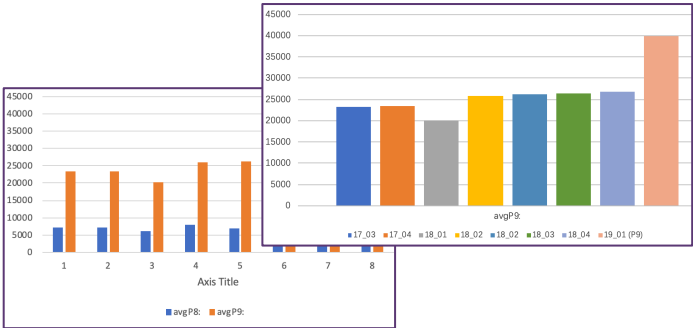
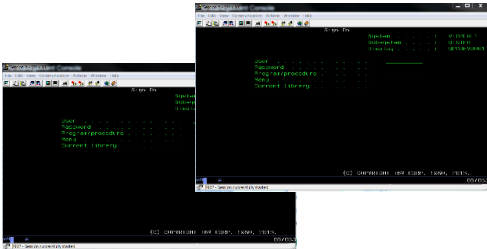


Db2 Mirror – Active Active, Web Clients

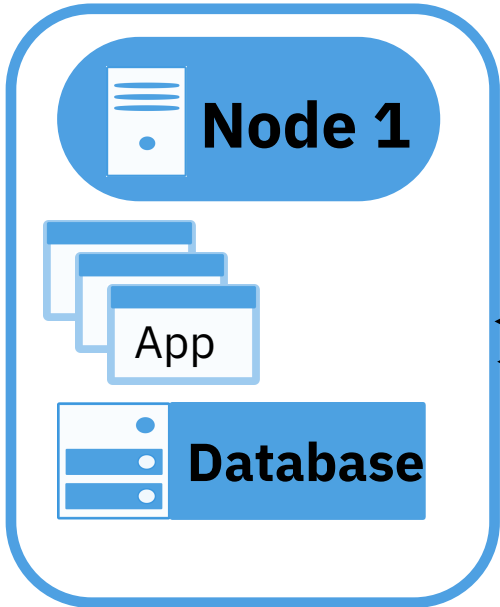


Application layer connects with either JDBC or Load Balancer

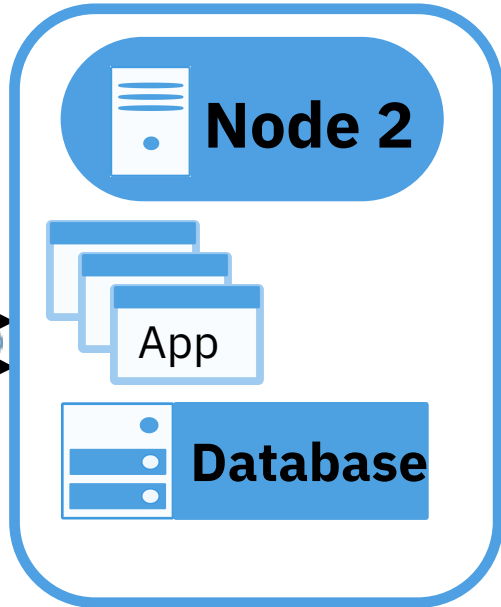
Db2 Mirror – Active Passive



Run Production Workloads on this node

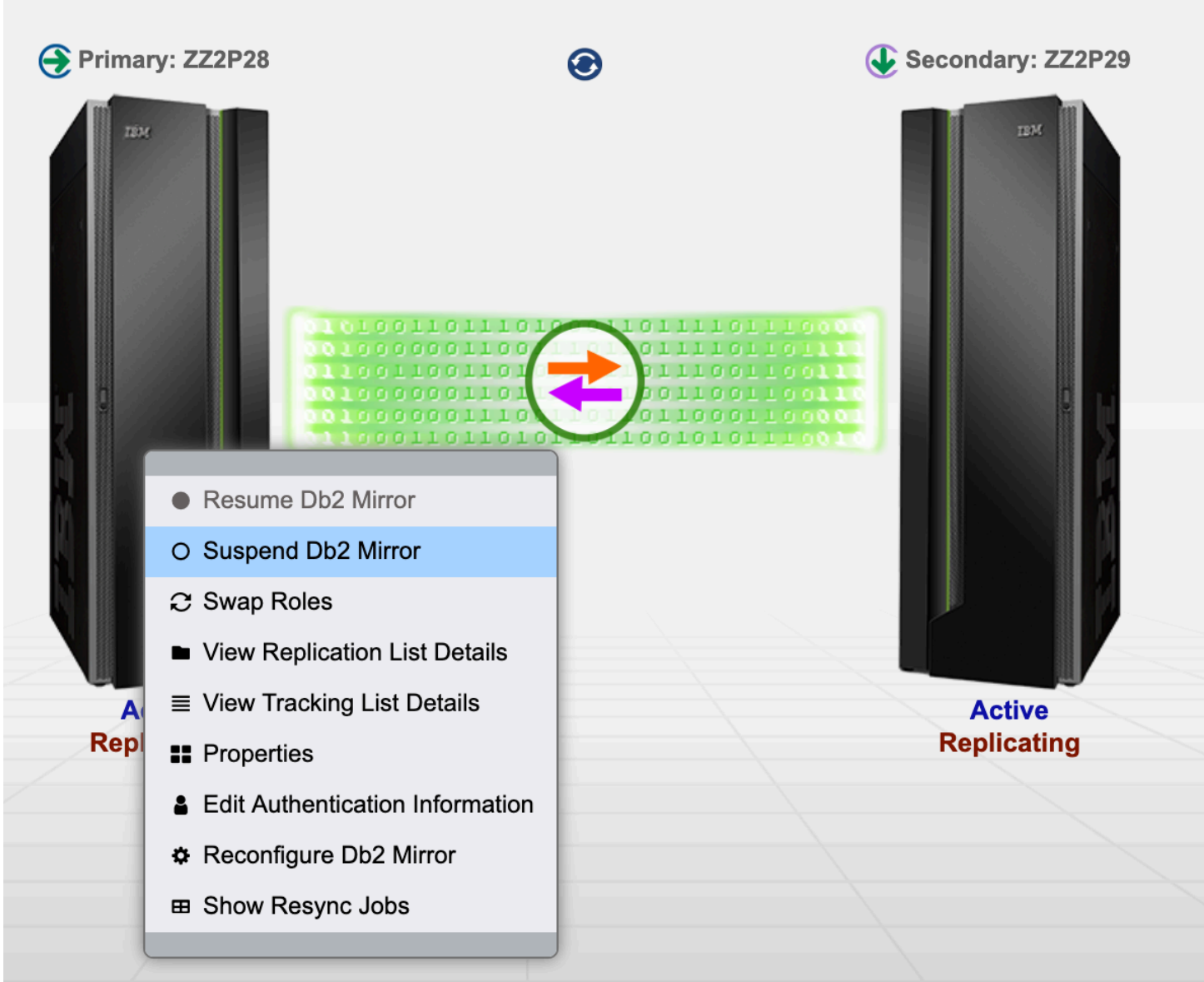


RoCE



Run Queries and reports on this node

Rolling Upgrade Scenario



Suspend the secondary node

Primary: ZZ2P28



Secondary: ZZ2P29



Tracking
Suspended



Blocked
Suspended

Do your maintenance on the Secondary suspended node

Primary: ZZ2P28



Tracking
Suspended



Secondary: ZZ2P29



Blocked
Suspended



Install PTFs and do Server Maintenance. This may include IPLing the system.



The Primary Node is the one designated to track changes

All Tracking - Details

Primary - ZZ2P28 Secondary - ZZ2P29

Current Tracking Entries [Summary](#) → [Details](#)

Filters

Status	Resync Group	Add Time	Sync Start	Library Name	Object Type	Object Name	Member Name	Resync Type	Tracking Group
	7	2019-04-23 19:44:08.554950250488		SPLMR000KW	*SPLF	OUTQ003		SAVE/RESTORE	4
	7	2019-04-23 19:44:07.085290065917		SPLMR000KW	*SPLF	OUTQ001		SAVE/RESTORE	4
	6	2019-04-23 19:44:06.219500269531		TRANS1000	*FILE	PF00000004	PF00000004	DB I/O	4
	6	2019-04-23 19:44:06.212479492187		TRANS1000	*FILE	PF00000008	PF00000008	DB I/O	4
	6	2019-04-23 19:44:06.189121234375		TRANS1000	*FILE	PF00000006	PF00000006	DB I/O	4
	6	2019-04-23 19:44:06.180943060546		TRANS1000	*FILE	PF00000002	PF00000002	DB I/O	4
	6	2019-04-23 19:44:06.180134039062		TRANS1000	*FILE	PF00000007	PF00000007	DB I/O	4
	6	2019-04-23 19:44:06.165935968750		TRANS1000	*FILE	PF00000003	PF00000003	DB I/O	4
	6	2019-04-23 19:44:06.161287496093		TRANS1000	*FILE	PF00000005	PF00000005	DB I/O	4
	7	2019-04-23 19:44:03.206840774002		SPLMR000KW	*SPLF	OUTQ004		SAVE/RESTORE	4

1 300

Showing 111 of 111



Resume Mirroring to get the Systems back in Sync

IBM Db2 Mirror for i

Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr IBM

GUI Build Time: 2019-05-08 12:18:42

The screenshot displays the IBM Db2 Mirror for i management interface. At the top, the title bar reads 'IBM Db2 Mirror for i' and the status bar shows 'Primary: ZZ2P28', 'Secondary: ZZ2P29', and 'User: qsecofr'. The main area shows two server icons representing the Primary and Secondary systems. The Primary system (ZZ2P28) is labeled 'Tracking Suspended' and has a context menu open over it. The menu options are: 'Resume Db2 Mirror' (selected), 'Suspend Db2 Mirror', 'Swap Roles', 'View Replication List Details', 'View Tracking List Details', 'Properties', 'Edit Authentication Information', 'Reconfigure Db2 Mirror', and 'Show Resync Jobs'. The Secondary system (ZZ2P29) is labeled 'Blocked Suspended' and has a red 'stop' icon over it. A vertical toolbar on the left contains various icons for monitoring, security, and configuration. A notification icon with the number '2' is in the bottom left corner.

- Resume Db2 Mirror
- Suspend Db2 Mirror
- ↻ Swap Roles
- ▢ View Replication List Details
- ☰ View Tracking List Details
- ⚙ Properties
- 👤 Edit Authentication Information
- ⚙ Reconfigure Db2 Mirror
- 📄 Show Resync Jobs

Mirror Resume Progress

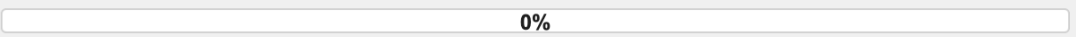
GUI Build Time: 2019-04-24 22:11:39

Summary - Current



*SYSBAS
TRACKING

> **Group 6**
(2019-04-27 10:24:25
-current)



≡ 946 operations (946 objects)

*SYSBAS
BLOCKED



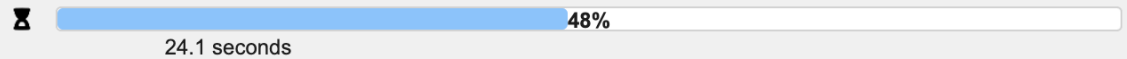
GUI Build Time: 2019-04-24 22:11:39

Summary - Current



*SYSBAS
TRACKING

> **Group 6**
(2019-04-27 10:24:25
-current)



≡ 1000 operations (1000 objects)

