



Advanced Strategies of High Availability and Disaster Recovery for SAP HANA

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Session ID # ASUG84183

About the Speakers

Ranjit Prithviraj

- Managing Director, Fitch Ratings
- Responsible for global strategy and management of Enterprise applications for Fitch Group
- “Are we there yet”

Sanjay Mahajan

- Director, Fitch Ratings
- Over 20 years of experience in SAP administration, security, databases including HANA, and various operating systems
- “Need to get a hobby other than Fitch and SAP”

Key Outcomes/Objectives

1. There are several different implementations possible for HA-DR depending on the requirements
2. High Availability can be further enhanced by implementing HA cluster for SAP application
3. Backups are integral part of the business continuity plan

Agenda

- **Fitch Overview**
- Available options for HA and DR implementation
- HA-DR implementation for HANA at Fitch
- HA-DR implementation for SAP Application using cluster at Fitch
- Important OSS notes, documentation, and references

Fitch Group

Fitch Group is a **global leader in financial information services** with operations in over 30 countries. Fitch Group is majority-owned by Hearst Corporation.

Fitch Ratings

Fitch Solutions

BMI Research

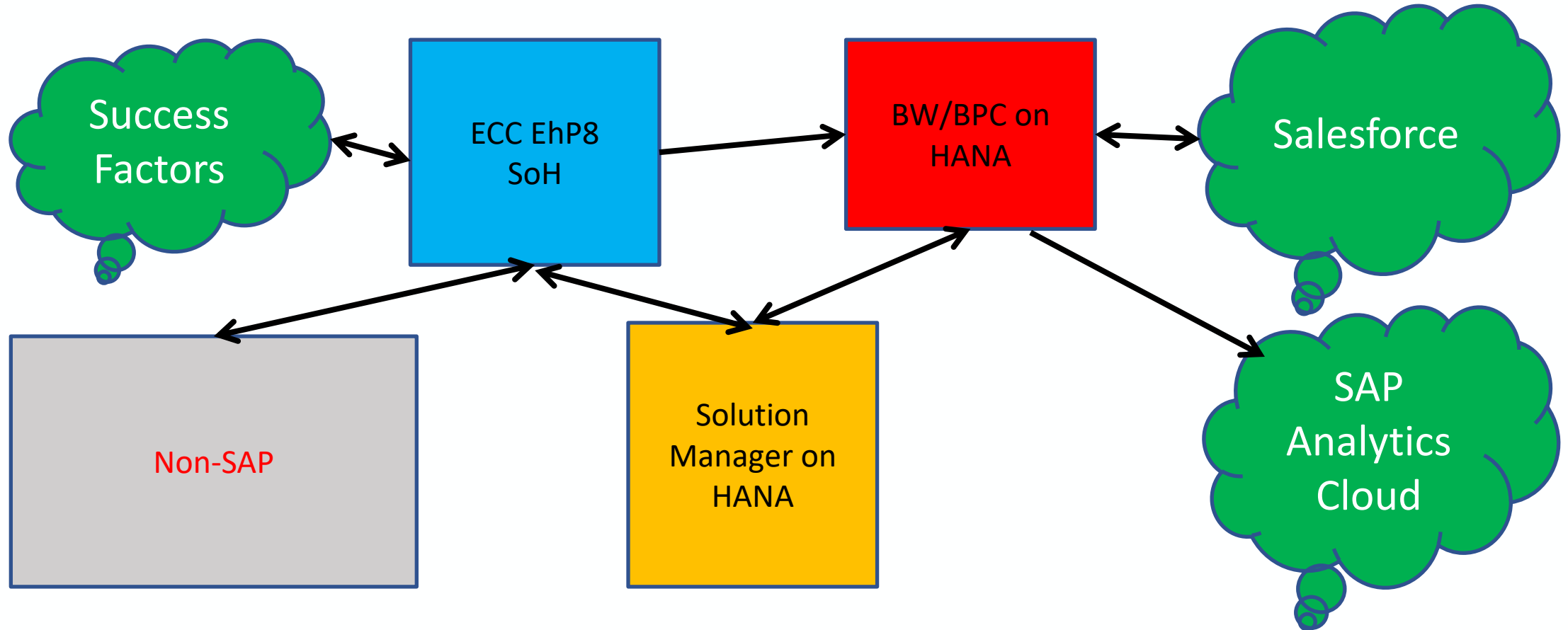
Fitch Learning

- One of the Big Three credit rating agencies
- Over \$1 Billion in revenue
- Over 4000 employees

Dual headquarters in New York and London

Our SAP landscape

We use SAP for Finance, SD, MM, T&E, Reporting, and HR. It interfaces with several non-SAP applications



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Basic Business Continuity Concepts

Recovery Point Objective (RPO): Maximum tolerable period of time which operational data is lost without the ability to recover. This is your business continuity plan's maximum allowable threshold for data loss. The RPO is expressed backwards in time (that is, into the past) from the point the failure occurs.

