Oracle® Cloud

Using Oracle Database Autonomous Recovery Service

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Contents

Preface

This guide describes how to use Autonomous Recovery Service to protect Oracle Cloud databases.

Audience

This guide is intended for database administrators responsible for the following tasks:

- Managing backup and restore for Oracle Cloud databases
- Maintaining backups

To use this document, you must be familiar with:

- Oracle Cloud Infrastructure concepts as described in Getting Started with Oracle Cloud Infrastructure
- Oracle Database concepts, basic database administration including backup and recovery concepts.

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The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Overview of Oracle Database Autonomous Recovery Service

Oracle Database Autonomous Recovery Service is a fully managed, standalone, and centralized cloud backup solution for Oracle Cloud Infrastructure (OCI) databases. Learn about the key concepts and benefits of using Oracle Database Autonomous Recovery Service.

- About Oracle Database Autonomous Recovery Service
  Oracle Database Zero Data Loss Autonomous Recovery Service, is a fully managed service based on the on-premises Oracle Zero Data Loss Recovery Appliance (ZDLRA) technology which offers modern cyber security protection for Oracle Databases of any size.
- Recovery Service Terminology
  Before using Recovery Service, familiarize yourself with the following key terms and concepts, including some terms related to Oracle Cloud Infrastructure Networking.
- Recovery Service Components
  Access Recovery Service components using the Oracle Cloud Infrastructure Console.
- Oracle Database Autonomous Recovery Service Technical Architecture
  This technical architecture diagram illustrates the Autonomous Recovery Service backup and recovery work flow for Oracle Databases in OCI and for Multicloud Oracle Databases.

About Oracle Database Autonomous Recovery Service

Oracle Database Zero Data Loss Autonomous Recovery Service, is a fully managed service based on the on-premises Oracle Zero Data Loss Recovery Appliance (ZDLRA) technology which offers modern cyber security protection for Oracle Databases of any size.

Recovery Service is the recommended solution for protecting Oracle Databases and provides the following unique advantages over Object Storage backups while keeping costs the same:

- **Achieve Faster Backups with Less Database Overhead** – Recovery Service eliminates the weekly full backup and uses an offloaded incremental forever backup paradigm, so that the database CPU, memory and I/O overheads are reduced along with the backup window. Your valuable database resources can now be more focused on business needs rather than backup tasks.
- **Be Confident in Reliable Recovery** – Recovery Service validates all backups for data anomalies which can impact recovery operations. Combining this validation process with immutability and enforced encryption, your data is safe, unalterable by anyone in the tenancy, and always ready for recovery in case of a ransomware attack.
- **Get Deeper Insights into your Database Protection** – Recovery Service provides a centralized data protection dashboard and addresses key questions on the state of your database backups. Are my backups healthy? How long has it been since my last backup? How far back can I recover? How much space is my backup using? Are all my databases using the same retention policy?

Oracle Database Zero Data Loss Autonomous Recovery Service is a unique solution which builds on the preceding advantages and enables an additional capability:

- **Zero Data Loss for all Database Backups** – The premium Zero Data Loss Autonomous Recovery Service provides real-time protection of the database, enabling recovery to within less than a second of when an outage or ransomware attack occurs. Now, if a ransomware attack happens, you know you are protected up to the moment before instead of having to go back to the last scheduled backup, which could have been hours ago.

Select Autonomous Recovery Service as the backup destination for Oracle managed automatic backups, which is the method that Oracle recommends for backing up Oracle Cloud Databases.

Recovery Service Terminology

Before using Recovery Service, familiarize yourself with the following key terms and concepts, including some terms related to Oracle Cloud Infrastructure Networking.

Level 0 Incremental Backup
A level 0 incremental backup performs the same function as a full backup in that they both back up all blocks that have ever been used. The difference is that a full backup does not affect blocks backed up by subsequent incremental backups, whereas an incremental backup affects blocks backed up by subsequent incremental backups.

Level 1 Backup or Incremental Backup
Incremental backups at level 1 back up only blocks that have changed since previous incremental backups. Blocks that have not changed are not sent again, because they are represented already in the level 0 or previous level 1 backups.

Protected Database
An Oracle Cloud database that sends backups to Recovery Service.

Protection Policy
A mechanism used by Recovery Service to control backup retention for protected databases. A protection policy defines the length of time, expressed as a window of time extending backward from the present, that backups are retained. Recovery Service retains database backups for a minimum period of 14 days and maximum period of 95 days. Each protected database must be assigned with one protection policy. A protection policy can be a Oracle-defined policy or a custom policy defined by you as per your internal storage requirements. You can associate multiple protected databases to a single protection policy.

Recovery point objective (RPO)
The data-loss tolerance of a business process or an organization. The RPO is often measured in terms of time, for example, five hours or two days worth of data loss.

Real-time Data Protection
The continuous transfer of redo changes from a protected database to Recovery Service. Real-time data protection helps to achieve a recovery point objective (RPO) near the last sub-second.

Recovery Service Catalog
A metadata database containing information about backups. Metadata views are stored in Oracle Cloud and managed by Recovery Service.

Recovery Service subnet
A Recovery Service subnet identifies a private subnet that is dedicated to backup operations within a virtual cloud network (VCN) in your tenancy. The OCI Console provides an easy-to-use interface to register Recovery Service subnets.

Recovery window
The maximum length of time, counting backward from the current time, that a database can be recovered.

Retention Period
The length of time, expressed as a window of time extending backward from the present, that backups are retained by Recovery Service. Recovery Service can retain database backups for a minimum period of 14 days and a maximum period of 95 days.

RMAN
Recovery Manager (RMAN) is the primary utility for backup and recovery of Oracle databases. RMAN enables a protected database to send backups to Recovery Service.

Subnet
A subnet is a networking component and a subdivision in a VCN. You must designate a private subnet for Recovery Service to access OCI databases in a VCN.

Virtual Cloud Network (VCN)
A virtual, private network that you set up in Oracle data centers.

Virtual Level 0
A complete database image as of one distinct point in time, maintained efficiently through the indexing of incremental backups from a protected database. The virtual full backups contain individual blocks from multiple incremental backups.

Recovery Service Components

Access Recovery Service components using the Oracle Cloud Infrastructure Console.

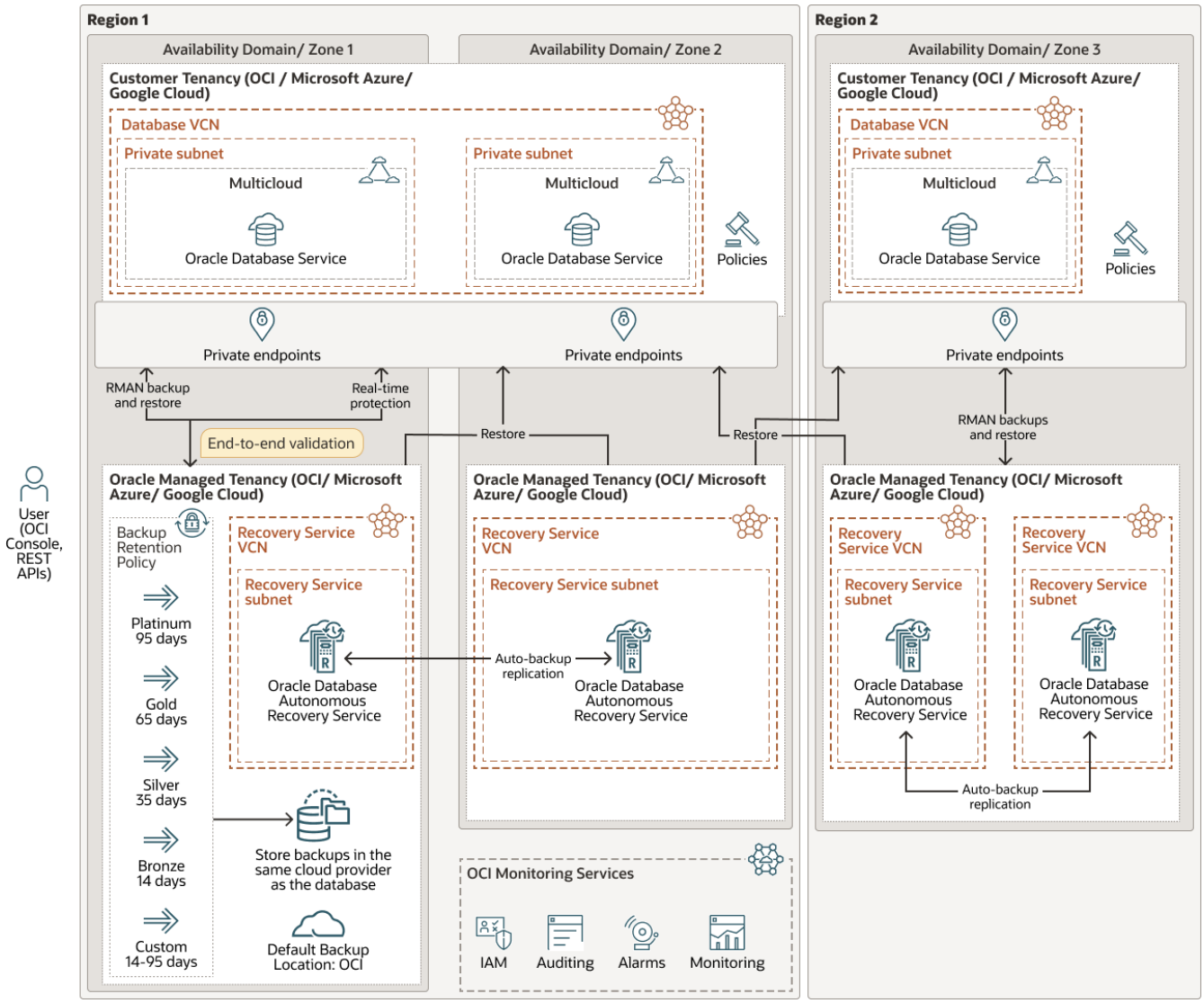
Table 1-1 Components of Recovery Service

Component	Description	More Information
Recovery Service subnets	Provides the interface to register a private subnet required to allow Recovery Service to access databases in a VCN.	Managing Recovery Service Subnets
Protection policies	Provides the interface to define the backup retention period and to configure additional options for backup storage and protection.	Managing Protection Policies
Protected databases	The component that represents an Oracle Cloud Database in Recovery Service. A protected database resource is created when you enable the Oracle-managed automatic backups option for a database, and set Autonomous Recovery Service as the backup destination.	Managing Protected Databases

Oracle Database Autonomous Recovery Service Technical Architecture

This technical architecture diagram illustrates the Autonomous Recovery Service backup and recovery work flow for Oracle Databases in OCI and for Multicloud Oracle Databases.

Figure 1-1 Oracle Database Autonomous Recovery Service Technical Architecture



> **Note:**
>
> Explore Oracle Database interactive architecture diagrams on Oracle Help Center.

Oracle Database Autonomous Recovery Service supports backups and data protection for Oracle Databases in OCI and multicloud Oracle Databases such as Oracle Database@Azure and Oracle Database@Google Cloud.

The OCI Console provides a unified interface to define your backup strategy using Recovery Service resources. Recovery Service centralizes backup storage in Oracle Cloud (default cloud backup location for protected databases). A protection policy based mechanism controls your backup storage demands. You do not need to perform any manual tasks to address storage utilization or monitoring.

Recovery Service requires a private subnet for backup and recovery operations in each database virtual cloud network (VCN) within your tenancy. Oracle recommends that your database VCN includes at least one private subnet dedicated for backups to Recovery Service. You can then register a Recovery Service subnet to allow Recovery Service to access databases in the VCN.

You can implement access control by assigning Oracle Cloud Infrastructure (OCI) policies. In the Console, use the Policy Builder to select **Autonomous Recovery Service** as the Policy Use Case, and then select the predefined policy templates. Policies permit Recovery Service to access databases in a chosen VCN and also allows the supported database services in OCI and multicloud Oracle Databases to use Recovery Service for data protection. For example, use the `Ability to do all things with Autonomous Recovery Service` policy template to allow a Oracle Database service in OCI to use Recovery Service. Assign the **Let Oracle Database@Azure use Autonomous Recovery Service for backup** policy template to allow an Oracle Database@Azure resource to use Recovery Service.

Recovery Service retains protected database backups for a minimum period of 14 days and a maximum period of 95 days. You can either choose the Oracle-defined policies (Platinum, Gold, Silver, or Bronze) that support common use cases for data retention, or create custom policies to suit your demands for backup retention. You can optionally enforce a retention lock on the backup retention period so that Recovery Service can prevent the modification or deletion of backups until the retention period ends. Retention lock is an optional feature to safeguard your protected database backups from inadvertent changes or malicious damages, such as ransomware attacks.

Recovery Service supports multicloud Oracle Databases and provides the flexibility to store backups either in Oracle Cloud (default backup storage location) or in the same cloud location where the database resides. By default, Recovery Service stores protected databases and related backups in Oracle Cloud. If you enable the **Store backups in the same cloud provider as the database** option for a protection policy, then Recovery Service stores the policy-linked protected database and its backups in the target database cloud location instead of Oracle Cloud. For example, for Oracle Database@Azure, Recovery Service stores the associated protected database backups in Azure if you have selected the **Store backups in the same cloud provider as the database** option in the protection policy.

Auto-backup replication is used for backup high-availability within a region. You can restore to any availability domain, zone, or region.

Recovery Service offers the real-time data protection feature that enables protected databases to minimize the possibility of data loss. A protected database can continuously transfer redo logs to Recovery Service and achieve a recovery point objective (RPO) near the last sub-second. Real-time data protection is an extra cost option.

You can also use the Oracle Cloud Infrastructure Monitoring service, including Alarms, to monitor database protection status and storage utilization. Recovery Service uses the Oracle Cloud Infrastructure Audit service, which automatically records calls to Recovery Service application programming interface (API) endpoints as log events.

2

Configuring Recovery Service

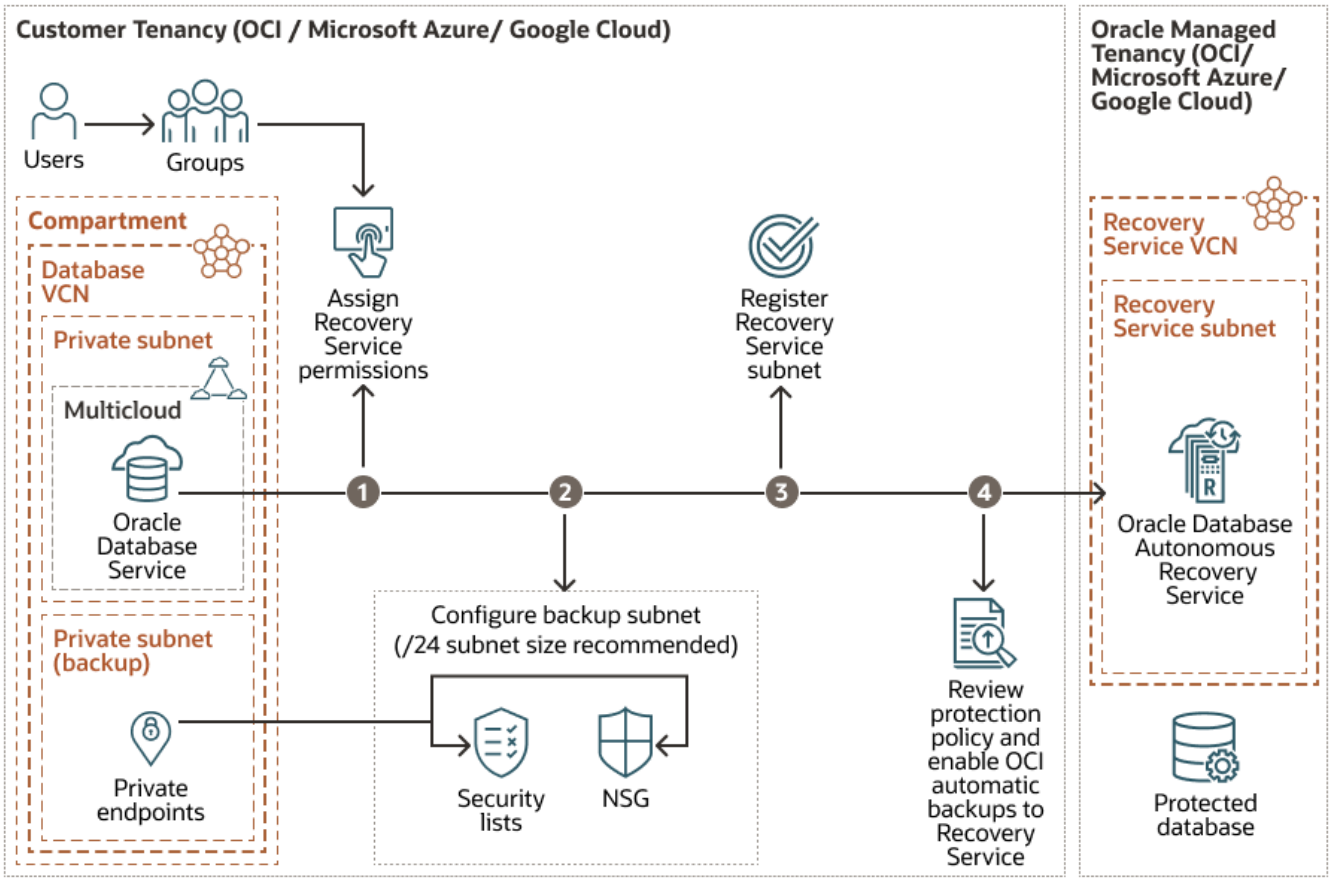
Review and complete the configuration tasks required to implement Recovery Service in your tenancy.

- Prerequisite Tasks for Using Recovery Service
  Before you enable and use Recovery Service as the backup destination, you must ensure to verify the minimum requirements and complete all the prerequisite tasks specific to your Oracle Cloud Database service.
- Oracle Database Releases That Support Recovery Service
  You can use Oracle Database Autonomous Recovery Service as the backup destination for Oracle Cloud databases provisioned with the following Oracle Database releases.
- Review Limits for Recovery Service
  A service limit is the quota or allowance set on a resource. Use the console to verify that your tenancy's Recovery Service resource limits are adequate to meet your database backup demands.
- Create Groups and Users to Manage Recovery Service
  Create Oracle Cloud Infrastructure (OCI) user accounts and groups to manage Recovery Service resources.
- Permissions Required for Oracle Databases in OCI to Use Recovery Service
  Assign the permissions required for OCI Databases to use Recovery Service for backups.
- Permissions Required for Multicloud Oracle Databases to Use Recovery Service
  Assign the permissions required for Oracle Database@Azure or Oracle Database@Google Cloud to use Recovery Service for backups.
- Configuring Network Resources for Recovery Service
  Use an IP4-only subnet in the database VCN for Recovery Service operations. Define security rules to control the backup traffic between your database and Recovery Service. Finally, register the private subnet as a Recovery Service subnet.
- Register a Recovery Service Subnet
  After you have created a private subnet for Recovery Service in your database VCN, use this procedure to register the subnet in Recovery Service.
- (Optional) Review Protection Policies for Database Backup Retention
  Recovery Service provides predefined protection policies to suit common use cases for backup retention. You can optionally create custom protection policies to suit your internal data retention requirements.
- Ways to Manage Recovery Service Resources
  In Oracle Cloud Infrastructure (OCI), you can create and manage Recovery Service resources using a variety of interfaces provided to fit your different management use cases.

Prerequisite Tasks for Using Recovery Service

Before you enable and use Recovery Service as the backup destination, you must ensure to verify the minimum requirements and complete all the prerequisite tasks specific to your Oracle Cloud Database service.