*SYSBAS
BLOCKED



Resync is Complete, Swap roles and repeat



Primary: ZZ2P28



Active Replicating



Secondary: ZZ2P29

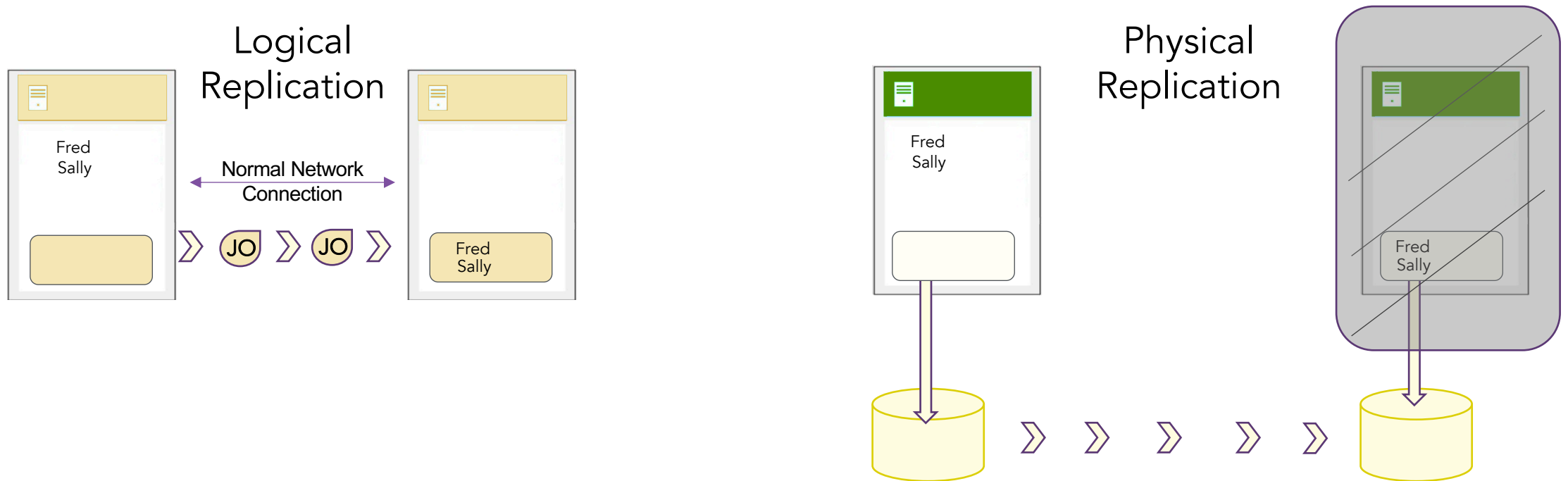


Active Replicating

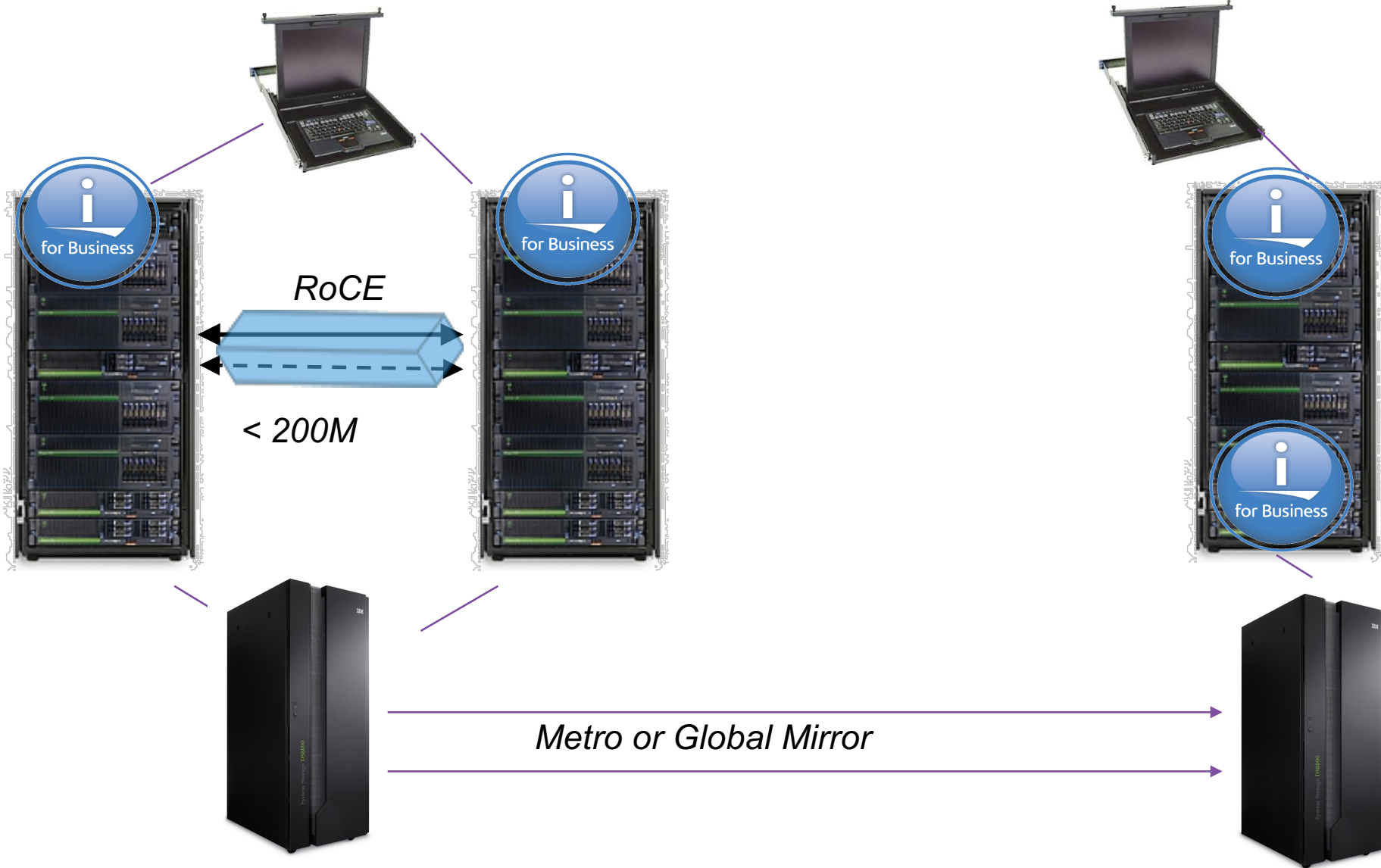


Db2 Mirror – What makes it different

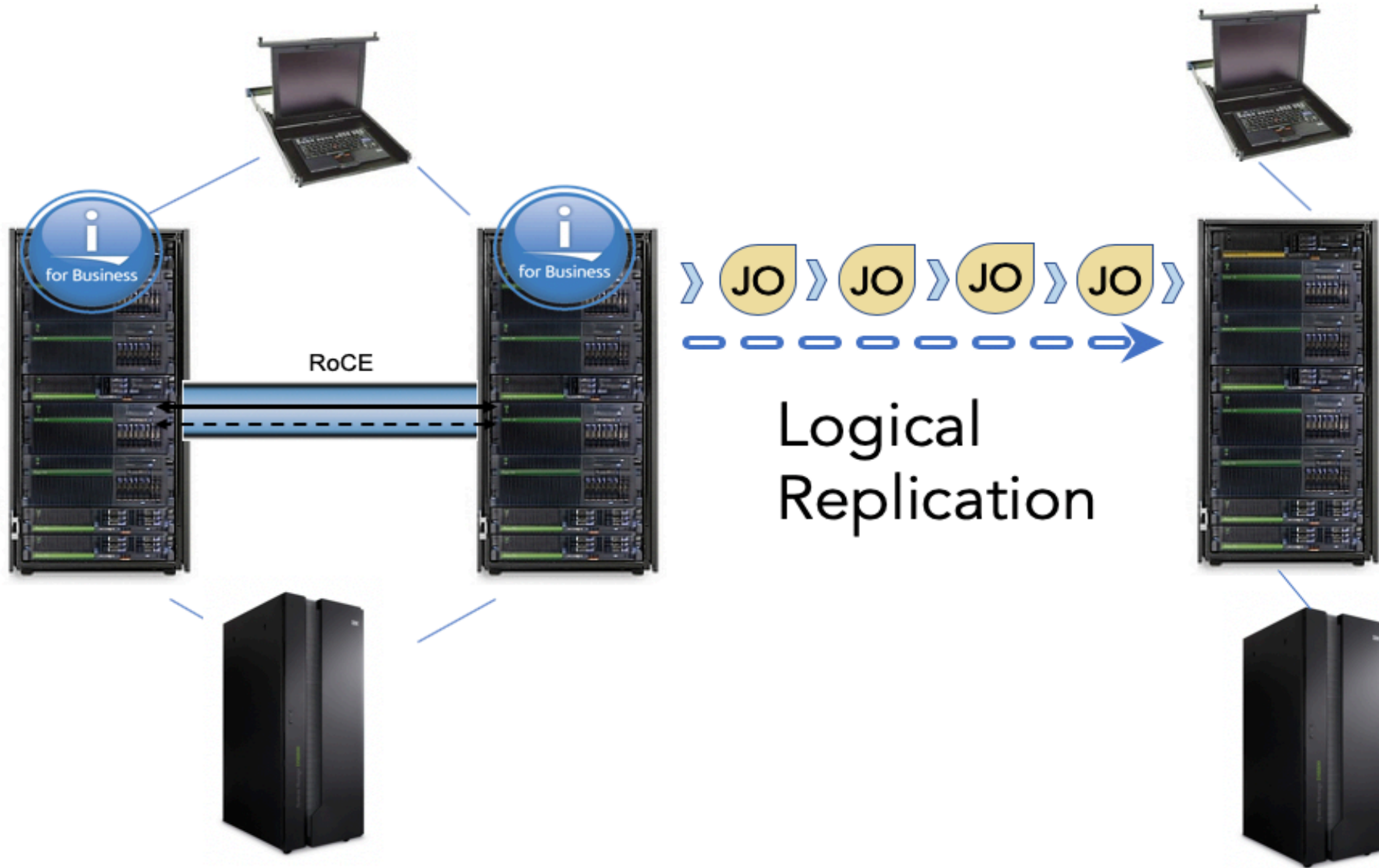
- New integrated IBM i synchronization technology
- Does not leverage any existing availability technology to provide continuous availability
 - But does work with existing technology



DR Solutions Built on Top of Db2 Mirror for IBM i



DR Solutions Built on Top of Db2 Mirror for IBM i



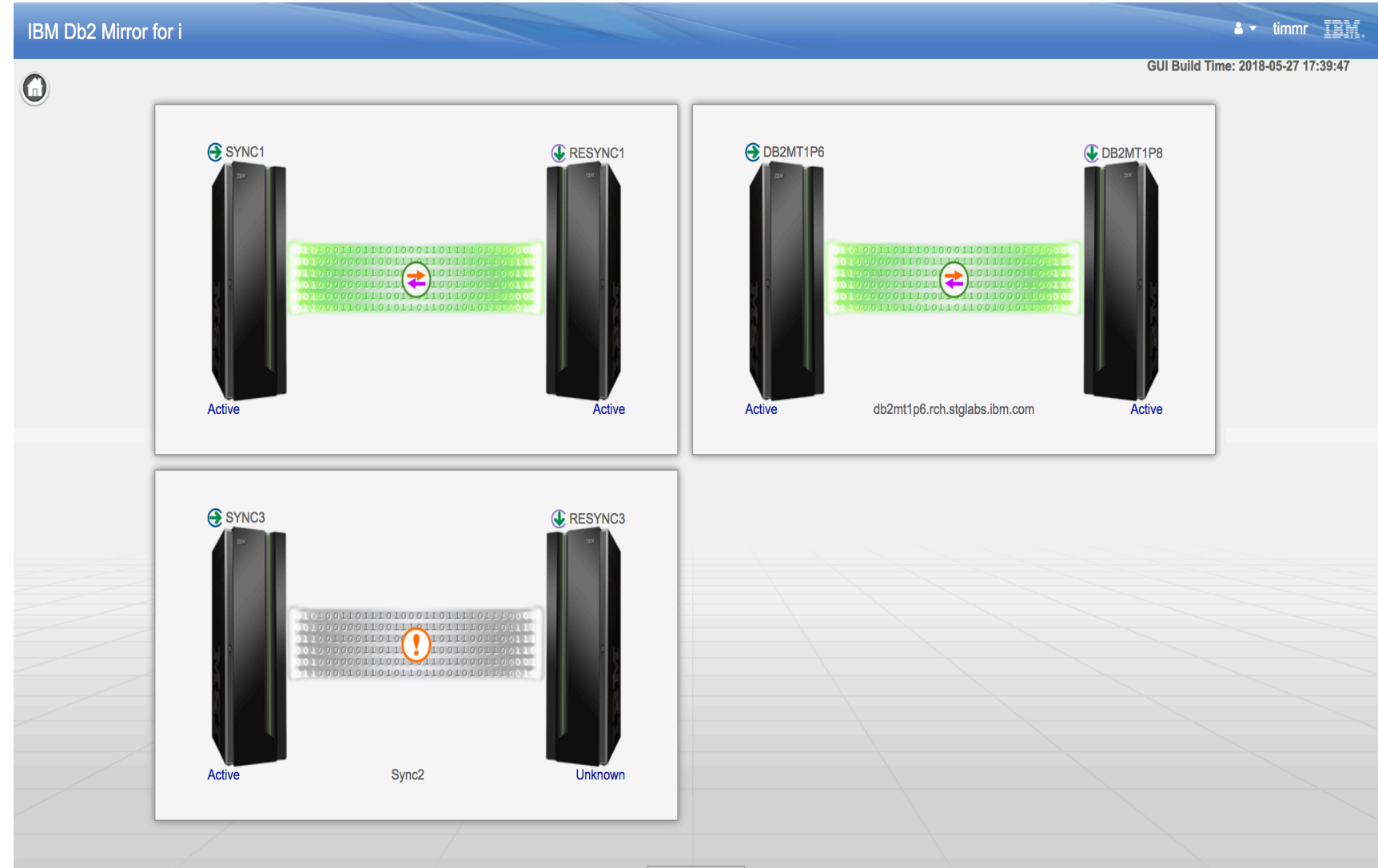
Db2 Mirror GUI

GUI runs on IBM i

GUI can run on the Db2 Mirror nodes

GUI can run outside of the Db2 Mirror nodes and manage multiple pairs

<http://systemname:2006/Db2Mirror>



SQL Services

Db2 Mirror - SQL Services - Septemb...

Contents

▼ DB2 Mirror Services

▶ Communication Services

▶ Product Services

▼ Replication Services

ADD_REPLICATION_CRITERIA pr...

CHECK_REPLICATION_CRITERIA...

INSPECT_REPLICATION_CRITERI...

PROCESS_PENDING_REPLICATI...

REMOVE_REPLICATION_CRITERI...

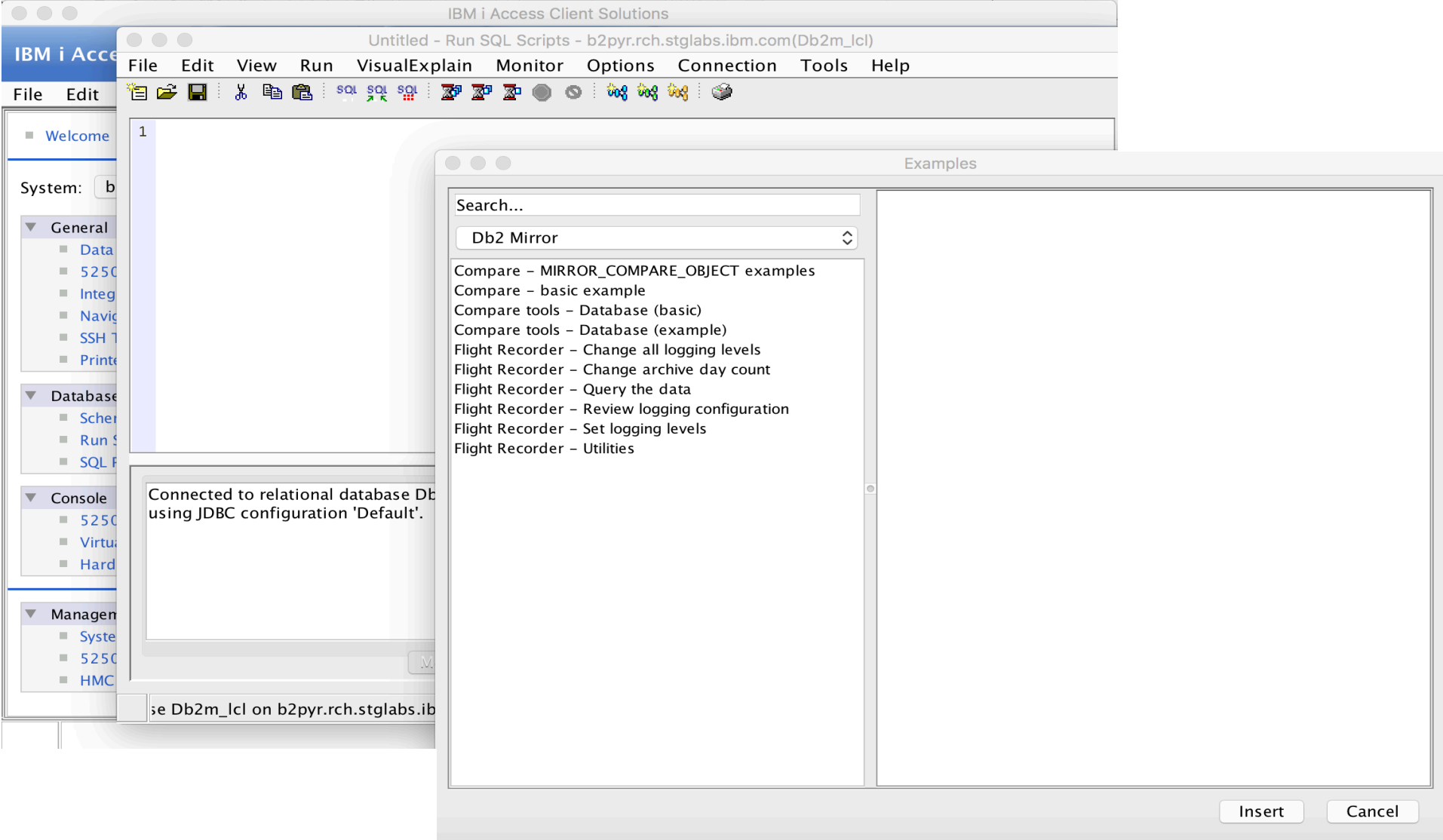
REPLICATION_CRITERIA_INFO vi...

▶ Resynchronization Services

- EXECUTE SQL privilege on this procedure
- *USE authority on the QSYS/QMRDBSSDBA *SRVPGM.

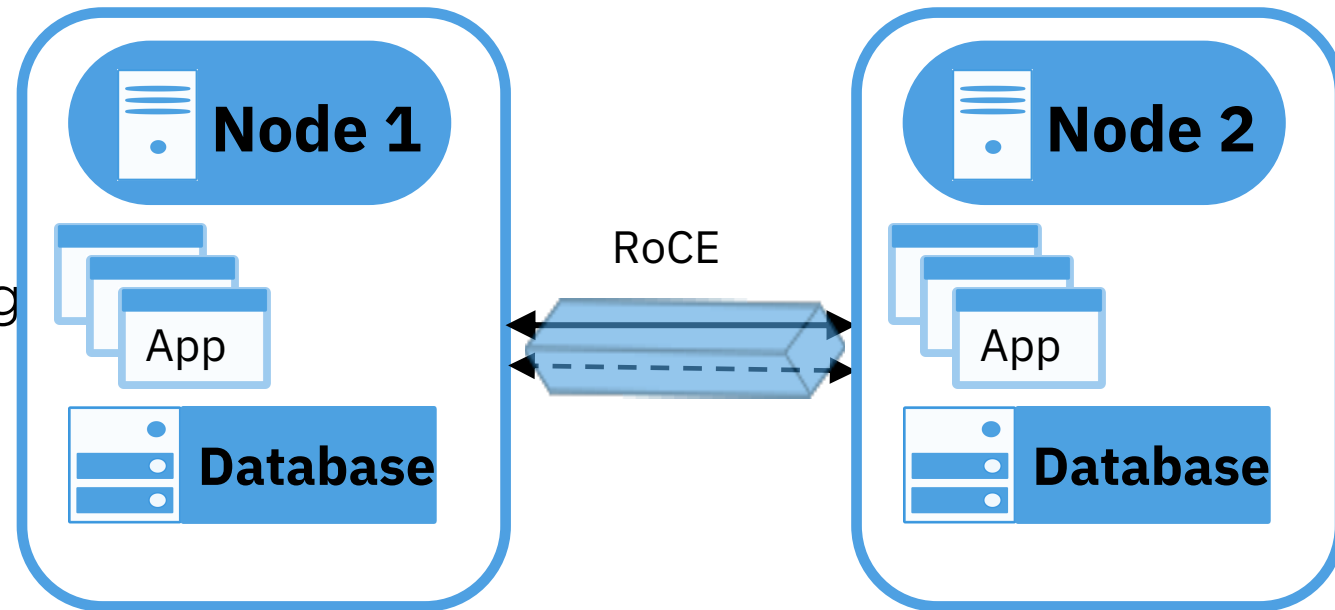
```
▶▶ ADD_REPLICATION_CRITERIA ( ( inclusion-state ,  
    [ INCLUSION_STATE => ]  
    , [ IASP_NAME => ] iasp-name , [ LIBRARY_NAME => ] library-name  
    , [ OBJECT_TYPE => ] object-type  
    , [ OBJECT_NAME => ] object-name , [ APPLY => ] apply  
    , [ APPLY_LABEL => ] apply-label ) )
```

ACS Insert from Examples



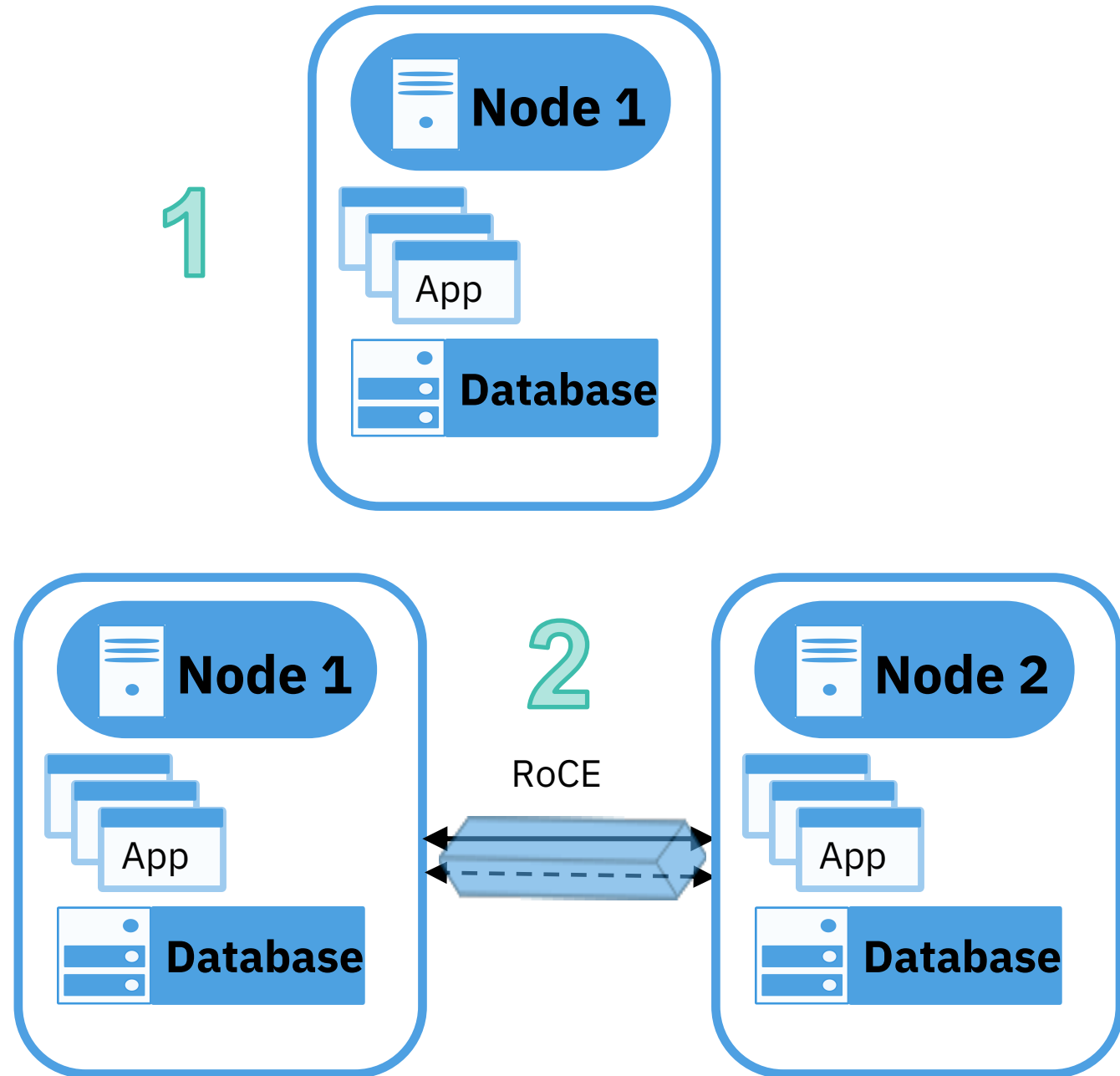
Performance Expectations

- With synchronous replication the complete path length will increase since the action may drive I/O on both nodes in order to finish. This could increase by up to $\sim(2-3)X$ for Db2 changes
- The ability to run transactions on both nodes will mitigate per transaction overhead and with a target of achieving equal to or greater transactional throughput
- Read workloads will not be impacted since they do not have to be replicated
- Single threaded or serial I/O workloads will be the most impacted.