Recovery Time Objective (RTO): Maximum permissible time it takes to recover the system after a disaster (or disruption) for system operations to resume. This objective can include the time for trying to fix the problem without recovery options, the recovery itself and testing of services before handing over to the business users.



Various HA-DR Solutions

Solution	Used for	RPO	RTO	Perf. ramp
Backup & Recovery	HA & DR	high	high	med
SAP HANA Host Auto-Failover	HA	0	med	long
SAP HANA Storage Replication w/ QA, Dev.	DR	0*	med	long
SAP HANA System Replication	HA & DR	0*	low	short
SAP HANA System Replication w/ QA, Dev.	HA & DR	0*	med	long

Various HA-DR Solutions

Watch Dog – restart failed service

Host Auto-failover – For HA and Scale out

Storage Replication – Supported by Storage Vendors

System Replication – HANA feature

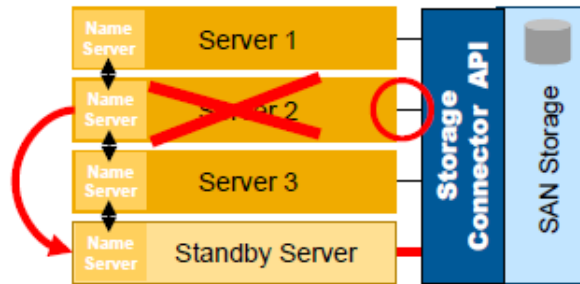
Linux Cluster – For HA and DR

HA DR Solutions

Host Auto-Failover

Cluster-like solution

- One data pool
- Includes solution for HA with internal cluster manager
- Uses Storage Connector APIs for communication with environment

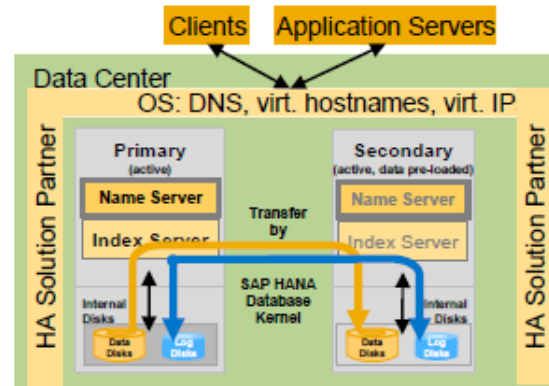


Covers HW problems with additional host(s)

System Replication

Similar to classical shadow database solutions

- Ambivalent solution for HA & DR
- Automation possible with external cluster manager

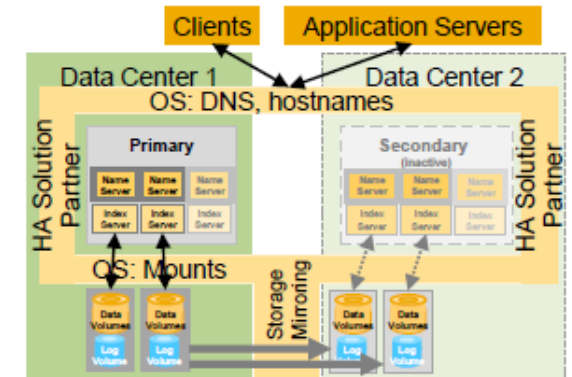


Covers HW and data integrity problems with an additional set of individually-driven data pools