Figure 2-1 Prerequisite Configuration Steps to Enable Recovery Service for Database Backups



- **Common Requirements for Oracle Database Services to Use Recovery Service**, see Table 2-1
  Common mandatory prerequisites required for using Recovery Service.
- **Prerequisites for Oracle Databases in OCI**, see Table 2-2
  Specific prerequisites for Oracle Exadata Database Service on Dedicated Infrastructure and Oracle Base Database Service to use Recovery Service for backups.
- **Prerequisites for Multicloud Oracle Databases**, see Table 2-3
  Specific prerequisites for multicloud Oracle Database services to use Recovery Service for backups.

> **Note:**
>
> Operational backups to two different backup destinations may create data loss scenarios. Therefore, before you enable automatic backups to Recovery Service, you must disable manual backup scripts and processes to other storage destinations.

Table 2-1 Common Requirements for Oracle Database Services to Use Recovery Service

Requirement	More Information
Verify whether Recovery Service is supported for your target database version.	Oracle Database Releases That Support Recovery Service
Ensure that Recovery Service resource limits are adequate.	Review Limits for Recovery Service
As a tenancy administrator, create the Oracle Cloud Infrastructure IAM users and groups to manage Recovery Service related tasks.	Create Groups and Users to Manage Recovery Service

Table 2-2 Prerequisites for Supported Oracle Databases in OCI

Step	Task	More Information
1	Use the Autonomous Recovery Service policy templates to assign permissions for Oracle Cloud Databases in OCI to use Recovery Service for backups.	Permissions Required for Oracle Databases in OCI to Use Recovery Service
2	Configure the required network resources to enable the backup network path to Recovery Service.	Configuring Network Resources for Recovery Service
3	Register a Recovery Service subnet.	Register Recovery Service Subnet
4	Review protection policies and enable automatic backups to Autonomous Recovery Service	(Optional) Review Protection Policies for Database Backup Retention Enable Automatic Backups to Recovery Service

Table 2-3 Prerequisites for Oracle Database@Azure and Oracle Database@Google Cloud

Step	Task	More Information
1	Use the Autonomous Recovery Service policy templates to assign the permissions required for Oracle Database@Azure or Oracle Database@Google Cloud to use Recovery Service for backups.	Permissions Required for Multicloud Oracle Databases to Use Recovery Service

Table 2-3 (Cont.) Prerequisites for Oracle Database@Azure and Oracle Database@Google Cloud

Step	Task	More Information
2	Do one of the following for Oracle Database@Azure and Oracle Database@Google Cloud: • If your backup subnet meets the recommended /24 subnet size requirement, then skip this step and directly proceed to register a Recovery Service subnet using NSG as described in step 3. • If your backup subnet does not meet the minimum subnet size requirements, you must first configure the network resources as described in this step, and then proceed to register the Recovery Service subnet.	Configuring Network Resources for Recovery Service
3	Register a Recovery Service subnet. For multicloud Oracle Databases, such as Oracle Database@Azure or Oracle Database@Google Cloud, you must register the Recovery Service subnet by associating NSGs.	Register Recovery Service Subnet
4	Review protection policies and then enable automatic backups to Recovery Service.	(Optional) Review Protection Policies for Database Backup Retention Enable Automatic Backups to Recovery Service

Related Topics

- Autonomous Recovery Service Checklist

Oracle Database Releases That Support Recovery Service

You can use Oracle Database Autonomous Recovery Service as the backup destination for Oracle Cloud databases provisioned with the following Oracle Database releases.

Table 2-4 Oracle Database Releases that Support Recovery Service

Oracle Database Edition and Version	More Information
Oracle Database 19c Release 16 (19.16) or later	Your target database must meet these minimum requirements: • To use Recovery Service, your target database must have a minimum compatibility level of 19.0 (the `COMPATIBLE` initialization parameter must be set to 19.0.0 or higher). • To use the Real-time data protection feature, your database must be provisioned with Oracle Database 19c Release 18 (19.18) or later.

Table 2-4 (Cont.) Oracle Database Releases that Support Recovery Service

Oracle Database Edition and Version	More Information
Oracle Database 21c Release 7 (21.7) or later	Your target database must meet these minimum requirements: • To use Recovery Service, your target database must have a minimum compatibility level of 19.0 (the `COMPATIBLE` initialization parameter must be set to 19.0.0 or higher). • To use the Real-time data protection feature, your database must be provisioned with Oracle Database 21c Release 8 (21.8) or later.
Oracle Database 23ai (23.4) or later	To use Recovery Service, your target database must have a minimum compatibility level of 19.0 (the `COMPATIBLE` initialization parameter must be set to 19.0.0 or higher).

> **Note:**
>
> For information about the supported Database Services in the Oracle US Government Cloud, see Oracle Database Releases That Support Recovery Service in Oracle US Government Cloud.

Related Topics

- Real-time Data Protection
  Recovery Service offers the real-time data protection feature that enables protected databases to minimize the possibility of data loss.

Review Limits for Recovery Service

A service limit is the quota or allowance set on a resource. Use the console to verify that your tenancy's Recovery Service resource limits are adequate to meet your database backup demands.

Autonomous Recovery Service has maximum limits for the number of protected databases and the backup storage space utilization. The limits apply to each region.

Table 2-5 Autonomous Recovery Service Resource Limits

Resource	Oracle Universal Credits	Pay As You Go or Trial
Autonomous Recovery Service Protected Database Count	Contact Us	Contact Us
Autonomous Recovery Service Space Used for Recovery Window (GB)	Contact Us	Contact Us

Use the console to review the current service limits and usage information, and request an increase in resource limits, if necessary.

1. In the navigation menu, select **Governance & Administration**, and then select **Tenancy Management**.

2. Select **Limits, Quotas and Usage**.
3. Select **Autonomous Recovery Service** from the **Service** list.

   Review the current limits and usage information.
4. Request a service resource limit increase, if necessary.

   See Requesting a Service Limit Increase for detailed steps.

> **Note:**
>
> You can also control the resource utilization within compartments. See Quota Policy Quick Start for detailed information.

Related Topics

- Service Limits

Create Groups and Users to Manage Recovery Service

Create Oracle Cloud Infrastructure (OCI) user accounts and groups to manage Recovery Service resources.

You can then assign Recovery Service policy statements to the groups. For example, create a group called `recoveryserviceadmin` and assign the policy that allows the group to manage protected databases, protection policies, and Recovery Service subnets.

Table 2-6 Creating Groups and Users for Recovery Service

Task	More Information
Create a group	To create a group
Create users	To create a user
Add users to a group	To add a user to a group
Assign policies to groups	Permissions Required for Oracle Databases in OCI to Use Recovery Service

Permissions Required for Oracle Databases in OCI to Use Recovery Service

Assign the permissions required for OCI Databases to use Recovery Service for backups.

In the Policy Builder, select **Autonomous Recovery Service** as the **Policy Use Case**, and then select these predefined policy templates:

- Ability to do all things with Autonomous Recovery Service
- Let users manage protection policies in Autonomous Recovery Service
- Let users manage Autonomous Recovery Service Subnets

> **Note:**
>
> Recovery Service includes separate policy templates for Oracle Database@Azure and Oracle Database@Google Cloud. If you are configuring Recovery Service for your multicloud Oracle Database, then skip this step and proceed to Permissions Required for Multicloud Oracle Databases to Use Recovery Service.

Ability to do all things with Autonomous Recovery Service

The **Ability to do all things with Autonomous Recovery Service** policy template includes all the policy statements required to provide permissions for the supported database services to use Recovery Service, and for Recovery Service to use the network resources to access databases in a VCN.

You can either select the policy template or add these policy statements using the manual editor in the Policy Builder.

Table 2-7 Policy Statements Required for Using Recovery Service

Policy Statement	Create In	Purpose
`Allow service database to manage recovery-service-family in tenancy`	Root compartment	Enables the OCI Database Service to access protected databases, protection policies, and Recovery Service subnets within your tenancy.
`Allow service database to manage tagnamespace in tenancy`	Root compartment	Enables the OCI Database Service to access the tag namespace in a tenancy.
`Allow service rcs to manage recovery-service-family in tenancy`	Root compartment	Enables Recovery Service to access and manage protected databases, Recovery Service subnets, and protection policies within your tenancy.
`Allow service rcs to manage virtual-network-family in tenancy`	Root compartment	Enables Recovery Service to access and manage the private subnet in each database VCN within your tenancy. The private subnet defines the network path for backups between a database and Recovery Service.
`Allow group admin to manage recovery-service-family in tenancy`	Root compartment	Enables users in a specified group to access all Recovery Service resources. Users belonging to the specified group can manage protected databases, protection policies, and Recovery Service subnets.

Let users manage protection policies in Autonomous Recovery Service

The **Let users manage protection policies in Autonomous Recovery Service** policy template grants permissions for users in a specified group to create, update, and delete protection policy resources in Recovery Service.

You can either select the policy template or add this policy statement using the manual editor in the Policy Builder.

Table 2-8 Policy Statement for Managing Protection Policies

Policy Statement	Create In	Purpose
`Allow group {group name} to manage recovery-service-policy in compartment {location}`	Compartment that owns the protection policies.	Enables all users in a specified group to create, update, and delete protection policies in Recovery Service.

Consider this example.

```
RecoveryServiceUserABC

Allow group RecoveryServiceUser to manage recovery-service-policy in
compartment ABC
```

Let users manage Autonomous Recovery Service Subnets

The **Let users manage Autonomous Recovery Service subnets** policy template grants permissions for users in a specified group to create, update, and delete Recovery Service subnet resources.

You can either select the policy template or add this policy statement in the Policy Builder.

Table 2-9 Policy Statement for Managing Recovery Service Subnets

Policy Statement	Create In	Purpose
`Allow Group {group name} to manage recovery-service-subnet in compartment {location}`	Compartment that owns the Recovery Service subnets.	Enables all users in a specified group to create, update, and delete Recovery Service subnets.

Consider this example.

```
RecoveryServiceAdminABC

Allow group RecoveryServiceAdmin to manage recovery-service-subnet in
compartment ABC
```

Related Topics

- Recovery Service Resource Types and Policies
  Learn how to develop policies required to control Recovery Service resources.

Permissions Required for Multicloud Oracle Databases to Use Recovery Service

Assign the permissions required for Oracle Database@Azure or Oracle Database@Google Cloud to use Recovery Service for backups.

In the Policy Builder, select **Autonomous Recovery Service** as the **Policy Use Case**, and then select one of these policy templates relevant to your multicloud Oracle Database service.

- Let Oracle Database@Azure use Autonomous Recovery Service for backup
- Let Oracle Database@Google Cloud use Autonomous Recovery Service for backup

Let Oracle Database@Azure use Autonomous Recovery Service for backup

This policy template includes these policy statements required by Oracle Database@Google Cloud to use Recovery Service for backups.

```
Allow service database to manage recovery-service-family in tenancy
Allow service database to manage tagnamespace in tenancy
Allow service rcs to manage recovery-service-family in tenancy
Allow service rcs to manage virtual-network-family in tenancy
Allow group admin to manage recovery-service-family in tenancy
Allow service database to use organizations-assigned-subscription in tenancy
where target.subscription.serviceName = 'ORACLEDBATAZURE'
```

`ORACLEDBATAZURE` indicates the service name for Oracle Database@Azure.

Let Oracle Database@Google Cloud use Autonomous Recovery Service for backup

This policy template includes these policy statements required by Oracle Database@Google Cloud to use Recovery Service for backups.

```
Allow service database to manage recovery-service-family in tenancy
Allow service database to manage tagnamespace in tenancy
Allow service rcs to manage recovery-service-family in tenancy
Allow service rcs to manage virtual-network-family in tenancy
Allow group admin to manage recovery-service-family in tenancyAllow service
database to use
organizations-assigned-subscription in tenancy where
target.subscription.serviceName = 'ORACLEDBATGOOGLE'
```

`ORACLEDBATGOOGLE` indicates the service name for Oracle Database@Google Cloud.

See Multicloud Oracle Database Backup Support for more information about using Recovery Service for multicloud Oracle Database backups.

Configuring Network Resources for Recovery Service

Use an IP4-only subnet in the database VCN for Recovery Service operations. Define security rules to control the backup traffic between your database and Recovery Service. Finally, register the private subnet as a Recovery Service subnet.

> **Note:**
>
> For Oracle Database@Azure and Oracle Database@Google Cloud, if your backup subnet meets the recommended /24 subnet size requirement, then skip this section and directly proceed to register the Recovery Service subnet using network security groups (NSGs). Otherwise, you must first complete the steps described in this section, and then proceed to register the Recovery Service subnet.

- About Using a Private Subnet for Recovery Service
  Recovery Service uses a private subnet inside a virtual cloud network (VCN) where your database resides. The private subnet defines the network path for backups between your database and Recovery Service.
- Review Networking Service Permissions to Configure a Subnet
  Ensure that you have these Networking Service permissions required to create a subnet in the database VCN and to assign security rules for Recovery Service.
- Review Subnet Size Requirements and Security Rules for Recovery Service Subnet
  The security rules are necessary to allow backup traffic between a database and Recovery Service.
- Create a Recovery Service Subnet in the Database VCN
  Use the OCI Console to configure a private subnet for Recovery Service in your database virtual cloud network (VCN).

About Using a Private Subnet for Recovery Service

Recovery Service uses a private subnet inside a virtual cloud network (VCN) where your database resides. The private subnet defines the network path for backups between your database and Recovery Service.

Oracle recommends that your database VCN must have a single private subnet dedicated for backups to Recovery Service. Your Oracle Cloud database can reside in the same private subnet used by Recovery Service, or in a different subnet within the same VCN.

You can either create a private subnet or use a preexisting subnet in your database VCN. Oracle recommends that you use a subnet size of /24 (256 IP addresses).

> **Note:**
>
> Select an IPv4-only subnet for Recovery Service in your database VCN. Do not select an IPv6-enabled subnet as Recovery Service does not support using an IPv6-enabled subnet. See Creating a Subnet to learn more.

The database VCN requires security rules to allow backup traffic between your database and Recovery Service. Security rules must include stateful ingress rules to allow destination ports 8005 and 2484. You can use these Networking service features to implement security rules:

- Security Lists
  A security list allows you to add security rules at the subnet level. In your database VCN, select the security list that is used for the Recovery Service subnet, and add the ingress rules to allow destination ports 8005 and 2484.
- Network Security Groups (NSG)
  Network security groups (NSG) enable granular control over security rules that apply to individual VNICs in a VCN. Recovery Service supports these options to configure security rules using NSGs:
  - To implement network isolation, create one NSG for the database VNIC (add egress rules to allow ports 2484 and 8005) and a separate NSG for Recovery Service (add ingress rules to allow ports 2484 and 8005).
  - Create and use a single NSG (with egress and ingress rules) for the database VNIC and Recovery Service.

> **Note:**
>
> If you have configured a security list and an NSG within your database VCN, then the rules defined in the NSGs takes precedence over the rules defined in a security list.

See Comparison of Security Lists and Network Security Groups to learn more.

After you create a private subnet in the database VCN, assign the security rules and then register the subnet as a Recovery Service subnet in Recovery Service. If you have created NSGs to implement security rules, then you must also ensure to associate the Recovery Service NSG with the Recovery Service subnet.

> **Note:**
>
> Oracle recommends using a private subnet for your backups. However, it is possible to use a public subnet.

Review Networking Service Permissions to Configure a Subnet

Ensure that you have these Networking Service permissions required to create a subnet in the database VCN and to assign security rules for Recovery Service.

Table 2-10 Networking Service Permissions Required to Create a Private Subnet and Configure Security Rules for Recovery Service

Operation	Required IAM Policies
Configure a private subnet in a database VCN	• `use vcns` for the compartment which the VCN is in • `use subnets` for the compartment which the VCN is in • `manage private-ips` for the compartment which the VCN is in • `manage vnics` for the compartment which the VCN is in • manage vnics for the compartment which the database is provisioned or is to be provisioned in

Alternatively, you can create a policy that allows a specified group with broader access to networking components.

For example, use this policy to allow a `NetworkAdmin` group to manage all networks in any compartment in a tenancy.

Example 2-1 Policy for Network Administrators

```
Allow group NetworkAdmin to manage virtual-network-family in tenancy
```

Review Subnet Size Requirements and Security Rules for Recovery Service Subnet

The security rules are necessary to allow backup traffic between a database and Recovery Service.

> **Note:**
>
> Select an IPv4-only subnet for Recovery Service in your database VCN. Do not select an IPv6-enabled subnet as Recovery Service does not support using an IPv6-enabled subnet. See Creating a Subnet to learn more.

Table 2-11 Subnet Size Requirements and Ingress Rules for the Recovery Service Private Subnet

Item	Requirements
Recommended subnet size	/24 (256 IP addresses)
General ingress rule 1: Allow HTTPS traffic from Anywhere	This rule allows backup traffic from your Oracle Cloud Infrastructure Database to Recovery Service. • **Stateless**: No (all rules must be stateful) • **Source Type**: CIDR • **Source CIDR**: CIDR of the VCN where the database resides • **IP Protocol**: TCP • **Source Port Range**: All • **Destination Port Range**: 8005

Table 2-11 (Cont.) Subnet Size Requirements and Ingress Rules for the Recovery Service Private Subnet

Item	Requirements
General ingress rule 2: Allows SQLNet Traffic from Anywhere	This rule allows recovery catalog connections and real-time data protection from your Oracle Cloud Infrastructure Database to Recovery Service. • **Stateless**: No (all rules must be stateful) • **Source Type**: CIDR • **Source CIDR**: CIDR of the VCN where the database resides • **IP Protocol**: TCP • **Source Port Range**: All • **Destination Port Range**: 2484

> **Note:**
>
> If you use network security groups (NSG) to implement security rules or if your database VCN restricts network traffic between subnets, then ensure to add an egress rule for ports 2484 and 8005 from the database NSG or subnet to the Recovery Service NSG or subnet that you create.

Create a Recovery Service Subnet in the Database VCN

Use the OCI Console to configure a private subnet for Recovery Service in your database virtual cloud network (VCN).

> **Note:**
>
> For Oracle Database@Azure and Oracle Database@Google Cloud, if your backup subnet meets the recommended /24 subnet size requirement, then skip this section and directly proceed to register the Recovery Service subnet using network security groups (NSGs). Otherwise, you must first complete the steps described in this section, and then proceed to register the Recovery Service subnet.

1. In the navigation menu, select **Networking**, and then select **Virtual cloud networks** to display the Virtual Cloud Networks page.
2. Select the VCN in which your database resides.
3. Use these steps to create a Recovery Service subnet with a security list. If you choose to use network security groups, then proceed to step 4.
   a. Under **Resources**, select **Security Lists**.
   b. Select the security list that is used for the VCN.

      You must add two ingress rules to allow destination ports 8005 and 2484.
   c. Click **Add Ingress Rules** and add these details to set up a stateful ingress rule that allows HTTPS traffic from anywhere:
      - **Source Type**: `CIDR`

- **Source CIDR**: Specify the CIDR of the VCN where the database resides.
- **IP Protocol**: `TCP`
- **Source Port Range**: `All`
- **Destination Port Range**: `8005`
- **Description**: Specify an optional description of the ingress rule to help manage the security rules.

d. Click **Add Ingress Rule** and add these details to set up a stateful ingress rule that allows SQLNet traffic from anywhere:

- **Source Type**: `CIDR`
- **Source CIDR**: Specify the CIDR of the VCN where the database resides.
- **IP Protocol**: `TCP`.
- **Source Port Range**: `All`
- **Destination Port Range**: `2484`.
- **Description**: Specify an optional description of the ingress rule to help manage the security rules.

