Solution Brief

PostgreSQL Database as a Service (DBaaS) with Astra Control

Simplified day 2 operations

January 2022

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Introduction

Kubernetes has become the standard IT infrastructure for businesses of all sizes. Production applications are being deployed on or migrated to Kubernetes.

Running a stateful application like PostgreSQL requires lots of planning, understanding the challenges, and identifying the right solutions. Do-it-yourself will result you to take the entire responsibility for building the database, setting up the backup and disaster recovery strategies. More Importantly to identify the way to do entire application portability.

The journey of implementing DBaaS for PostgreSQL requires the following actions on day 1, whether it's

a managed Kubernetes service or vanilla Kubernetes:

1. Identify or build your own registry.
2. Identify the right storage and the Container Storage Interface (CSI) provisioner.
3. Find the performance requirements and define appropriate storage classes.
4. Create your own manifest or identify a helm chart that meets your requirements.

Deploy the PostgreSQL application

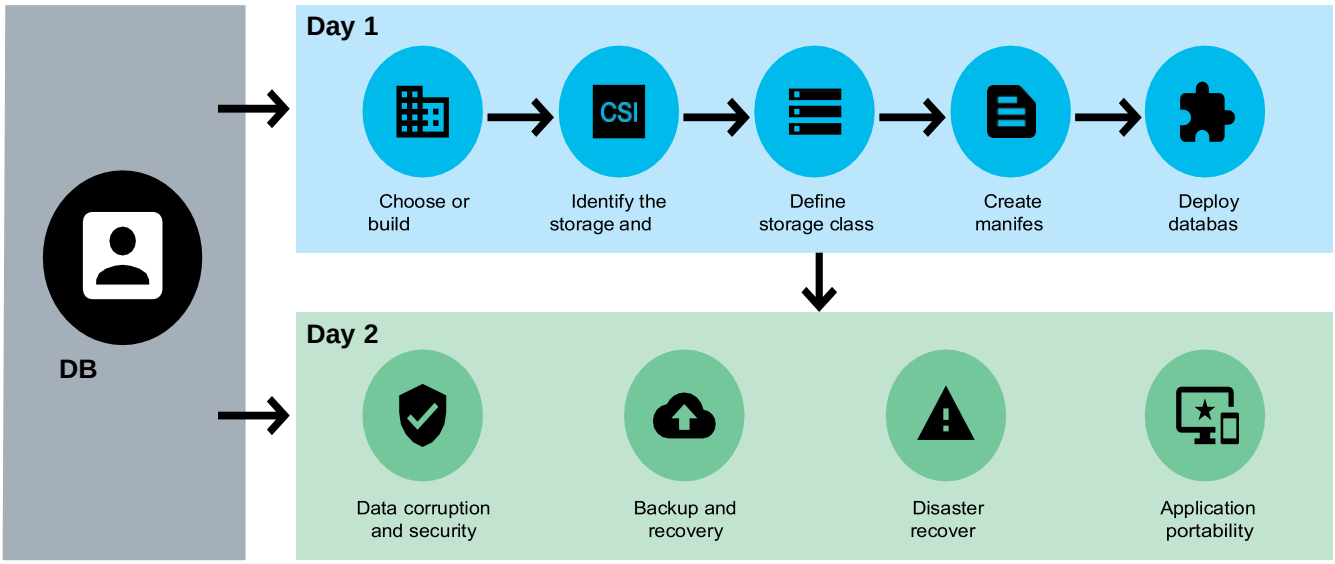

Figure 1) Build your own DBaaS.

Kubernetes offers solutions for all day 1 requirements. When it comes to day 2 operations, you need a strategy and solution for:

1. Data corruption and security
2. Backup and recovery
3. Disaster recovery

4. Application portability

Kubernetes natively doesn't have any solutions to address the day 2 challenges.

