

TECH NOTE

Nutanix Database Service Database Data Protection

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Nutanix, Inc.
1740 Technology Drive, Suite 150
San Jose, CA 95110

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1. Introduction

Audience

This tech note is part of the Nutanix Solutions Library. We wrote it for architects and database administrators who seek to understand how Nutanix Database Service (NDB) (formerly Nutanix Era) can protect database data. Readers of this document should already be familiar with Nutanix, databases, and NDB.

Purpose

In this document, we cover the following topics:

- Backup and quick restore points.
- Database data, which includes database data files and database transaction log files.
- External backup and restore solutions.
- NDB management plane high availability.

Note: This document doesn't discuss specific technical steps to recover databases using any of the methods described. It only provides a high-level overview of the options.

Unless otherwise stated, the solution described in this document is valid on all supported AOS releases.

Document Version History

Version Number	Published	Notes
1.0	September 2020	Original publication.
2.0	January 2021	Updated with Era 2.1 capabilities.

Version Number	Published	Notes
2.1	March 2022	Refreshed content.
2.2	July 2022	Updated product naming from Nutanix Era to Nutanix Database Service.

Nutanix Database Service

NDB (formerly Nutanix Era) automates and simplifies database administration, bringing one-click simplicity and invisible operations to database provisioning and life-cycle management.

NDB enables database administrators to perform operations such as database registration, provisioning, cloning, patching, and restore. It allows administrators to define provisioning standards with end-state driven functionality that includes network segmentation, high availability database deployments, and much more. With the NDB multicloud capability, you can easily manage databases across multiple locations, both on-premises and in the cloud, with Nutanix clusters.

For more information, read the [NDB solution brief](#).

2. Nutanix Database Service Database Data Protection

NDB, the Nutanix database-as-a-service (DBaaS) management plane, operates on one or more VMs running in a Nutanix cluster with at least three Nutanix nodes (physical servers). The default NDB management plane deployment in a single Nutanix cluster consists of one VM running all services (API, agent, database, and web).

The following figure presents a logical implementation of the NDB VM, database VMs, Nutanix cluster, and the physical hardware.

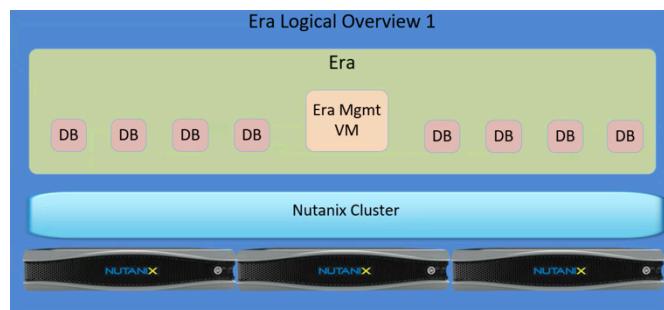


Figure 1: Overview of NDB, Database VMs, Nutanix, and Hardware

In a multicloud NDB environment, where NDB manages database VMs in multiple Nutanix clusters, the NDB management plane requires one NDB management agent VM running only the agent service in each additional Nutanix cluster it manages. The NDB management VM still runs all four services.

The following figure expands on the previous one to include the two Nutanix clusters and an NDB management agent VM.



Figure 2: Overview of Multicloud NDB Deployment

You can deploy the NDB management plane in a high availability configuration that includes six VMs:

- One VM that provides the front-end services (API, agent, web).
- Two VMs that provide a high availability proxy service. Used by the front-end services to communicate with the back-end service.
- Three VMs that provide the back-end service (Postgres DB cluster).

NDB's time machine functionality, which captures and maintains snapshots and transactional logs of your source databases as defined in the service-level agreement (SLA) schedule, manages database data protection. Use the time machine functionality to create clones of your database VMs and restore them to a point in time using snapshots and transactional logs.

Note: This document doesn't discuss how to configure NDB time machine or third-party backup and restore solutions to meet recovery point objectives (RPOs) or recovery time objectives (RTOs).