> **Note:**
>
> Select an IPv4-only subnet for Recovery Service in your database VCN. Do not select an IPv6-enabled subnet as Recovery Service does not support using an IPv6-enabled subnet. See Creating a Subnet to learn more.

See: Review Subnet Size Requirements and Security Rules for Recovery Service Subnet for more information.

e. In the Virtual Cloud Networks Details page, click **Create Subnet**.

f. Create a private subnet or select a private subnet that already exists in the database VCN. Oracle recommends a subnet size of /24 (256 IP addresses) for the private subnet.

g. In the Subnet Details page, under **Resources** select **Security Lists**. Add the security list that includes the ingress rules to allow destination ports 8005 and 2484.

> **Note:**
>
> If your database VCN restricts network traffic between subnets, then ensure to add an egress rule for ports 2484 and 8005 from the database subnet to the Recovery Service subnet that you create.

4. Use these steps to create a Recovery Service subnet with network security groups (NSG).

a. Under **Resources**, select **Network Security Groups**.

b. Click **Create Network Security Group**.

Use one of these supported methods to configure security rules using NSGs:

- To implement network isolation, create one NSG for the database VNIC (add egress rules to allow ports 2484 and 8005) and a separate NSG for Recovery Service (add ingress rules to allow ports 2484 and 8005).

- Create and use a single NSG (with egress and ingress rules) for the database VNIC and Recovery Service.

The Network Security Group page lists the NSGs that you create.

> **Note:**
>
> For additional configuration details, refer the relevant OCI Database Service documentation.

5. After you create the Recovery Service subnet in the database VCN, proceed to register the subnet as a Recovery Service subnet. Oracle recommends that you register a single Recovery Service subnet per VCN.

   If you have implemented security rules using NSGs, then you must also ensure to add the Recovery Service NSG to the Recovery Service subnet.

Register a Recovery Service Subnet

After you have created a private subnet for Recovery Service in your database VCN, use this procedure to register the subnet in Recovery Service.

Multiple protected databases can use the same Recovery Service subnet. In order to ensure that the required number of IP addresses are available to support the Recovery Service private endpoints, you can assign multiple subnets to a Recovery Service subnet that is used by more than one protected database.

> **Note:**
>
> - Select an IPv4-only subnet for Recovery Service in your database VCN. Do not select an IPv6-enabled subnet as Recovery Service does not support using an IPv6-enabled subnet.
> - For Oracle Database@Azure and Oracle Database@Google Cloud, you must register the Recovery Service subnet by associating network security groups (NSG).

Ensure that you have completed the prerequisite configuration tasks specific to your Oracle Database service before you register the Recovery Service subnet.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. In the **Compartment** field, select a compartment where you want to create the Recovery Service subnet.
5. Click **Register Recovery Service subnet**, and specify the details.
6. In the **Name** field, enter a name for the Recovery Service subnet.
7. In the **Compartment** field, select the compartment where you want to create the Recovery Service subnet.

8. In the **Virtual cloud network** field, select the database VCN.

   Click **Change Compartment** to select a VCN belonging to a different compartment.

9. In the **Subnet** field, select a private subnet that you have configured for Recovery Service operations in your database VCN.

   Click **Change Compartment** to select a private subnet from a different compartment.

10. (Optional) Click **+Another Subnet** to assign an additional subnet to the Recovery Service subnet.

    If a single subnet does not contain enough IP addresses to support the Recovery Service private endpoints, then you can assign multiple subnets.

11. Click **Show advanced options** to configure these additional features.

    - Network security groups
    - Tags

    If you have used a network security group (NSG) to implement security rules for Recovery Service in the database VCN, then you must add the Recovery Service NSG to the Recovery Service subnet. The Recovery Service NSG can reside in the same compartment or in a different compartment. However, the NSG must belong to the same VCN to which the specified subnet belongs.

    > **Note:**
    >
    > For Oracle Database@Azure and Oracle Database@Google Cloud, you must register the Recovery Service subnet by associating network security groups (NSG).

    a. In the **Network security groups** section, select **Use network security groups to control traffic**.

    b. Select the Recovery Service NSG you have created in the database VCN.

    c. Click **+Another network security group** to associate multiple NSGs (maximum five).

    (Optional) In the **Tag Namespace** field, consider adding a tag namespace, or tagging the control with an existing tag namespace.

12. Click **Register**.

You can replace a subnet or add more subnets to support the required number of private endpoints.

13. Use these steps to update an existing Recovery Service subnet:

    a. In the Recovery Service subnet details page, under **Resources**, click **Subnets**.

    b. Click **Add subnets** and select the subnets you want to add.

    c. To replace an existing subnet, click the Action menu, and select **Remove subnet**. You can then add another subnet.

    > **Note:**
    >
    > A Recovery Service subnet must be associated with at least one subnet belonging to your database VCN.

14. Use these steps to manage the network security groups (NSGs) for an existing Recovery Service subnet:
    a. In the **Network security groups** section, click **Add network security groups**.
    b. Select and add the Recovery Service network security groups (maximum five).
    c. To remove an NSG, select the resource and click **Remove**.

(Optional) Review Protection Policies for Database Backup Retention

Recovery Service provides predefined protection policies to suit common use cases for backup retention. You can optionally create custom protection policies to suit your internal data retention requirements.

1. In the navigation menu, select **Oracle Database**, and then select **Database Backups** to view the Database Backups page.
2. Click **Protection Policies**.
3. Recovery Service provides four Oracle-defined protection policies based on typical use cases for backup retention. You cannot modify these policies:
    - **Platinum**: 95 days
    - **Gold**: 65 days
    - **Silver**: 35 days
    - **Bronze**: 14 days
4. Optionally, create a custom policy to suit your backup retention requirements. See: Creating a Protection Policy .

Related Topics

- Policy-Based Data Protection Management
  Recovery Service simplifies backup management through protection policies.

Ways to Manage Recovery Service Resources

In Oracle Cloud Infrastructure (OCI), you can create and manage Recovery Service resources using a variety of interfaces provided to fit your different management use cases.

Interface	More Information
OCI Console	Using the Console
Application Programming Interfaces (APIs)	Oracle Database Autonomous Recovery Service API
Command-Line Interfaces (CLIs)	Using the CLI

Related Topics

- Using Recovery Service to Backup and Recover Oracle Cloud Databases
  Learn how to configure Recovery Service as the backup destination for Oracle Cloud Infrastructure (OCI) managed automatic backups.
- Using the API to Manage Recovery Service Resources
  Review the list of APIs that you can use for managing Recovery Service resources.

3

Recovery Service Concepts

Recovery Service is designed to leverage the combined capabilities of the Oracle Zero Data Loss Recovery Appliance and Oracle Recovery Manager (RMAN).

- Backup Automation and Storage in Oracle Cloud
  Recovery Service stores backups in Oracle Cloud by default.
- Network Isolation for Backup Operations
  Recovery Service requires a private subnet for backup and recovery operations in each database virtual cloud network (VCN) within your tenancy.
- Centralized Backup Management
  Centralize your database backup strategy in Oracle Cloud Infrastructure (OCI).
- Policy-Based Data Protection Management
  Recovery Service simplifies backup management through protection policies.
- Real-time Data Protection
  Recovery Service offers the real-time data protection feature that enables protected databases to minimize the possibility of data loss.
- Typical Workflow for Recovery Service Administrators
  Review the workflow as a guide to configure Recovery Service for backing up your Oracle Cloud databases.

Backup Automation and Storage in Oracle Cloud

Recovery Service stores backups in Oracle Cloud by default.

Recovery Service centralizes backup storage in Oracle Cloud. A protection policy based mechanism controls your database backup retention and storage requirements. You do not need to perform any manual tasks to address storage utilization or monitoring.

The OCI-managed automatic backups feature is the preferred backup method for Oracle Cloud Databases because you can easily configure the backup settings using the Console.

When you enable automatic backups for an Oracle Database Service resource, such as an Exadata Cloud Service instance database or an Oracle Base Database DB System, you can set Autonomous Recovery Service as the backup destination. You must assign a Recovery Service protection policy to automate backup retention, cloud storage location, and backup protection.

The database can then transfer backups to Recovery Service for complete and secure data protection.

You can create an on-demand long-term retention (LTR) backup with Recovery Service and retain the backup for up to **10** years. LTR backups are independent of the automatic backups and stored in the Object Storage Infrequent Access tier. You can restore an LTR backup to create a new database within the retention period.

Recovery Service enforces a single protection policy for each database. A protection policy defines the number of days to retain database backups for recoverability. A policy also allows you to set a preferred cloud location to store the backups (for multicloud Oracle Databases) and provides the option to set retention locking to safeguard the backups.

> **Note:**
>
> For multicloud Oracle Databases, such as Oracle Database@Azure and Oracle Database@Google Cloud, Recovery Service provides the flexibility to store backups in the same cloud location where the source database resides. See Multicloud Oracle Database Backup Support for more information.

Recovery Service includes a group of Oracle-defined protection policies (**Platinum**, **Gold**, **Silver**, and **Bronze** policies) that cover typical use cases for backup retention. Optionally, you can create custom policies to suit your internal storage demands.

Custom policies allow the flexibility to retain backups for a period ranging from a minimum period of **14** days to a maximum period of **95** days. You can recover a database from backups up to until the retention period expires.

> **Note:**
>
> As a backup administrator for your Oracle Cloud Databases, you can use the Oracle Cloud Infrastructure (OCI) Console to create and apply protection policies in your backup strategy. You can attach multiple databases to a single protection policy.

Related Topics

- Enable Automatic Backups to Recovery Service
  Use this procedure to enable the Oracle-managed automatic backups feature and set Recovery Service as the backup destination for Oracle Cloud databases in your tenancy.
- About Configuring Protection Policies
  Recovery Service uses protection policies to control specific requirements for backup storage, retention, and protection. Use the OCI Console to configure and manage protection policies.
- Create Long-Term Retention Backups with Recovery Service
  You can create long-term retention backups (LTR) for compliance, regulatory, and other business needs. LTR backups are independent of the automatic backups and stored in the Object Storage Infrequent Access tier. You can restore an LTR backup to create a new database within the retention period.

Network Isolation for Backup Operations

Recovery Service requires a private subnet for backup and recovery operations in each database virtual cloud network (VCN) within your tenancy.

An important part of your backup strategy is network isolation and access control for transferring backups over the network. Recovery Service simplifies this process using Recovery Service subnets.

Oracle recommends that your database VCN includes at least one private subnet dedicated for backups to Recovery Service. You can then register a Recovery Service subnet to enable Recovery Service to access databases in the VCN.

You can implement access control by assigning Oracle Cloud Infrastructure (OCI) policies that permit Recovery Service to access databases only in a chosen VCN.

Centralized Backup Management

Centralize your database backup strategy in Oracle Cloud Infrastructure (OCI).

The OCI Console provides a unified interface to centralize your backup strategy for all Oracle Cloud databases in your tenancy. You can use the **Database Backups** page to configure Recovery Service resources, monitor backups of protected databases, and analyze your backup storage utilization for individual databases.

In the OCI Console, select the **Oracle Databases** menu, and click **Database Backups** to view and configure the following Recovery Service resources:

Protected Databases
The Protected databases page lists each Oracle Cloud database protected by Recovery Service. Oracle Cloud databases must use the OCI-managed automatic backups feature to send backups to Recovery Service. When you enable the automatic backups option for a database, Recovery Service creates a protected database resource associated with the database.

Recovery Service Subnets
A Recovery Service subnet resource defines the network path between Recovery Service and Oracle Cloud databases in a VCN. You can use the Recovery service subnets page to register a private subnet in the VCN where your databases resides.

Protection Policies
The Protection policies page lists both the **Oracle-defined** policies and any **User-defined** policies that you create. Use the Protection policies page to centrally manage policies, and to know the protected databases attached to each policy.

Policy-Based Data Protection Management

Recovery Service simplifies backup management through protection policies.

- Backup Retention
  Recovery Service retains protected database backups for a minimum period of **14** days and a maximum period of **95** days. Long-term retention (LTR) backups can be retained for a period ranging from **90** days to **3650** days (10 years).
- Recovery Window
  Recovery window is the maximum length of time, counting backward from the current time, that a protected database can be recovered.
- Retention Lock
  Retention lock is an optional feature to safeguard your protected database backups from inadvertent changes or malicious damages, such as ransomware attacks.
- Multicloud Oracle Database Backup Support
  Recovery Service supports multicloud Oracle Databases, such as Oracle Database@Azure and Oracle Database@Google Cloud and provides the flexibility to store backups in the same cloud location where a multicloud database resides.

Backup Retention

Recovery Service retains protected database backups for a minimum period of **14** days and a maximum period of **95** days. Long-term retention (LTR) backups can be retained for a period ranging from **90** days to **3650** days (10 years).

Recovery Service protection policies control the length of time for which protected database backups are retained for recovery purposes. A protection policy defines the backup retention period in days.

For a protected database, Recovery Service ensures that the backups are retained for the period defined in the assigned protection policy, so that database recovery is possible to any point in time within this interval, counting backward from the current time.

For example, the Oracle-defined **Silver** protection policy has a predefined 35-day backup retention period. A protected database that is assigned with the **Silver** policy can recover from backups within the 35-day interval, counting backward from the current time.

When you create a long-term retention (LTR) backup with Recovery Service, you can choose to retain the LTR backup for the period defined in the protection policy or specify a custom long-term retention period (up to **10** years). See Create Long-Term Retention Backups with Recovery Service for detailed information.

Recovery Window

Recovery window is the maximum length of time, counting backward from the current time, that a protected database can be recovered.

You must assign each protected database exactly one protection policy that determines the maximum period that Recovery Service will retain backup data to support recovery. For each protected database in a protection policy, Recovery Service attempts to ensure that the oldest backup is able to support a point-in-time recovery to any time within the specified interval (for example, the past 7 days), counting backward from the current time.

Retention Lock

Retention lock is an optional feature to safeguard your protected database backups from inadvertent changes or malicious damages, such as ransomware attacks.

Retention lock applies to the backup retention period defined in a protection policy. Recovery Service mandates a minimum delay of 14-days for the retention lock to take effect. During the scheduled delay, you can either increase or decrease the backup retention period or disable the retention lock, if necessary.

After the scheduled delay ends, the retention period is permanently locked. You are only allowed to increase the retention period. Recovery Service prevents the modification or deletion of backups until the backup retention period ends. For example, assume that a custom protection policy retains backups for 50 days. When the retention lock is in effect, you are only allowed to increase the backup retention period to a maximum 95 days, and Recovery Service prohibits the deletion of protected database backups during the 50 day retention period.

See, *Using Retention Lock to Protect Backups* for additional information.

Related Topics

- Using Retention Lock to Protect Backups
  Retention lock applies to the backup retention period defined in a protection policy.

Multicloud Oracle Database Backup Support

Recovery Service supports multicloud Oracle Databases, such as Oracle Database@Azure and Oracle Database@Google Cloud and provides the flexibility to store backups in the same cloud location where a multicloud database resides.

Recovery Service creates protected databases and related backups in Oracle Cloud by default. You can optionally override this default behavior for your multicloud Oracle Databases such as Oracle Database@Azure and Oracle Database@Google Cloud.

If you enable the **Store backups in the same cloud provider as the database** option for a protection policy, then the policy-linked protected database and backups will be stored in the same cloud location where the Oracle Database is provisioned. For example, for Oracle Database@Azure, Recovery Service stores the associated protected database backups in Azure if you have selected the **Store backups in the same cloud provider as the database** option in the protection policy.

If you do not select the **Store backups in the same cloud provider as the database** for a protection policy, then the policy-linked protected database and backups will be stored in Oracle Cloud even if your Oracle Database is provisioned in a different cloud location.

Related Topics

- About Configuring Protection Policies
  Recovery Service uses protection policies to control specific requirements for backup storage, retention, and protection. Use the OCI Console to configure and manage protection policies.
- Creating a Protection Policy
  Use this procedure to create a custom protection policy.
- Enable Automatic Backups to Recovery Service
  Use this procedure to enable the Oracle-managed automatic backups feature and set Recovery Service as the backup destination for Oracle Cloud databases in your tenancy.

Real-time Data Protection

Recovery Service offers the real-time data protection feature that enables protected databases to minimize the possibility of data loss.

You can backup multiple Oracle Cloud databases to Recovery Service. You can also configure each database to use real-time data protection.

When you enable real-time data protection, a protected database can continuously transfer redo logs to Recovery Service and achieve a recovery point objective (RPO) near the last sub-second.

Real-time data protection is an extra cost option.

Related Topics

- Enable Real-time Data Protection for Protected Databases
  Recovery Service offers the ability to use Real-time data protection, a premium capability to help minimize the possibility of data loss and enhance protection for your Oracle Cloud databases.

Typical Workflow for Recovery Service Administrators

Review the workflow as a guide to configure Recovery Service for backing up your Oracle Cloud databases.

- General OCI-Related Tasks
  An administrator at your organization must set up an Oracle Cloud Infrastructure (OCI) account, configure the tenancy, create groups, users, and assign permissions to the groups to manage Recovery Service related tasks.

- OCI Database-Related Tasks
  A database administrator must ensure recommended network configuration to allow Oracle Cloud Infrastructure (OCI) databases in a virtual cloud network (VCN) to connect with Recovery Service.
- Recovery Service Related Tasks to Enable OCI-Managed Automatic Backups
  You must configure Recovery Service subnets and protection policies (optional) to define your automatic backup strategy.

General OCI-Related Tasks

An administrator at your organization must set up an Oracle Cloud Infrastructure (OCI) account, configure the tenancy, create groups, users, and assign permissions to the groups to manage Recovery Service related tasks.

Table 3-1 General OCI-Related Tasks

Task	Description	More Information
Create OCI groups and user accounts	Create groups and add users to the groups.	Create Groups and Users to Manage Recovery Service
Create policies to assign permissions to use Recovery Service.	The IAM user groups must be assigned the required permissions using policies to use Recovery Service	Permissions Required for Oracle Databases in OCI to Use Recovery Service Recovery Service Resource Types and Policies

Related Topics

- Getting Started with Oracle Cloud

OCI Database-Related Tasks

A database administrator must ensure recommended network configuration to allow Oracle Cloud Infrastructure (OCI) databases in a virtual cloud network (VCN) to connect with Recovery Service.

Table 3-2 OCI Database-Related Tasks

Tasks	Description	More Information
Provision your OCI databases in a VCN and configure a single private subnet dedicated for backups to Recovery Service	Create a private subnet in the VCN.	VCN and Subnets
Assign service permissions	Recovery Service must be able to access OCI databases provisioned in a specific VCN and compartment.	Permissions Required for Oracle Databases in OCI to Use Recovery Service
Enable communication between your Oracle Cloud database and Recovery Service	Configure networking service resources to enable connectivity between your database and Recovery Service	Configuring Network Resources for Recovery Service

Recovery Service Related Tasks to Enable OCI-Managed Automatic Backups

You must configure Recovery Service subnets and protection policies (optional) to define your automatic backup strategy.

Table 3-3 Tasks for Enabling OCI Managed Automatic Backups to Recovery Service

Task	Description	More Information
Register Recovery Service subnet	Recovery service subnets provide network isolation for Recovery Service operations in a database VCN.	Managing Recovery Service Subnets
Review Oracle-defined protection policies or create custom protection policies	Oracle-defined protection policies provide common use cases for backup retention. Optionally, create custom policies to suit your internal backup storage demands.	Managing Protection Policies

Table 3-3 (Cont.) Tasks for Enabling OCI Managed Automatic Backups to Recovery Service

Task	Description	More Information
Enable automatic backups	Select Recovery Service as the backup destination for automatic backups.	Using Recovery Service to Backup and Recover Oracle Cloud Databases

Note:

Operational backups to two different backup destinations may create data loss scenarios. Therefore, before you enable automatic backups to Recovery Service, you must

Table 3-3 (Cont.) Tasks for Enabling OCI Managed Automatic Backups to Recovery Service

Task	Description	More Information
		disable manual backup scripts and processes to other storage destinations.