Astra Control simplifies and automates the day 1 operations by simply registering the Kubernetes cluster. The day 1 operations are simplified to

1. Identify or build your own registry.
2. Create your own manifest or identify a helm chart that meets your requirements.
3. Register the Kubernetes cluster with Astra.
4. Deploy the PostgreSQL application

Astra Control managing your application addresses the following day 2 challenges

1. Data corruption and security
2. Backup and recovery
3. Disaster recovery
4. Application portability

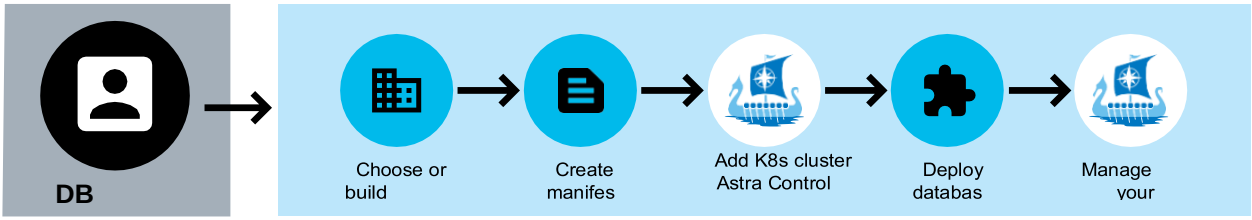

Figure 2) Day 1 operations with Astra.

NetApp Astra Control overview

NetApp Astra Control is an application-aware data management solution that manages, protects, and moves data-rich Kubernetes workloads in both public clouds and on-premises. Astra Control enables data protection, disaster recovery, and migration for your Kubernetes workloads leveraging NetApp's industry-leading data management technology for snapshots, backups, replication, and cloning. NetApp Astra Control is available in two deployment models:

- NetApp Astra Control Service: A NetApp-managed service that provides application-aware data management of Kubernetes clusters in Google Kubernetes Engine (GKE) and Azure Kubernetes Service (AKS).
- NetApp Astra Control Center: Self-managed software that provides application-aware data management of Kubernetes clusters running in your on-premises environment.

Managing PostgreSQL with Astra

Astra Control Service (ACS) provides management, protection, and cloning for Google Kubernetes Engine (GKE) or Azure Kubernetes Service (AKS) clusters located in the public cloud. Astra Control

Center (ACC) provides the same experience and functionality for RedHat Openshift Container Platform (OCP), Rancher or Upstream Kubernetes clusters located on-premises.
Upon adding a cluster, ACS:

- Installs NetApp® Trident, NetApp's open-source Kubernetes storage orchestrator.
- Creates a bucket on the cloud object store for saving application backups.
- Creates a service account on your cluster for itself.

ACC on premises (supported with Redhat OpenShift Container Platform, Rancher and Upstream Kubernetes) uses your current Trident installation, Trident based Storage classes for ONTAP backend and allows you to add your own object storage bucket for backups.

The following example shows two Kubernetes clusters, one AKS (Azure Kubernetes Service) cluster located in Azure East US (Virginia) region and another GKE (Google Kubernetes Engine) cluster located in the GCP europe-west2 region.

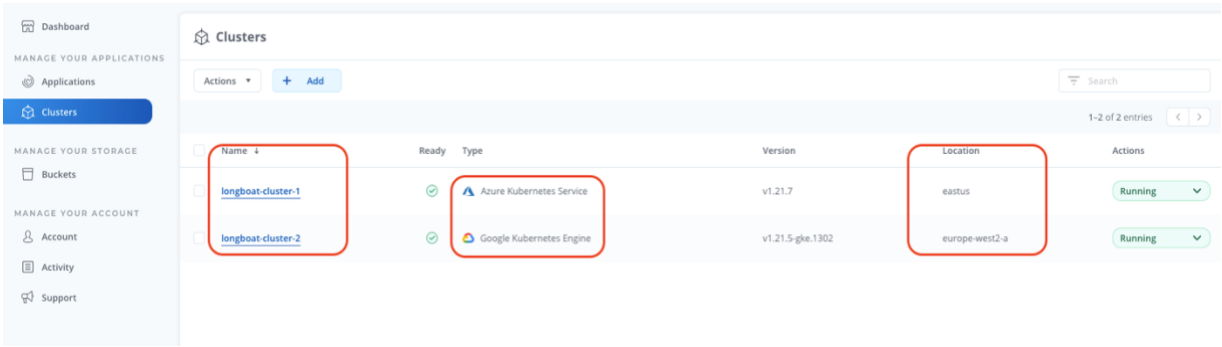

Figure 3) Registered kubernetes clusters.