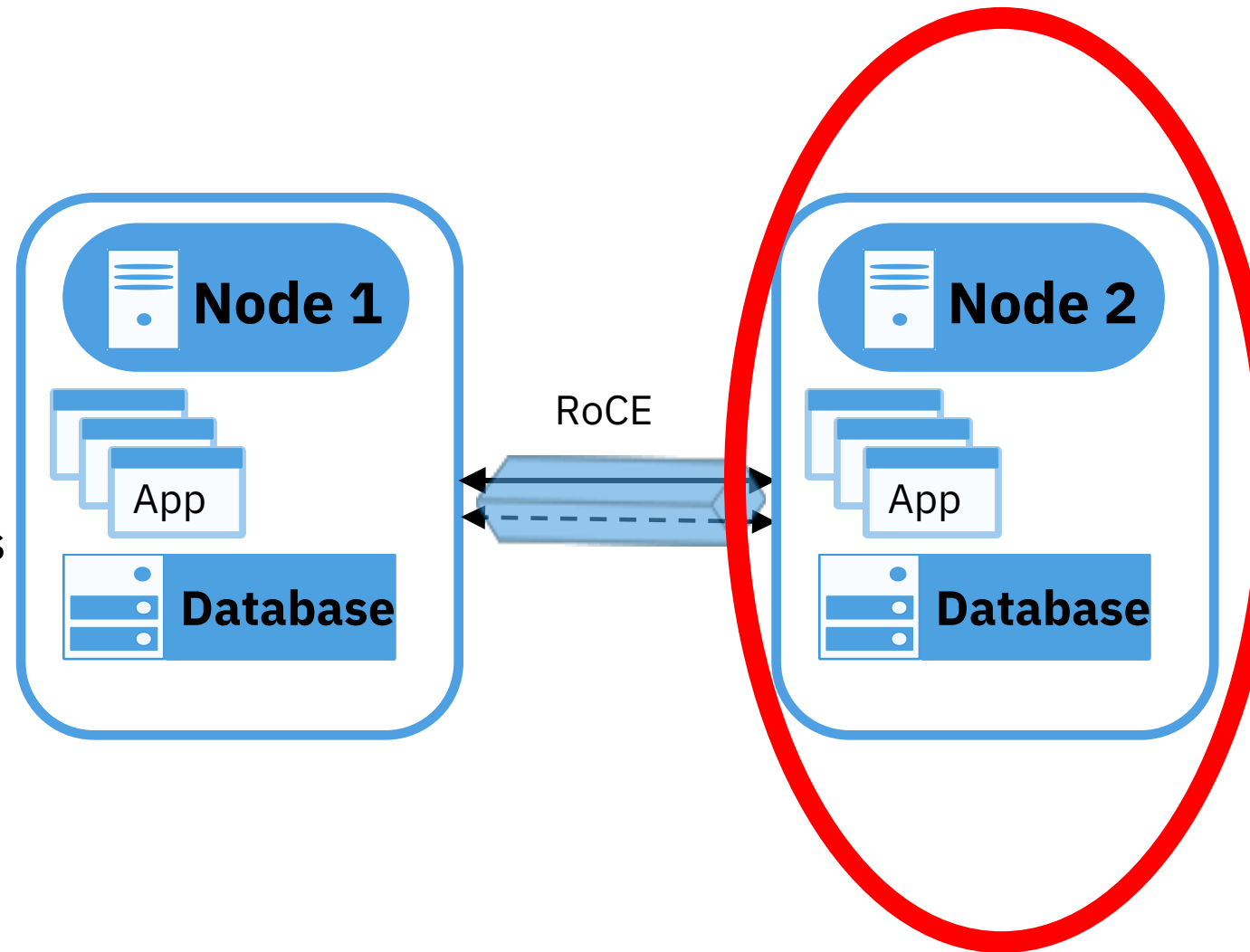
Setup of Db2 Mirror 2nd Node

- Guided wizard to setup
 - Input secondary config information
 - Start DB2Mirror
 - Clone original lpar
- On the clone lpar initial IPL, the config information will be set. ie IP addresses and system name.
- The Source and Clone will connect and form a cluster.
- The Source will sync any new changes that have happened after the clone and before the cluster formation.



Setup of Db2 Mirror 2nd Node

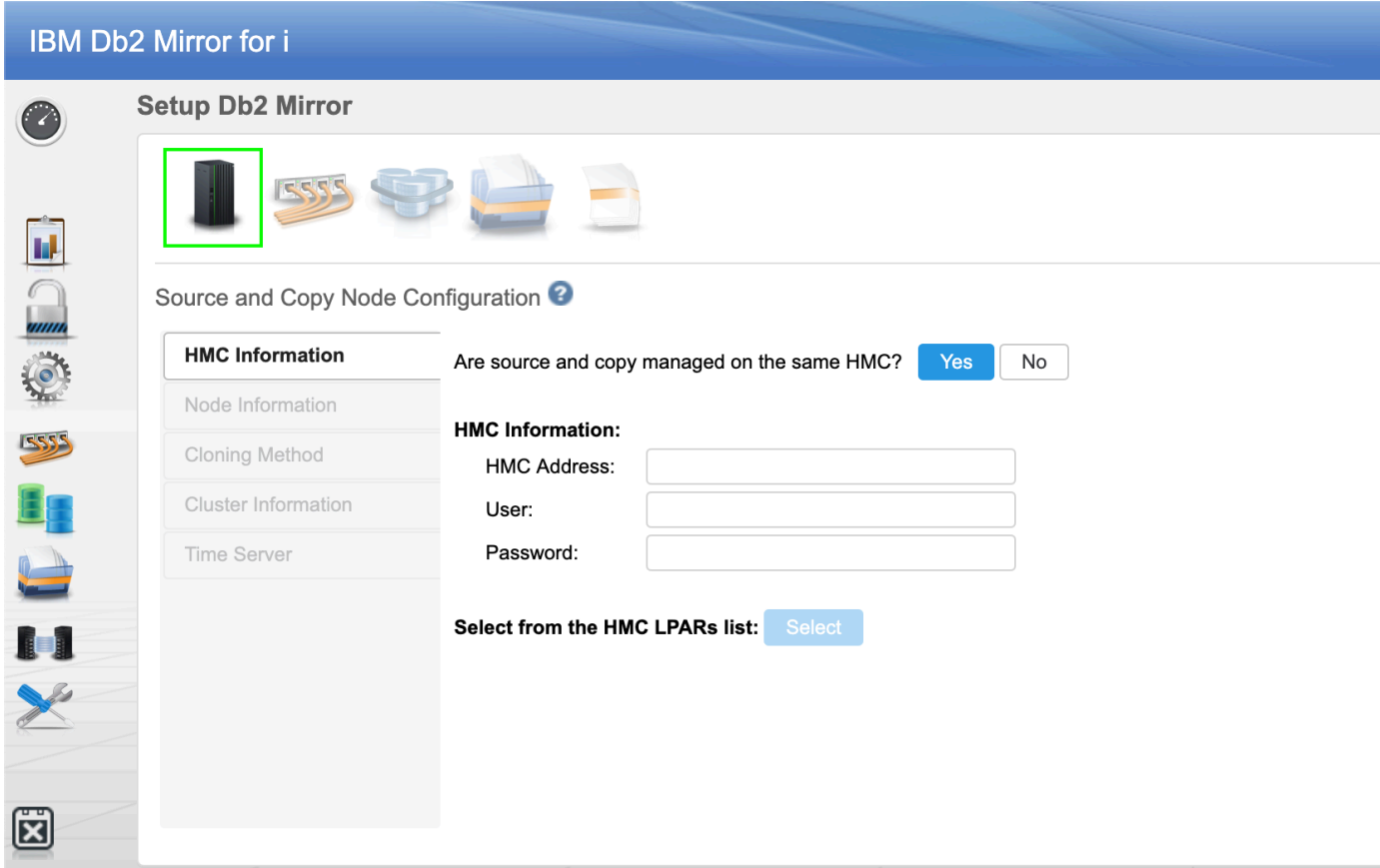
- Before starting setup
 1. Define a second lpar at the HMC
 - CPU/MEM should be similar to the the source lpar
 2. Zone/Connect Storage Controller to the Node 2 lpar
 3. Create LUNs the same number and size as Node1.
 4. Assign LUNs to Node 2



Setup of Db2 Mirror 2nd Node

- Input HMC info:
- Source and Target don't have to be on the same HMC

- Select the LPARs from the List



Communication Hardware

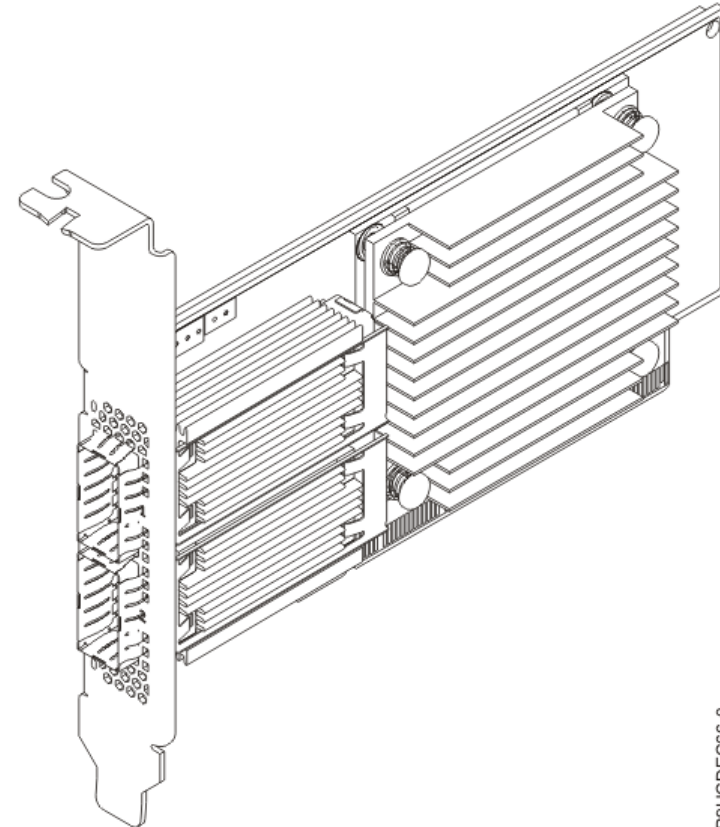
4 Adapter Options

- PCIe3 2-port 10 Gb NIC & ROCE SR/Cu adapter (FC EC2R and EC2S; CCIN 58FA)
- PCIe3 2-port 25/10 Gb NIC & ROCE SFP28 adapter (FC EC2T and FC EC2U; CCIN 58FB)
- PCIe3 2-port 100 GbE NIC & ROCE QSFP28 Adapter (FC EC3L and EC3M; CCIN 2CEC)
- PCIe4 2-port 100 GbE ROCE x16 adapter (FC EC66 and EC67; CCIN 2CF3)

Max Cable length = 100 M

Optional RoCE switch

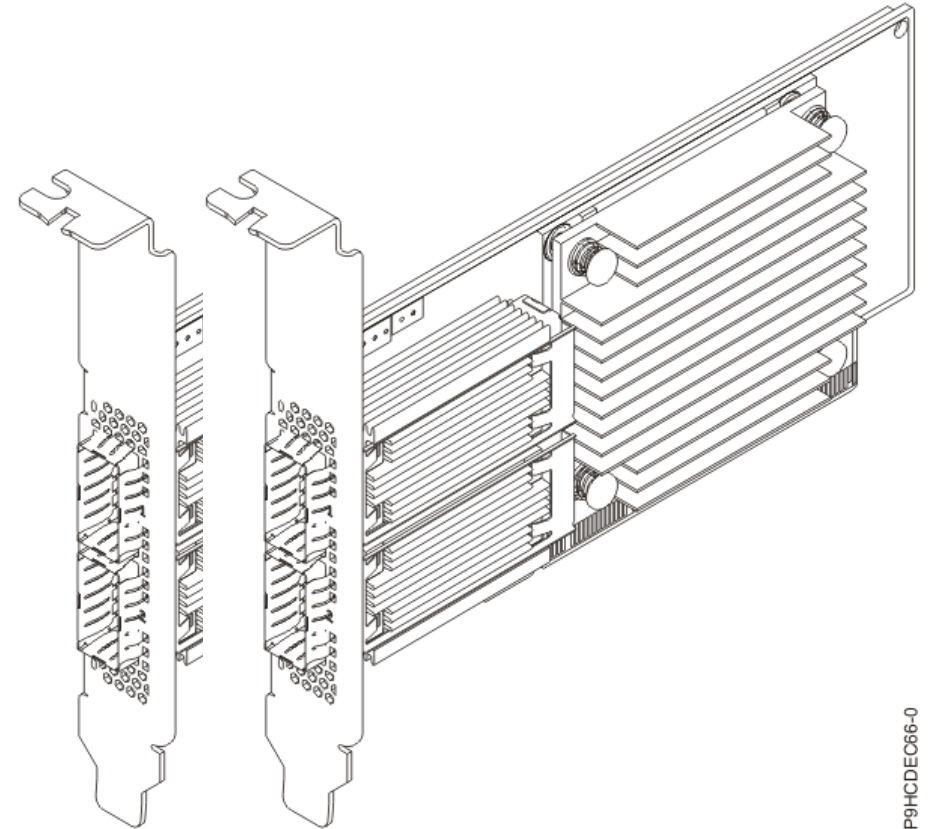
Power9 enables SR-IOV



P9HCDEC66-0

Network Redundancy Groups (NRG)

- Network Redundancy Groups are a logical group of physical ports.
- Up to 16 links can form an NRG.
- Ability to prioritize different types of traffic onto separate physical links
- Failover domain is the entire group of ports



Db2 Mirror Setup

Primary - ZZ2P28 Secondary - ZZ2P29

Group ^	IP Address - ZZ2P28 ⇅	Priority ⇅	Link State ⇅	IP Address - ZZ2P29 ⇅
All ▾	All ▾	All ▾	All ▾	All ▾
✓ Database Replication	169.254.2.28	1	✓ Up	169.254.2.29
	169.254.3.28	1	⏻ Standby	169.254.3.29
✓ Db2 Mirror Environment Manager	169.254.2.28	1	✓ Up	169.254.2.29
	169.254.3.28	1	⏻ Standby	169.254.3.29
✓ IFS Replication	169.254.2.28	1	✓ Up	169.254.2.29
	169.254.3.28	1	⏻ Standby	169.254.3.29
✓ System Object Replication	169.254.2.28	1	✓ Up	169.254.2.29
	169.254.3.28	1	⏻ Standby	169.254.3.29
✓ Resynchronization	169.254.2.28	1	✓ Up	169.254.2.29
	169.254.3.28	1	⏻ Standby	169.254.3.29

View NRG Statistics

5 separate NRG categories to isolate traffic

Default Inclusion State for Replication Rules

IBM Db2 Mirror for i

Primary: ZZ2P28 Secondary: ZZ2P28

Setup Db2 Mirror



Replication List Configuration ?

Mirror Options

*SYSBAS

Default Inclusion State

The objects within *SYSBAS or an IASP are eligible to be included in the Db2 Mirror environment. The default inclusion state must be set for each before continuing.

Exclude - All objects for this group are excluded by default. Additional rules may be added to include specific libraries and objects within this group.

Include - All eligible objects for this group are included by default. Additional rules may be added to restrict specific libraries and objects from being mirrored.

 *SYSBAS  Exclude

 Refresh

NOTE: Can only be chosen at setup time or re-configuration time.