4

Using Recovery Service to Backup and Recover Oracle Cloud Databases

Learn how to configure Recovery Service as the backup destination for Oracle Cloud Infrastructure (OCI) managed automatic backups.

- About Using Recovery Service to Backup and Recover Oracle Cloud Databases
  Learn how to automate backups using Recovery Service.
- Backing Up Oracle Cloud Databases to Recovery Service
  Learn how to use the Oracle-managed automatic backups feature to backup an Oracle Cloud database to Recovery Service.
- Recovering a Database Using Recovery Service
  Learn how to recover a database using backups created by Recovery Service.
- Backup Retention for a Terminated Database
  Recovery Service supports data recovery from accidental or malicious damages, and also provides you with options to retain backups after terminating a database.

Related Topics

- Ways to Manage Recovery Service Resources
  In Oracle Cloud Infrastructure (OCI), you can create and manage Recovery Service resources using a variety of interfaces provided to fit your different management use cases.

About Using Recovery Service to Backup and Recover Oracle Cloud Databases

Learn how to automate backups using Recovery Service.

The OCI Console managed automatic backups feature is the preferred method for backing up Oracle Cloud databases because you can easily configure backup settings using the console.

The automatic backups feature supports Recovery Service as the backup destination to provide you with a fully automated cloud backup solution. You do not need to perform any manual backups or backup storage administration tasks.

Use the Console to configure automatic backups and set Autonomous Recovery Service as the backup destination. By default, the Oracle-defined Silver (35-day retention period) protection policy is applied for backup retention. Alternatively, you can assign a different Oracle-defined policy or a custom policy to suit your internal storage demands.

When you enable automatic backups, OCI automatically sends an initial full (RMAN level 0) backup and successive incremental (RMAN level 1) backups to Recovery Service. Backups are retained for the period defined in the assigned protection policy.

After you enable automatic backups, Recovery Service creates an associated protected database resource. The Protected databases page provides you an unified interface to view a list of all the protected databases in your tenancy. You can select a protected database to view

the list of backups, monitor database protection and backup status, and analyze storage utilization.

You can use the console to restore a database using a backup created by Recovery Service. You can also create a new database by using a protected database backup.

> **Note:**
>
> For more information, refer your Oracle Cloud Database Service documentation.

Backing Up Oracle Cloud Databases to Recovery Service

Learn how to use the Oracle-managed automatic backups feature to backup an Oracle Cloud database to Recovery Service.

- About Backing Up an Oracle Cloud Database to Recovery Service
  Backing up your Oracle Cloud Database to Recovery Service offers the advantage of enhanced data protection and simplified backup management.
- Enable Automatic Backups to Recovery Service
  Use this procedure to enable the Oracle-managed automatic backups feature and set Recovery Service as the backup destination for Oracle Cloud databases in your tenancy.
- Create Long-Term Retention Backups with Recovery Service
  You can create long-term retention backups (LTR) for compliance, regulatory, and other business needs. LTR backups are independent of the automatic backups and stored in the Object Storage Infrequent Access tier. You can restore an LTR backup to create a new database within the retention period.
- Viewing the Protection Details of a Database
  A protected database is an Oracle Cloud database that uses Recovery Service for backups and data protection. Use this procedure to review the details of a protected database resource.
- Viewing the Backups List for a Protected Database
  In the OCI Console, view the protected database backups from the Database Details page.

About Backing Up an Oracle Cloud Database to Recovery Service

Backing up your Oracle Cloud Database to Recovery Service offers the advantage of enhanced data protection and simplified backup management.

You must use the Oracle-managed backups feature, also called automatic backups, to protect a database using Recovery Service. Use the console to configure automatic backups and set Autonomous Recovery Service as the backup destination. You can then access and monitor the protected databases and backups using the console.

When you create a database, such as an Exadata Cloud Infrastructure instance, you can enable automatic backups and set Autonomous Recovery Service as the backup destination. You can also enable automatic backups to Recovery Service after the database is created.

> **Note:**
>
> Operational backups to two different backup destinations may create data loss scenarios. Therefore, before you enable automatic backups to Recovery Service, you must disable manual backup scripts and processes to other storage destinations.

Enable Automatic Backups to Recovery Service

Use this procedure to enable the Oracle-managed automatic backups feature and set Recovery Service as the backup destination for Oracle Cloud databases in your tenancy.

> **Note:**
>
> Operational backups to two different backup destinations may create data loss scenarios. Therefore, before you enable automatic backups to Recovery Service, you must disable manual backup scripts and processes to other storage destinations.

Ensure that you have met all the prerequisites as described in Configuring Recovery Service.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, select the relevant database service, and navigate to the required database system page.

   Choose a compartment containing the database you want to view, and click the name of the required database.

   For example, follow these steps to navigate to the cloud VM cluster containing the database that you want to back up to Recovery Service.

   a. Open the navigation menu, click **Oracle Database**, then click **Oracle Exadata Database Service on Dedicated Infrastructure**.

   b. Click **Exadata VM Clusters**.

   c. In the list of VM clusters, find the VM cluster you want to access and click its highlighted name to view the details page for the cluster.

   Follow these steps to access DB systems:

   a. Open the navigation menu, click **Oracle Database** and then select **Oracle Base Database Service**.

   b. Click **DB Systems**.

   c. In the list of DB systems, find the DB System you want to access, and then click its name to display details about the system.

   The details section indicates whether the database is configured to use automatic backups. If you have previously enabled automatic backups for this database, then the Backups section indicates the backup destination, the backup retention period, and the health of database backups, among other details.
3. In the Database Details page, click **Configure automatic backups**.
4. In the **Configure automatic backups** dialog, select **Enable automatic backups**.
5. Select these options to configure automatic backups:

a. **Backup destination** - Select **Autonomous Recovery Service** as the backup destination for the database.

b. **Protection policy** - Defines the retention period for backups created by Recovery Service. The **Protection policy** field defaults to the Oracle-defined **Silver** policy which has a backup retention period of 35 days. You can optionally select a different Oracle-defined protection policy or a custom protection policy that you have created.

   Recovery Service retains database backups for the period defined in the selected protection policy. For example, if you have assigned a **Silver** policy, then backups for the database will be available for a maximum period of 35 days.

6. Review the backup **Location** for this database.

   Location indicates the cloud location where the backups will be stored for this database.

   - **OCI**: Indicates that Recovery Service will store the database backups in Oracle Cloud.
   - **Store backup in the same cloud provider as the database**: Indicates that Recovery Service will store the database backups in the same cloud location where the database is provisioned.

   Recovery Service stores backups in Oracle Cloud by default. However, if the database is provisioned in a different cloud location and if you have enabled the **Store backups in the same cloud provider as the database** option in the chosen protection policy, then Recovery Service stores the backups in the same cloud location where the database is provisioned. For example, for Oracle Database@Azure, Recovery Service stores the associated protected database backups in Azure if you have selected the **Store backups in the same cloud provider as the database** option in the protection policy. See Multicloud Oracle Database Backup Support for more information.

   When the protected database backup is complete, the protected database details page displays the relevant cloud provider **Subscription** details and the exact **Backup location** information. See Viewing the Protection Details of a Database for more information.

7. Review whether the chosen protection policy enforces a **Retention lock** to protect the database backups. If the lock is **Enabled**, then Recovery Service prohibits the modification or deletion of backups until the retention period expires.

   See Using Retention Lock to Protect Backups to know more about retention lock and how the retention lock takes effect.

8. **Real-time data protection** - Real-time data protection enhances database protection, minimizes data loss, and supports a recovery point up to the last sub-second. This is an extra cost option.

   See: Oracle Database Releases That Support Recovery Service for information about the Oracle Database versions that support using Real-time data protection for your database.

9. **Deletion options after database termination** - Options that you can use to retain protected database backups after the database is terminated. These options can also help restore the database from backups in case of accidental or malicious damages to the database.

   a. **Retain backups according to the protection policy retention period** - Select this option if you want to retain database backups for the entire period defined in the protection policy after the database is terminated.

   b. **Retain backups for 72 hours, then delete** - Select this option to retain backups for a period of 72 hours after you terminate the database.

10. Click **Save changes**.

    After you enable automatic backups, Recovery Service automatically creates an associated protected database resource to represent the database in Recovery Service.

In the Database Details page, the Backups section indicates **Autonomous Recovery Service** as the **Backup destination**. This page also displays these fields to provide additional details about database protection:

- **Automatic backup**: Indicates whether the database uses automatic backups.
- **Health**: Indicates the protection status of the database in Recovery Service. The allowed values are: **Protected**, **Warning**, and **Alert**.
  - A **Protected** status indicates that Recovery Service can ensure database recovery to any point in time within the entire recovery window, and the potential data loss exposure since the last backup is less than 10 seconds (if real-time data protection is enabled) or less than 70 minutes (if real-time data protection is disabled).
  - A **Warning** status indicates that Recovery Service can ensure database recovery within the current recovery window, and the potential data loss exposure since the last backup is greater than 10 seconds (if real-time data protection is enabled) or greater than 70 minutes, (if real-time data protection is disabled).
  - An **Alert** status indicates that Recovery Service cannot recover the database within the current recovery window, and the latest backup has failed.
- **Data loss exposure**: Time for potential data loss since the last backup was taken.
- **Last failed backup**: The date and time of the most recent failed backup
- **Last completed backup**: The date and time of the most recent successful backup
- **Next scheduled backup**: The date and time of the next scheduled backup
- **Space used for recovery window**: The amount of storage space that is currently used to meet the recovery window goal for the protected database
- **Backup destination**: Indicates that the database sends backups to Recovery Service.
- **Real-time protection**: Indicates whether the real-time redo data is sent from the protected database to Recovery Service. Real-time data protection minimizes the possibility of data loss and enhances data protection. This is an extra-cost option.
- **Protection policy**: The protection policy that defines the maximum period to retain the backups created for the database. Click **Edit Policy** to view the Configure automatic backups pane and change the protection policy.

.

11. In the **Backup destination** field, click the **Autonomous Recovery Service** link to view the protected database details page.

Related Topics

- Managing Protected Databases
  A protected database is an Oracle Cloud database that sends backups to Recovery Service. Learn how to use the Oracle Cloud Infrastructure (OCI) Console to view and monitor the protected databases in your tenancy.
- Enable Real-time Data Protection for Protected Databases
  Recovery Service offers the ability to use Real-time data protection, a premium capability to help minimize the possibility of data loss and enhance protection for your Oracle Cloud databases.

Create Long-Term Retention Backups with Recovery Service

You can create long-term retention backups (LTR) for compliance, regulatory, and other business needs. LTR backups are independent of the automatic backups and stored in the

Object Storage Infrequent Access tier. You can restore an LTR backup to create a new database within the retention period.

Recovery Service retains long-term backups for a period ranging from **90** days to **10** years.

In the OCI Console, create a LTR backup from the Backups section of the Database details page. Choose one of these options for an LTR backup:

- **Retain backup per protection policy retention period**: Select this option to retain an LTR backup as per the retention period set in the associated protection policy. For example, if the database is associated with the **Gold** protection policy, then Recovery Service retains the LTR backup for a maximum period of **65** days.
- **Specify long-term backup retention period**: Choose this option to define a custom long-term retention period ranging from a minimum period of **90** days to a maximum period of **3650** days (**10 years**) from when the LTR backup was created.

Recovery Service automatically deletes an LTR backup after the specified retention period ends.

The **Backups** section of the Database details page lists all the backups, including the **Long-term backup** type that you create.

When you terminate a database, Recovery Service retains the LTR backups as per one of these retention options that you have selected while terminating the source database:

- **Delete backups in 72 hours**: Recovery Service retains LTR backups for a maximum period of 72 hours after you terminate the database.
- **Delete based on policy**: Recovery Service retains LTR backups until the LTR retention period ends.

> **Note:**
>
> Refer the relevant OCI Database Service documentation for detailed steps to create LTR backups using the OCI Console.

Viewing the Protection Details of a Database

A protected database is an Oracle Cloud database that uses Recovery Service for backups and data protection. Use this procedure to review the details of a protected database resource.

1. Log in to your OCI tenancy.
2. Do one of the following to view the protected database details page:
   - In the navigation menu, click **Oracle Database**, select the relevant database service, and navigate to the required database system page. Choose a compartment containing the database you want to view, and click the name of the required database.
     In the **Backup Destination** field, click the **Autonomous Recovery Service** link.
   - In the navigation menu, click **Oracle Database**, and select **Database Backups**. Under **Protected Databases**, find the protected database you want to access, and then click the name to display the details.

   Consider the following examples:

   Exadata VM Clusters:

Under **Oracle Exadata Database Service on Dedicated Infrastructure**, click **Exadata VM Clusters**. In the list of VM clusters, find the VM cluster you want to access and click its highlighted name to view the details page for the cluster. In the Database Details page, under **Backup Destination**, click **Autonomous Recovery Service**.

DB Systems:
Under **Oracle Base Database Service**, click **DB Systems**, find the Exadata DB system you want to access, and then click its name to display details about it. In the Database Details page, under **Backup Destination**, click **Autonomous Recovery Service** .

3. Review the fields displayed in the Protected database information section:

- **Protection summary**:
  - **Health** - Indicates the protection status of the database in Recovery Service. The allowed values are: **Protected**, **Warning**, and **Alert**.
    * A **Protected** status indicates that Recovery Service can ensure database recovery to any point in time within the entire recovery window, and the potential data loss exposure since the last backup is less than 10 seconds (if real-time data protection is enabled) or less than 70 minutes (if real-time data protection is disabled).
    * A **Warning** status indicates that Recovery Service can ensure database recovery within the current recovery window, and the potential data loss exposure since the last backup is greater than 10 seconds (if real-time data protection is enabled) or greater than 70 minutes, (if real-time data protection is disabled).
    * An **Alert** status indicates that Recovery Service cannot recover the database within the current recovery window, and the latest backup has failed.

    For an **Active** protected database, its details page automatically refreshes the **Health** field at an interval of one minute. This ensures that you are viewing the latest **Health** status.
  - **Real-time protection**: Indicates whether the real-time redo data is sent from the protected database to Recovery Service. Real-time data protection minimizes the possibility of data loss and enhances data protection. This is an extra-cost option.
  - **Data loss exposure**: Indicates the time elapsed since the last valid backup or the period of potential data loss exposure.
    For an **Active** protected database, its details page automatically refreshes the **Data loss exposure** field at an interval of one minute. This ensures that you are viewing the latest data about a potential data loss exposure.
  - **Protection policy**: The protection policy that defines the maximum period to retain the backups created for the database.
  - **Current recovery window**: Indicates how far back in time, starting from the current time, the database can be recovered. If data loss exposure occurs during the said period, then the recovery window decreases by as much. The database can be restored to any point in time, counting backward from the beginning of the data loss exposure period, if any.
- **Space usage**
  - **Space used for recovery window**: The amount of storage space that is currently used to meet the recovery window goal for the protected database.
  - **Protected database size**: The size of the database that is being protected.
- **Database backup summary**
  - **Last failed backup**: The date and time of the most recent failed backup

  - **Last completed backup**: The date and time of the most recent successful backup
  - **Next scheduled backup**: The date and time of the next scheduled backup
- **Protected database**:
  - **Database details**: The Oracle Cloud database that is being protected by Recovery Service. Click the link to view the associated Database Details page.
  - **DB unique name**: The user-specified database name and a system-generated suffix. For example: `dbtst_phx1cs`.
  - **Database version**: The Oracle database release version.
  - **Compartment**: The compartment that contains the protected database.
- **General information**:
  - **Subscription**: The cloud provider subscription with which the protected database resource is associated. For example, this field displays the Microsoft Azure subscription information for a Oracle Database@Azure service resource linked with this protected database.
  - **Backup location**: Indicates the backup storage location for the protected database.
    The backup location is controlled by the **Store backups in the same cloud provider as the database** option in the protection policy linked with the protected database. If the option is enabled, then the protected database backups will be stored in the same cloud location as the database.

    The **Backup location** field displays one of these values:

    * **Google Cloud** - Indicates that the protected database is associated with a Oracle Database@Google Cloud service database and its backups are also stored in Google Cloud.
    * **Microsoft Azure** - Indicates that the protected database is associated with a Oracle Database@Azure service database and its backups are also stored in Microsoft Azure.
    * **Oracle Cloud** - Indicates that the protected database backups are stored in the Oracle Cloud, which is the default storage location for protected database backups.
  - **OCI Show**: Click **Show** to view the OCID of the protected database
  - **OCI Copy**: Click **Copy** to copy the OCID of the protected database
  - **Compartment**: The compartment that contains the protected database resource
  - **Backup configuration created**: The date and time when the database was configured to backup to Recovery Service
  - **Backup configuration updated**: The date and time when the database backup configuration was last updated

4. Click **Metrics** to view the default metric charts that help you to monitor the protected database. See, Available Metrics: oci_recovery_service.
5. Click **Network Details** to view and manage the Recovery Service subnets associated with the protected database.
6. Click **Work requests** to view the work requests associated with the protected database.
7. Select the **Tags** section to view the tags applied to the protected database resource item.

Viewing the Backups List for a Protected Database

In the OCI Console, view the protected database backups from the Database Details page.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, select the relevant database service, and navigate to the required database system page. Choose a compartment containing the database you want to view, and click the name of the required database.

   Consider the following examples:

   Exadata VM Clusters: Under **Oracle Exadata Database Service on Dedicated Infrastructure**, click **Exadata VM Clusters**. In the list of VM clusters, find the VM cluster you want to access and click its highlighted name to view the details page for the cluster.

   DB Systems: Under **Oracle Base Database (VM, BM)**, click **DB Systems**, find the Exadata DB system you want to access, and then click its name to display details about it.

   The database details page is displayed.
3. Under **Resources**, click **Backups**.
4. The Backups list displays detailed information about each backup, and provides options you can use to perform specific actions using backups.

Recovering a Database Using Recovery Service

Learn how to recover a database using backups created by Recovery Service.

- About Recovering a Database from Recovery Service
  Use the OCI Console to restore an Oracle Cloud Database.
- Recovering a Database
  Use this procedure to recover a database using the automatic backups created by Recovery Service.

About Recovering a Database from Recovery Service

Use the OCI Console to restore an Oracle Cloud Database.

Use the Console to restore a database from backups created by Recovery Service. You can restore to the last known good state of the database, or you can specify a point in time or an existing System Change Number (SCN). You can also create a new database by using a standalone backup.

Recovering a Database

Use this procedure to recover a database using the automatic backups created by Recovery Service.

> **Note:**
>
> The in-place restore options described in this section do not apply to long-term retention (LTR) backups. You can restore an LTR backup to create a new database. See Create a DB System From a Backup Using the Console for detailed information.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, select the relevant database service, and navigate to the required database system page.
3. Choose a compartment containing the database you want to view.
4. Click the name of the required database.

   For example, to restore a bare metal or virtual machine DB system database, click **Oracle Database**, select **Oracle Base Database (VM, BM)**, select a DB system, and then select the database that you want to restore.
5. In the Database Details page, click **Restore**.
6. Select one of the following options:
   - **Restore to the latest** - Restores the database to the last known good state with the least possible data loss.
   - **Restore to a timestamp** - Restores the database to the timestamp specified.
   - **Restore to SCN** - Restores the database using the System Change Number (SCN) specified. This SCN must be valid.
7. Click **Restore database** and confirm the action.