Storage Replication

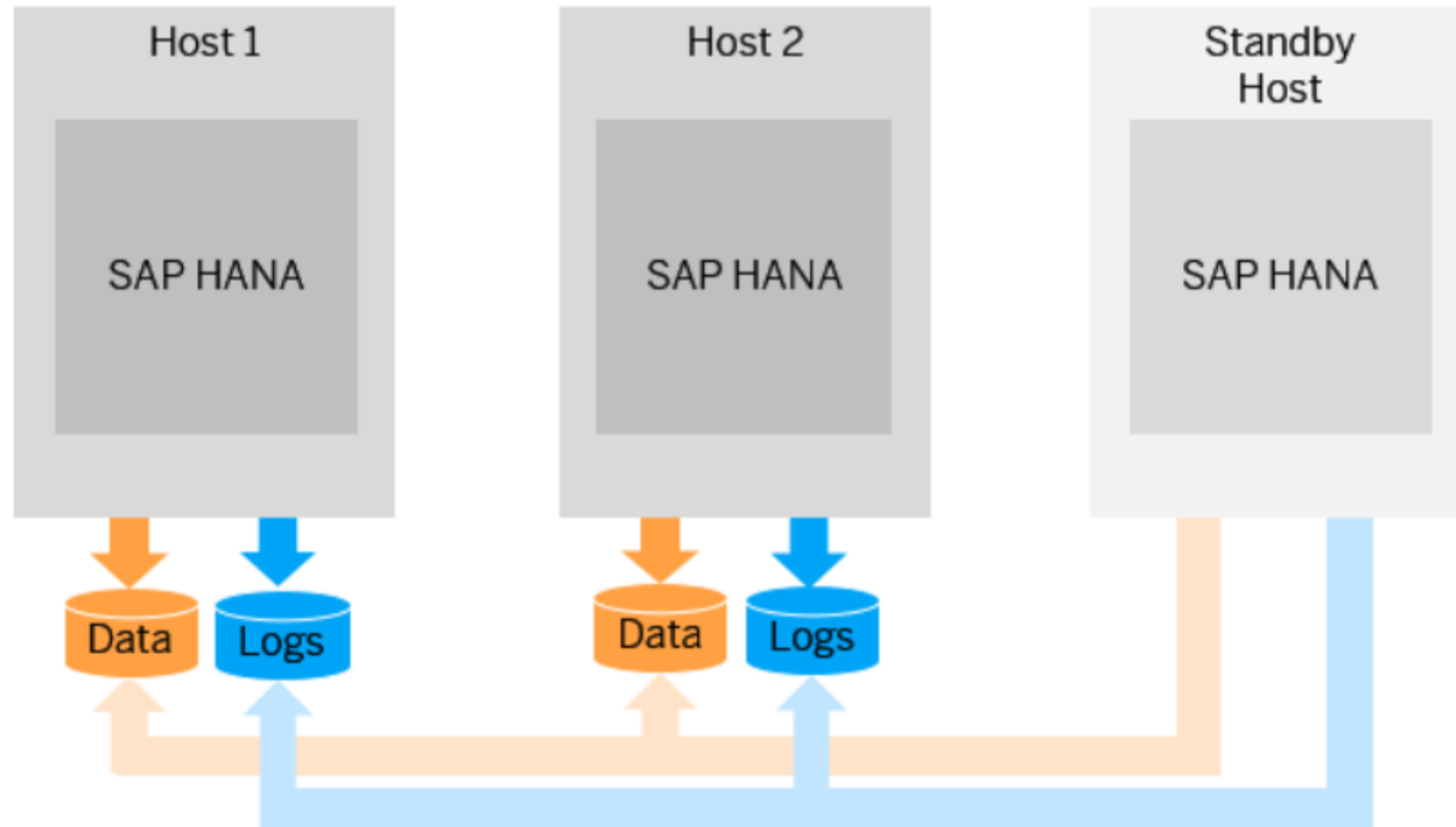
Often already used by several customers

- Usually used for DR
- Automation possible with external cluster manager

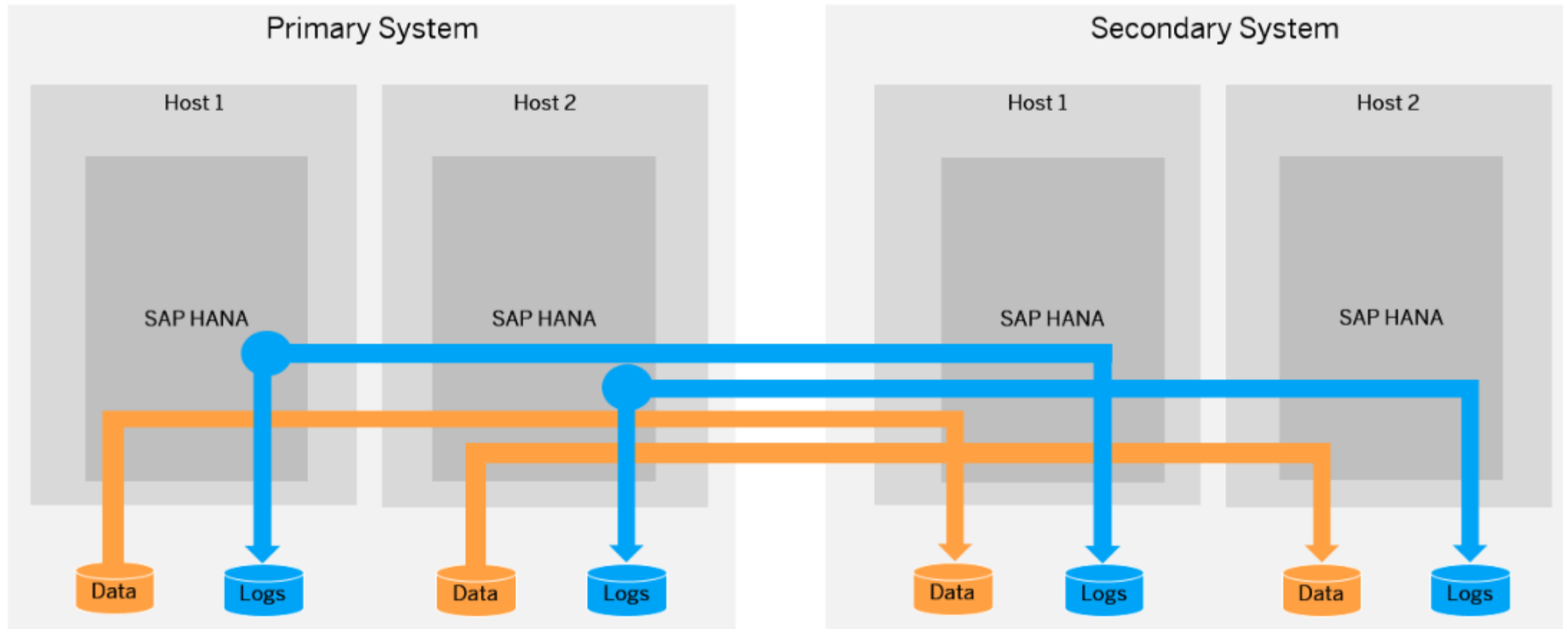