NDB provides options for long-term retention and low RPOs. You can define and apply these options by database workload using the Era SLA profiles, which offer the following configurable options:

- Continuous database snapshot retention days.
- Number of daily database snapshots specified in days.
- Weekly database snapshot retention specified in weeks.
- Monthly database snapshot retention specified in months.
- Quarterly snapshot retention specified in quarters.

- Log catch-up, which defines how often database transaction log files are copied from the source database VM to the NDB management plane.

You can apply NDB database data protection quickly to provide consistent and storage-optimized backup and restore options. The RPO is based on the log catch-up definition, so NDB copies the database transaction log files from the database to the NDB management service. You can also combine NDB with existing backup and restore solutions to respect your specific requirements.

There are multiple options to protect database data for NDB-managed databases. Base your decision on the business and technical requirements of your specific use case. Requirements that may influence the decision include:

- Uptime requirements.
- RPOs.
- RTOs.
- Failure domain.
- Whether you require separate systems (hardware and OS) to run workloads and store backups.

The options we discuss here involve the following entities:

- One or two Nutanix clusters (NTNX01 and NTNX02 in the figures).
- The NDB management plane (ERA), which consists of one or more VMs and runs in NTNX01.
- Databases with their corresponding VMs managed by NDB. We highlight one database workload, DB1, throughout the options.
- Database snaps (DB Snap), the snapshots created of the databases managed by NDB.
- Transactional log files (DB Trn) created by the databases but stored and controlled by NDB.
- An external backup and restore (B&R) solution.

Option 1: Nutanix Database Service with One Nutanix Cluster

With a single Nutanix cluster, NDB protects database workloads by:

- Storing database transaction log files in the NDB management plane logical construct, which is external to the VMs running the databases.
- Storing snapshots of the VMs and their databases in the Nutanix cluster (NTNX01).