Backup Retention for a Terminated Database

Recovery Service supports data recovery from accidental or malicious damages, and also provides you with options to retain backups after terminating a database.

In the OCI Console, you can choose one of these options to retain the database backups prior to terminating your database.

- **Retain backups according to the protection policy retention period** - After you terminate a database, Recovery Service will continue to retain the protected database backups for the period defined in the associated protection policy. Long-term retention (LTR) backups will be retained as per the specified LTR backup retention period.
- **Retain backups for 72 hours, then delete** - Recovery Service will retain all backups, including LTR backups, for a period of 72 hours (3-days) after you terminate a database.

In case of accidental or malicious damages to a database, Recovery Service supports recovery from backups for a period of 72 hours (3-days).

When you terminate a source database or if you disable automatic backups for the database, Recovery Service automatically schedules the deletion of the associated protected database resource and its backups.

After you terminate a source database, the associated protected database resource enters the **Delete Scheduled** state, and remains in this state for a period of 72 hours (default delay) or until the retention period expires, depending on the option that you have selected to retain backups.

If you disable automatic backups for a database, Recovery Service schedules the deletion of the associated protected database resource and its backups after a 72 hour delay. The protected database enters the **Delete Scheduled** state.

Recovery Service automatically deletes the protected database resource and the database backups after the scheduled delay ends.

> **Note:**
>
> If the retention lock is enabled for the protection policy, then when you terminate a database or disable its automatic backups, Recovery Service will delete the protected database resource and its backups only after the retention period ends. See, Using Retention Lock to Protect Backups to learn about using policy retention lock.

Related Topics

- Using Retention Lock to Protect Backups
  Retention lock applies to the backup retention period defined in a protection policy.
- Life Cycle States of Recovery Service Resources
  Learn how Recovery Service resources progress through different life cycle states based on specific events.

5

Managing Protected Databases

A protected database is an Oracle Cloud database that sends backups to Recovery Service. Learn how to use the Oracle Cloud Infrastructure (OCI) Console to view and monitor the protected databases in your tenancy.

- Filter Protected Databases by Compartment
  Use this procedure to find protected databases specific to an individual compartment.
- Filter Protected Databases by State
  Use this procedure to filter protected databases by their life cycle state.
- Filter Protected Databases by Health
  Use this procedure to find a protected database based on the protection status or health status of the database in Recovery Service.
- Viewing Protected Database Details
  Each protected database uniquely identifies an Oracle Cloud database that sends backups to Recovery Service.
- Enable Real-time Data Protection for Protected Databases
  Recovery Service offers the ability to use Real-time data protection, a premium capability to help minimize the possibility of data loss and enhance protection for your Oracle Cloud databases.
- Downloading Protected Database Network Connection Details
  Use this procedure to download the network configuration details for a protected database.
- Access the Network Connection Details for a Protected Database
  Use this procedure to view the details about the Recovery Service subnet associated with a protected database.
- Moving a Protected Database to a Different Compartment
  Use this procedure to relocate a protected database to a different compartment.
- Applying Tags to a Protected Database
  You can apply tags to organize and group protected databases based on their specific purpose.

Filter Protected Databases by Compartment

Use this procedure to find protected databases specific to an individual compartment.

You must have the following permissions to view protected databases in a selected compartment:

```
RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the **Database Backups** page.
3. The **Protected databases** list populates in the page.

4. Under **List scope**, select a compartment from the list.

Filter Protected Databases by State

Use this procedure to filter protected databases by their life cycle state.

You must have the following permissions to view protected databases in a selected compartment:

```
RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. The **Protected databases** list populates in the page.
4. Under **List scope**, select a compartment from the list.
5. Under **Filters**, select a state from the list.
   - **Creating**
   - **Active**
   - **Updating**
   - **Failed**
   - **Delete Scheduled**
   - **Deleting**
   - **Deleted**

   See *Life Cycle States of Recovery Service Resources* for detailed information about the transition of a protected database through the different life cycle states.

Related Topics

- Life Cycle States of Recovery Service Resources
  Learn how Recovery Service resources progress through different life cycle states based on specific events.

Filter Protected Databases by Health

Use this procedure to find a protected database based on the protection status or health status of the database in Recovery Service.

You must have the following permissions to view protected databases in a selected compartment:

```
RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the **Database Backups** page.
3. The **Protected databases** list populates in the page.

4. Under **List scope**, select a compartment from the list.
5. Under **Health**, select a health status.
   - **Any health**
   - **Protected**:
     A **Protected** status indicates that Recovery Service can ensure database recovery to any point in time within the entire recovery window, and the potential data loss exposure since the last backup is less than 10 seconds (if real-time data protection is enabled) or less than 70 minutes (if real-time data protection is disabled).
   - **Warning**:
     A **Warning** status indicates that Recovery Service can ensure database recovery within the current recovery window, and the potential data loss exposure since the last backup is greater than 10 seconds (if real-time data protection is enabled) or greater than 70 minutes, (if real-time data protection is disabled).
   - **Alert**:
     An **Alert** status indicates that Recovery Service cannot recover the database within the current recovery window, and the latest backup has failed.

Viewing Protected Database Details

Each protected database uniquely identifies an Oracle Cloud database that sends backups to Recovery Service.

When you enable automatic backups for an Oracle Cloud database and set Recovery Service as the backup destination, Recovery Service creates an associated protected database resource.

Required IAM Policy

```
RECOVERY_SERVICE_PROTECTED_DATABASE_READ
```

1. Log in to your OCI tenancy.
2. For information about the different ways to access protected databases and review the details, see: Viewing the Protection Details of a Database.

Related Topics

- Viewing the Backups List for a Protected Database
  In the OCI Console, view the protected database backups from the Database Details page.
- Enable Automatic Backups to Recovery Service
  Use this procedure to enable the Oracle-managed automatic backups feature and set Recovery Service as the backup destination for Oracle Cloud databases in your tenancy.

Enable Real-time Data Protection for Protected Databases

Recovery Service offers the ability to use Real-time data protection, a premium capability to help minimize the possibility of data loss and enhance protection for your Oracle Cloud databases.

Use this procedure to enable Real-time data protection (extra-cost option) for a protected database.

> **Note:**
>
> Recovery Service supports Real-time data protection for Oracle Cloud databases provisioned with these Oracle Database versions:
>
> - Oracle Database 19c Release 18 (19.18) or later
> - Oracle Database 21c Release 8 (21.8) or later
> - Oracle Database 23ai (23.4) or later

Required IAM Policy

```
RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Use the **List Scope** option to choose a compartment containing the required protected database.
4. In the **Protected databases** list, click the Action menu, and select **View details**.
5. Perform one of these steps in the Protected database details page:
   - The page displays an alert message with instructions to enable real-time data protection. Click **View Source Database** in the alert message.
   - In the **Protected database** section, click the name of the database in the **Database details** field.

   The source database details page is displayed.
6. Click **Configure automatic backups**.
7. Select **Real-time data protection**.
8. Click **Save changes**.

Downloading Protected Database Network Connection Details

Use this procedure to download the network configuration details for a protected database.

Required IAM Policy

```
RECOVERY_SERVICE_PROTECTED_DATABASE_READ
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Use the **List scope** option to choose a compartment containing the protected database you want to view.
   - In the Protected databases list, click the Action menu, and select **View details**.
   - Alternatively, click the name of the required protected database.

The Protected database details page is displayed.

4. Click **Download configuration** to save the configuration zip file.

   By default, the file name is `dbrsconfig.zip`. You can rename the zip file with a name of your choice.

Oracle recommends that you protect the downloaded configuration files to prevent unauthorized access to the protected database.

5. Unzip `dbrsconfig.zip` to extract the following files:
   - `dbrsnames.ora` - This file includes connect descriptors or network identification information required for the protected database client to connect with Recovery Service.
   - `certChainPem` - This file stores the trusted certificate (CA Bundle) specific to your region and tenancy.
   - `cabundle.txt`
   - `hosts.txt`

Access the Network Connection Details for a Protected Database

Use this procedure to view the details about the Recovery Service subnet associated with a protected database.

Required IAM Policies

```
RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Use the **List scope** option to choose a compartment containing the required protected database.
   - In the Protected databases list, click the Action menu, and select **View details**.
   - Alternatively, click the name of the required protected database.
4. In the Protected database details page, navigate to the **Resources** section, and click **Network details**.
5. Click **Show** and then click **Copy** to copy the network connection string.

Moving a Protected Database to a Different Compartment

Use this procedure to relocate a protected database to a different compartment.

Before you move a protected database to a different compartment, ensure that the associated resources, which includes the database, Recovery Service subnet, and protection policy can access the protected database in the new compartment.

Required IAM Policy

```
RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Use the **List scope** option to choose a compartment containing the protected database you want to relocate. Perform one of these actions:
   - In the Protected databases list, click the Action menu, and select **Move resource**.
   - Click the name of the required resource. In the Protected database details page, click **Move resource**.
4. Choose a new destination compartment, and click **Move resource**.

Related Topics

- Managing Compartments

Applying Tags to a Protected Database

You can apply tags to organize and group protected databases based on their specific purpose.

You must have the following permissions to apply tags to a protected database:

```
RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Use the **List scope** option to choose a compartment containing the protected database to which you want to apply tags.
4. In the Protected databases list, click the Action menu for the required resource, and select **Add tags**.

   Alternatively, click the name of the required protected database. In the Protected database details page, click **Add tags**.

   The **Add tags** dialog box is displayed.
5. In the **Tag namespace** field, consider adding a tag namespace (an identifying text string applied to a set of compartments), or tagging the protection policy with an existing tag namespace.
6. Click **Add tags**.

Related Topics

- Resource Tags

6

Managing Protection Policies

Protection policies provide automated backup retention management. Learn how to set up protection policies using a centralized interface within the Oracle Cloud Infrastructure (OCI) Console.

About Configuring Protection Policies

Recovery Service uses protection policies to control specific requirements for backup storage, retention, and protection. Use the OCI Console to configure and manage protection policies.

Protection Policies enable automatic backup management for protected databases. Each protected database must be associated with one protection policy.

A protection policy allows you to define these rules for backup retention, protection, and backup storage location (for multicloud Oracle Databases):

- **Backup retention period** (required)
  Defines the maximum period to retain database backups created by Recovery Service. The allowed range is 14 days to 95 days.
- **Retention lock** (optional)
  Safeguards protected database backups by restricting the modification or deletion of backups until the retention period ends.

- **Preferred cloud location to store backups** (optional)
  Recovery Service supports multicloud Oracle Databases and provides the flexibility to store backups either in Oracle Cloud (default storage location) or in the same cloud location where the database resides.

  By default, Recovery Service stores protected databases and related backups in Oracle Cloud. You can override this behavior for your multicloud Oracle Databases, such as Oracle Database@Azure and Oracle Database@Google Cloud.

  If you enable the **Store backups in the same cloud provider as the database** option for a protection policy, then Recovery Service stores the policy-linked protected database and its backups in the target database cloud location instead of Oracle Cloud. For example, for Oracle Database@Azure, Recovery Service stores the associated protected database backups in Azure if you have selected the **Store backups in the same cloud provider as the database** in the protection policy.

Based on your business requirements, you can assign separate policies for each protected database or use a single policy across all protected databases in a VCN. You can use these two types of protection policies:

- **Oracle defined**
  There are four Oracle-defined protection policies based on typical use cases for backup retention. You cannot modify these policies.
  - **Platinum** (95 days): The **Platinum** policy retains backups for **95** days
  - **Gold** (65 days): The **Gold** policy retains backups for **65** days
  - **Silver** (35 days): The **Silver** policy retains backups for **35** days
  - **Bronze** (14 days): The **Bronze** policy retains backups for **14** days
- **User defined**
  These are custom protection policies that you can create based on your business requirements. Custom policies limit backup retention period to a minimum period of 14 days and to a maximum period of 95 days.

The OCI Console is the primary interface to configure protection polices for all databases in your tenancy.

Using Retention Lock to Protect Backups

Retention lock applies to the backup retention period defined in a protection policy.

Locking the backup retention period enables Recovery Service to prevent the modification of backups for the duration defined in the policy. Use the retention lock feature to protect backups from accidental modifications or malicious damages, such as ransomware.

When you enable the retention lock, you must also set a date for the lock to take effect. Recovery Service mandates a minimum delay of 14 days to permanently lock the retention period defined in a policy.

For example, assuming that you enable the retention lock on August 1, you can set the lock date as August 15 or later.

During the specified delay period, you can either increase or decrease the backup retention period or disable the retention lock, if necessary.

When the specified delay ends, the retention period is permanently locked. Recovery Service strictly prohibits the modification or deletion of backups until the retention period expires.

Be aware of these restrictions that apply (to all users including tenancy administrators) if the retention period is permanently locked for a protection policy.

- You cannot disable the retention lock
- You are only allowed to increase the backup retention period for the policy (maximum 95 days)
- You cannot assign a different protection policy to a protected database if the retention period is permanently locked for the existing policy

> **Note:**
>
> If you assign a database to a policy where the retention period is permanently locked, then Recovery Service does not immediately enforce the retention lock for the newly added database. You can leverage the 14 day (minimum) grace period before the retention lock can take permanent effect for the newly added database. For example, assume that the retention period is permanently locked for a policy on August 15. If you assign the same policy to another database on August 16, then the retention lock would take effect only August 30 for the newly added database.

Filter Protection Policies by Compartment

Use this procedure to find protection policies specific to an individual compartment.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Under **List Scope**, select a compartment from the list.

Filter Protection Policies by State

Use this procedure to find protection policies by their life cycle state.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Under **List scope**, select a compartment from the list.
5. Under **Filters**, select a state from the list.

- **Any State**
- **Creating**
- **Active**
- **Updating**
- **Failed**
- **Deleting**
- **Deleted**

See *Life Cycle States of Recovery Service Resources* for detailed information about each life cycle state.

Related Topics

- Life Cycle States of Recovery Service Resources
  Learn how Recovery Service resources progress through different life cycle states based on specific events.

Creating a Protection Policy

Use this procedure to create a custom protection policy.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_CREATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Click **Create protection policy**.

   The **Create protection policy** panel is displayed.
5. In the **Name** field, specify a name for the policy.
6. In the **Create in compartment** field, select the compartment where you want to create the protection policy.
7. In the **Backup retention period (in days)** field, specify the maximum number of days to retain backups using this policy.

You can specify a minimum period of 14 days and a maximum period of 95 days for retaining backups using this policy.

8. (Optional) Use these steps to lock the backup retention period.
   a. Select **Enable retention lock**.
   b. In the **Scheduled lock time** field, select a date that occurs at least 14 days after the current date.

      Recovery Service mandates a minimum delay of 14 days to permanently lock the retention period. During the delay period, you can either increase or decrease the retention period or disable the lock, if necessary. At the end of the specified time delay, the backup retention period is permanently locked. You are only allowed to increase the retention period.

9. (optional) Select the **Store backups in the same cloud provider as the database** option if the source database is provisioned in a different cloud location and if you want Recovery Service to store the backups in the same cloud location as the database.

   Recovery Service creates protected databases and related backups in Oracle Cloud by default. You can optionally override this default behavior for multicloud Oracle Databases such as Oracle Database@Azure and Oracle Database@Google Cloud.

   If you enable the **Store backups in the same cloud provider as the database** option for a protection policy, then the policy-linked protected database and backups will be stored in the same cloud location where the database is provisioned. For example, for Oracle Database@Azure, Recovery Service stores the associated protected database backups in Azure if you have selected the **Store backups in the same cloud provider as the database** option in the protection policy.

   If you do not select the **Store backups in the same cloud provider as the database** for a protection policy, then the policy-linked protected database and backups will be stored in Oracle Cloud even if your Oracle Database is provisioned in a different cloud location.

   > **Caution:**
   >
   > You cannot undo the selection of the **Store backups in the same cloud provider as the database** option after you create the policy.

10. To specify additional features, select **Show advanced options**. In the **Tag namespace** field, consider adding a tag namespace (an identifying text string applied to a set of compartments), or tagging the control with an existing tag namespace.
11. Click **Create**.

The protection policy is created.

Related Topics

- Using Retention Lock to Protect Backups
  Retention lock applies to the backup retention period defined in a protection policy.

Viewing Protection Policy Details

Use this procedure to access information about a protection policy.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_READ
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. In the Protection policies page, use the **List scope** option to find the policy you want to view.
   - In the **Protection policies** list, click the Action menu, and select **View details**.
   - Alternatively, click the name of the required protection policy.

   The Protection policy details page is displayed.

5. The Protection policy information section displays different options that you can use to view the detailed information about a policy.
   - **OCID Show** - Click **Show** to view the protection policy's OCID
   - **OCID Copy** - Click **Copy** to copy the OCID of the protection policy
   - **Compartment** - The compartment to which the policy belongs
   - **Created** - When the policy was created
   - **Updated** - When the policy was last updated
   - **Policy type** - Indicates whether the policy is **Oracle defined** or a **User defined** custom policy.
   - **Backup location** - Indicates the backup storage location for protected databases using this policy.
     The value **OCI** indicates that the backups will be stored in Oracle Cloud (default backup location). If the **Backup location** indicates **Store backups in the same cloud provider as the database**, then the backups will be stored in the same cloud location where the source database is provisioned. For example, if this policy is linked to an Oracle Database that is provisioned in Microsoft Azure, then database backups will be stored in Azure instead of Oracle Cloud.
   - **Backup retention period** - The retention period (in days) defined in the policy.
6. Under **Resources**, click **Protected databases** to view all the protected databases using this policy.

Updating a Protection Policy

Use this procedure to update an existing user-defined protection policy.

You can edit a user-defined protection policy to change the policy name and modify the backup retention period.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Use the **List scope** option to find the protection policy you want to edit.
   - In the **Protection policies** list, click the Action menu, and select **Edit**.
   - Alternatively, click the name of the required protection policy, and click **Edit**.

   The Edit protection policy panel is displayed.
5. In the **Name** field, update the name as necessary.
6. In the **Backup retention period (in days)** field, you can choose to update the retention period. You can specify a value ranging from 14 days to 95 days.

   If you have enabled the retention lock and if the scheduled lock date is earlier than the current date, it indicates that the retention period is permanently locked. In this case, you can only increase the backup retention period for the policy.

7. If the scheduled lock date is greater than the current date, then you can clear the **Enable retention lock** option to disable the lock. See, Using Retention Lock to Protect Backups for more information.
8. Click **Save changes**.

Moving a Protection Policy to a Different Compartment

Use this procedure to relocate a protection policy to a different compartment.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_MOVE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Use the **List scope** option to find the protection policy you want to move to a different compartment.
   - In the **Protection Policies** list, click the Action menu, and select **Move resource**.
   - Alternatively, click the name of the required protection policy. In the Protection policy details page, click **Move resource**.

   The Move resource dialog box is displayed.
5. Choose a compartment and click **Move resource**.

Applying Tags to a Protection Policy

Use this procedure to apply tags to an existing user-defined protection policy.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Use the **List scope** option to find the protection policy to which you want to apply tags.
   - In the **Protection policies** list, click the Action menu, and select **Add tags**.
   - Alternatively, click the name of the required protection policy. In the Protection policy details page, click **Add tags**.

   The Add tags dialog box is displayed.
5. In the **Tag namespace** field, consider adding a tag namespace (an identifying text string applied to a set of compartments), or tagging the protection policy with an existing tag namespace.
6. Click **Add tags**.

Deleting a Protection Policy

You can delete only user-defined protection policies that you no longer use.