Replication List Rules

Manage Replication List - Rules

Primary - ZZ2P28

Secondary - ZZ2P29

Rules Inspect

Active Pending Active/Pending

Add a Rule ?

test

Object Type

Object Name

Exclude

Include

Definition Only

User Defined Rules Only

Default Inclusion State: Exclude

Status	Library Name	Object Name	Replication State	Rule Group	Action	Rule Source	IASP Name
	Filter					All	All
	QCMD325283	*FILE	Exclude	Active	🗑️	User	*SYSBAS
	QCMD333586	*DTAARA	Exclude	Active	🗑️	User	*SYSBAS
	QCMD542100	*JRN	Exclude	Active	🗑️	User	*SYSBAS
	QCMD681367	*OUTQ	Exclude	Active	🗑️	User	*SYSBAS
	QCMD759797	*DTAQ	Exclude	Active	🗑️	User	*SYSBAS
	QCMD821435	*JOBQ	Exclude	Active	🗑️	User	*SYSBAS
	QCMD980732	*JOBQ	Exclude	Active	🗑️	User	*SYSBAS
	QDEXDATA	*PGM	Exclude	Active	🗑️	User	*SYSBAS
	QDEXDATA01	*SQLPKG	Exclude	Active	🗑️	User	*SYSBAS
	SPLMR000KW	*SQLUDT	Exclude	Active	🗑️	User	*SYSBAS
	TRANS1000	*SQLXSR	Exclude	Active	🗑️	User	*SYSBAS
		*SRVPGM	Exclude	Active	🗑️	User	*SYSBAS
		*ALL	Include	Active	🗑️	User	*SYSBAS
		*ALL	Include	Active	🗑️	User	*SYSBAS
		*ALL	Include	Active	🗑️	User	*SYSBAS
		*ALL	Include	Active	🗑️	User	*SYSBAS

Add Rules for existing objects and objects that don't exist yet

Add Rules for an object type or a specific object name

1 300

Total Rows: 14

Replication List Rules

Manage Replication List - Rules

Primary - ZZ2P28 Secondary - ZZ2P29

Rules Inspect

Add a Rule ?

test *ALL *ALL Exclude Include Definition Only

Set the rule to include or exclude the object/library from replication

User Defined Rules Only

Default Inclusion State: Exclude

Status	Library Name	Object Type	Object Name	Replication State	Rule Group	Action	Rule Source	IASP Name
	Filter	All	Filter	All	All		All	All
	QCMD325283	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD333586	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD542101	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD681367	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD759797	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD821435	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD980732	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QDEXDATA	*ALL	*ALL	Include	Active		User	*SYSBAS
	QDEXDATA01	*ALL	*ALL	Include	Active		User	*SYSBAS
	SPLMR000KW	*ALL	*ALL	Include	Active		User	*SYSBAS
	TRANS1000	*ALL	*ALL	Include	Active		User	*SYSBAS

1 300

Total Rows: 14

Inspect what the Rules look like applied to the System

IBM Db2 Mirror for i Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr IBM

GUI Build Time: 2019-04-24 22:11:39

Manage Replication List - Inspect

Primary - ZZ2P28 Secondary - ZZ2P29 Rules **Inspect**

Library Name	Replication State	Object Count	Object Name	Object Type	Object Replication State
QUSKTEMP	Exclude	0	CPYSPLF	*FILE	Include
QUTL	Exclude	8	DTAQ001	*DTAQ	Include
QVOITEST	Exclude	0	DTAQ002	*DTAQ	Include
QWEBQRY	Exclude	658	DTAQ003	*DTAQ	Include
QWEBQRYX	Exclude	24	DTAQ004	*DTAQ	Include
QXMLSERV	Exclude	5	DTAQ005		Include
SBPGETLOG	Exclude	2	MSGQ001	*MSGQ	Ineligible
SPLMASTER	Exclude	200	OUTQFINAL		
→ SPLMR000KW	Include	13	OUTQ001		
SPLMR000SS	Include	13	OUTQ002		
SPLMR001KW	Include	8	OUTQ003		
SPLMR001SS	Include	8	OUTQ004		
SYSIBM	Exclude	65	OUTQ005		
SYSIBMADM	Exclude	81			
SYSPROC	Exclude	2			
SYSTOOLS	Exclude	59			
TRANSWL	Exclude	19			
TRANS1000	Include	1000			
TRANS10000	Exclude	10000			
VOLANO	Exclude	25			
WHITNEYK	Exclude	0			

Show Applied Rules

***SYSBAS - SPLMR000KW - *DTAQ - DTAQ004**

Applied Rule:

	Precedence Order	IASP Name	Library	Object Type	Object Name	State
	1	*SYSBAS	SPLMR000KW	*ALL	*ALL	Include
🔒	2	*SYSBAS	*ALL	*ALL	*ALL	Exclude

OK Cancel

Total Rows: 200

System Defined Rules

Manage Replication List - Rules

Primary - ZZ2P28

Secondary - ZZ2P29

Rules Inspect

Active Pending Active/Pending
All Pending Groups

Add a Rule

Library Name Object Type Object Name Exclude Include Definition Only

System Defined Rules Only

System Defined Rules are predefined and cannot be changed

Default Inclusion State: Exclude

Status	Library Name	Object Type	Object Name	Replication State	Rule Group	Action	Rule Source	IASP Name
	Filter	All	Filter	All	All		All	All
🔒	QBRM	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QCA400W	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QCLUSTER	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDB2MIR	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDB2MS	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDEVELOP	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDEVTOOLS	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDEXBASE	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDNS	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0002	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0003	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0004	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0005	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0006	*ALL	*ALL	Exclude	Active		System	*SYSBAS
🔒	QDOC0007	*ALL	*ALL	Exclude	Active		System	*SYSBAS

Pending Rules

IBM Db2 Mirror for i Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr IBM

Manage Replication List - Rules GUI Build Time: 2019-04-24 22:11:39

✔ Success: Pending rule [Test1pgms-*PGM-*ALL-Include] has been successfully added to Pending Group 'app1'. ✕

Primary - ZZ2P28 Secondary - ZZ2P29 Rules Inspect Active **Pending** Active/Pending

Add a Rule ?

Test1pgms *PGM *ALL

User Defined Rules Only

Create a group of rules before applying them to the system

Default Inclusion State: ⊖ Exclude

Status	Library Name	Object Type	Object Name	Replication State	Rule Group	Action	Rule Source	IASP Name
	Filter	All	Filter	All	All		All	All
➔	TEST1	*ALL	*ALL	➕ Include	app1	🗑	User	*SYSBAS
➔	TEST1PGMS	*PGM	*ALL	➕ Include	app1	🗑	User	*SYSBAS

1 / 100 Total Rows: 2

Apply Pending Group

Visualize Pending Groups

IBM Db2 Mirror for i Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr

Manage Replication List - Rules Success: Pending rule [Test1pgms-*PGM-*ALL-Include] has been successfully added to Pending Group 'app1'. GUI Build Time: 2019-04-24 22:11:39

Primary - ZZ2P28 Secondary - ZZ2P29 Rules Inspect Active Pending **Active/Pending**

Add a Rule app1

Test1pgms *PGM *ALL Exclude Include Definition Only

User Defined Rules Only

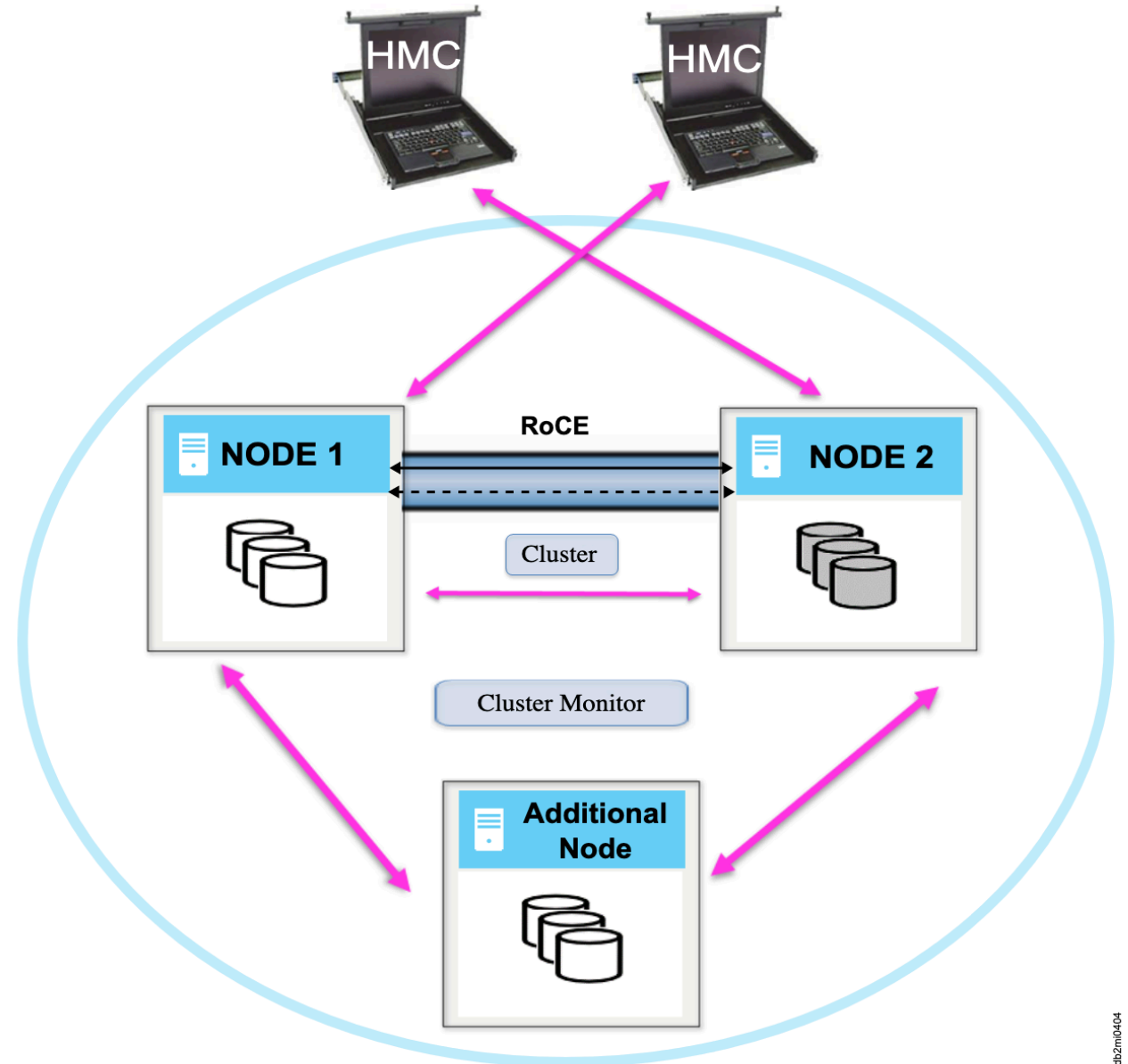
Default Inclusion State: Exclude

Status	Library Name	Object Type	Object Name	Replication State	Rule Group	Action	Rule Source	IASP Name
	Filter	All	Filter	All	All		All	All
	QCMD325283	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD333586	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD542101	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD681367	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD759797	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD821435	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QCMD980732	*ALL	*ALL	Exclude	Active		User	*SYSBAS
	QDEXDATA	*ALL	*ALL	Include	Active		User	*SYSBAS
	QDEXDATA01	*ALL	*ALL	Include	Active		User	*SYSBAS
	SPLMR000KW	*ALL	*ALL	Include	Active		User	*SYSBAS
	SPLMR000SS	*ALL	*ALL	Include	Active		User	*SYSBAS
	SPLMR001KW	*ALL	*ALL	Include	Active		User	*SYSBAS
	SPLMR001SS	*ALL	*ALL	Include	Active		User	*SYSBAS
➔	TEST1	*ALL	*ALL	Include	app1		User	*SYSBAS
➔	TEST1PGMS	*PGM	*ALL	Include	app1		User	*SYSBAS
	TRANS1000	*ALL	*ALL	Include	Active		User	*SYSBAS

Apply Pending Group Total Rows: 19

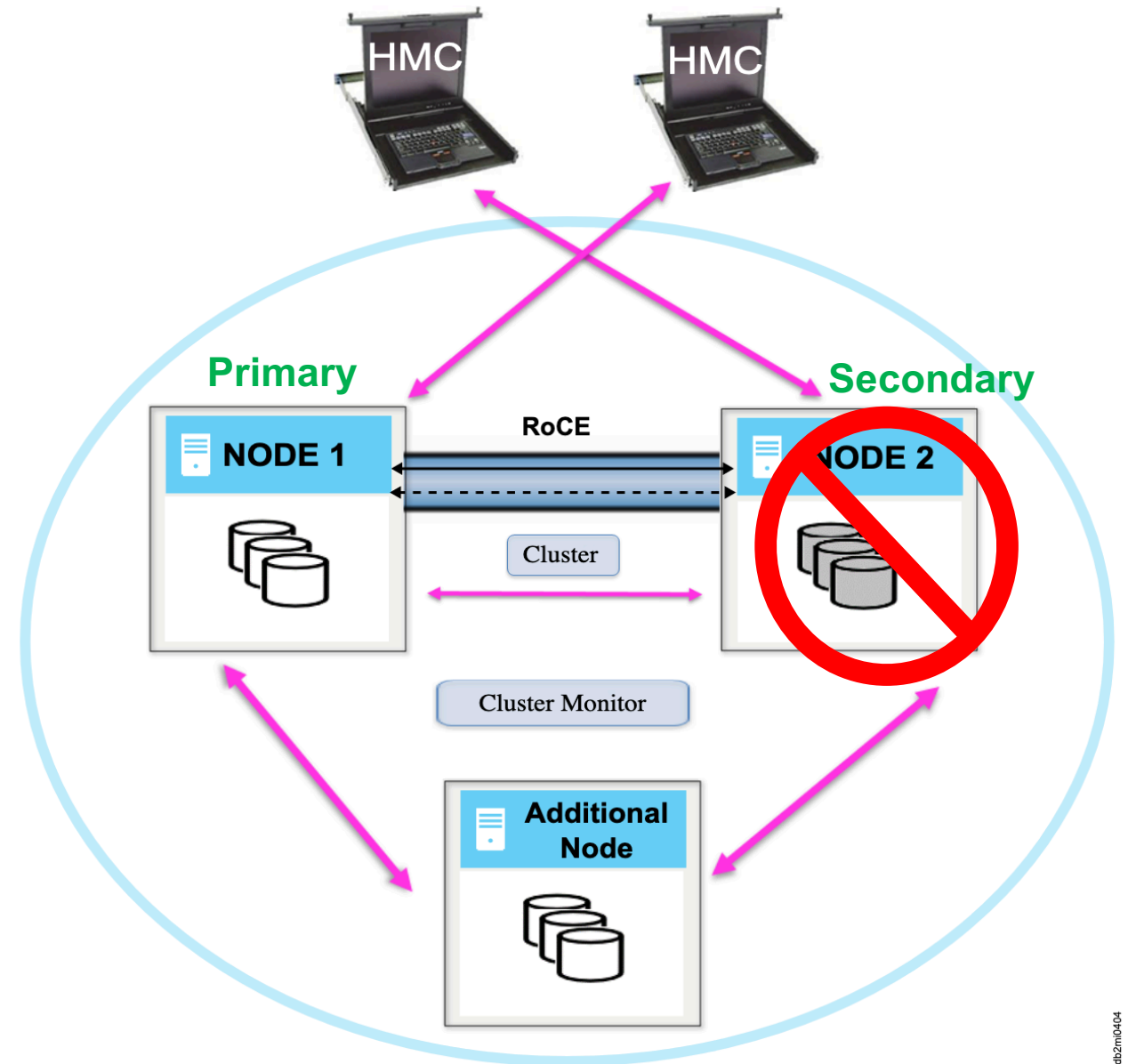
Detecting Errors

- Nodes are designed as a 'Primary' or 'Secondary' to indicate which node is preferred to 'track'.
- HMCs are used for failure detection of the partner node to indicate the Secondary can automatically take over as the Primary and begin tracking to allow Db2 transactions to continue.
- The Secondary side will block changes to Db2 transactions



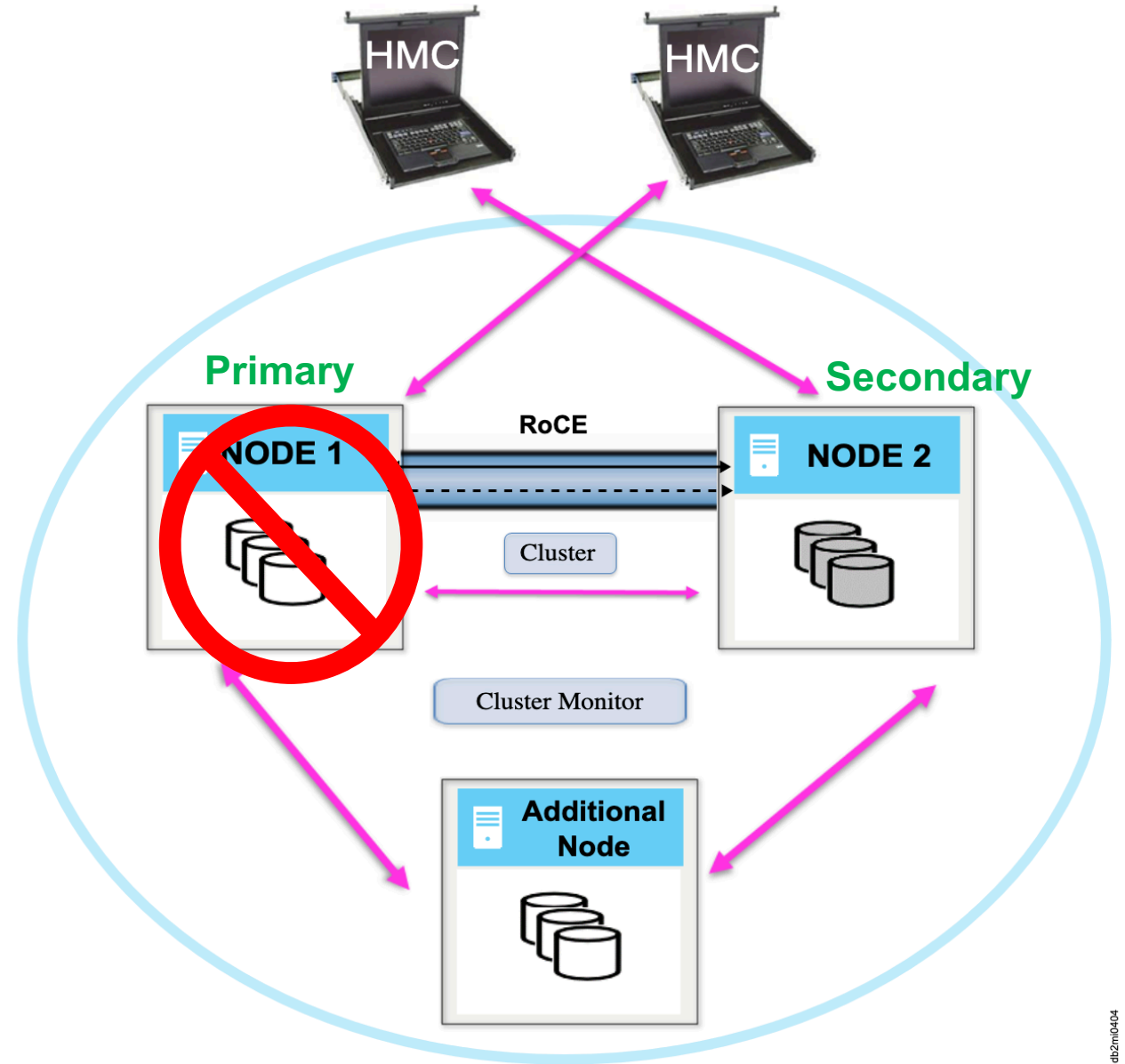
Detecting Errors – State Change

- **If the Secondary Fails:**
 - **IPLs**
 - **MSD**
 - **Goes to Restricted State**
- The Primary will begin tracking replicated object changes and the application will continue to run.
- The Secondary will be in a ‘blocked’ state and not allow changes to replicated objects until the two nodes have resumed mirroring.