After your Kubernetes cluster is registered, install PostgreSQL on cluster longboat-cluster-2 using the current Bitnami Helm chart or a custom manifest. Trident automatically provisions the Kubernetes Persistent Volume Claims from Cloud Volume Services GCP for PostgreSQL. Astra Control discovers the applications on your registered clusters, and you can easily manage either just the application, all the resources in the entire namespace as one unit or a custom group based on kubernetes labels.

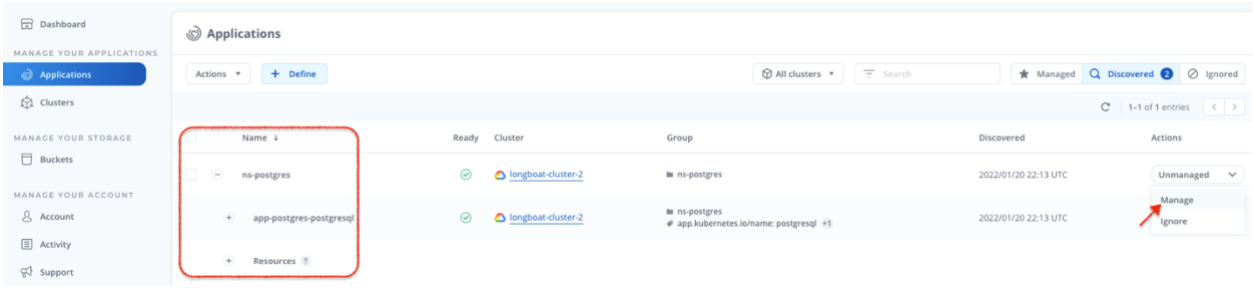

Figure 4) Managing the PostgreSQL application.

After managing the application, Astra Control can take snapshots, backups, and clones of that application, its Kubernetes resources, and its associated Persistent Volumes.

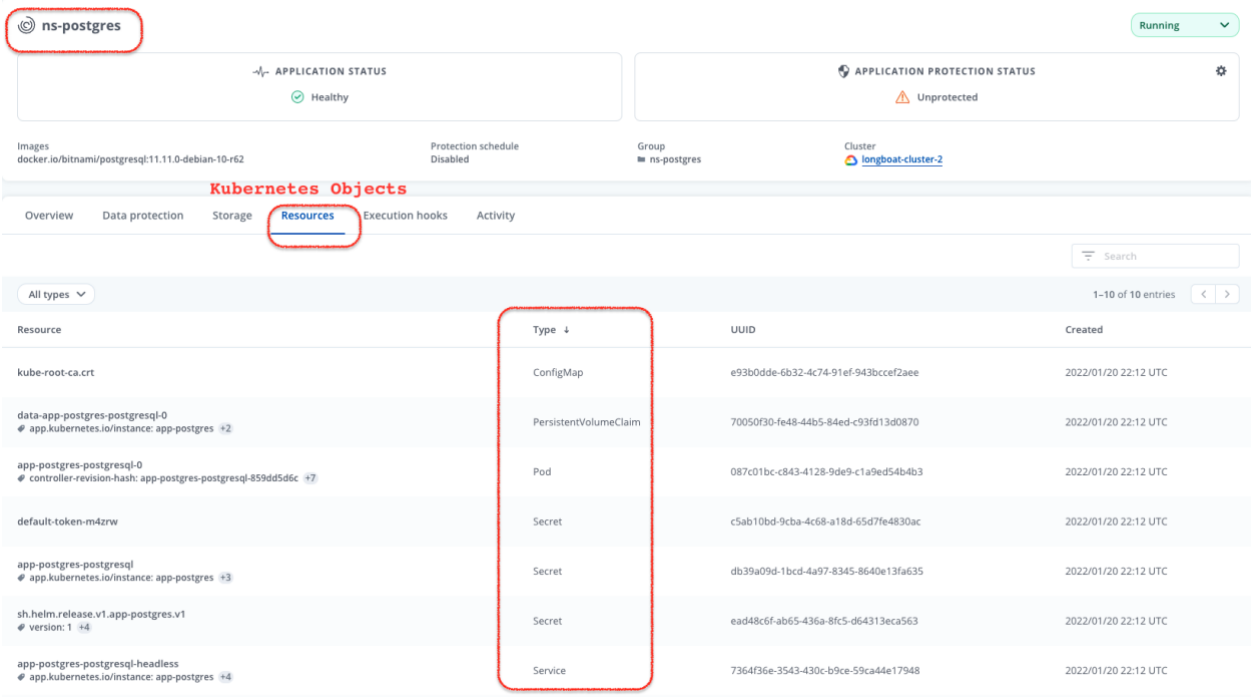

Figure 6) Kubernetes objects of managed PostgreSQL application.