Required IAM Policy

```
RECOVERY_SERVICE_POLICY_DELETE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Protection Policies**.
4. Use the **List scope** option to find the protection policy you want to delete.
   - In the **Protection policies** list, click the Action menu, and select **Delete**.
   - Alternatively, click the name of the required protection policy. In the Protection policy details page, click **Delete**.

   The Delete protection policy dialog box is displayed.
5. Click **Remove** to confirm your action.

7

Managing Recovery Service Subnets

Recovery Service subnets define the network path for backup operations between a database and Recovery Service in each database VCN. Learn how to use the Oracle Cloud Infrastructure (OCI) Console to register and manage Recovery Service subnets in your tenancy.

About Configuring Recovery Service Subnets

Recovery service subnets enable network isolation for Recovery Service operations in a VCN.

Recovery Service connects with your Oracle Cloud databases provisioned in a virtual cloud network (VCN) within your tenancy. Recovery Service subnets establish network presence for Recovery Service in each VCN.

Your database VCN must include a single private subnet dedicated for backups to Recovery Service.

In the Oracle Cloud Infrastructure (OCI) Console, the **Recovery Service Subnets** page provides the interface to quickly register a recovery service subnet by selecting an existing subnet in your database VCN.

You can register only a single Recovery Service subnet per VCN in your tenancy.

Related Topics

- Register Recovery Service Subnet
  Use this procedure to register a Recovery Service subnet.
- About Using a Private Subnet for Recovery Service
  Recovery Service uses a private subnet inside a virtual cloud network (VCN) where your database resides. The private subnet defines the network path for backups between your database and Recovery Service.
- Create a Recovery Service Subnet in the Database VCN
  Use the OCI Console to configure a private subnet for Recovery Service in your database virtual cloud network (VCN).

Filter Recovery Service Subnets by Compartment

Use this procedure to find Recovery Service subnets specific to an individual compartment.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Under **List Scope**, select a compartment from the list.

Filter Recovery Service Subnets by State

Use this procedure to find Recovery Service subnets based on their life cycle state.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_INSPECT
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Under **List Scope**, select a compartment from the list.
5. Under **Filters** field, select a state from the list.
   - **Any state**
   - **Creating**
   - **Active**
   - **Updating**
   - **Failed**
   - **Deleting**

- **Deleted**

  See *Life Cycle States of Recovery Service Resources* for detailed information about each life cycle state.

Related Topics

- Life Cycle States of Recovery Service Resources
  Learn how Recovery Service resources progress through different life cycle states based on specific events.

Register Recovery Service Subnet

Use this procedure to register a Recovery Service subnet.

Multiple protected databases can use the same Recovery Service subnet. In order to ensure that the required number of IP addresses are available to support the Recovery Service private endpoints, you can assign multiple subnets to a Recovery Service subnet that is used by more than one protected database.

> **Note:**
>
> - Select an IPv4-only subnet for Recovery Service in your database VCN. Do not select an IPv6-enabled subnet as Recovery Service does not support using an IPv6-enabled subnet.
> - For Oracle Database@Azure and Oracle Database@Google Cloud, you must register the Recovery Service subnet by associating network security groups (NSG).

Ensure that you have completed the prerequisite configuration tasks specific to your Oracle Database service before you register the Recovery Service subnet.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. In the **Compartment** field, select a compartment where you want to create the Recovery Service subnet.
5. Click **Register Recovery Service subnet**, and specify the details.
6. In the **Name** field, enter a name for the Recovery Service subnet.
7. In the **Compartment** field, select the compartment where you want to create the Recovery Service subnet.
8. In the **Virtual cloud network** field, select the database VCN.

   Click **Change Compartment** to select a VCN belonging to a different compartment.
9. In the **Subnet** field, select a private subnet that you have configured for Recovery Service operations in your database VCN.

   Click **Change Compartment** to select a private subnet from a different compartment.
10. (Optional) Click **+Another Subnet** to assign an additional subnet to the Recovery Service subnet.

If a single subnet does not contain enough IP addresses to support the Recovery Service private endpoints, then you can assign multiple subnets.

11. Click **Show advanced options** to configure these additional features.
    - Network security groups
    - Tags

    If you have used a network security group (NSG) to implement security rules for Recovery Service in the database VCN, then you must add the Recovery Service NSG to the Recovery Service subnet. The Recovery Service NSG can reside in the same compartment or in a different compartment. However, the NSG must belong to the same VCN to which the specified subnet belongs.

    > **Note:**
    >
    > For Oracle Database@Azure and Oracle Database@Google Cloud, you must register the Recovery Service subnet by associating network security groups (NSG).

    a. In the **Network security groups** section, select **Use network security groups to control traffic**.
    b. Select the Recovery Service NSG you have created in the database VCN.
    c. Click **+Another network security group** to associate multiple NSGs (maximum five).

    (Optional) In the **Tag Namespace** field, consider adding a tag namespace, or tagging the control with an existing tag namespace.

12. Click **Register**.

You can replace a subnet or add more subnets to support the required number of private endpoints.

13. Use these steps to update an existing Recovery Service subnet:
    a. In the Recovery Service subnet details page, under **Resources**, click **Subnets**.
    b. Click **Add subnets** and select the subnets you want to add.
    c. To replace an existing subnet, click the Action menu, and select **Remove subnet**. You can then add another subnet.

    > **Note:**
    >
    > A Recovery Service subnet must be associated with at least one subnet belonging to your database VCN.

14. Use these steps to manage the network security groups (NSGs) for an existing Recovery Service subnet:
    a. In the **Network security groups** section, click **Add network security groups**.
    b. Select and add the Recovery Service network security groups (maximum five).
    c. To remove an NSG, select the resource and click **Remove**.

Related Topics

- About Configuring Recovery Service Subnets
  Recovery service subnets enable network isolation for Recovery Service operations in a VCN.

Viewing Recovery Service Subnet Details

Use this procedure to access detailed information about a Recovery Service subnet.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_READ
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Use the **List scope** option to choose a compartment containing the Recovery Service subnet you want to view.
5. In the **Recovery Service subnets** list, click the Action menu, and select **View details**. Alternatively, click the name of the required subnet.
6. The Recovery Service subnet details page displays different options that you can use to access detailed information about the selected resource item.
   - **OCID Show** - Click **Show** to view the Recovery Service subnet's OCID.
   - **OCID Copy** - Click **Copy** to copy the Recovery Service subnet's OCID.
   - **VCN** - The VCN in which the Recovery Service subnet exists. Click the link to view the virtual cloud network (VCN) details page.
   - **Subnet** - The private subnet used for backup operations in the database VCN. Click the link to view the subnet details page.
   - **Created** - The date and time when the resource was created.
   - **Updated** - The date and time when the resource was last updated.
7. In the **Subnets** section, click **Add subnets** and select an additional subnet you want to add. Use the **+Another subnet** option to select new subnets.

Renaming a Recovery Service Subnet

Use this procedure to modify the name of an existing Recovery Service subnet.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.

4. Use the **List scope** option to choose a compartment containing the Recovery Service subnet you want to rename.
5. In the **Recovery Service subnet** list, click the Action menu, and select **Rename**. Alternatively, click the name of the required resource, and then click **Rename**.

   The Rename Recovery Service subnet dialog box is displayed.
6. Specify a new name for the subnet.
7. Click **Save changes**.

Moving a Recovery Service Subnet to a Different Compartment

Use this procedure to relocate a Recovery Service subnet to a different compartment.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_MOVE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Use the **List scope** option to choose a compartment containing the Recovery Service subnet you want to move.
5. In the **Recovery Service subnets** list, click the Action menu and select **Move resource**. Alternatively, click the name of the required resource item, and then click **Move resource**.

   The Move resource dialog box is displayed.
6. Choose a new compartment and then click **Move resource**.

Related Topics

- Managing Compartments

Applying Tags to a Recovery Service Subnet

You can apply tags to organize and group Recovery Service subnets based on their purpose.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_UPDATE
```

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Use the **List scope** option to choose a compartment containing the required subnet.
5. In the **Recovery Service subnets** list, click the Action menu, and select **Add tags**. Alternatively, click the name of the required resource item, and then click **Add tags**.

   The Add tags dialog box is displayed.

6. In the **Tag namespace** field, consider adding a tag namespace (an identifying text string applied to a set of compartments), or tagging the Recovery Service subnet with an existing tag namespace.
7. Click **Add tags**.

Related Topics

- Tagging Overview

Deleting a Recovery Service Subnet

Use this procedure to delete a Recovery Service subnet that you no longer use.

Required IAM Policy

```
RECOVERY_SERVICE_SUBNET_DELETE
```

.

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. Click **Recovery Service Subnets**.
4. Use the **List scope** option to choose a compartment containing the subnet you want to delete.
5. In the **Recovery Service subnets** list, click the Action menu, and select **Delete**. Alternatively, click the name of the required subnet, and click **Delete**.
6. Click **Remove** to confirm your action.

8

Using the API to Manage Recovery Service Resources

Review the list of APIs that you can use for managing Recovery Service resources.

Recovery Service application programming interface (API) assist to manage protected databases, Recovery Service subnets, and protection policies.

- Using the API to Manage Protected Databases
  Review the list of REST API endpoints to manage protected databases.
- Using the API to Manage Protection Policies
  Review the list of REST API endpoints to create and manage protection policies.
- Using the API to Manage Recovery Service Subnets
  Review the list of REST API endpoints to register and manage Recovery Service subnets.
- Using the APIs to Manage LTR Backups
  Review the list of REST API endpoints to create and manage long-term retention (LTR) backups of a protected database using Recovery Service.

Related Topics

- Ways to Manage Recovery Service Resources
  In Oracle Cloud Infrastructure (OCI), you can create and manage Recovery Service resources using a variety of interfaces provided to fit your different management use cases.

Using the API to Manage Protected Databases

Review the list of REST API endpoints to manage protected databases.

For information about using the API and signing requests, see *REST APIs* and *Security Credentials*. For information about SDKs, see *Software Development Kits and Command Line Interface*

Use the following REST API endpoints to manage protected databases.

- **Create a protected database:** `CreateProtectedDatabase`
  You can perform a dry run of the `CreateProtectedDatabase` API in order to verify that all the prerequisites are met before actually creating a protected database.

  See, *Performing a Dry Run to Check the Preparedness for Creating a Protected Database*.
- **Delete a protected database:** `DeleteProtectedDatabase`
- **View the details of a protected database:** `GetProtectedDatabase`
- **Retrieve the protected database configuration details:** `FetchProtectedDatabaseConfiguration`
- **Modify a protected database:** `UpdateProtectedDatabase`
- **Change the protected database compartment:** `ChangeProtectedDatabaseCompartment`
- **Cancel the deletion of a protected database:**`CancelProtectedDatabaseDeletion`

- **Schedule the deletion of a protected database:** `ScheduleProtectedDatabaseDeletion`

Performing a Dry Run to Check the Preparedness for Creating a Protected Database

When you run the `CreateProtectedDatabase` API with the `opc-dry-run` option set as `TRUE`, it indicates that the request is a dry run to check for any missing prerequisites before creating a protected database. During a dry-run, the `CreateProtectedDatabase` API returns error messages to warn you about any missing requirements, without actually creating a protected database. If an errors occurs, you can review, correct, and repeat the dry-run until the `CreateProtectedDatabase` request does not return any errors.

These are the common issues that you can identify by performing a dry run of the `CreateProtectedDatabase` API:

- The Recovery Service subnet has insufficient free IP addresses to support the required number of private endpoints.
  Ensure that sufficient unallocated IP addresses remain available in the subnet used for Recovery Service operations in the database VCN.

  See, Register Recovery Service Subnet
- Recovery Service does not have permissions to manage the network resources in a chosen compartment.
  Review and assign the required policies. See, Permissions Required for Oracle Databases in OCI to Use Recovery Service
- Recovery Service is out of capacity.
  Review the service limits for your tenancy and request for an increase

  See, Autonomous Recovery Service Limits
- Recovery Service resources exceed quota limits
  Review and manage Recovery Service resource consumption within compartments. See, Autonomous Recovery Quotas .
- A protected database, having the same database ID, already exists
  Select a different database to use Recovery Service
- The specified protection policy does not exist, or it is not in an **Active** state
  See, Managing Protection Policies
- The prerequisite of registering a Recovery Service subnet is not met
  Ensure that you register a Recovery Service subnet before enabling automatic backups to Recovery Service

  See, Register Recovery Service Subnet

Example 8-1 Dry Run Request of the `CreateProtectedDatabase` API

This example is a sample dry run request.

```
CreateProtectedDatabaseRequest createProtectedDatabaseRequest =
CreateProtectedDatabaseRequest.builder()
.createProtectedDatabaseDetails(createProtectedDatabaseDetails)
.opcRetryToken("EXAMPLE-opcRetryToken-Value")
.opcDryRun(true)
.opcRequestId("UCCBPPQDHXIF5I7A11SS<unique_ID>").build();
```

This is a sample output of the dry run.

```
Status Code : 409
Service Code: IncorrectState
Error Message:
Authorization failed. Autonomous Recovery Service does not have the required security
```

```
policies to
manage virtual-network-family in the chosen compartment.
See, 'Prerequisites for Using Recovery Service as a Automatic Backup Destination' in the
Recovery Service documentation.

The following compartment quotas were exceeded:
protected-database-backup-storage-gb in policy 'example-policy' by 1.

The prerequisite of registering a Recovery Service subnet is not met.
Ensure that you register a Recovery Service subnet before enabling automatic backups.
See, 'Register Recovery Service Subnet' in the Recovery Service documentation.
```

Ensure that you review and perform all the prerequisite tasks described in Configuring Recovery Service.

Related Topics

- REST APIs
- Security Credentials
- Software Development Kits and Command Line Interface
- CreateProtectedDatabase
- DeleteProtectedDatabase
- GetProtectedDatabase
- FetchProtectedDatabaseConfiguration
- UpdateProtectedDatabase
- ChangeProtectedDatabaseCompartment

Using the API to Manage Protection Policies

Review the list of REST API endpoints to create and manage protection policies.

For information about using the API and signing requests, see *REST APIs* and *Security Credentials*. For information about SDKs, see *Software Development Kits and Command Line Interface*

Use the following REST API endpoints to manage Protection policies.

- **Create a Protection policy:** `CreateProtectionPolicy`
- **Delete a Protection policy:** `DeleteProtectionPolicy`
- **View the details of a Protection policy:** `GetProtectionPolicy`
- **Modify a Protection policy:** `UpdateProtectionPolicy`
- **Change Protection policy compartment:** `ChangeProtectionPolicyCompartment`

Related Topics

- REST APIs
- Security Credentials
- Software Development Kits and Command Line Interface
- CreateProtectionPolicy
- DeleteProtectionPolicy
- GetProtectionPolicy

- UpdateProtectionPolicy
- ChangeProtectionPolicyCompartment

Using the API to Manage Recovery Service Subnets

Review the list of REST API endpoints to register and manage Recovery Service subnets.

For information about using the API and signing requests, see *REST APIs* and *Security Credentials*. For information about SDKs, see *Software Development Kits and Command Line Interface*.

Use the following REST API endpoints to manage Recovery Service subnets.

- **Create a Recovery service subnet:** `CreateRecoveryServiceSubnet`
- **Delete a Recovery service subnet:** `DeleteRecoveryServiceSubnet`
- **View the details of a Recovery service subnet:** `GetRecoveryServiceSubnet`
- **Modify a Recovery service subnet:** `UpdateRecoveryServiceSubnet`
- **Change Recovery service subnet compartment:** `ChangeRecoveryServiceSubnetCompartment`

Related Topics

- REST APIs
- Security Credentials
- Software Development Kits and Command Line Interface
- CreateRecoveryServiceSubnet
- DeleteRecoveryServiceSubnet
- GetRecoveryServiceSubnet
- UpdateRecoveryServiceSubnet
- ChangeRecoveryServiceSubnetCompartment

Using the APIs to Manage LTR Backups

Review the list of REST API endpoints to create and manage long-term retention (LTR) backups of a protected database using Recovery Service.

For information about using the API and signing requests, see *REST APIs* and *Security Credentials*. For information about SDKs, see *Software Development Kits and Command Line Interface*

Use the following REST API endpoints to manage long-term backups for your Oracle Databases that use Recovery Service as the backup destination.

- **Create a long-term backup of a protected database:** `CreateLongTermBackup`
- **Update a long-term backup of a protected database:** `UpdateLongTermBackup`
- **Retrieve a long-term backup of a protected database:** `GetLongTermBackup`
- **Lists all the long-term backups of a protected database:** `ListLongTermBackups`
- **Delete a long-term backup of a protected database:** `DeleteLongTermBackup`
- **Cancel a long-term backup of a protected database:** `CancelLongTermBackup`

Related Topics

- REST APIs
- Security Credentials
- Software Development Kits and Command Line Interface
- CreateLongTermBackup
- UpdateLongTermBackup
- GetLongTermBackup
- ListLongTermBackups
- DeleteLongTermBackup
- CancelLongTermBackup

9

Recovery Service Resource Types and Policies

Learn how to develop policies required to control Recovery Service resources.

- About Recovery Service Resource Types
  Review the list of resource types you can use to create policies for Recovery Service.
- Supported Variables for Recovery Service
  Use variables when adding conditions to a policy. Recovery Service supports only the general variables.
- Details of Verb+Resource-Type Combinations
  Review the list of permissions and API operations covered by each verb for Recovery Service.
- Permissions Required for Each API Operation
  Review the list of permissions for Recovery Service resources in a logical order, grouped by resource-type.

Related Topics

- Permissions Required for Oracle Databases in OCI to Use Recovery Service
  Assign the permissions required for OCI Databases to use Recovery Service for backups.

About Recovery Service Resource Types

Review the list of resource types you can use to create policies for Recovery Service.

You can use two types of resources, individual and family, to define policies.

An individual resource-type controls access to a specific resource. For example, the `recovery-service-policy` resource-type represents the protection policy resource. Use the following individual resource-types to control Recovery Service resources.

```
recovery-service-protected-database
recovery-service-policy
recovery-service-subnet
long-term-backup
recovery-service-work-request
```

A family resource-type includes multiple individual resource-types. If you want to write a policy to grant access to all the Recovery Service resources, then use the family resource-type called `recovery-service-family`.

Related Topics

- How Policies Work

Supported Variables for Recovery Service

Use variables when adding conditions to a policy. Recovery Service supports only the general variables.

Related Topics

- General Variables for All Requests

Details of Verb+Resource-Type Combinations

Review the list of permissions and API operations covered by each verb for Recovery Service.

- Recovery Service Family Resource Types
  Each Recovery Service resource-type verb grants different levels of access.
- recovery-service-family
  Review the list of permissions and API operations for the `recovery-service-family` resource type.
- recovery-service-protected-database
  Review the list of permissions and API operations for the `recovery-service-protected-database` resource-type.
- recovery-service-subnet
  Review the list of permissions and API operations for the `recovery-service-subnet` resource-type.
- recovery-service-policy
  Review the list of permissions and API operations for the `recovery-service-policy` resource type.
- long-term backup
  Review the list of permissions and API operations for the `long-term backup` resource type.
- recovery-service-work-request
  Review the list of permissions and API operations for the `recovery-service-work-request` resource type.

Related Topics

- Permissions
- Verbs
- Resource-Types

Recovery Service Family Resource Types

Each Recovery Service resource-type verb grants different levels of access.

The level of access is cumulative as you go from `inspect` to `read`, to `use`, and to `manage`. A plus sign (+) in a table cell indicates incremental access compared to the cell directly above it, whereas "no extra" indicates no incremental access.

To govern control to a specific resource, you must define at least one policy that follows this syntax:

```
Allow group group name to verb resource-type in compartment compartment name
```

```
RecoveryServiceAdminGroup
Allow RecoveryServiceAdminGroup to manage recovery-service-protected-database in
tenancy
```

recovery-service-family

Review the list of permissions and API operations for the `recovery-service-family` resource type.