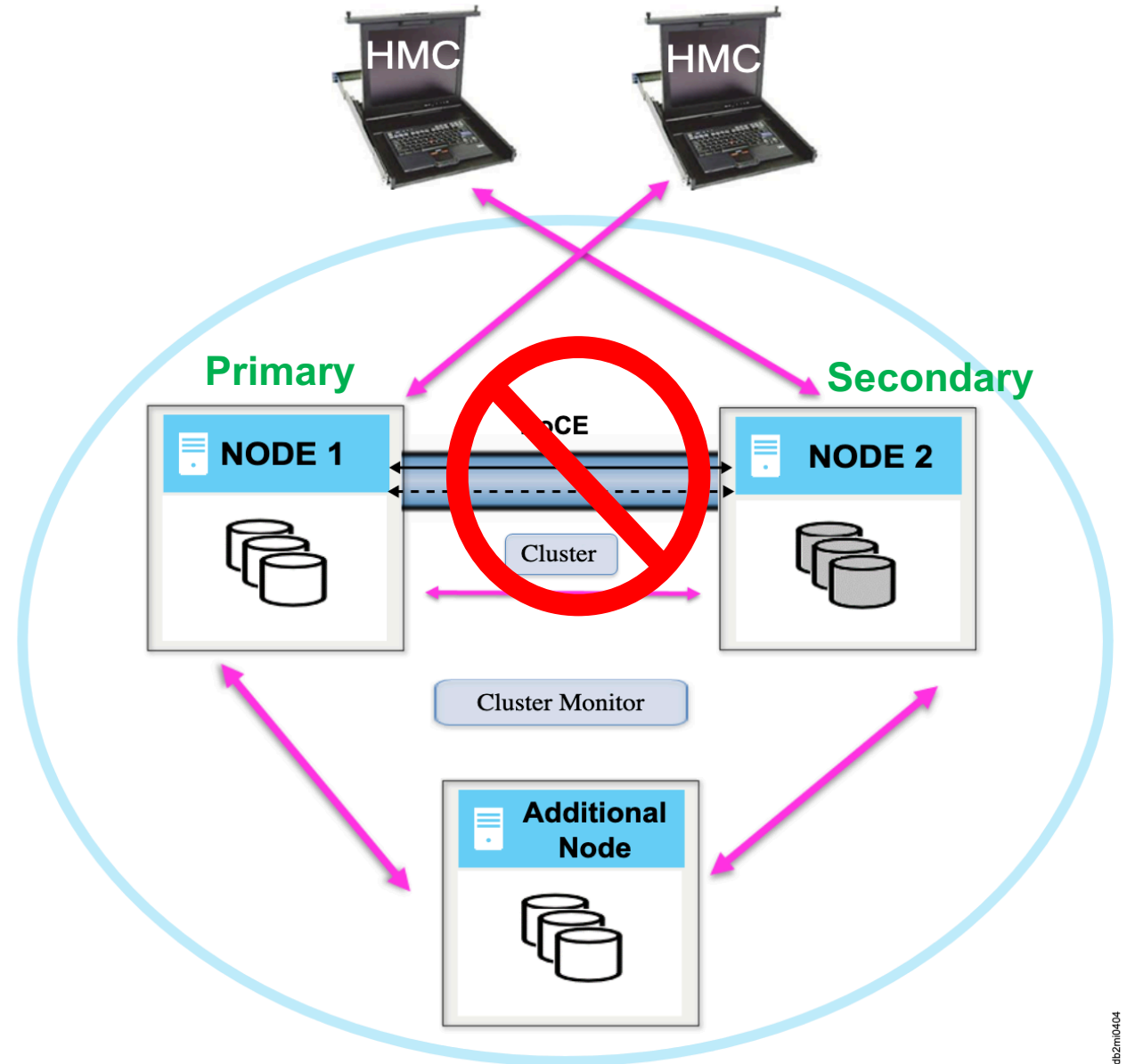
Detecting Errors – State Change

- **If the Primary Fails (Crash/MSD):**
- If the secondary can connect to the HMC and determine the primary has failed, the secondary will take over as the primary and begin tracking.
- If the secondary cannot detect the failure it will remain blocked. The user may choose to force the secondary to become the primary.



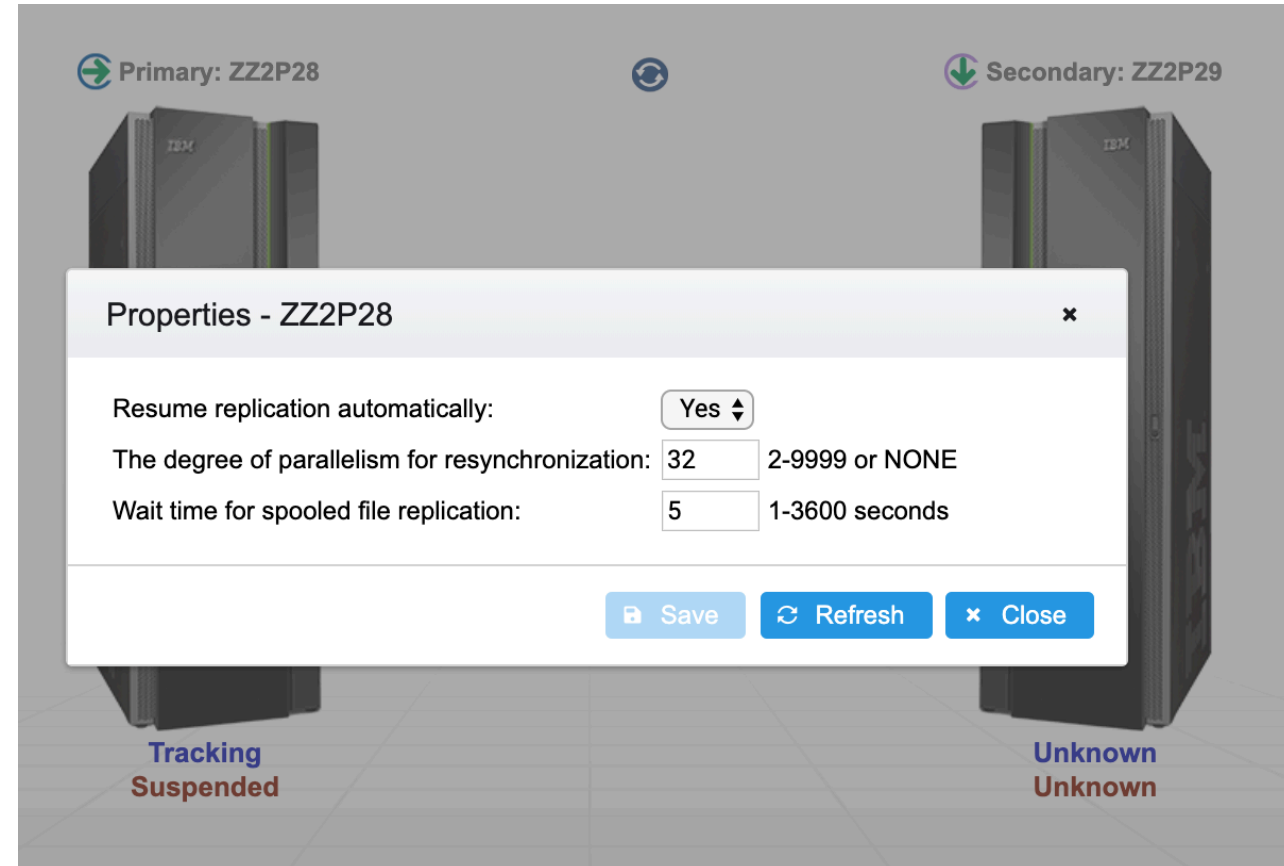
Detecting Errors – State Change

- **If the network fails:**
- If there is no communication between the 2 nodes over the RoCE network, the Primary will continue to track replicated objects and the secondary will block changes to replicated objects until the mirroring is resumed.



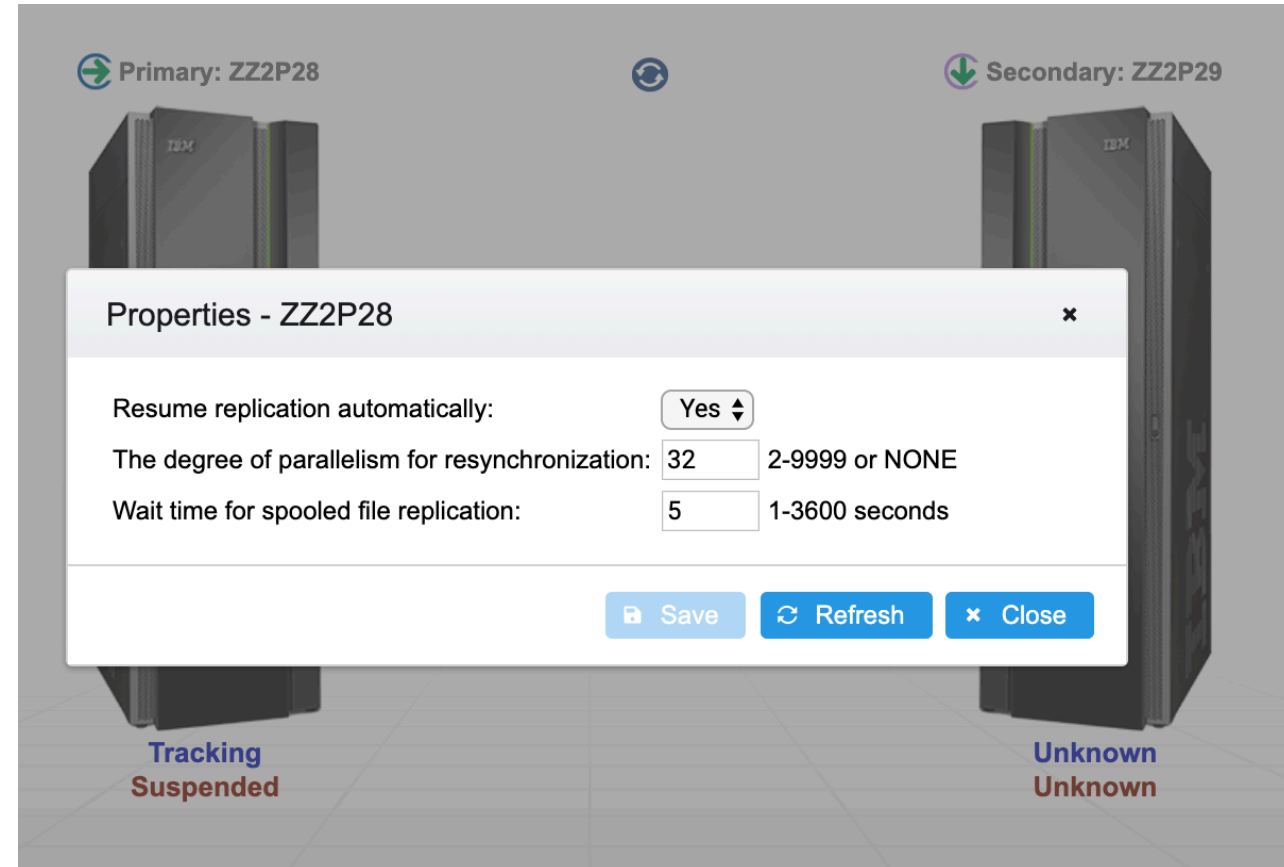
Resume Automatically

- The resume automatically property is defaulted to yes. This means if it was a system detected event such as a communication failure or crash, the mirror will resume once the failure is resolved.
- If the user suspends mirroring, then the user has to explicitly call resume.



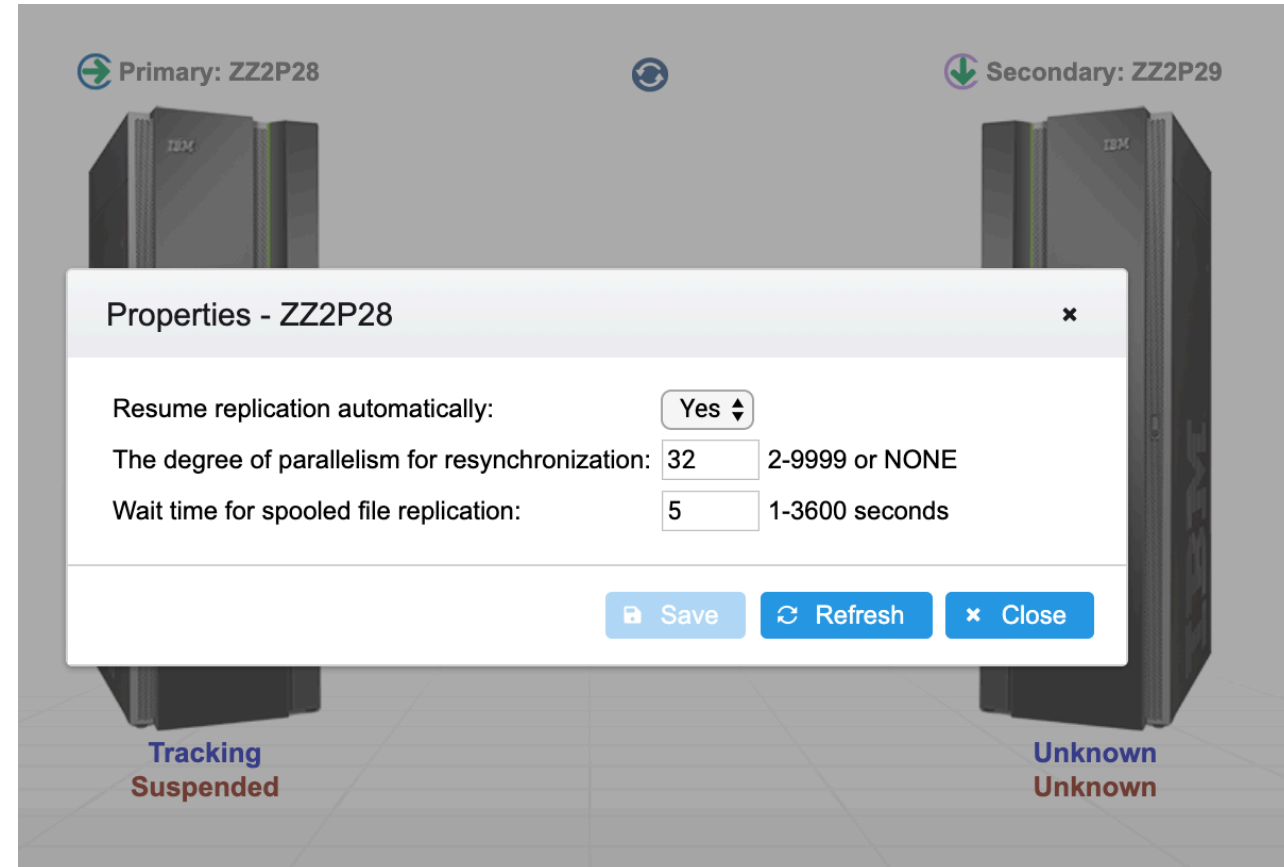
Resync Parallelism

- If 5770SS1 Option 26 (DB2® Symmetric Multiprocessing) is installed you can take advantage of resyncing multiple objects at the same time.



Spool File Wait Time

- Spool files are periodically gathered up and saved/restored to the other node. The wait time defines the interval to wait before bundling them up. If your system creates spool files very rapidly this can be a more efficient way to replicate them to the other side.