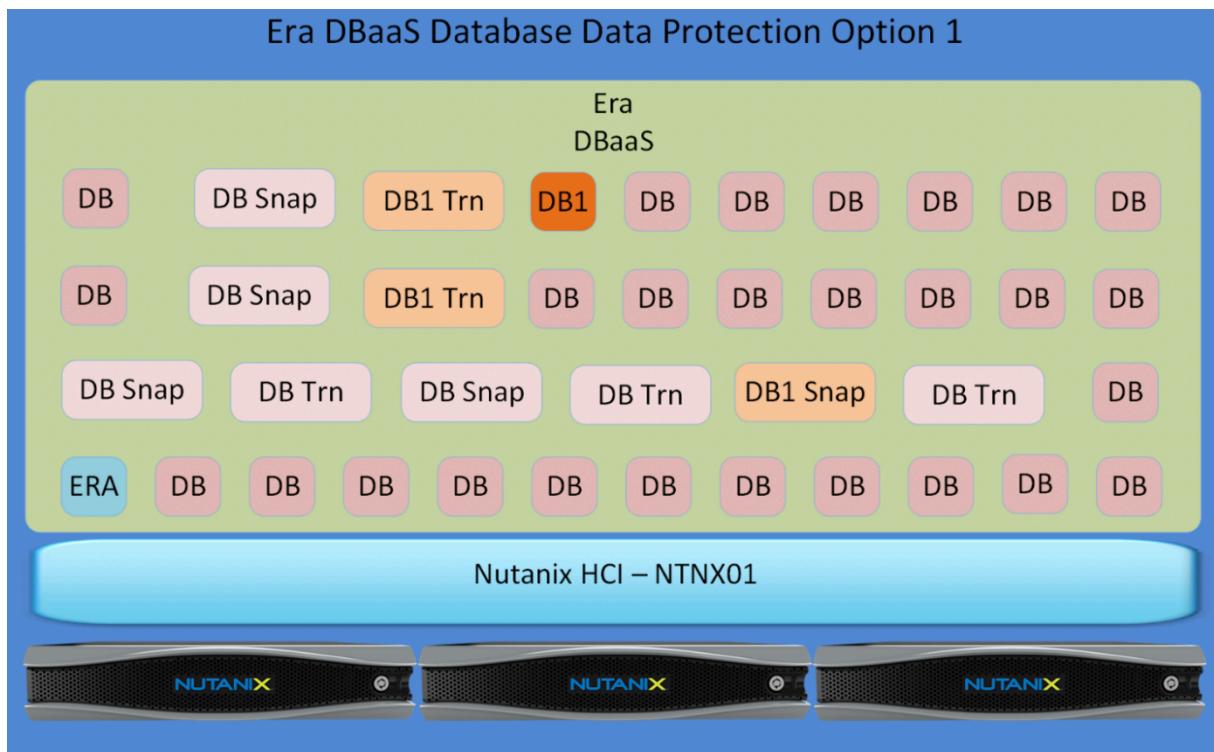


Figure 3: NDB with One Nutanix Cluster Overview

DB1 (VM and database) runs in NTNX01, which is also where the database data protection entities are maintained.

Option 2: Nutanix Database Service with Multiple Nutanix Clusters

With multiple Nutanix clusters, NDB protects database workloads by:

- Storing database transaction log files in the NDB management plane logical construct, which is external to the database VMs. The transactional log files are stored in NTN01 and NTN02. Additional Nutanix clusters can store the transactional log files if desired.
- Storing snapshots of the VMs and their databases in the Nutanix cluster where the VMs and their databases run, as well as in one additional Nutanix cluster. You can use multiple additional Nutanix clusters if desired.

Note: You can apply different SLA profiles and snapshot maintenance definitions to the different Nutanix clusters.

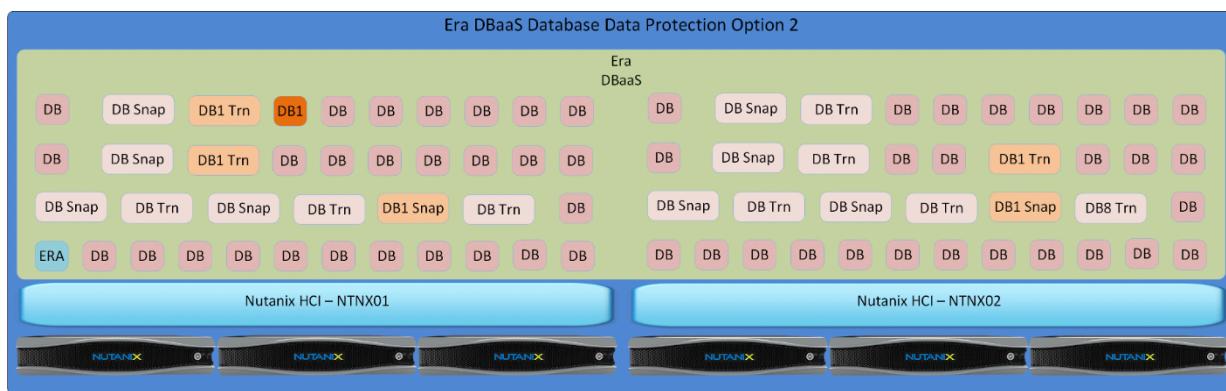


Figure 4: NDB with Multiple Nutanix Clusters Overview

DB1 runs in NTN01, so NDB protects the database data by:

- Storing database snapshots (DB1 Snap) in NTN01 and NTN02.
- Storing database transaction log files (DB1 Trn) in NTN01 and NTN02.

Option 3: Nutanix Database Service with One Nutanix Cluster and External Backup and Restore

This option is the same as running NDB with one Nutanix cluster, but it includes an external backup and restore solution. In addition to the protection capabilities mentioned, this solution stores the VMs and their databases outside the NDB logical and physical construct.

You can automatically install and configure external backup and restore agents based on your requirements when you provision databases with NDB. Use NDB

pre- and post-command capabilities or drive installation and configuration using an external orchestration endpoint.