Table 9-1 recovery-service-family - *INSPECT*

Permissions	APIs Fully Covered	APIs Partially Covered
RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT RECOVERY_SERVICE_POLICY_INSPECT RECOVERY_SERVICE_SUBNET_INSPECT RECOVERY_SERVICE_WORK_REQUEST_INSPECT RECOVERY_SERVICE_LONG_TERM_BACKUP_INSPECT	ListProtectedDatabases ListProtectionPolicies ListRecoveryServiceSubnets ListWorkRequests ListLongTermBackups	*none*

Table 9-2 recovery-service-family - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered
INSPECT+ RECOVERY_SERVICE_PROTECTED_DATABASE_READ RECOVERY_SERVICE_POLICY_READ RECOVERY_SERVICE_SUBNET_READ RECOVERY_SERVICE_WORK_REQUEST_READ RECOVERY_SERVICE_LONG_TERM_BACKUP_READ	GetProtectedDatabase GetProtectionPolicy GetRecoveryServiceSubnet GetWorkRequest GetLongTermBackup	*none*

Table 9-3 recovery-service-family - *UPDATE*

Permissions	APIs Fully Covered	APIs Partially Covered
READ+ RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE RECOVERY_SERVICE_POLICY_UPDATE RECOVERY_SERVICE_SUBNET_UPDATE RECOVERY_SERVICE_LONG_TERM_BACKUP_UPDATE	UpdateProtectedDatabase UpdateProtectionPolicy UpdateRecoveryServiceSubnet UpdateLongTermBackup	*none*

Table 9-4 recovery-service-family - *MANAGE*

Permissions	APIs Fully Covered	APIs Partially Covered
USE+ RECOVERY_SERVICE_PROTECTED_DATABASE_CREATE RECOVERY_SERVICE_PROTECTED_DATABASE_DELETE RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE RECOVERY_SERVICE_POLICY_CREATE RECOVERY_SERVICE_POLICY_DELETE RECOVERY_SERVICE_POLICY_MOVE RECOVERY_SERVICE_SUBNET_CREATE RECOVERY_SERVICE_SUBNET_DELETE RECOVERY_SERVICE_SUBNET_MOVE RECOVERY_SERVICE_LONG_TERM_BACKUP_CREATE RECOVERY_SERVICE_LONG_TERM_BACKUP_DELETE RECOVERY_SERVICE_LONG_TERM_BACKUP_CANCEL	CreateProtectedDatabase DeleteProtectedDatabase ChangeProtectedDatabaseCompartment CreateProtectionPolicy DeleteProtectionPolicy ChangeProtectionPolicyCompartment CreateRecoveryServiceSubnet DeleteRecoveryServiceSubnet ChangeRecoveryServiceSubnetCompartment CreateLongTermBackup DeleteLongTermBackup CancelLongTermBackup	*none*

recovery-service-protected-database

Review the list of permissions and API operations for the `recovery-service-protected-database` resource-type.

Table 9-5 recovery-service-protected-database - *INSPECT*

Permission	APIs Fully Covered	APIs Partially Covered
RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT	ListProtectedDatabases	*none*

Table 9-6 recovery-service-protected-database - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered
INSPECT+ RECOVERY_SERVICE_PROTECTED_DATABASE_READ	GetProtectedDatabase	*none*

Table 9-7 recovery-service-protected-database - *UPDATE*

Permissions	APIs Fully Covered	APIs Partially Covered
READ+ RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE	UpdateProtectedDatabase	*none*

Table 9-8 recovery-service-protected-database - *MANAGE*

Permissions	APIs Fully Covered	APIs Partially Covered
USE+ RECOVERY_SERVICE_PROTECTED_DATABASE_CREATE RECOVERY_SERVICE_PROTECTED_DATABASE_DELETE RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE	CreateProtectedDatabase DeleteProtectedDatabase ChangeProtectedDatabaseCompartment	*none*

recovery-service-subnet

Review the list of permissions and API operations for the `recovery-service-subnet` resource-type.

Table 9-9 recovery-service-subnet - *INSPECT*

Permissions	APIs Fully Covered	APIs Partially Covered
RECOVERY_SERVICE_SUBNET_INSPECT	ListRecoveryServiceSubnets	*none*

Table 9-10 recovery-service-subnet - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered
INSPECT+ RECOVERY_SERVICE_SUBNET_READ	GetRecoveryServiceSubnet	*none*

Table 9-11 recovery-service-subnet - *UPDATE*

Permissions	APIs Fully Covered	APIs Partially Covered
READ+ RECOVERY_SERVICE_SUBNET_UPDATE	UpdateRecoveryServiceSubnet	*none*

Table 9-12 recovery-service-subnet - *MANAGE*

Permissions	APIs Fully Covered	APIs Partially Covered
USE+ RECOVERY_SERVICE_SUBNET_CREATE RECOVERY_SERVICE_SUBNET_DELETE RECOVERY_SERVICE_SUBNET_MOVE	CreateRecoveryServiceSubnet DeleteRecoveryServiceSubnet ChangeRecoveryServiceSubnetCompartment	*none*

recovery-service-policy

Review the list of permissions and API operations for the `recovery-service-policy` resource type.

Table 9-13 recovery-service-policy - *INSPECT*

Permissions	APIs Fully Covered	APIs Partially Covered
RECOVERY_SERVICE_POLICY_INSPECT	ListProtectionPolicies	*none*

Table 9-14 recovery-service-policy - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered
INSPECT+ RECOVERY_SERVICE_POLICY_READ	GetProtectionPolicy	*none*

Table 9-15 recovery-service-policy - *UPDATE*

Permissions	APIs Fully Covered	APIs Partially Covered
READ+ RECOVERY_SERVICE_POLICY_UPDATE	UpdateProtectionPolicy	*none*

Table 9-16 recovery-service-policy - *MANAGE*

Permissions	APIs Fully Covered	APIs Partially Covered
USE+ RECOVERY_SERVICE_POLICY_CREATE RECOVERY_SERVICE_POLICY_DELETE RECOVERY_SERVICE_POLICY_MOVE	CreateProtectionPolicy DeleteProtectionPolicy ChangeProtectionPolicyCompartment	*none*

long-term backup

Review the list of permissions and API operations for the `long-term backup` resource type.

Table 9-17 long-term-backup - *INSPECT*

Permissions	APIs Fully Covered	APIs Partially Covered
RECOVERY_SERVICE_LONG_TERM_BACKUP_INSPECT	ListLongTermBackups	*none*

Table 9-18 long-term-backup - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered
INSPECT+ RECOVERY_SERVICE_LONG_TERM_BACKUP_READ	GetLongTermBackup	*none*

Table 9-19 long-term-backup - *UPDATE*

Permissions	APIs Fully Covered	APIs Partially Covered
READ+ RECOVERY_SERVICE_LONG_TERM_BACKUP_UPDATE	UpdateLongTermBackup	*none*

Table 9-20 long-term-backup - *MANAGE*

Permissions	APIs Fully Covered	APIs Partially Covered
USE+ RECOVERY_SERVICE_LONG_TERM_BACKUP_CREATE RECOVERY_SERVICE_LONG_TERM_BACKUP_CANCEL RECOVERY_SERVICE_LONG_TERM_BACKUP_DELETE	CreateLongTermBackup CancelLongTermBackup DeleteLongTermBackup	*none*

recovery-service-work-request

Review the list of permissions and API operations for the `recovery-service-work-request` resource type.

Table 9-21 recovery-service-work-request - *INSPECT*

Permissions	APIs Fully Covered	APIs Partially Covered
`RECOVERY_SERVICE_WORK_REQUEST_INSPECT`	`ListWorkRequests`	*none*

Table 9-22 recovery-service-work-request - *READ*

Permissions	APIs Fully Covered	APIs Partially Covered

INSPECT+ `RECOVERY_SERVICE_WORK_REQUEST_READ`	`GetWorkRequest`
	`ListWorkRequestErrors`
	`ListWorkRequestLogs`
		none

Permissions Required for Each API Operation

Review the list of permissions for Recovery Service resources in a logical order, grouped by resource-type.

Table 9-23 Resource Type and Permissions

Resource Type	Permissions
recovery-service-family	RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT RECOVERY_SERVICE_PROTECTED_DATABASE_READ RECOVERY_SERVICE_PROTECTED_DATABASE_CREATE RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE RECOVERY_SERVICE_PROTECTED_DATABASE_DELETE RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE RECOVERY_SERVICE_POLICY_INSPECT RECOVERY_SERVICE_POLICY_READ RECOVERY_SERVICE_POLICY_CREATE RECOVERY_SERVICE_POLICY_UPDATE RECOVERY_SERVICE_POLICY_DELETE RECOVERY_SERVICE_POLICY_MOVE RECOVERY_SERVICE_SUBNET_INSPECT RECOVERY_SERVICE_SUBNET_READ RECOVERY_SERVICE_SUBNET_CREATE RECOVERY_SERVICE_SUBNET_UPDATE RECOVERY_SERVICE_SUBNET_DELETE RECOVERY_SERVICE_SUBNET_MOVE RECOVERY_SERVICE_WORK_REQUEST_INSPECT RECOVERY_SERVICE_WORK_REQUEST_READ
recovery-service-protected-database	RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT RECOVERY_SERVICE_PROTECTED_DATABASE_READ RECOVERY_SERVICE_PROTECTED_DATABASE_CREATE RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE RECOVERY_SERVICE_PROTECTED_DATABASE_DELETE RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE
recovery-service-policy	RECOVERY_SERVICE_POLICY_INSPECT RECOVERY_SERVICE_POLICY_READ RECOVERY_SERVICE_POLICY_CREATE RECOVERY_SERVICE_POLICY_UPDATE RECOVERY_SERVICE_POLICY_DELETE RECOVERY_SERVICE_POLICY_MOVE
recovery-service-subnet	RECOVERY_SERVICE_SUBNET_INSPECT RECOVERY_SERVICE_SUBNET_READ RECOVERY_SERVICE_SUBNET_CREATE RECOVERY_SERVICE_SUBNET_UPDATE RECOVERY_SERVICE_SUBNET_DELETE RECOVERY_SERVICE_SUBNET_MOVE
recovery-service-work-request	RECOVERY_SERVICE_WORK_REQUEST_INSPECT RECOVERY_SERVICE_WORK_REQUEST_READ

Table 9-23 (Cont.) Resource Type and Permissions

Resource Type	Permissions
long-term-backup	RECOVERY_SERVICE_LONG_TERM_BACKUP_INSPECT RECOVERY_SERVICE_LONG_TERM_BACKUP_READ RECOVERY_SERVICE_LONG_TERM_BACKUP_CREATE RECOVERY_SERVICE_LONG_TERM_BACKUP_UPDATE RECOVERY_SERVICE_LONG_TERM_BACKUP_DELETE RECOVERY_SERVICE_LONG_TERM_BACKUP_CANCEL

Table 9-24 API Operations and Permissions

API Operation	Permissions Required for the Operation
CreateProtectedDatabase	RECOVERY_SERVICE_PROTECTED_DATABASE_CREATE
DeleteProtectedDatabase	RECOVERY_SERVICE_PROTECTED_DATABASE_DELETE
GetProtectedDatabase	RECOVERY_SERVICE_PROTECTED_DATABASE_READ
ListProtectedDatabases	RECOVERY_SERVICE_PROTECTED_DATABASE_INSPECT
UpdateProtectedDatabase	RECOVERY_SERVICE_PROTECTED_DATABASE_UPDATE
ChangeProtectedDatabaseCompartment	RECOVERY_SERVICE_PROTECTED_DATABASE_MOVE
CreateProtectionPolicy	RECOVERY_SERVICE_POLICY_CREATE
DeleteProtectionPolicy	RECOVERY_SERVICE_POLICY_DELETE
GetProtectionPolicy	RECOVERY_SERVICE_POLICY_READ
ListProtectionPolicies	RECOVERY_SERVICE_POLICY_INSPECT
UpdateProtectionPolicy	RECOVERY_SERVICE_POLICY_UPDATE
ChangeProtectionPolicyCompartment	RECOVERY_SERVICE_POLICY_MOVE
CreateRecoveryServiceSubnet	RECOVERY_SERVICE_SUBNET_CREATE
DeleteRecoveryServiceSubnet	RECOVERY_SERVICE_SUBNET_DELETE
GetRecoveryServiceSubnet	RECOVERY_SERVICE_SUBNET_READ
ListRecoveryServiceSubnets	RECOVERY_SERVICE_SUBNET_INSPECT
UpdateRecoveryServiceSubnet	RECOVERY_SERVICE_SUBNET_UPDATE
ChangeRecoveryServiceSubnetCompartment	RECOVERY_SERVICE_SUBNET_MOVE
ListWorkRequests	RECOVERY_SERVICE_WORK_REQUEST_INSPECT
GetWorkRequest ListWorkRequestErrors ListWorkRequestLogs	RECOVERY_SERVICE_WORK_REQUEST_READ

Table 9-24 (Cont.) API Operations and Permissions

API Operation	Permissions Required for the Operation
CreateLongTermBackup	RECOVERY_SERVICE_LONG_TERM_BACKUP_CREATE
DeleteLongTermBackup	RECOVERY_SERVICE_LONG_TERM_BACKUP_DELETE
GetLongTermBackup	RECOVERY_SERVICE_LONG_TERM_BACKUP_READ
UpdateLongTermBackup	RECOVERY_SERVICE_LONG_TERM_BACKUP_UPDATE
CancelLongTermBackup	RECOVERY_SERVICE_LONG_TERM_BACKUP_CANCEL

10

Recovery Service Metrics

Learn how to access Recovery Service metrics and monitor protected database backups.

- About Recovery Service Metrics
  Learn about the metrics emitted by the metric namespace: `oci_recovery_service` (Oracle Database Autonomous Recovery Service).
- Available Metrics: oci_recovery_service
  This topic describes the Recovery Service performance metrics available for every protected database resource. You do not need to enable monitoring on the resource to view the default metrics.
- Using the Console to View Protected Database Metrics
  Learn how to use the console to view the metric charts for Recovery Service and monitor your protected databases.
- Using Alarms to Monitor Protected Databases
  You can create alarms for metrics emitted by the `oci_recovery_service` namespace.

About Recovery Service Metrics

Learn about the metrics emitted by the metric namespace: `oci_recovery_service` (Oracle Database Autonomous Recovery Service).

A protected database is an Oracle Cloud database that uses Recovery Service for backups and data protection.

Use Recovery Service metrics to monitor the backup performance of your protected databases. For example, you can use metrics to monitor the protection status or health of your database, the amount of backup storage space utilized to meet the recovery window goal, etc.

In the OCI Console, use the Protected database details page to view the default metric charts for a single protected database. Use the Oracle Cloud Infrastructure Monitoring service to view metrics for multiple protected databases.

You can also use the Oracle Cloud Infrastructure Monitoring service to build metric queries and create alarms to be notified when the metrics meet alarm-specified triggers.

The following terms are helpful for understanding metrics:

- **Namespace**: A container for Recovery Service metrics. `oci_recovery_service` is the Recovery Service namespace.
- **Metrics**: The fundamental concept in telemetry and monitoring. Metrics define a time-series set of datapoints. Each metric is uniquely defined by namespace, metric name, compartment identifier, a set of one or more dimensions, and a unit of measure. Each datapoint has a timestamp, a value, and a count associated with it.
- **Dimensions**: A key-value pair that defines the characteristics associated with the metric. For example, `resourceId`, which is the protected database OCID.
- **Statistics**: Metric data aggregations over specified periods of time. Aggregations are done using the namespace, metric name, dimensions, and the datapoint unit of measure within the time period specified.

- **Alarms**: Used to automate operations monitoring and performance. An alarm keeps track of changes that occur over a specific period of time. It also performs one or more defined actions, based on the rules defined for the metric.

To monitor resources, you must have the required type of access to Recovery Service resources in a policy written by an administrator.

Available Metrics: oci_recovery_service

This topic describes the Recovery Service performance metrics available for every protected database resource. You do not need to enable monitoring on the resource to view the default metrics.

Table 10-1 Recovery Service Metric Dimensions

Dimension	Description
`resourceId`	The OCID of a protected database.
`dBUniqueName`	The unique name identifying the protected database in Recovery Service.

Default Metrics

These default metric charts are available for each protected database from the Protected database details page.

Table 10-2 Default metrics for protected databases

Metric	Metric Display Name	Unit	Description and Metric Chart Defaults	Dimensions
`SpaceUsedForRecoveryWindow`	Space used for recovery window	GB	The amount of storage space that is currently used to meet the recovery window goal for the protected database. Statistic: Max Interval: 1 day	resourceId dBUniqueName
`ProtectedDatabaseSize`	Protected database size	GB	The total storage space consumed by a database protected by Recovery Service. Statistic: Max Interval: 1 day	resourceId dBUniqueName

Table 10-2 (Cont.) Default metrics for protected databases

Metric	Metric Display Name	Unit	Description and Metric Chart Defaults	Dimensions
`ProtectedDatabaseHealth`	Protected database health	Count	Indicates the current protection status or health of the database. • A value of **0** indicates that the database is **Protected** • A value of **1** indicates a **Warning** status due to a potential data loss exposure • A value of **2** indicates an **Alert** status if the latest backup has failed Statistic: Max Interval: 30 minutes	resourceId dBUniqueName
`DataLossExposure`	Data loss exposure	Mean	Indicates the time since the last valid backup, or the amount of time for potential data loss. Statistic: Mean Interval: 30 minutes	resourceId dBUniqueName

Related Topics

- Using the Console to View Protected Database Metrics
  Learn how to use the console to view the metric charts for Recovery Service and monitor your protected databases.

Using the Console to View Protected Database Metrics

Learn how to use the console to view the metric charts for Recovery Service and monitor your protected databases.

To view the default metric charts for a single protected database:

1. Log in to your OCI tenancy.
2. In the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database Backups page.
3. In the **Compartment** field, select the compartment that contains the protected database you want to view.

4. In the **Protected databases** list, click the name of the protected database you want to monitor.
5. In the Protected database details page, under **Resources**, click **Metrics**.

To view the default metric chart for multiple protected databases

1. Open the navigation menu and click **Observability & Management**. Under **Monitoring**, click **Service Metrics**.
2. Choose the **Compartment** that contains the protected databases you want to monitor.
3. In the **Metric namespace** field, select **oci_recovery_service**.
4. The Service Metrics page dynamically updates the page to show charts for each metric that is emitted by the selected metric namespace.

To view custom query metric charts using Metrics Explorer

1. Open the navigation menu and click **Observability & Management**. Under **Monitoring**, click **Metrics Explorer**. The **Metrics Explorer** page displays an empty chart with fields to build a query.
2. Select a **Compartment**.
3. In the **Metric namespace** field, select **oci_recovery_service**.
4. In the **Metric name** field, select a metric. For example, select **DataLossExposure** to create a metric chart that displays data loss exposure information for protected databases.
5. Refine your query. For instructions, see: *Building Metric Queries*.
6. Click **Update Chart**.
7. The chart shows the results of your new query. You can optionally add more queries by clicking **Add Query** below the chart.
8. Optionally, click **Create Alarm** to create an alarm from the query.

Related Topics

- Available Metrics: oci_recovery_service
  This topic describes the Recovery Service performance metrics available for every protected database resource. You do not need to enable monitoring on the resource to view the default metrics.
- Building Metric Queries
- Monitoring

Using Alarms to Monitor Protected Databases

You can create alarms for metrics emitted by the `oci_recovery_service` namespace.