Managing and Monitoring

— Exit Points for several of the state transitions

Exit Point	Exit Point Format	Description
QIBM_QMRDB_PRECLONE	PREC0100	Db2 Mirror ASP pre-clone
QIBM_QMRDB_POSTCLONE	PSTC0100	Db2 Mirror ASP post-clone
QIBM_QMRDB_ROLE_CHG	RCHG0100	Db2 Mirror replication role change
QIBM_QMRDB_STATE_CHG	SCHG0100	Db2 Mirror replication state change

Serviceability



- Serviceability
- Compare
- View GUI Logs
- Configure GUI Logs
- History Log Info
- Db2 Mirror Flight Recorder
- Capture Job Logs
- QSYSOPR Messages

Primary: ZZ2P28



Active Replicating



Secondary: ZZ2P29



Active Replicating



Compare

IBM Db2 Mirror for i

Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr IBM

GUI Build Time: 2019-01-08 15:51:42

Compare

Primary - ZZ2P28

Secondary - ZZ2P29

Compare Results

Library Name ^	Replication State ⇅	Object Count ⇅
QUSRDIRCF	EXCLUDE	3
QUSRDIRDB	EXCLUDE	190
QUSRHASM	EXCLUDE	0
QUSRICC	EXCLUDE	66
QUSRSYS	EXCLUDE	2244
QUSRTEMP	EXCLUDE	0
QUTL	EXCLUDE	8
QVOITEST	EXCLUDE	0
QWEBQRY	EXCLUDE	658
QWEBQRYX	EXCLUDE	24
QXMLSERV	EXCLUDE	5
SBPGETLOG	EXCLUDE	2
SYSIBM	EXCLUDE	65
SYSIBMADM	EXCLUDE	96
SYSPROC	EXCLUDE	2
SYSTOOLS	EXCLUDE	55
TRANSWL	EXCLUDE	19
TRANS1000	INCLUDE	1000
TRANS10000	EXCLUDE	10000
VOLANO	EXCLUDE	25
WHITNEYK	EXCLUDE	0

Showing 161 of 161

Object Name ⇅	Object Type ⇅	Object Replication State
PF00000001	*FILE	INCLUDE
PF00000002	*FILE	INCLUDE
PF00000003	*FILE	INCLUDE
PF00000004	*FILE	INCLUDE
PF00000005	*FILE	INCLUDE
PF00000006	*FILE	INCLUDE
PF00000007	*FILE	INCLUDE
PF00000008	*FILE	INCLUDE
PF00000009	*FILE	INCLUDE
PF00000010	*FILE	INCLUDE
PF00000011	*FILE	INCLUDE
PF00000012	*FILE	INCLUDE
PF00000013	*FILE	INCLUDE
PF00000014	*FILE	INCLUDE
PF00000015	*FILE	INCLUDE
PF00000016	*FILE	INCLUDE
PF00000017	*FILE	INCLUDE
PF00000018	*FILE	INCLUDE
PF00000019	*FILE	INCLUDE
PF00000020	*FILE	INCLUDE
PF00000021	*FILE	INCLUDE
PF00000022	*FILE	INCLUDE
PF00000023	*FILE	INCLUDE

- Compare Attributes
- Compare Data
- Compare Data/Attributes

Showing 300 of 1000



Compare Results

IBM Db2 Mirror for i

Primary: ZZ2P28 Secondary: ZZ2P29 User: qsecofr

GUI Build Time: 2019-04-20 22:31:40

Compare - Results

Primary - ZZ2P28

Secondary - ZZ2P29

Compare Results

	lasp Name	Library Name	Compare Attributes	Compare Data	Job Number	User Name	Job Name	Start Time	End Time	State	Failu
0	*SYSBAS	TRANS1000	YES	YES	560785	QUSER	QZDASOINIT	2019-04-23 21:07:31	2019-04-23 21:08:51	COMPLETED	
0	*SYSBAS	SPLMR000KW	YES	YES	560759	QUSER	QZDASOINIT	2019-04-23 21:05:24	2019-04-23 21:07:15	COMPLETED	
0	*SYSBAS	TRANS1000	YES	YES	482347	QUSER	QZDASOINIT	2019-04-22 15:09:06	2019-04-22 15:11:40	COMPLETED	
0	*SYSBAS	TRANS1000	YES	YES	395559	QUSER	QZDASOINIT	2019-03-18 10:45:03	2019-03-18 10:52:26	COMPLETED	

1 300

Showing 4 of 4

Alerts



Primary: ZZ2P28



Active Replicating



Secondary: ZZ2P29



Active Replicating



Alerts



Alerts

Alerts

QSYSOPR Messages

Primary - ZZ2P28

Secondary - ZZ2P29

Mark All Read

Filters



Time Stamp	Message ID	Severity	Message Text
2019-01-13 16:14:41.208034	CPIC904	0	Db2 Mirror replication is active for ASP group *SYSBAS.
2019-01-13 16:13:17.868360	CPIC901	0	Db2 Mirror replication is suspended for ASP group *SYSBAS. Reason code 212.
2019-01-13 16:04:29.968608	CPIC904	0	Db2 Mirror replication is active for ASP group *SYSBAS.
2019-01-13 16:00:53.233493	CPDC905	0	Db2 Mirror Network Redundancy Group (NRG) link 169.254.3.28 is active.
2019-01-13 16:00:48.458097	CPDC905	0	Db2 Mirror Network Redundancy Group (NRG) link 169.254.2.28 is active.
2019-01-13 15:38:10.982108	CPIC901	0	Db2 Mirror replication is suspended for ASP group *SYSBAS. Reason code 212.
2019-01-13 14:24:51.426806	CPF32CD	60	Db2 Mirror resynchronization failed for job 125827/QSYS/QMRDBESYNC.
2019-01-13 14:24:26.206567	CPIC904		
2019-01-13 14:13:19.059670	CPDC905		
2019-01-13 14:12:49.197270	CPDC905		

Message Details

Message ID: CPIC904 **Severity:** 0
Message Type: INFORMATIONAL **Time Sent:** 2019-01-13 16:14:41
From User: QSYS **From Job:** [131507/QSYS/QMRDBECTLR](#)
From Program: QMRDBEUTIL

Message Text:
Db2 Mirror replication is active for ASP group *SYSBAS.
Cause:
Db2 Mirror replication has been started or resumed for the ASP group.
Recovery:

Technical Description:
For more information, refer to the Db2 Mirror topic collection in the IBM Knowledge Center.

Close

Close

IASPs

Db2 Mirror IASP Support

- IASPs are optional for Db2 data
- IASPs are required for IFS concurrent sharing
 - PowerHA required to switch IFS IASPs
- DB IASPs have their own Replication Rules and Object Tracking List

IASP Support

← → ↻ ⓘ Not Secure | sync3.rch.stglabs.ibm.com:2006/Db2Mirror/mainframe/home

IBM Db2 Mirror for i Primary: SYNC3 Secondary: RESYNC3 User: whitneyk IBM

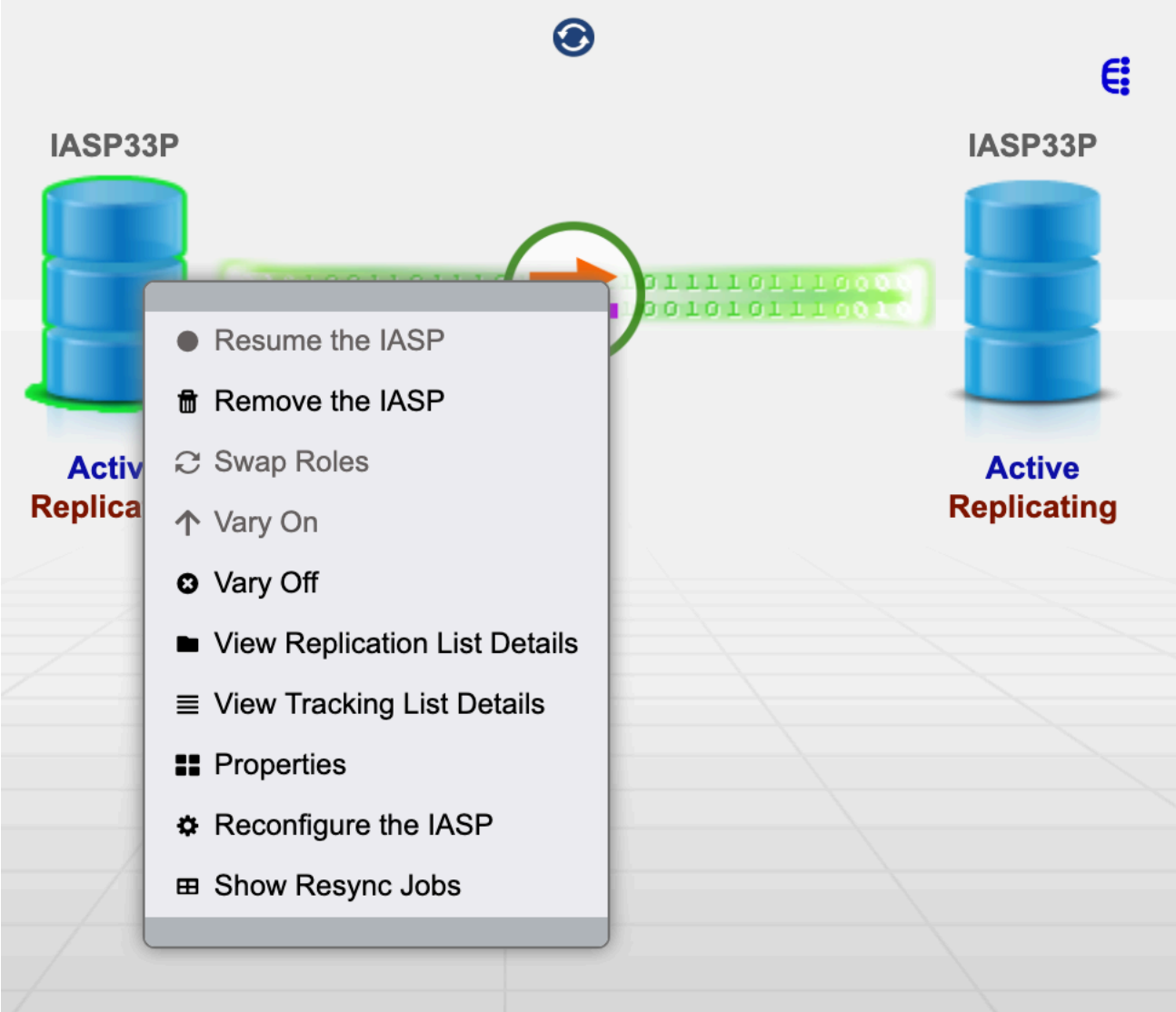
GUI Build Time: 2019-04-24 22:11:39

Primary: SYNC3 Active Replicating

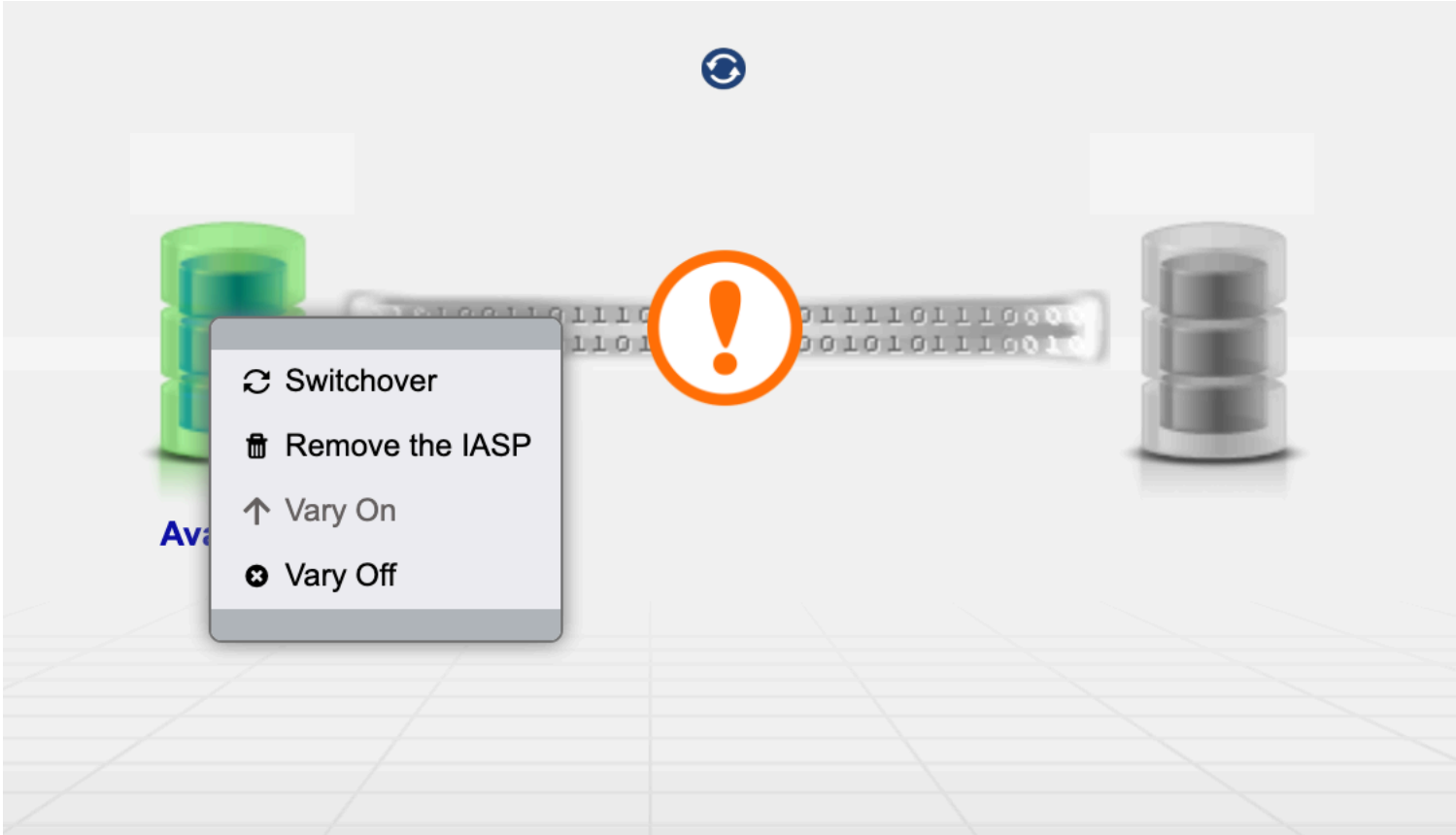
Secondary: RESYNC3 Active Replicating

SYSBASE IASP33P ITST1 ITST2 ITST3 IFS1 IFS2

IASP Support



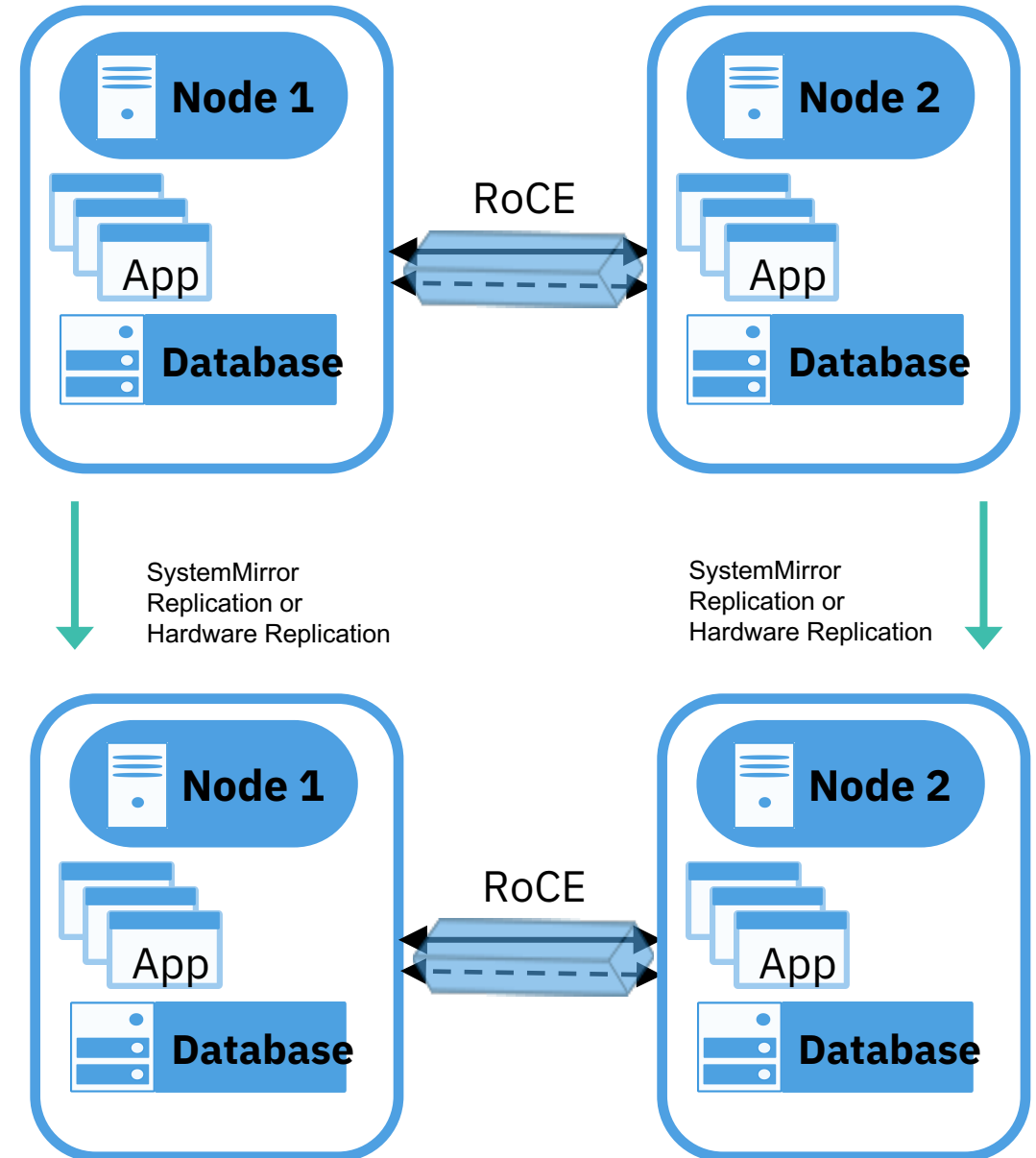
Switch over IFS IASPs



Disaster Recovery

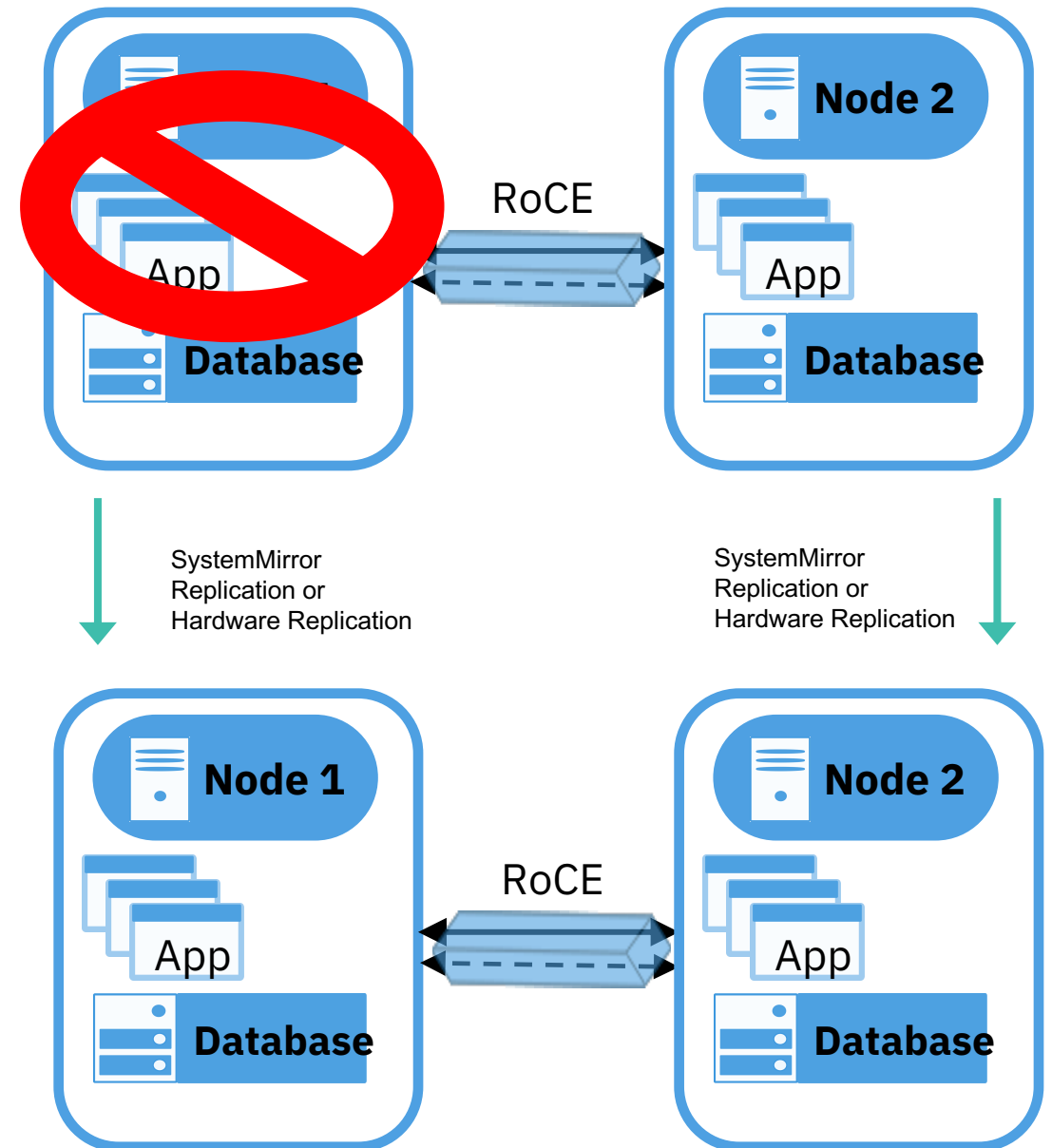
Topology Options – DR

- As long as one local Db2Mirror node is up, production will remain at the local site.
- If both local nodes are unavailable, then a switch to the DR site can be initiated.
- The default will be that a switch to DR requires system administrator intervention, although a policy could be defined to initiate the switch automatically.
- Only one node will be activated at the DR site, and then a Db2Mirror resynch will be started to the 2nd DR node.