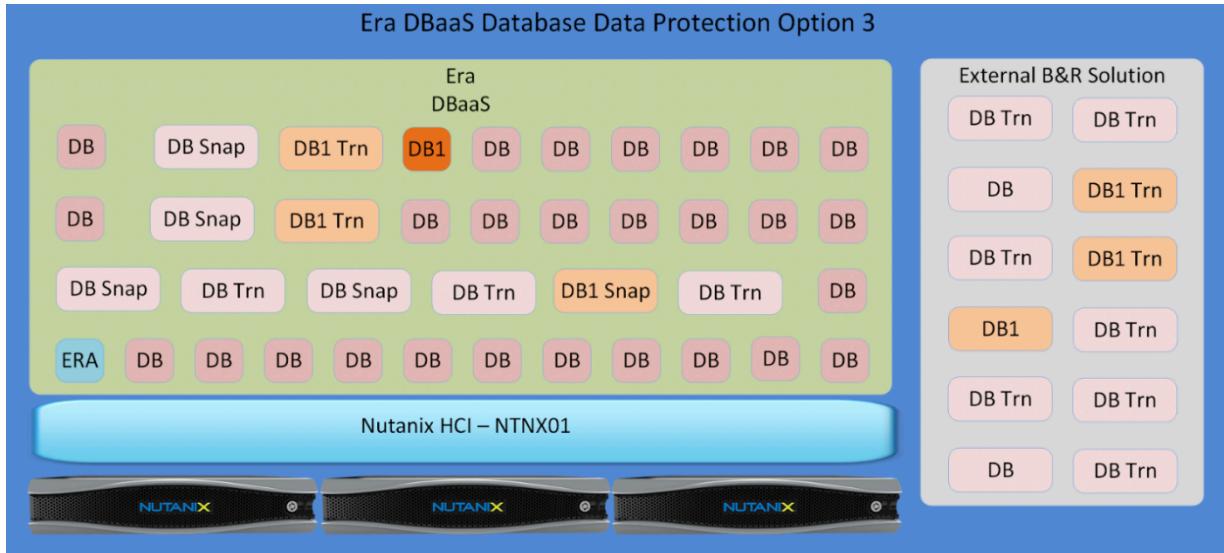


Figure 5: NDB with One Nutanix Cluster and External Backup and Restore Overview

The external backup and restore solution can run on Nutanix HCI but must be in a Nutanix cluster separate from the one where the NDB management plane runs.

DB1 runs in NTNX01, so NDB protects the database data by:

- Storing database snapshots (DB1 Snap) and database transaction log files (DB1 Trn) in NTN01.
 - Storing the information to restore the VM (as an entity or at the file level) and a copy of DB1 Trn in the external backup and restore system.

Option 4: Nutanix Database Service with Multiple Nutanix Clusters and External Backup and Restore

This option is the same as running NDB with multiple Nutanix clusters, but it includes an external backup and restore solution. In addition to the protection capabilities mentioned, this solution stores the VMs and their databases outside the NDB logical and physical construct.

You can automatically install and configure external backup and restore agents based on your requirements when you provision databases with NDB. Use NDB pre- and post-command capabilities or drive installation and configuration using an external orchestration endpoint.

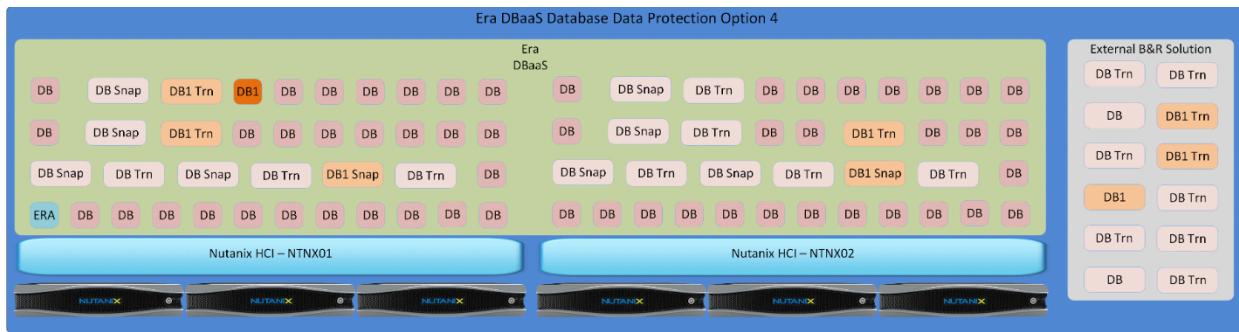


Figure 6: NDB with Multiple Nutanix Clusters and External Backup and Restore Overview