Use the Oracle Cloud Infrastructure Monitoring service alarms feature to passively monitor your protected databases resources and notify you when metrics meet alarm-specified triggers.

From each metric displayed in the Protected database details page, you can set an alarm and be notified when a condition is met. For example, you can create an alarm to notify you when the space used for recovery window is more than 70%, or when the protected database health status changes to **1** (warning).

To set an alarm from the Protected database details page

1. Open the navigation menu, click **Oracle Database**, and select **Database Backups** to display the Database backups page.
2. Choose the compartment that contains the protected databases you want to monitor, and then select a protected database from the list.
3. In the Protected database details page, under **Resources**, click **Metrics**.
4. From any of the available metric charts, click the **Options** menu, and select **Create an alarm on this query**. The Oracle Cloud Infrastructure Monitoring service Create Alarm page is displayed.
5. Specify the alarm settings. For detailed instructions to create an alarm, see *Managing Alarms*.

To set an alarm from the Alarm Definitions page of the Monitoring service

1. Open the navigation menu and click **Observability & Management**. Under **Monitoring**, click **Alarm Definitions**.
2. Click **Create Alarm**.
3. Specify the alarm settings. In the **Metric description** section, select the `oci_recovery_service` namespace. In the **Metric name** field, and select any one of the metrics emitted by the `oci_recovery_service` namespace. For detailed instructions to create an alarm, see *Managing Alarms*.

Related Topics

- Available Metrics: oci_recovery_service
  This topic describes the Recovery Service performance metrics available for every protected database resource. You do not need to enable monitoring on the resource to view the default metrics.
- Managing Alarms
- Monitoring
- Best Practices for your Alarms

11

Recovery Service Events

The Recovery Service resources emit events, which are structured messages that indicate changes in resources.

- About Recovery Service Events and Event Types
  You can create rules in the Events service for Recovery Service event types.
- Protected Databases Event Types
  Review details about the events emitted by the Recovery Service protected databases resource.
- Recovery Service Subnets Event Types
  Review details about the events emitted by the Recovery Service subnets resource.
- Protection Policies Event Types
  Review details about the events emitted by the Recovery Service protection policies resource.
- Viewing Audit Log Events
  Audit provides records of API operations performed against supported services as a list of log events.

About Recovery Service Events and Event Types

You can create rules in the Events service for Recovery Service event types.

Recovery Service emits events for these resources:

- Protected Databases
- Recovery Service Subnets
- Protection Policies

Related Topics

- Overview of Events

Protected Databases Event Types

Review details about the events emitted by the Recovery Service protected databases resource.

Table 11-1 Recovery Service: Protected Database Event Types

Friendly Name	Event Type
Protected Database - Change Billing Compartment Begin	`com.oraclecloud.autonomousrecoveryservice.changeprotecteddatabasebillingcompartment.begin`

Table 11-1 (Cont.) Recovery Service: Protected Database Event Types

Friendly Name	Event Type
Protected Database - Change Billing Compartment End	com.oraclecloud.autonomousrecoveryservice.changeprotecteddatabasebillingcompartment.end
Protected Database - Change Compartment Begin	com.oraclecloud.autonomousrecoveryservice.changeprotecteddatabasecompartment.begin
Protected Database - Change Compartment End	com.oraclecloud.autonomousrecoveryservice.changeprotecteddatabasecompartment.end
Protected Database - Create Begin	com.oraclecloud.autonomousrecoveryservice.createprotecteddatabase.begin
Protected Database - Create End	com.oraclecloud.autonomousrecoveryservice.createprotecteddatabase.end
Protected Database - Delete Begin	com.oraclecloud.autonomousrecoveryservice.deleteprotecteddatabase.begin
Protected Database - Delete End	com.oraclecloud.autonomousrecoveryservice.deleteprotecteddatabase.end
Get Protected Database Configuration Begin	com.oraclecloud.autonomousrecoveryservice.fetchprotecteddatabaseconfiguration.begin
Get Protected Database Configuration End	com.oraclecloud.autonomousrecoveryservice.fetchprotecteddatabaseconfiguration.end
Protected Database - Update Begin	com.oraclecloud.autonomousrecoveryservice.updateprotecteddatabase.begin
Protected Database - Update End	com.oraclecloud.autonomousrecoveryservice.updateprotecteddatabase.end

Example 11-1 Reference Event for Protected Databases

Here's a reference event for protected databases:

```
{
    "eventType":
"com.oraclecloud.autonomousrecoveryservice.updateprotecteddatabase.begin",
    "cloudEventsVersion": "0.1",
    "eventTypeVersion": "2.0",
    "source": "autonomousRecoveryService",
    "eventTime": "2022-09-08T20:39:38.446Z",
    "contentType": "application/json",
    "eventID": "unique_ID",
    "data": {
      "compartmentId": "ocid1.compartment.oc1..unique_ID",
      "compartmentName": "example_compartment",
      "resourceName": "example protected database",
      "resourceId":
"ocid1.recoveryserviceprotecteddatabase.oc1.phx.unique_ID",
```

```
      "availabilityDomain": "availability_domain",
      "freeFormTags": {},
      "definedTags": {
        "Oracle-Tags": {
          "CreatedBy": "oracleidentitycloudservice/example_email",
          "CreatedOn": "2022-09-08T20:38:53.109Z"
        }
      },
      "additionalDetails": {
        "X-Real-Port": 35739
      }

    }
  },
```

Recovery Service Subnets Event Types

Review details about the events emitted by the Recovery Service subnets resource.

Table 11-2 Recovery Service Subnets Event Types

Friendly Name	Event Type
Recovery Service Subnet - Change Compartment Begin	`com.oraclecloud.autonomousrecoveryservice.changerecoveryservicesubnetcompartment.begin`
Recovery Service Subnet - Change Compartment End	`com.oraclecloud.autonomousrecoveryservice.changerecoveryservicesubnetcompartment.end`
Recovery Service Subnet - Create Begin	`com.oraclecloud.autonomousrecoveryservice.createrecoveryservicesubnet.begin`
Recovery Service Subnet - Create End	`com.oraclecloud.autonomousrecoveryservice.createrecoveryservicesubnet.end`
Recovery Service Subnet - Delete Begin	`com.oraclecloud.autonomousrecoveryservice.deleterecoveryservicesubnet.begin`
Recovery Service Subnet - Delete End	`com.oraclecloud.autonomousrecoveryservice.deleterecoveryservicesubnet.end`
Recovery Service Subnet - Update Begin	`com.oraclecloud.autonomousrecoveryservice.updaterecoveryservicesubnet.begin`
Recovery Service Subnet - Update End	`com.oraclecloud.autonomousrecoveryservice.updaterecoveryservicesubnet.end`

Example 11-2 Reference Event for Recovery Service Subnets

Here's a reference event for Recovery Service subnets:

```
{
      "eventType":
"com.oraclecloud.autonomousrecoveryservice.createrecoveryservicesubnet.begin",
      "cloudEventsVersion": "0.1",
      "eventTypeVersion": "2.0",
      "source": "autonomousRecoveryService",
```

```
  "eventTime": "2022-09-08T20:39:38.446Z",
  "contentType": "application/json",
  "eventID": "unique_ID",
  "data": {
    "compartmentId": "ocid1.compartment.oc1..unique_ID",
    "compartmentName": "example_compartment",
    "resourceName": "example recovery service subnet",
    "resourceId": "ocid1.recoveryservicesubnet.oc1.phx.unique_ID",
    "availabilityDomain": "availability_domain",
    "freeFormTags": {},
    "definedTags": {
      "Oracle-Tags": {
        "CreatedBy": "oracleidentitycloudservice/example_email",
        "CreatedOn": "2022-09-08T20:38:53.109Z"
      }
    },
    "additionalDetails":{
      "X-Real-Port": 35739
    }
  }
},
```


Protection Policies Event Types

Review details about the events emitted by the Recovery Service protection policies resource.

Table 11-3 Recovery Service: Protection Policies Event Types

Friendly Name	Event Type
Protection Policy - Change Compartment Begin	`com.oraclecloud.autonomousrecoveryservice.changeprotectionpolicycompartment.begin`
Protection Policy - Change Compartment End	`com.oraclecloud.autonomousrecoveryservice.changeprotectionpolicycompartment.end`
Protection Policy - Create Begin	`com.oraclecloud.autonomousrecoveryservice.createprotectionpolicy.begin`
Protection Policy - Create End	`com.oraclecloud.autonomousrecoveryservice.createprotectionpolicy.end`
Protection Policy - Delete Begin	`com.oraclecloud.autonomousrecoveryservice.deleteprotectionpolicy.begin`
Protection Policy - Delete End	`com.oraclecloud.autonomousrecoveryservice.deleteprotectionpolicy.end`
Protection Policy - Update Begin	`com.oraclecloud.autonomousrecoveryservice.updateprotectionpolicy.begin`
Protection Policy - Update End	`com.oraclecloud.autonomousrecoveryservice.updateprotectionpolicy.end`

Example 11-3 Reference Event for Protection Policies

Here's a reference event for protection policies:

```
{
      "eventType":
"com.oraclecloud.autonomousrecoveryservice.updateprotectionpolicy.end",
      "cloudEventsVersion": "0.1",
      "eventTypeVersion": "2.0",
      "source": "autonomousRecoveryService",
      "eventTime": "2022-09-08T20:39:38.446Z",
      "contentType": "application/json",
      "eventID": "unique_ID",
      "data": {
        "compartmentId": "ocid1.compartment.oc1..unique_ID",
        "compartmentName": "example_compartment",
        "resourceName": "example protection policy",
        "resourceId": "ocid1.recoveryservicepolicy.oc1.phx.unique_ID",
        "availabilityDomain": "availability_domain",
        "freeformTags": null,
        "definedTags": null,
        "additionalDetails": null
      }
    },
    "additionalDetails": []
  }
```

Viewing Audit Log Events

Audit provides records of API operations performed against supported services as a list of log events.

Use the console to view Recovery Service events logged by Audit.

For more information on searching logs, see *Using the Console*.

Related Topics

- Overview of Audit
- View Audit Log Events
- Using the Console

A
Troubleshooting

Learn how to address typical issues and errors that you may encounter while working with Recovery Service.

- Troubleshoot Backup Failures to Recovery Service
  If your database fails to backup to Recovery Service, use the information in this topic to troubleshoot the issue.
- Getting Help for Recovery Service
  You can collect diagnostics to analyze an issue. If you need help to resolve the issue, raise a service request with My Oracle Support and share the diagnostics.

Troubleshoot Backup Failures to Recovery Service

If your database fails to backup to Recovery Service, use the information in this topic to troubleshoot the issue.

Typically, automatic backups to Recovery Service may fail because of configuration issues in the database VCN, or due to network connectivity problems between your database and Recovery Service.

These sections describe the common errors associated with backup failures, and provides troubleshooting information.

Connection timed out

Backups to Recovery Service may fail if the connection from a database client to Recovery Service could not be completed within the time out period.

How to Diagnose

Run the `tnsping` command from the database client to verify connectivity between your database and Recovery Service.

For example:

```
tnsping dbrs
```

This message indicates that a connection could not be established with Recovery Service.

```
TNS Ping Utility for Linux: Version 19.0.0.0.0 - Production on 26-APR-2023 06:09:46
Used parameter files:

/u01/app/oracle/product/19.0.0.0/dbhome_1/network/admin/sqlnetdb.ora

Used TNSNAMES adapter to resolve the alias
Attempting to contact (DESCRIPTION = (FAILOVER = on) (CONNECT_TIMEOUT = 3) (RETRY_COUNT
= 3) (TRANSPORT_CONNECT_TIMEOUT = 3) (ADDRESS_LIST = (LOAD_BALANCE = on) (ADDRESS =
(PROTOCOL = TCPS)(HOST = sales-server)(PORT = 1421)) (ADDRESS = (PROTOCOL = TCPS)(HOST =
sales-server)(PORT = 1421))) (CONNECT_DATA = (SERVER = DEDICATED) (SERVICE_NAME =
sales.example.com)))
TNS-12535: TNS:operation timed out
```

Probable Cause 1
Port 8005 is not open to allow HTTP traffic.

Solution
Add an ingress rule to allow HTTP traffic from **Destination Port Range** 8005. You must add this rule to the security list used by the VCN in which your database resides.

See, Review Subnet Size Requirements and Security Rules for Recovery Service Subnet

Probable Cause 2
Port 2484 is not open to allow SQL Net traffic

Solution
Add an ingress rule to allow SQL Net traffic from **Destination Port Range** 2484. You must add this ingress rule to the security list used by the VCN in which your database resides.

See, Review Subnet Size Requirements and Security Rules for Recovery Service Subnet

Probable Cause 3
An egress rule may be preventing network traffic on ports 8005 and 2484.

Solution
If your database VCN restricts network traffic between subnets, then ensure to add an egress rule for ports 2484 and 8005 from the database subnet to the Recovery Service subnet that you create.

See, Review Subnet Size Requirements and Security Rules for Recovery Service Subnet

Probable Cause 4
You could be using a custom DNS setup, which will lead to incorrect IP address resolution.

Solution
Perform a `nslookup` on the host names provided in the `dbrsnames.ora` file. You can also obtain the host names when you run the `tnsping` command. The IP address must match the IP addresses provided in the protected database `hosts.txt` file. You can download the `hosts.txt` file from the protected database details page in the OCI Console.
See, Downloading Protected Database Network Connection Details.

Subnet does not have any more available IP addresses

While creating a protected database, the work request may report a failed state for the associated Recovery Service subnet.

Probable Cause
There are insufficient unallocated IP addresses in the subnet used for Recovery Service operations in the database VCN.

Solution
To prevent a recurrence of this issue, ensure that sufficient unallocated IP addresses remain available in the subnet, or use a different Recovery Service subnet.

See, Register Recovery Service Subnet

A problem occurred while creating the protected database resource

If there is a problem while creating a protected database, then you may encounter an error message that suggests to contact Oracle Support for assistance.

Probable Cause
Protected database creation may fail for unknown reasons.

Solution
You may retry later. If the problem persists, contact Oracle Support.
See, Submit a Service Request.

Getting Help for Recovery Service

You can collect diagnostics to analyze an issue. If you need help to resolve the issue, raise a service request with My Oracle Support and share the diagnostics.

- Collect Diagnostics
  Review this section to learn how you can diagnose backup and restore issues.
- Submit a Service Request
  You can contact Oracle Support for assistance with onboarding your database, backup failures, or restore issues while working with Recovery Service.

Collect Diagnostics

Review this section to learn how you can diagnose backup and restore issues.

Database Service	How to Diagnose Backup and Restore Issues
Oracle Base Database Service	Identify the Cause of Backup Failures
Oracle Exadata Database Service on Dedicated Infrastructure	For backup failures, see: SRDC - Exadata Cloud Required Diagnostic Data Collection for RMAN Backup (Doc ID 2653098.1) For restore issues, see: SRDC - Exadata Cloud Required Diagnostic Data Collection for RMAN Restore and Recover (Doc ID 2653673.1)

Submit a Service Request

You can contact Oracle Support for assistance with onboarding your database, backup failures, or restore issues while working with Recovery Service.

Before you create a service request:

- You must have a Support Identifier which verifies your eligibility for Support services
- You must have an account at My Oracle Support

Use these steps to submit a service request to Oracle Support.

1. Access and log in to My Oracle Support.
2. Select the **Service Requests** tab, and click **Create Technical SR**.

   The Create Service Request wizard is displayed.
3. In the **Problem Summary** field, enter a brief description of the problem.
4. In the **Problem Description** field, enter a detailed information of the problem. Include any diagnostic information or error messages you may have encountered in the OCI Console. See, Collect Diagnostics.

> **Note:**
>
> It is important that you specify that the issue is related to Autonomous Recovery Service, and also indicate whether the problem affects onboarding, backups, or restore operations for your database.

5. Select an appropriate **Severity** value for the issue.
6. Navigate to the **Where is the problem?** section.
7. Select the **Cloud** tab.
8. In the **Service Type** field, do one of the following:
   - For Oracle Base Database Service service, select **Oracle Cloud Infrastructure - Database Service**
   - For Oracle Exadata Database Service on Dedicated Infrastructure, select **Oracle Cloud Infrastructure - Exadata Cloud Service**
9. In the **Problem Type** field, do one of the following:
   - For Oracle Base Database Service, select **OCI VM/BM Database Administration**, and then select one of these options:
     - **Backup** - for onboarding or backup related issues for your database
     - **Restore** - for issues related to restoring backups from Recovery Service
   - For Oracle Exadata Database Service on Dedicated Infrastructure, select **Database Lifecycle > Backup Cloud Services (Backup, Restore, Recovery)**.
10. Provide the **Support Identifier** details.
11. Click **Next** until you have provided all the mandatory information.
12. Click **Submit**.

    Your service request is submitted.

B
Reference

This section provides reference information about Recovery Service.

- Life Cycle States of Recovery Service Resources
  Learn how Recovery Service resources progress through different life cycle states based on specific events.

Life Cycle States of Recovery Service Resources

Learn how Recovery Service resources progress through different life cycle states based on specific events.

Table B-1 Life Cycle States of Protected Databases

Life Cycle State	Description
Creating	A protected database is in the process of being created. You must wait for a protected database to reach the **Active** state before you can modify or delete the resource.
Active	A protected database is created and available for use.
Updating	A protected database is being updated. A protected database usually moves back to the **Active** state after modification.
Failed	A protected database failed during creation or modification.

Table B-1 (Cont.) Life Cycle States of Protected Databases

Life Cycle State	Description
Delete Scheduled	The protected database and its backups are scheduled for deletion due to one of these reasons: • You have terminated the source database • You have disabled automatic backups for the database Before you terminate a database, you can specify whether to retain the protected database backups for a period of 72 hours or until the policy retention period expires. After you terminate the source database: • Recovery Service schedules the deletion of the associated protected database and its backups • The protected database enters the **Delete Scheduled** state • The protected database remains in the **Delete Scheduled** state, either for 72 hours (default delay) or until the policy retention period ends, depending on the option that you have selected while terminating the source database When you disable automatic backups for a database, the protected database enters the **Delete Scheduled** state. Recovery Service schedules the deletion of the associated protected database and its backups after a 72 hour delay. At the end of the scheduled delay, the protected database exits the **Delete Scheduled** state and enters the **Deleting** state. When a protected database is in the **Delete Scheduled** state, the **Health** field does not display the protection status. A protected database may return to the **Active** state if the scheduled deletion is canceled.
Deleting	The protected database and its backups is being deleted, and cannot be modified. A protected database exits the **Delete Scheduled** state and enters the **Deleting** state when the scheduled delay of 72 hours ends or after the backup retention period ends, depending on the option you have selected while terminating the source database.
Deleted	The protected database is deleted and cannot be modified.

Table B-2 Life Cycle States of Recovery Service Subnets

Life Cycle State	Description
Creating	The Recovery Service subnet is being created. At this stage, you cannot modify or delete the resource.

Table B-2 (Cont.) Life Cycle States of Recovery Service Subnets

Life Cycle State	Description
Active	The Recovery Service subnet has been created and is available for use.
Updating	The Recovery Service subnet is being updated and not available for modification.
Failed	The Recovery Service subnet failed during creation or modification.
Deleting	The Recovery Service subnet is being deleted and cannot be modified.
Deleted	The Recovery Service subnet is deleted and cannot be modified.

Table B-3 Life Cycle States of Protection Policies

Life Cycle State	Description
Creating	The protection policy is being created. You cannot modify or delete a policy when it is in this state.
Active	The protection policy is created and available for use.
Updating	The protection policy is being modified.
Failed	The protection policy failed while being created or modified.
Deleting	The protection policy is being deleted, and cannot be modified.
Deleted	The protection policy is deleted.