All the data generated by PostgreSQL database clients can be automatically protected by using snapshots and backups. Astra Control snapshots and backups preservethe application state, its Kubernetes resources, and its volumes in one easily manageable unit. PostgreSQL and other stateful applications benefit from application consistent snapshots and backups. In built Pre and Post execution hooks in Astra Control provide the ability to perform application aware backups for PostgreSQL.

NetApp Astra Control supports both on-demand and scheduled snapshots and backups. When using execution hooks, the pre-snapshot script will run first before taking any snapshot or backup. When taking on-demand backups, you have the option to choose any existing snapshot. Otherwise, the backup will be created from the application's current state (from a new snapshot). Astra Control application backups are always saved in an external object store. You can choose a different object store when Astra Control have more than one object store configured.

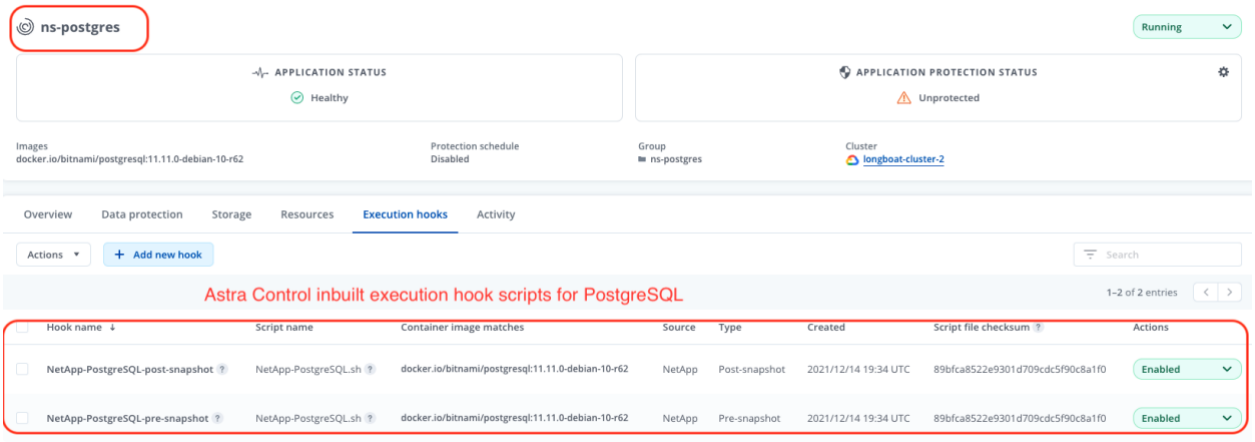

Figure 7) Astra Control inbuilt pre and post snapshot execution hooks for PostgreSQL