Covers HW (data center) failures on a broader scale

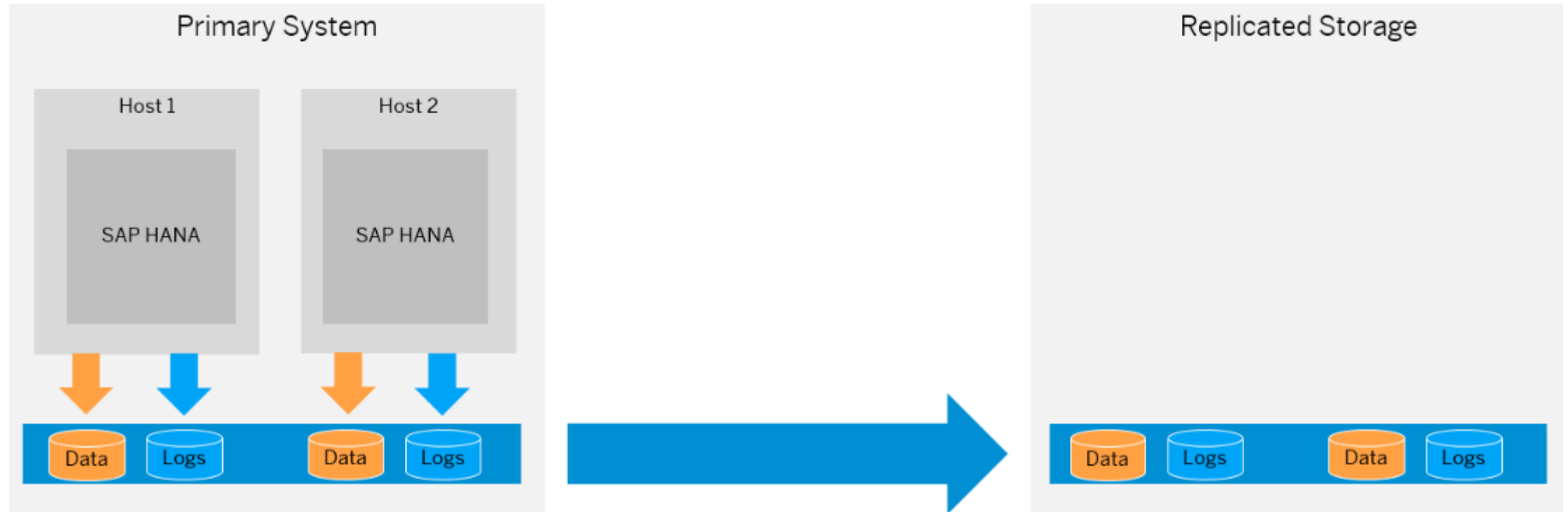
Host Auto-failover details



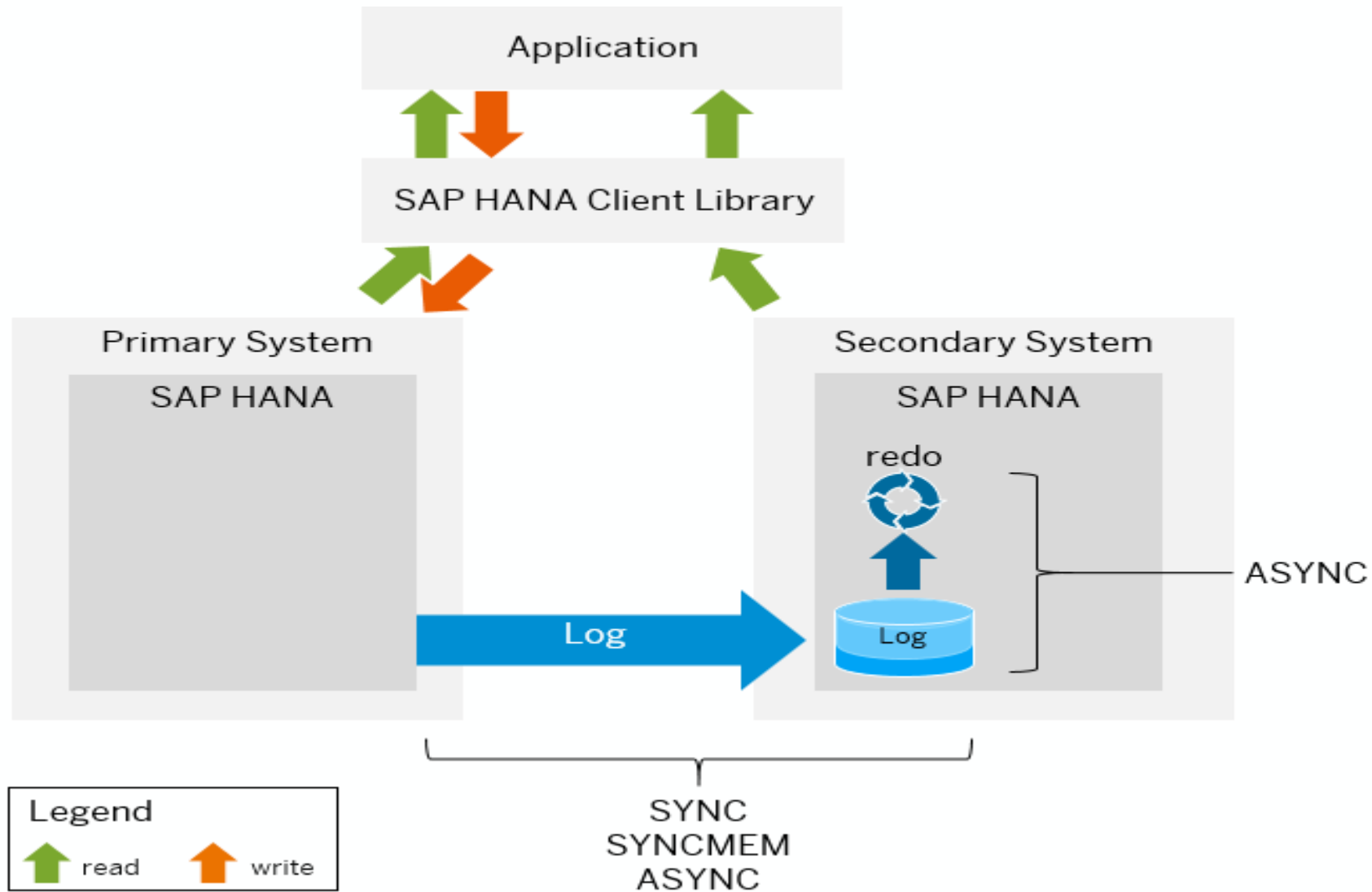
System Replication Details



Storage Replication Details