The external backup and restore solution can run on Nutanix HCI but must be in a Nutanix cluster separate from the one where the NDB management plane runs.

DB1 runs in NTN01, so NDB protects the database data by:

- Storing database snapshots (DB1 Snap) in NTN01 and NTN02.
- Storing database transaction log files (DB1 Trn) in NTN01 and NTN02 plus the external backup and recovery system.
- Storing the information to restore the VM (as an entity or at the file level) in the external backup and recovery system.

Option 5: External Backup and Restore

This option uses an external backup and restore system to protect database data, which lacks NDB's fast, storage-efficient backups and takes longer to restore. We don't suggest using this method.

You can automatically install and configure external backup and restore agents based on your requirements when you provision databases with NDB. Use NDB pre- and post-command capabilities or drive installation and configuration using an external orchestration endpoint.

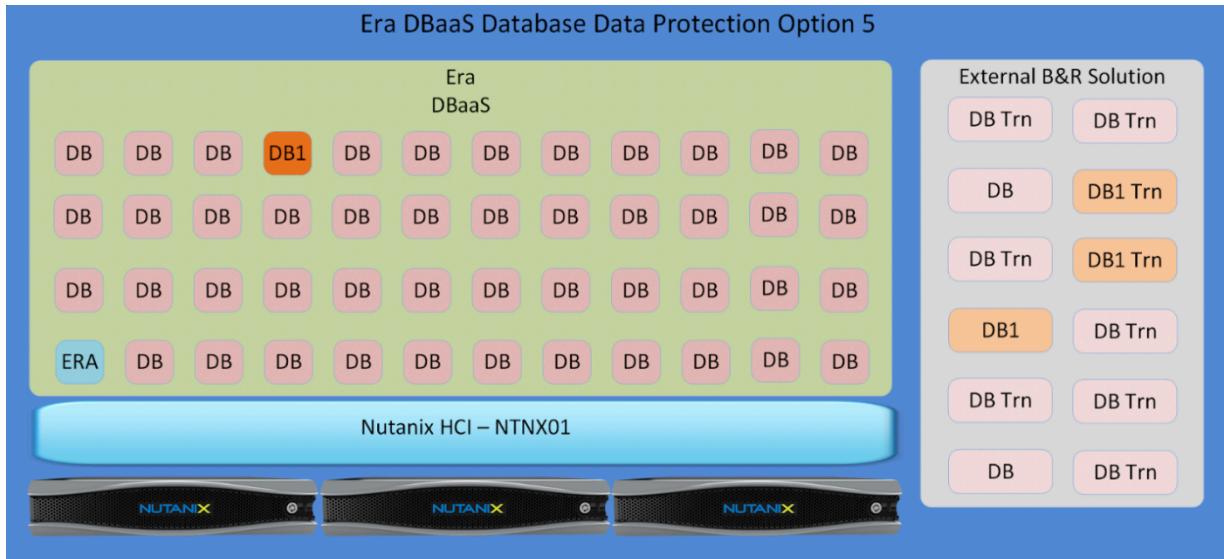


Figure 7: External Backup and Restore Overview

The external backup and restore solution can run on Nutanix HCI but must be in a Nutanix cluster separate from the one where the NDB management plane runs.

DB1 runs in NTNX01, so the solution protects database data by:

- Storing the information to restore the VM (as an entity or at the file level) and database transaction log files (DB1 Trn) in the external backup and restore system.

This option applies when using NDB time machine cloning and refresh capabilities or when the time machine capabilities aren't used at all.