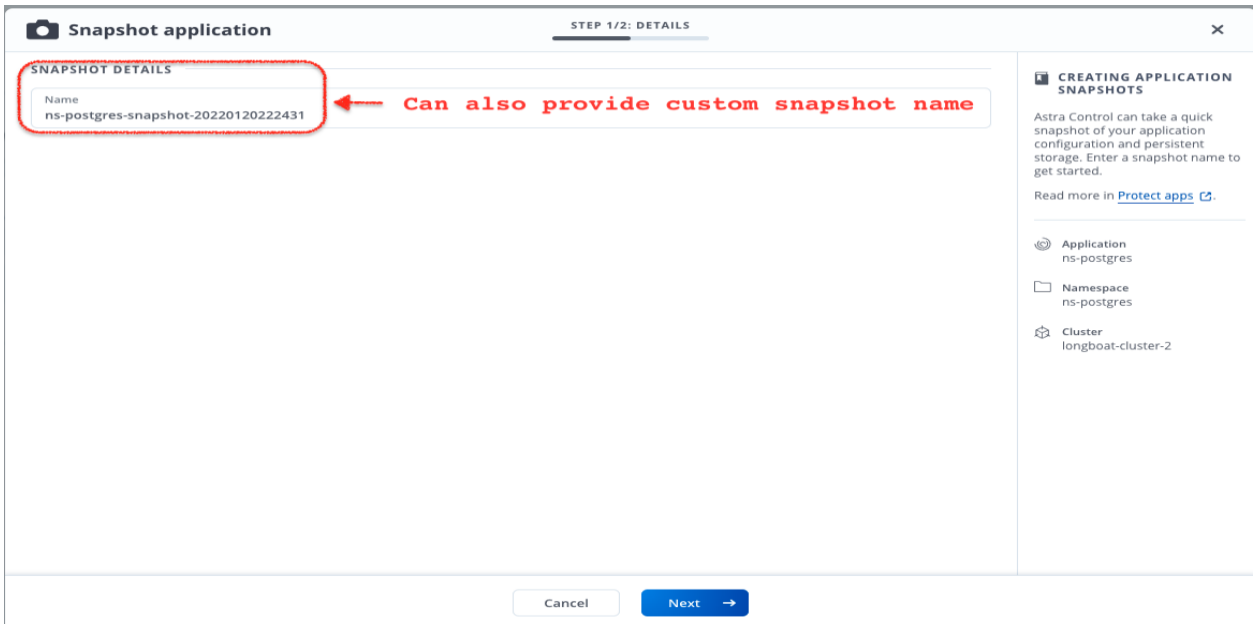

Figure 8) On-demand application snapshot.