Active-Active



Back up Options

Backups Persistence

Data:

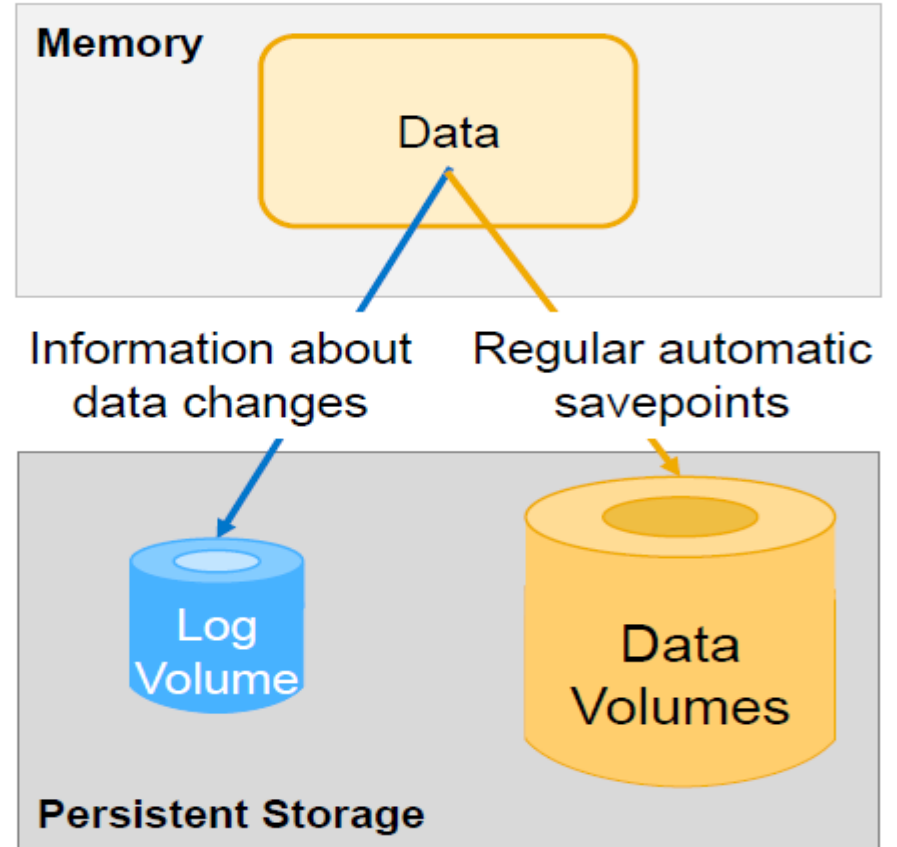
- SQL data and undo log information
- Kept in-memory to ensure maximum performance
- Write process is asynchronous