Database Data Protection Option Comparison

This section provides a summary of the advantages and disadvantages of the different database data protection options.

Table: Option 1: NDB with One Nutanix Cluster

Pros	Cons
Fast recovery with Nutanix HCI.	The Nutanix cluster is a single point of failure.

Pros	Cons
Storage-optimized.	Backups of database transaction log files are stored in the same system that the database runs in.
Uses the same management solution for the running database workloads and business continuity.	
Uses the same infrastructure solution for the running database workloads and database data protection.	

Table: Option 2: NDB with Multiple Nutanix Clusters

Pros	Cons
Fast recovery with Nutanix HCI.	Consumes additional storage because some information is stored twice.
Backups are stored in two locations: in the same system where the databases run and in a different system.	

Table: Option 3: NDB with One Nutanix Cluster and External Backup and Restore

Pros	Cons
Fast recovery with Nutanix HCI.	Consumes additional storage because some information is stored twice.
Backups are stored in two locations: in the same system where the databases run and in the external backup and recovery system.	Requires multiple solutions (including management interfaces) to protect database data. NDB doesn't have control over or insight regarding the external backup and restore solution. Requires integration development or additional deployment and configuration steps to automatically protect the NDB-deployed database workloads with the external backup and restore solution.

Table: Option 4: NDB with Multiple Nutanix Clusters and External Backup and Restore

Pros	Cons
<p>Fast recovery with Nutanix HCI.</p> <p>Backups are stored in multiple locations: in the same system where the databases run, in a different system, and in the external backup and recovery system.</p>	<p>Consumes additional storage because some information is stored in at least three systems.</p> <p>Requires multiple solutions (including management interfaces) to protect database data.</p> <p>NDB doesn't have control over or insight into the external backup and restore solution.</p> <p>Requires integration development or additional deployment and configuration steps to automatically protect the NDB-deployed database workloads with the external backup and restore solution.</p>

Table: Option 5: External Backup and Restore

Pros	Cons
<p>Backups are stored in the external backup and recovery system.</p>	<p>Consumes additional storage because some information is stored twice for restore capabilities.</p> <p>Requires multiple solutions (including management interfaces) to protect database data.</p> <p>NDB doesn't have control over or insight into the external backup and restore solution.</p> <p>Requires integration development or additional deployment and configuration steps to automatically protect the Era-deployed database workloads with the external backup and restore solution.</p>

Recommendations

- Make educated decisions based on the database data protection requirements for each database workload.
- Use Era with multiple Nutanix clusters to avoid one Nutanix cluster being the single point of failure.
- Use an external backup and restore solution in addition to multiple Nutanix clusters if you have one or more of the following technical requirements:
 - › You must store backups in a system based on technology that is different from the technology running workloads.
 - › You must maintain backups in a specific backup and restore system.
 - › You require different media types for long-term archiving.

3. Appendix

Nutanix Database Service Management Plane

The NDB management plane consists of one or more VMs and stores information about entities such as databases, clones, time machines, and backups in the NDB repository. Depending on availability requirements, you can deploy the NDB management plane in a single VM or in multiple VMs.

With a single-VM deployment, the NDB management services, database, and application (including APIs and the UI) all run in the same VM, which relies on hypervisor high availability to protect against hypervisor failure.

With a multiple-VM deployment, a PostgreSQL cluster with three VMs provides high availability to the NDB repository. When the primary database fails, NDB automatically fails over to a standby database. In addition to the PostgreSQL VMs, there are two http proxy VMs and one application VM, for a total of six VMs in the high-availability NDB topology. This setup increases uptime during unexpected failures (such as hypervisor or Era VM failures), planned maintenance, and upgrades.

About Nutanix

Nutanix is a global leader in cloud software and a pioneer in hyperconverged infrastructure solutions, making clouds invisible and freeing customers to focus on their business outcomes. Organizations around the world use Nutanix software to leverage a single platform to manage any app at any location for their hybrid multicloud environments. Learn more at www.nutanix.com or follow us on Twitter [@nutanix](https://twitter.com/nutanix).

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