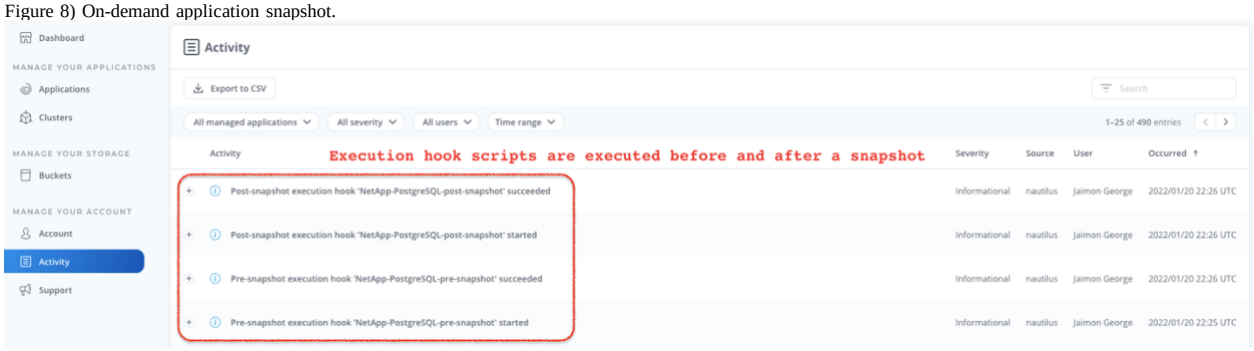

Figure 9) Running Pre and Post Execution hooks

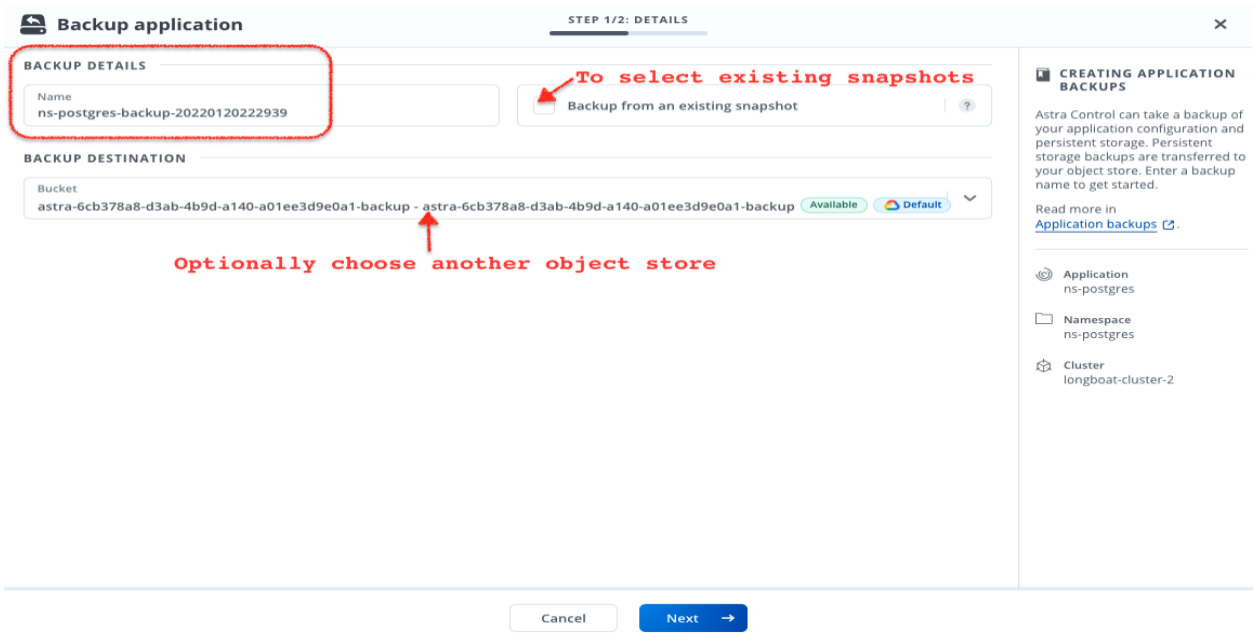

Figure 9) On-demand application backup.

Set up a snapshot and backup schedule and retention policy for the snapshots and backups.

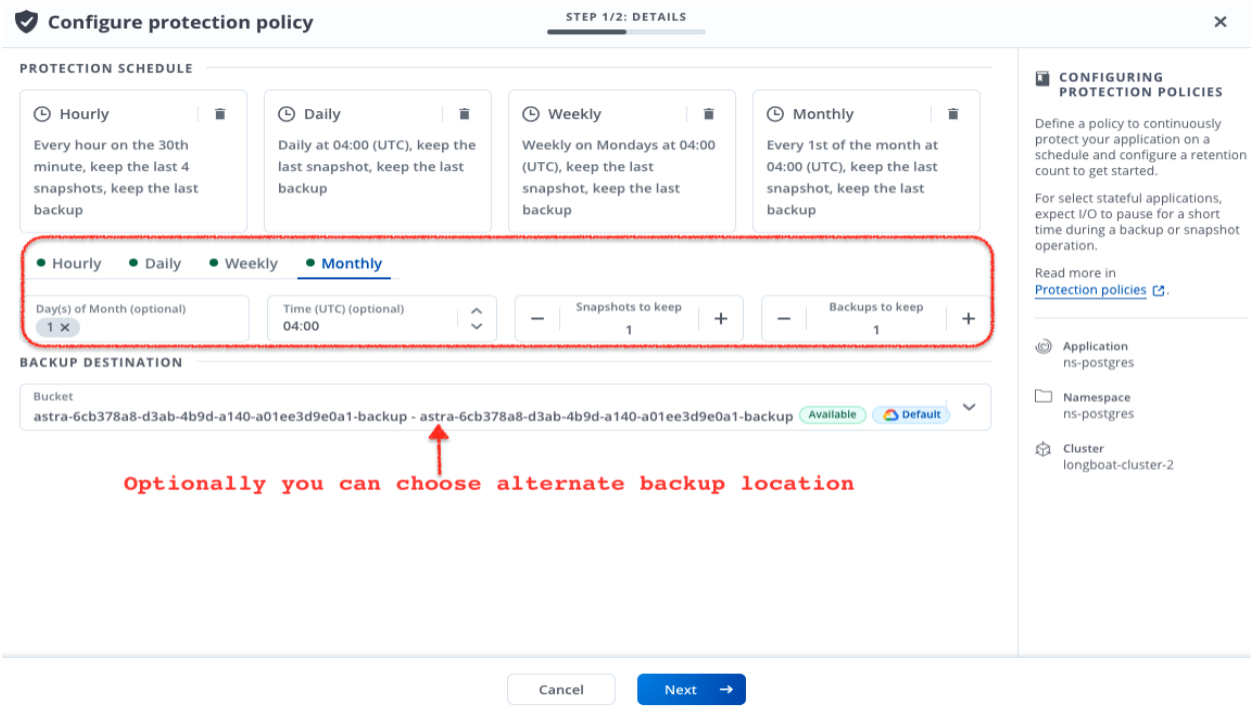

Figure 10) Configure protection policy.