Log:

- Information about data changes (redo log)
- Directly saved to persistent storage when transaction is committed (synchronous)
- Cyclical overwrite (only after backup)

Savepoint:

- Changed data and undo log is written from memory to persistent storage
- Automatic
- At least every 5 minutes (customizable)

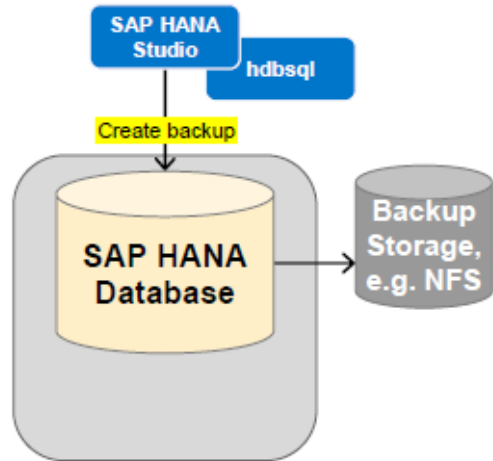


Back up Options

B&R to file system

Point-in-time recovery

- Check of physical consistency with header/trailer check sums



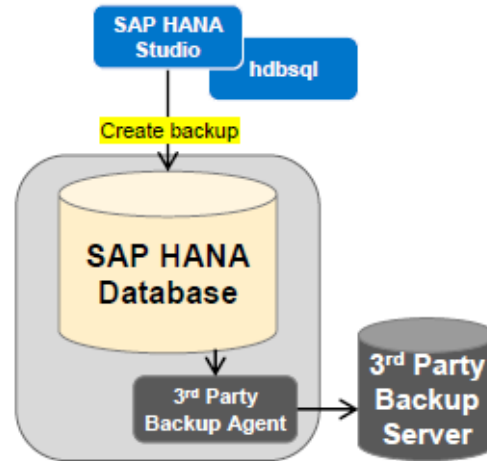
Early option often with local or remote disk pools

Follow-up work necessary to transport backup files to Save location

B&R to 3rd party backup tool

Point-in-time recovery

- Check of physical consistency with header/trailer check sums



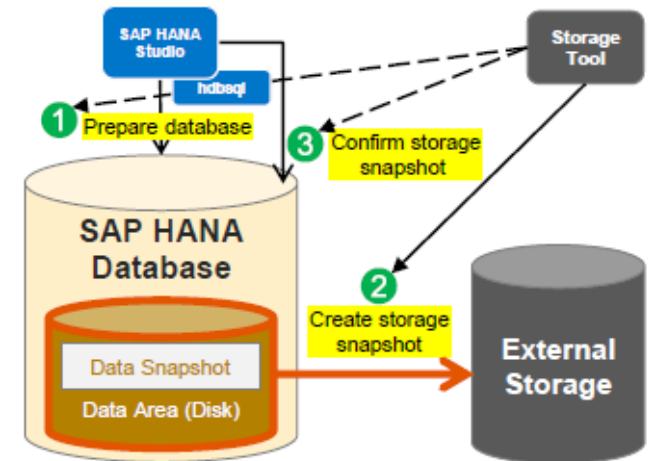
Most comfortable solution

SAP HANA has full control of B&R management

B&R using storage snapshots

Point-in-time recovery

- No check of physical consistency with header/trailer check sums



Very useful to create fast and ad-hoc backups in seconds to minutes

Better combined with the other options to get check data for free

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HA-DR implementation at Fitch

The screenshot shows the SAP HANA Studio interface for a production system. The window title is "hdbstudio - System: SYSTEMDB@... Instance: 00 Connected User: SMAHAJ01 System Usage: Production System...". The main content area displays the "SYSTEMDB@EHP (SMAHAJ01) [Production System] SYSTEMDB" overview. The "General Information" tab is active, showing various system details. A red box highlights the "System Replication Status" property, which is set to "All services are active and in sync". Other properties include "Operational Status" (All services started), "System Usage" (Production System), "Start Time of First Started Service" (Feb 16, 2019 2:15:12 PM), and "Start Time of Most Recently Started Service" (Feb 16, 2019 2:33:18 PM). The "Current Alerts and Messages" section shows 25 alerts with LOW priority. The "SAP HANA Used Memory" and "Disk Usage" sections are partially visible at the bottom.