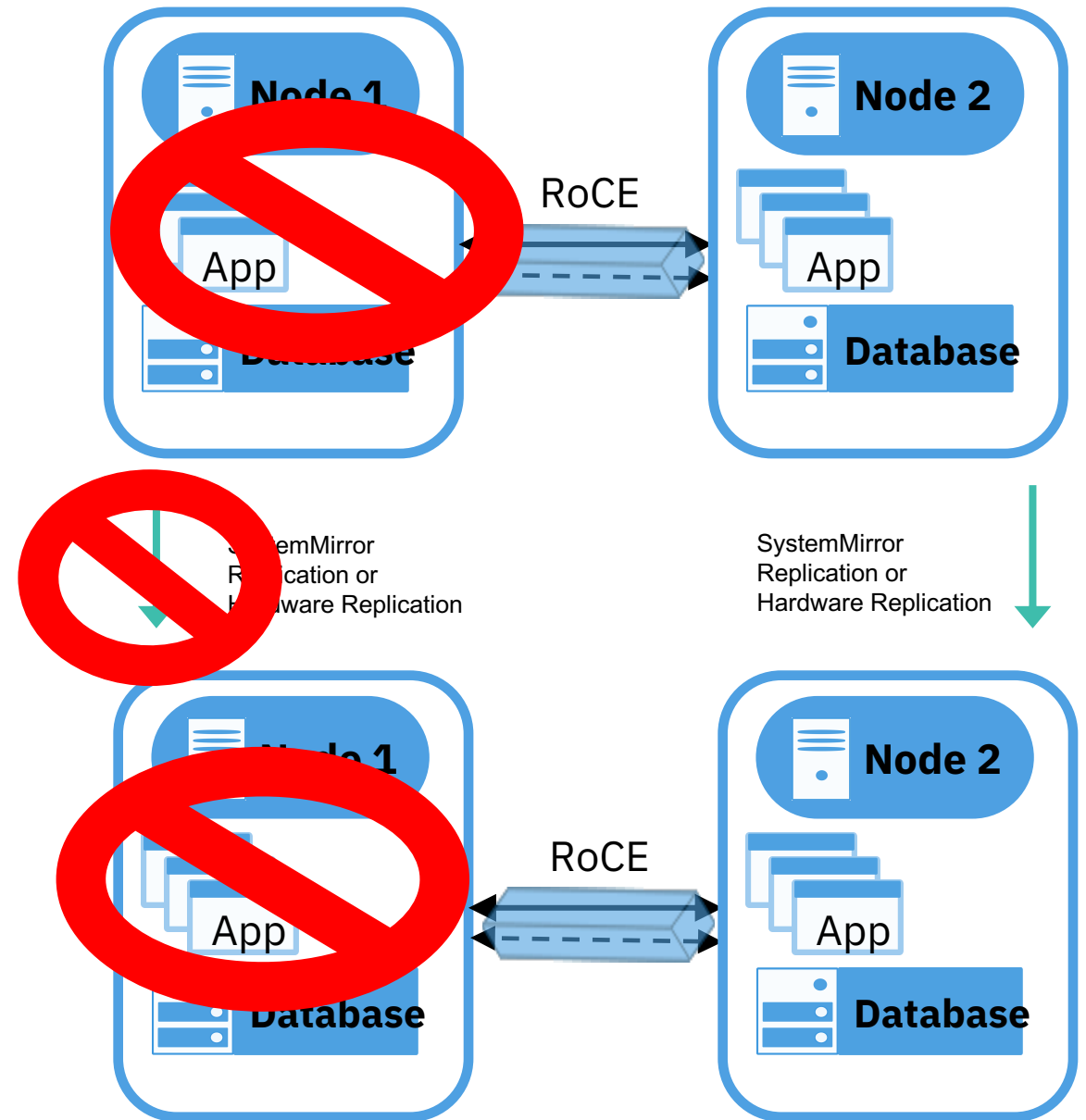
Topology Options – DR

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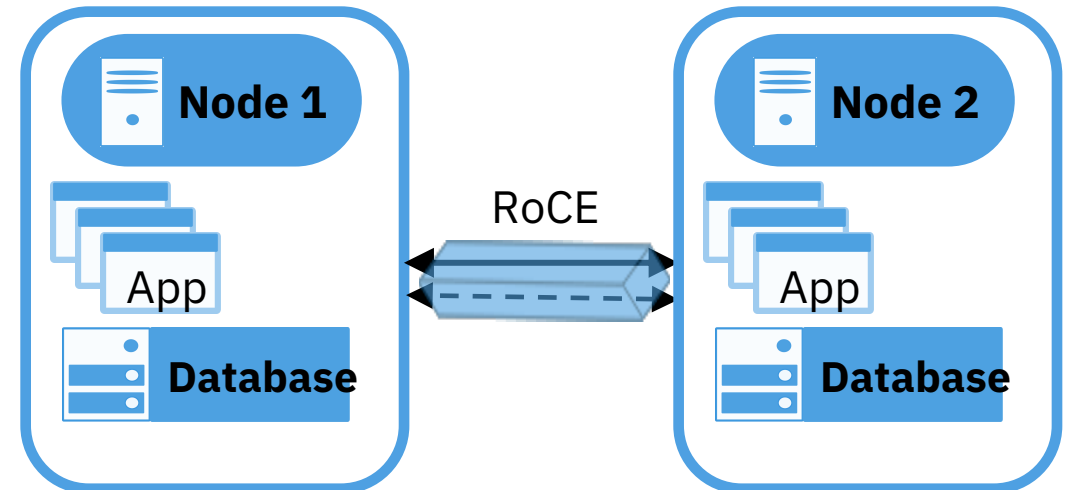
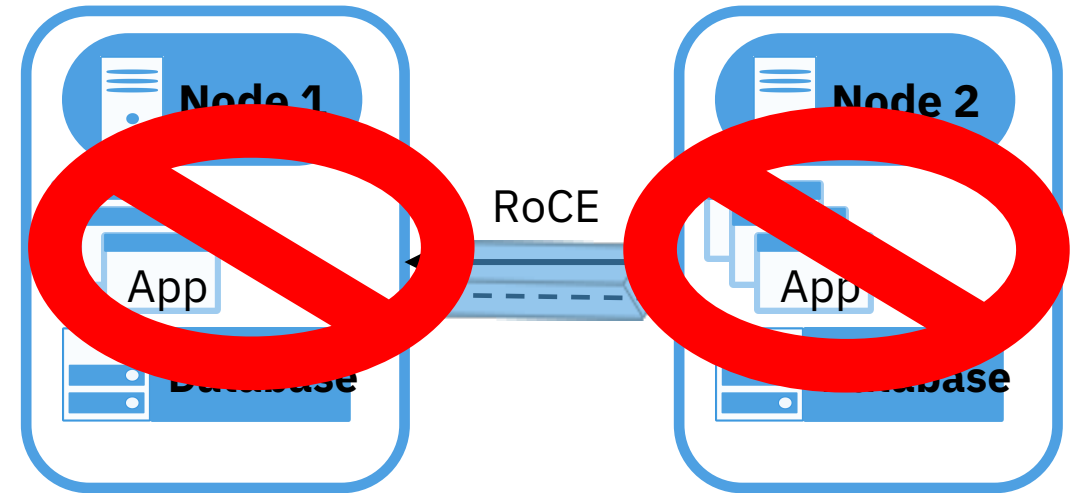
Topology Options – DR

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- The default will be that a switch to DR requires system administrator intervention, although a policy could be defined to initiate the switch automatically.
- Only one node will be activated at the DR site, and then a Db2Mirror resynch will be started to the 2nd DR node.



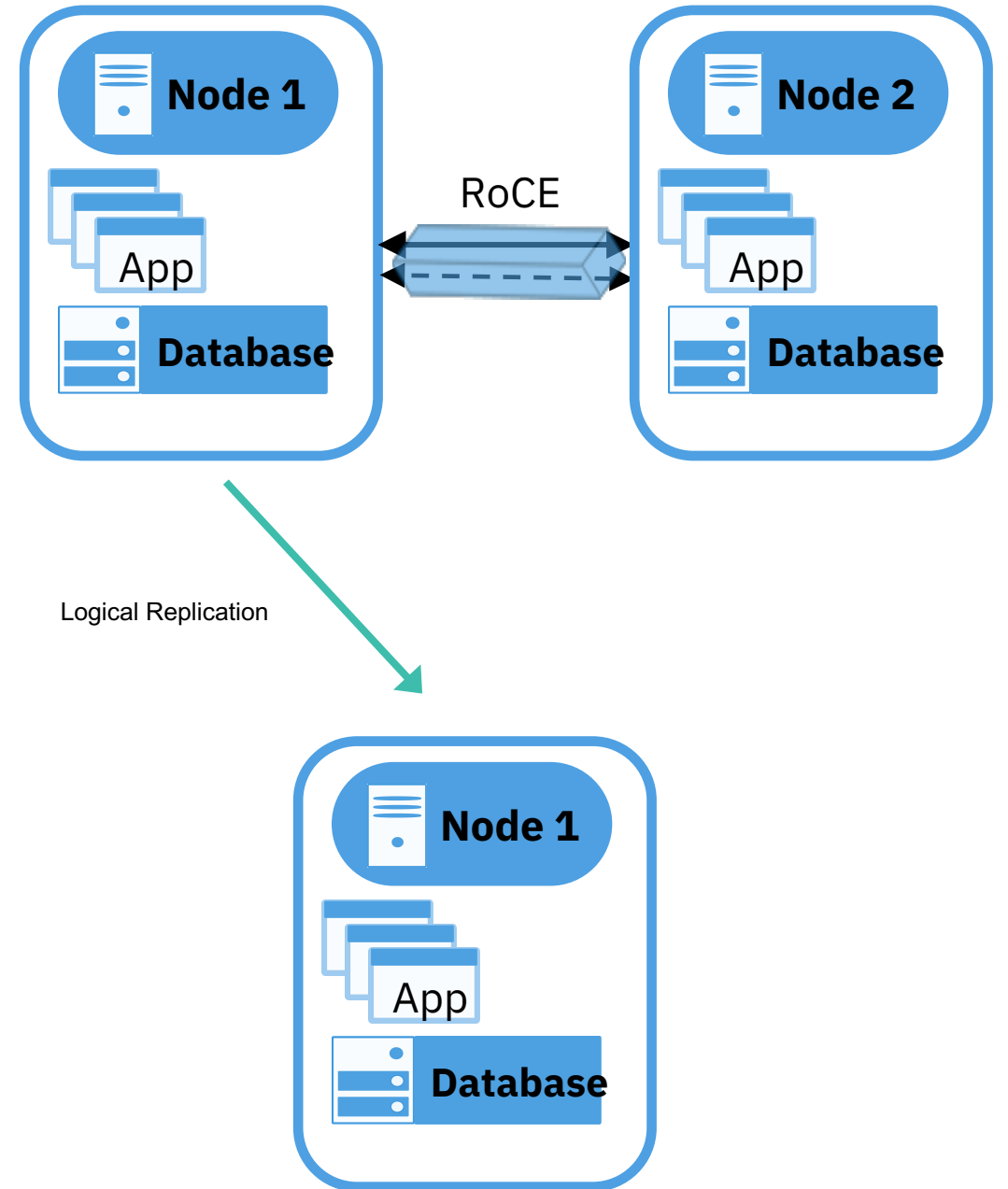
Topology Options – DR

- As long as one local Db2Mirror node is up, production will remain at the local site.
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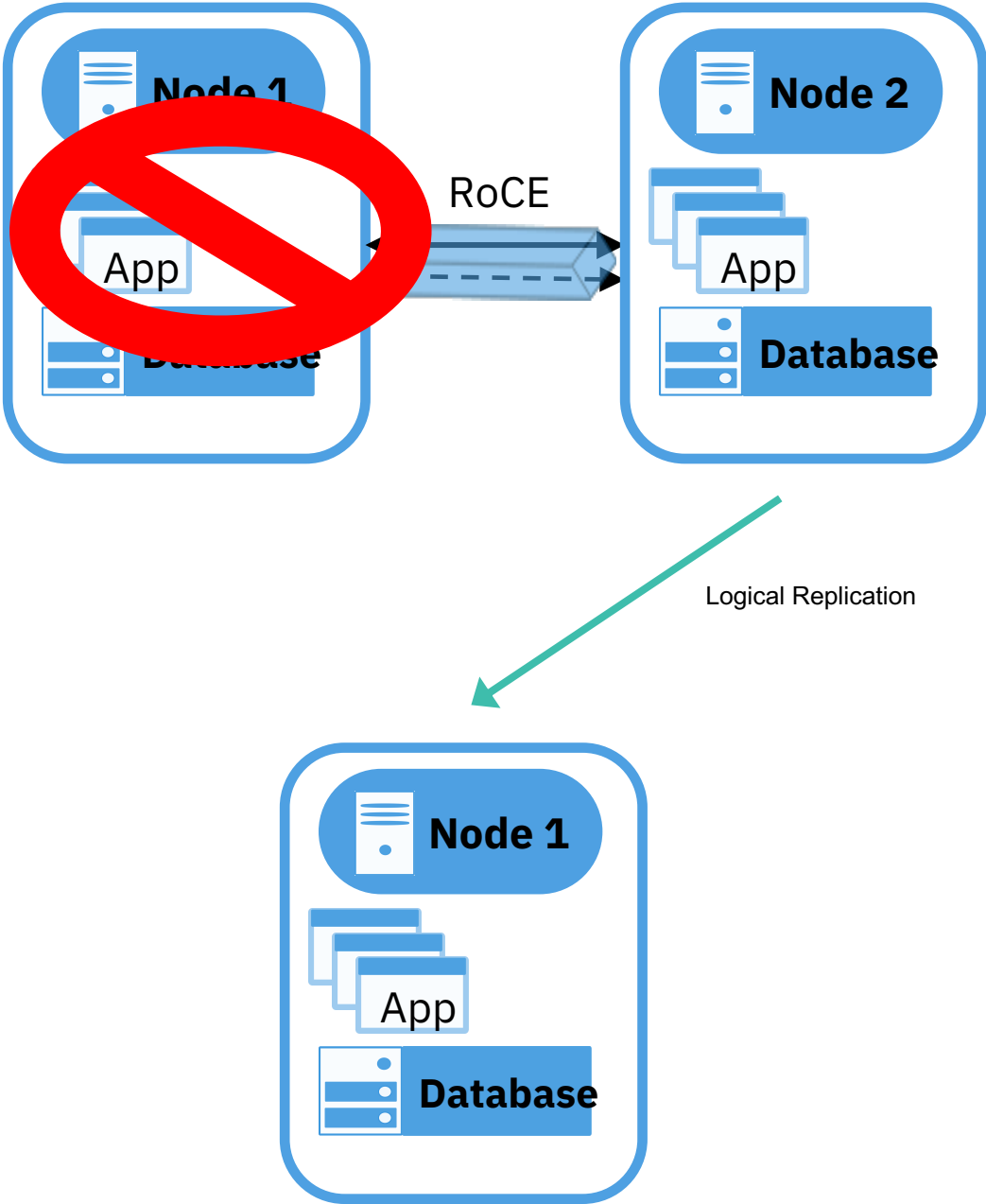
Logical Replication

- Logical replication solutions have the option to move the source node between the Db2 Mirror nodes and go to a single DR node