Property	Value
Operational Status:	All services started
System Usage:	Production System
Start Time of First Started Service:	Feb 16, 2019 2:15:12 PM
Start Time of Most Recently Started Service:	Feb 16, 2019 2:33:18 PM
System Replication Status:	All services are active and in sync
Distributed System:	No
Version:	1.00.122.08.1490178281 (fa/hana1sp12)
Build Time:	Mar 22, 2017 11:32:17 AM
Platform:	SUSE Linux Enterprise Server 12.1
Linux Kernel Version:	3.12.67-60.64.24-default
Hardware Manufacturer:	Xen

HA-DR implementation at Fitch

hdbstudio - System: SYSTEMDB@[REDACTED] Instance: 00 Connected User: SMAHAJ01 System Usage: Production System - SAP HANA Studio

File Edit Navigate Project Run Window Help

SYSTEMDB@EHP

SYSTEMDB@[REDACTED] (SMAHAJ01) [Production System] SYSTEMDB [REDACTED]

Last Update: Mar 30, 2019 6:24:07 PM Interval: 60 Seconds

Overview Landscape Alerts Performance Volumes Configuration System Information Diagnosis Files Trace Configuration

Services Hosts Redistribution System Replication

Enter your filter Visible rows: 2/2 Filters... Save as File

#	HOST	#	SECONDARY_HOST	#	REPLICATION_MODE	#	REPLICATION_STATUS	#	R...	#	PORT	#	VOLUME_ID	#	SITE_ID	#	SITE_NAME	#	SECONDARY_PORT	#	SECONDARY_SITE_ID	#	SECONI
	[REDACTED]				ASync		ACTIVE				30,001		1		2		[REDACTED]		30,001		1		[REDACTED]
	[REDACTED]				ASync		ACTIVE				30,040		2		2		[REDACTED]		30,040		1		[REDACTED]

Properties Error Log

Property	Value

EHP:SAP-EHP-PUE...YSTEMDB:SMAHAJ01

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HA-DR Cluster at Fitch

The screenshot shows the SUSE Hawk web interface. The browser address bar displays a URL ending in "/630/cib/live/state". The page title is "SUSE Hawk" and the user is logged in as "hacluster". The main content area is titled "Status" and features a green checkmark icon. Below this is a "Resources" section with a search bar and a table of resources.

	Status	ID	Location	Type	Operations
+	●	fencing-sap-ehp-phe		external/ec2	■ ▾ 🔍
+	●	fencing-sap-ehp-pue		external/ec2	■ ▾ 🔍
+	●	cln_SAPHanaTopology_EHP_HD...		Clone	■ ▾ 🔍
+	●	msl_SAPHana_EHP_HDB00		Multi-state	■ 🔊 ▾ 🔍
+	●	IP_Group		Group	■ ▾ 🔍
+	●	res_AWS_RT53		aws-vpc-route53	■ ▾ 🔍

HA-DR Cluster at Fitch

The screenshot shows the SUSE Hawk web interface for managing an HA-DR cluster. The browser address bar shows a URL ending in `7630/cib/live/state`. The interface includes a sidebar with navigation options under 'MANAGE' and 'CONFIGURATION'. The main content area displays a table of resources and a 'Nodes' section with a search bar and a table of node details.

MANAGE

- Status
- Dashboard
- History

CONFIGURATION

- Add a resource
- Add a constraint
- Choose a wizard
- Edit
- Cluster Configuration

Resources Table

+	●	Name	Group	Actions
		IP_Group	Group	[-] [Q]
		res_AWS_RT53	aws-vpc-route53	[-] [Q]

Showing 1 to 6 of 6 rows 25 records per page

Nodes

Search

Status	Name	Maintenance	Standby	Operations
●	[Redacted]	[Off]	[Off]	[Refresh] [Q]
●	[Redacted]	[Off]	[Off]	[Refresh] [Q]

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Backup set up at Fitch

- Create a backup admin user such as BACKUP_ADMIN in SYSTEMDB
- Create a connection in DBACOCKPIT

User Parameters

New User

User Name*: Disable ODBC/JDBC access

Authentication

Password
Password*: Confirm*:
Force password change on next logon: Yes No

SAML SAP Logon Ticket
[Configure](#)

Kerberos X509 SAP Assertion Ticket
[Configure](#)

External ID*:

Valid From: Valid Until:

Session Client:

Granted Roles | System Privileges | Object Privileges | Analytic Privileges | Package Privileges | Application Privileges | Privileges on Users

Details for 'BACKUP OPERATOR'

System Privilege	Grantor
BACKUP ADMIN	SYSTEM
BACKUP OPERATOR	SYSTEM

Grantable to other users and roles

DB Connections: Change Connection Entry

Last Refresh: 02/01/2018 13:16:08

System Configuration | DB Connections

System ED5

SAP HANA database: Database Administration

- Current Status
- Performance
- Configuration
- Jobs
- Diagnostics
- System Information
- Documentation
- System Landscape
 - System Configuration
 - Database Connections
 - DB Connection Monitor
 - Central Calendar
 - Landscape Self-Monitoring