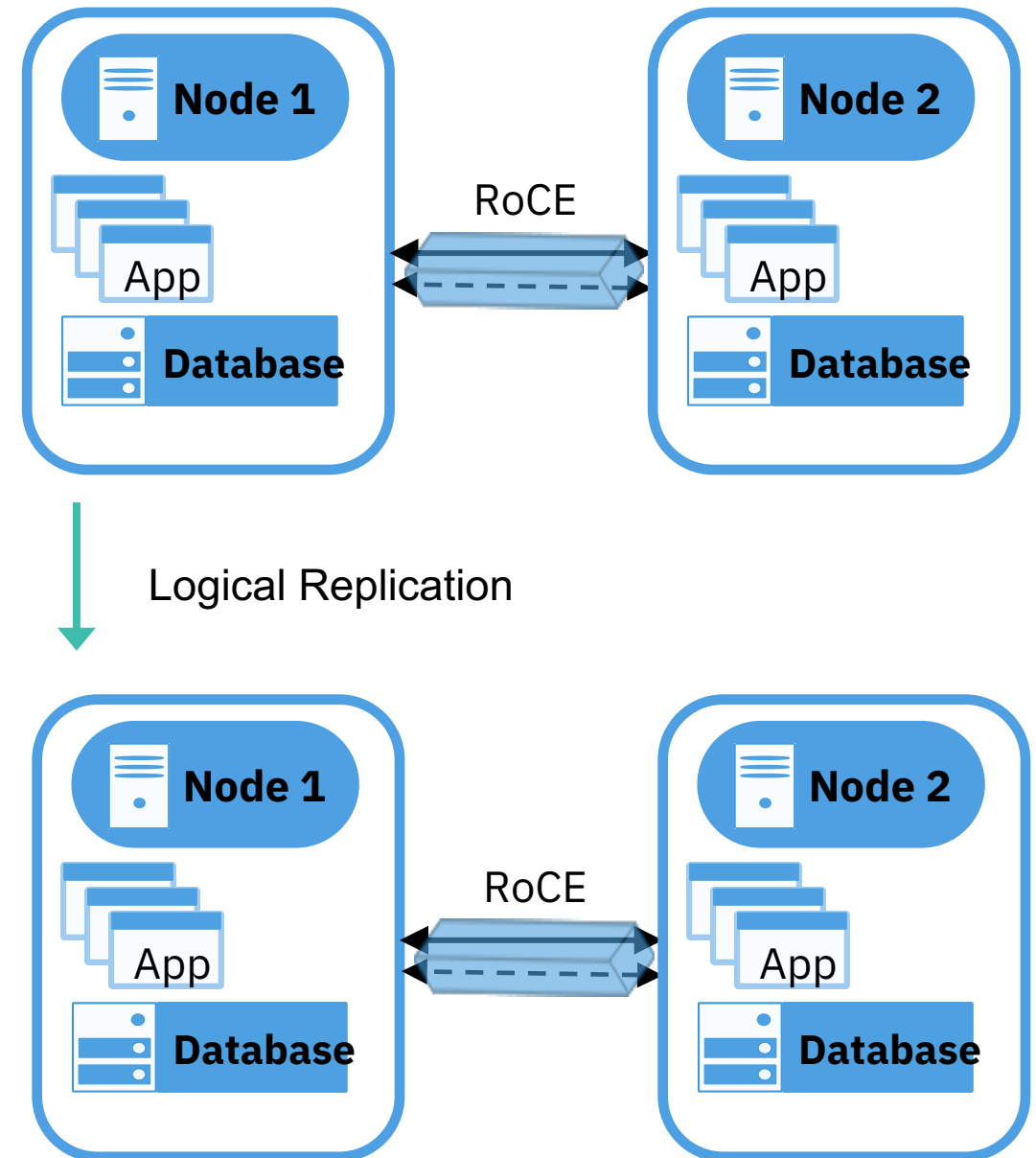
Logical Replication

- Logical replication solutions have the option to move the source node between the Db2 Mirror nodes and go to a single DR node



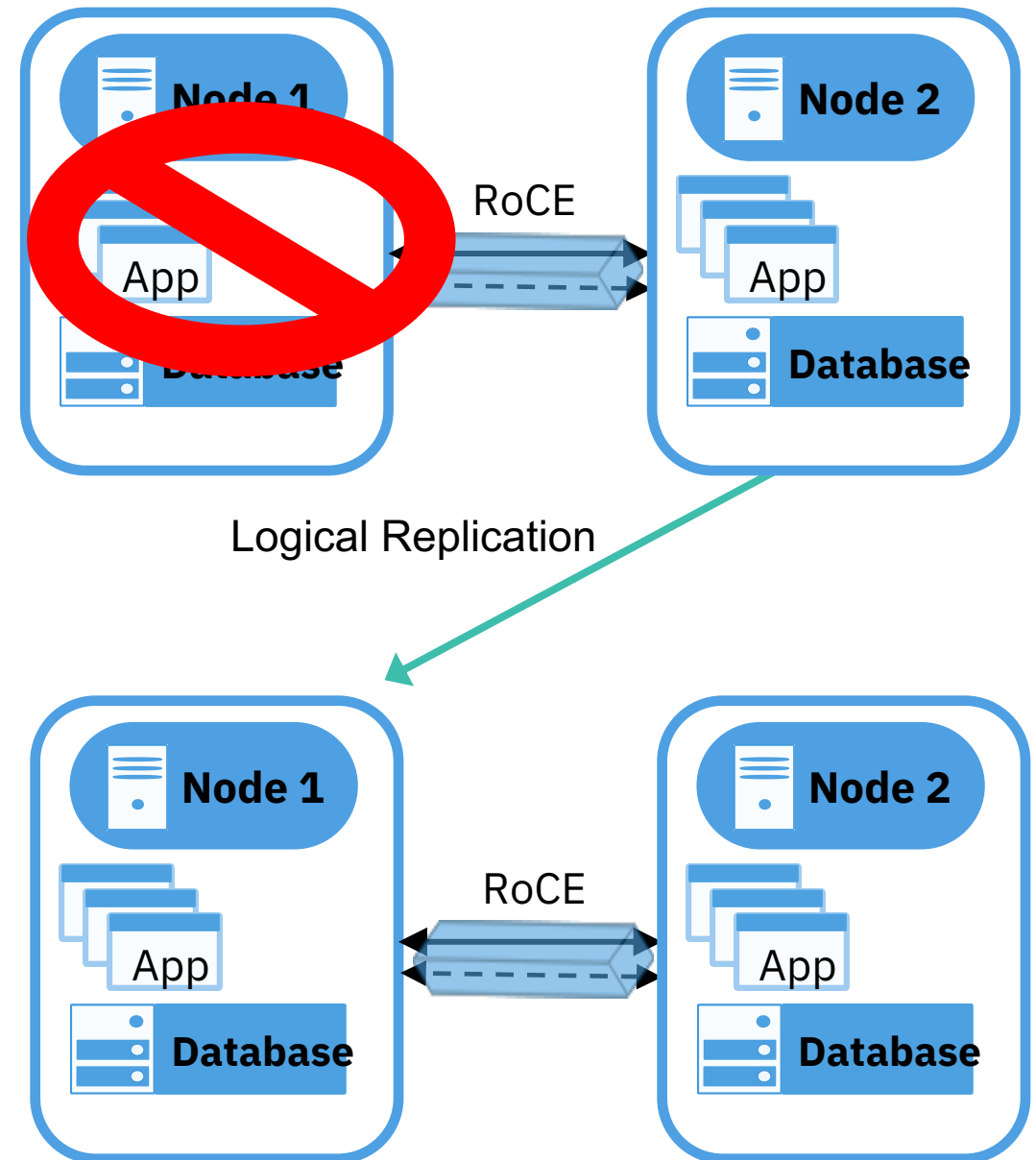
Logical Replication

- Logical replication solutions have the option to move the source node between the Db2 Mirror nodes and go to a Db2 Mirror pair.



Logical Replication

- Logical replication solutions have the option to move the source node between the Db2 Mirror nodes and go to a Db2 Mirror pair.



Software Requirements and Licensing

Software Required for Db2 Mirror Pair

- 5770SS1 Option 3 (Extended Base Directory Support)
- 5770SS1 Option 12 (Host Servers)
- 5770SS1 Option 26 (DB2® Symmetric Multiprocessing) - Optional
- 5770SS1 Option 30 (Qshell)
- 5770SS1 Option 34 (Digital Certificate Manager)
- 5770SS1 Option 41 (High Availability Switchable Resources)
- 5770SS1 Option 48 (IBM Db2Mirror)
- 5770JV1 *BASE (IBM Developer Kit for Java)
 - Option 16 (Java SE 8 32 bit)
 - Option 17 (Java SE 8 64 bit)
- 5733SC1 *BASE(IBM Portable Utilities for i)
 - Option 1 (OpenSSH, OpenSSL, zlib)
- 5770DG1 *BASE (IBM HTTP Server for i)
- 5770DBM *BASE (IBM Db2 Mirror for i)
 - Option 1 (Db2 Mirror Enablement)

Open Source Packages Required for Setup

- python2-six-1.10.0-1.ibm7.1.noarch.rpm
- python2-itoolkkit-1.5.1-1.ibm7.1.ppc64.rpm
- python2-ibm_db-2.0.5.8-1.ibm7.1.ppc64.rpm
- cloudinit-1.0-0.ibm7.1.ppc64.rpm

Software Required for Db2 GUI Node

- 5770SS1 Option 3 (Extended Base Directory Support)
- 5770SS1 Option 12 (Host Servers)
- ~~— 5770SS1 Option 26 (DB2® Symmetric Multiprocessing) – Optional~~
- 5770SS1 Option 30 (Qshell)
- ~~— 5770SS1 Option 34 (Digital Certificate Manager)~~
- ~~— 5770SS1 Option 41 (High Availability Switchable Resources)~~
- ~~— 5770SS1 Option 48 (IBM Db2Mirror)~~
- 5770JV1 *BASE (IBM Developer Kit for Java)
- Option 16 (Java SE 8 32 bit)
- Option 17 (Java SE 8 64 bit)
- 5733SC1 *BASE(IBM Portable Utilities for i)
- Option 1 (OpenSSH, OpenSSL, zlib)
- 5770DG1 *BASE (IBM HTTP Server for i)
- 5770DBM *BASE (IBM Db2 Mirror for i)
- ~~— Option 1 (Db2 Mirror Enablement)~~

Licensing

Db2 Mirror for i (5770-DBM)

- Pricing: \$20K (U.S. list price)* per processor core - for any size machine
 - Note: e-config offers Small and Medium price features, both are priced the same
 - Includes one year of SWMA
- License both source and target
 - The processor cores to support the workload on source and target must be licensed
- IBM i (5770-SS1) Option 48 “Db2 Data Mirroring” is required and automatically included with 5770-DBM orders
 - No additional charge for Option 48
 - Option 48 is only available with Db2 Mirror and cannot be ordered separately
- 70-day evaluation period available for 5770-DBM and IBM i Option 48
 - I.e. standard try-and-buy period as IBM i and the keyed IBM i LPPs. After 70 days, enter the software license key

Licensing, continued

- Db2 Mirror price structure:
 - Processor feature 5051 is the priced feature
 - Base feature 5050 is a no-charge user interface for managing Db2 Mirror on other systems in the network
- The Db2 Mirror two production nodes will not qualify as a CBU. DR nodes could qualify
- For Db2 Mirror, the processor charge metric and subcapacity terms are the same for DB2 Mirror as, e.g., IBM i operating system and PowerHA for i
 - Workload Capping Groups are not supported for subcapacity licensing for Db2 Mirror

[Db2 Mirror Software License Terms](#)

Db2 Mirror for i workshop

IBM Systems Lab Services — Power Systems IBM i



Overview

The Db2 Mirror for i workshop will provide customers and business partners the opportunity to build skills in Db2 mirror as well as testing their applications on a DB2 Mirror environment in the lab. The workshop will be 2 weeks with the first week covering planning, implementation, setting up libraries in a DB2 Mirror environment and Database requirements/changes. The second week will focus on application changes and performance requirements/testing.

Target Audience

- Any customer or BP who wishes to learn about Db2 mirror in depth and test their application

Benefits

- By the end of the workshop, the attendees will have the skills to start planning their Db2 mirror environment.

Qualifying Questions

- Do you need a zero time failover environment to an active high availability system
- Do you wish to start working towards a true active/active solution

Team Contacts

Owner: Selwyn Dickey sdickey@us.ibm.com

Eric Barsness ericbar@us.ibm.com

Opportunity manager Mike Gordon mgordo@us.ibm.com

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Key Features

- The workshop is fixed price for 2 weeks. It is anticipated that not all people will attend both weeks. The first week is aimed more at technical specialists while the second week is more application and performance.
- During the 2 weeks, access to consultants across aspects of IBM i will be available to maximize the benefit of the workshop. This includes, performance, database/SQL, application and infrastructure experts
- The hardware will be capped at 5 x Power 8 processors per partition with 32 GB of memory per core, and 10TB of DS8000 disk per partition.
- The testing can be performed for IASP/PowerHA, or full system
- No HIPAA or PHI data can be loaded on the IBM systems

Deliverables

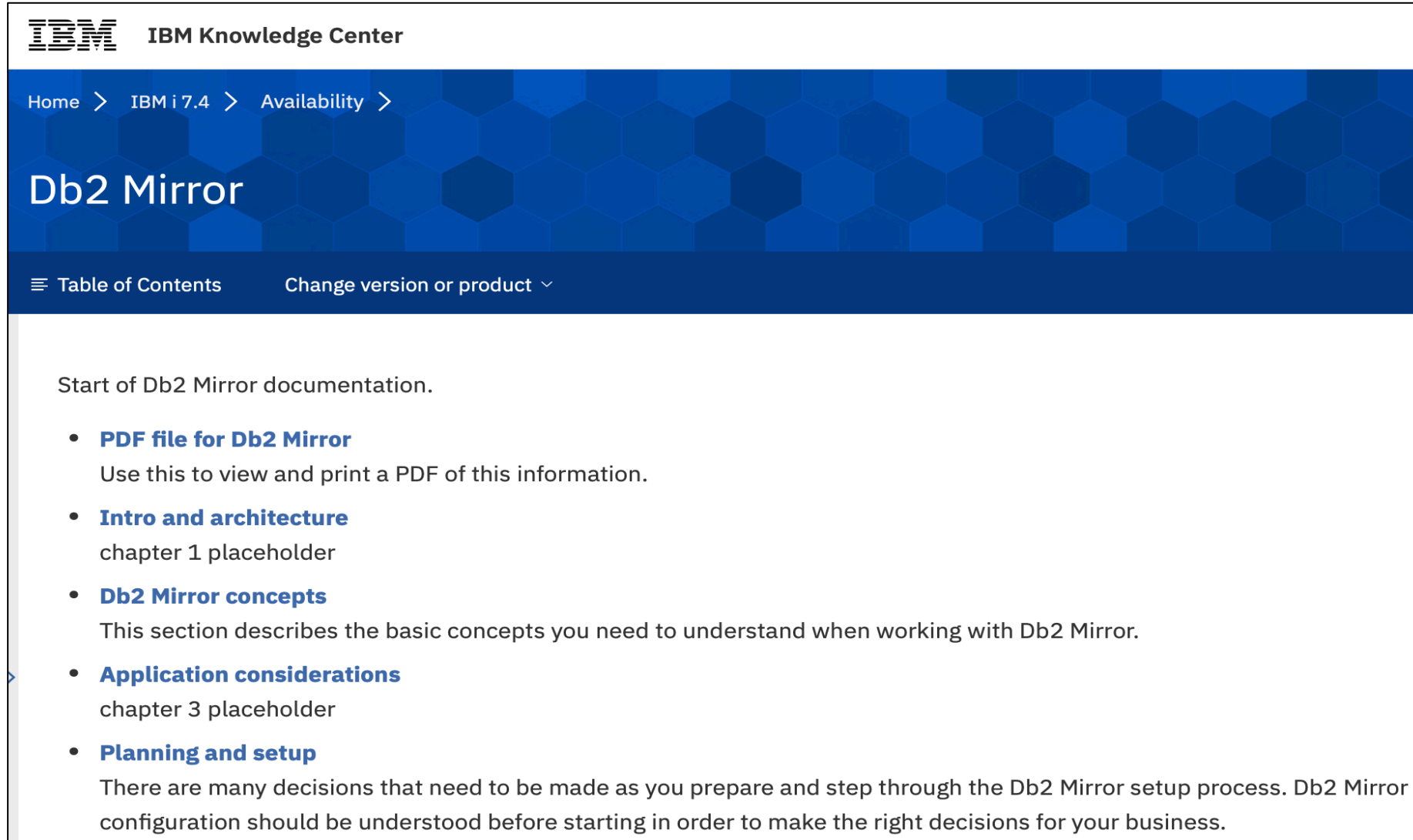
- Any presentation used in the workshop will be available to the attendees
- Any data (performance, object changes etc) will be available for the attendees to save to tape and take home

Duration (optional)

80 hours (no outside working hours)

Db2 Mirror – Where to get more information

www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/db2mi/db2mintro.htm



The screenshot shows the IBM Knowledge Center interface for Db2 Mirror documentation. The page has a blue header with the IBM logo and 'IBM Knowledge Center' text. Below the header is a breadcrumb trail: 'Home > IBM i 7.4 > Availability >'. The main title 'Db2 Mirror' is displayed in large white text on a blue background. A dark blue navigation bar contains a hamburger menu icon, 'Table of Contents', and a dropdown menu for 'Change version or product'. The main content area is white and contains the following text and list:

Start of Db2 Mirror documentation.

- **PDF file for Db2 Mirror**
Use this to view and print a PDF of this information.
- **Intro and architecture**
chapter 1 placeholder
- **Db2 Mirror concepts**
This section describes the basic concepts you need to understand when working with Db2 Mirror.
- **Application considerations**
chapter 3 placeholder
- **Planning and setup**
There are many decisions that need to be made as you prepare and step through the Db2 Mirror setup process. Db2 Mirror configuration should be understood before starting in order to make the right decisions for your business.

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- IBM products are manufactured from new parts or new and used parts. In some cases, a product may not be new and may have been previously installed. Regardless, our warranty terms apply.”
- **Any statements regarding IBM's future direction, intent or product plans are subject to change or withdrawal without notice.**
- Performance data contained herein was generally obtained in a controlled, isolated environments. Customer examples are presented as illustrations of how those
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