Database Connection Details

Connection Name: Current

Database System:

Connection Maximum:

Connection Optimum:

Permanent Connection

User Name:

Password:

Confirm:

Connection Parameters:

Parameter Name	Parameter Value
Database Host	sap-ehd-due
SQL Port	30013

Backup set up at Fitch

- Schedule backup in DB13
- Repeat the steps for each Tenant database
- Verify the backups in HANA Studio

Display Details of Action

Action Description

Action	Complete Data Backup	1 / 1
Planned Start	02/02/2018 08:53:55	
Status	Finished successfully	
Action Started	02/02/2018 08:53:55	
Action Finished	02/02/2018 08:54:16	

Action Parameters | Job Log | Program Log

General Backup Destination

Destination Type	File
Backup Destination	/backup/data/SYSTEMDB
Backup Prefix	COMPLETE_DATA_BACKUP_\$DAYOFWEEK

Note that the customer-specific changes to the SAP HANA database configuration are not saved as part of the data backup.
More Information: SAP HANA Administration Guide

Continue Re-Execute Cancel

Schedule a New Action

Action Description

Action	Complete Data Backup	1 / 1
Planned Start	02/01/2018 14:00:00	
Status		

Action Parameters | Recurrence

Recurrence Pattern

Every 1

Day(s) at

<input type="checkbox"/>	00:00	<input type="checkbox"/>	01:00	<input type="checkbox"/>	02:00	<input type="checkbox"/>	03:00	<input type="checkbox"/>	04:00	<input type="checkbox"/>	05:00
<input type="checkbox"/>	06:00	<input type="checkbox"/>	07:00	<input type="checkbox"/>	08:00	<input type="checkbox"/>	09:00	<input type="checkbox"/>	10:00	<input type="checkbox"/>	11:00
<input type="checkbox"/>	12:00	<input type="checkbox"/>	13:00	<input checked="" type="checkbox"/>	14:00	<input type="checkbox"/>	15:00	<input type="checkbox"/>	16:00	<input type="checkbox"/>	17:00
<input type="checkbox"/>	18:00	<input type="checkbox"/>	19:00	<input type="checkbox"/>	20:00	<input type="checkbox"/>	21:00	<input type="checkbox"/>	22:00	<input type="checkbox"/>	23:00

Hour(s)

Week(s) on Mon Tue Wed Thu Fri Sat Sun

Once only

Recurrence Range

Start 02/01/2018 at 14:00:00

No end date

End after 1 Occurrences

End by at 00:00:00

Execute action every 1 day(s) at 14:00

Add Cancel

Recommendation on parameters

global.ini/[system_replication] section:

enable_log_retention = auto

logshipping_max_retention_size = 1048576

keep_old_style_alert = false

global.ini/[inifile_checker]

enable = true

interval = 3600

exclusion_global.ini/SYSTEM = storage/*, persistence/*path*, *hostname_resolution*,
system_replication/*

exclusion_nameserver.ini/SYSTEM = landscape/*

exclusion_daemon.ini/HOST = */instances

exclusion_* = traceprofile_*

DR Exercise

- Simulate failure by taking network cards down (via Linux commands)
- Both HANA DB and SAP clusters failover within 5 minutes
- HANA database and SAP application both come up
- Users are back online after 5 minutes outage, and no data loss
- Perform DR to original primary sync (via system replication) – Register secondary system
- Failback both clusters
- Perform system checks
- Perform production to DR sync – register secondary

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Important OSS notes

- 1999880 - FAQ: SAP HANA System Replication
- 2183363 - Configuration of SAP HANA internal network
- 1755396 - Released DT solutions for SAP HANA with disk replication
- 2211663 - The license changes in an SAP HANA database after the deregistration of the secondary site from a system replication setting
- 2369981 - Required configuration steps for authentication with HANA System Replication
- 611361 - Hostnames of SAP ABAP Platform servers
- 1945676 - Correct usage of hdbnsutil -sr_unregister
- 2036111 - Configuration parameters for the SAP HANA system
- 2063657 - SAP HANA System Replication Takeover Decision Guideline
- 2053504 - System replication: Hanging client processes after a takeover
- 2391079 - Access restrictions in Active/Active (read enabled) system setup

References

- <http://help.sap.com>
- Open SAP course - High Availability and Disaster Recovery with the SAP HANA Platform
<https://open.sap.com/>
- SAP Blogs <https://blogs.sap.com/2017/01/18/>

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Presentation Materials

Access the slides from 2019 ASUG Annual Conference here:

<http://info.asug.com/2019-ac-slides>

Q&A

For questions after this session, contact us at ranjit.prithviraj@fitchratings.com and sanjay.mahajan@fitchratings.com.

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