After reviewing the information, set the protection policy. Astra Control automatically takes snapshots and backups based on the schedule and follows the retention policy defined.

Migrating PostgreSQL application to another cloud provider

After a successful backup, the PostgreSQL application is protected against disasters like losing the Kubernetes cluster or a human error like deleting the namespace. You can use the Clone option to redeploy PostgreSQL to a new namespace within the cluster or to the new cluster. When choosing the option, you can also select an existing snapshot or backup to go back to a point in time copy of the PostgreSQL application.

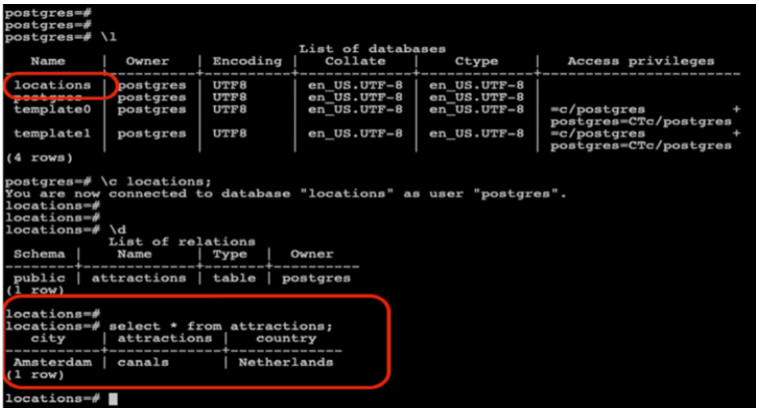

Figure 11) Test database in PostgreSQL application

Clone PostgreSQL to longboat-cluster-1, in Azure region, east-us using its current state. You could also clone from an existing backup or snapshot. When cloning from the current state, Astra Control first creates a backup and then uses that backup for migrating to the destination cluster. This brings up a new instance of PostgreSQL, running at the same state as in the source kubernetes cluster.

For example, suppose that you have a new team in a different location that is going to take over the responsibility of managing the PostgreSQL database. But they are using Azure Subscription to run the application. You want to migrate the PostgreSQL applications to an AKS cluster that's using the new team. PostgreSQL is currently running on the longboat-cluster-2 (GKE) cluster located in the EU-WEST-2 (London) region.

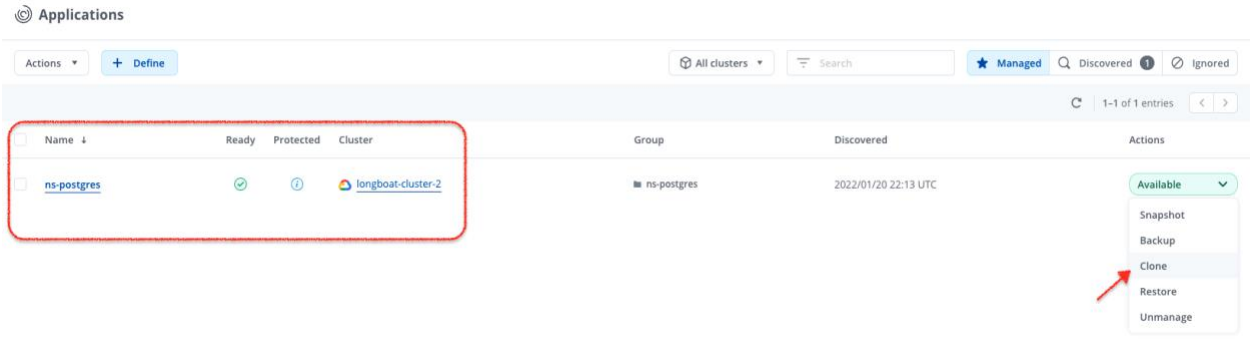

Figure 12a) Migrating PostgreSQL from the current state.

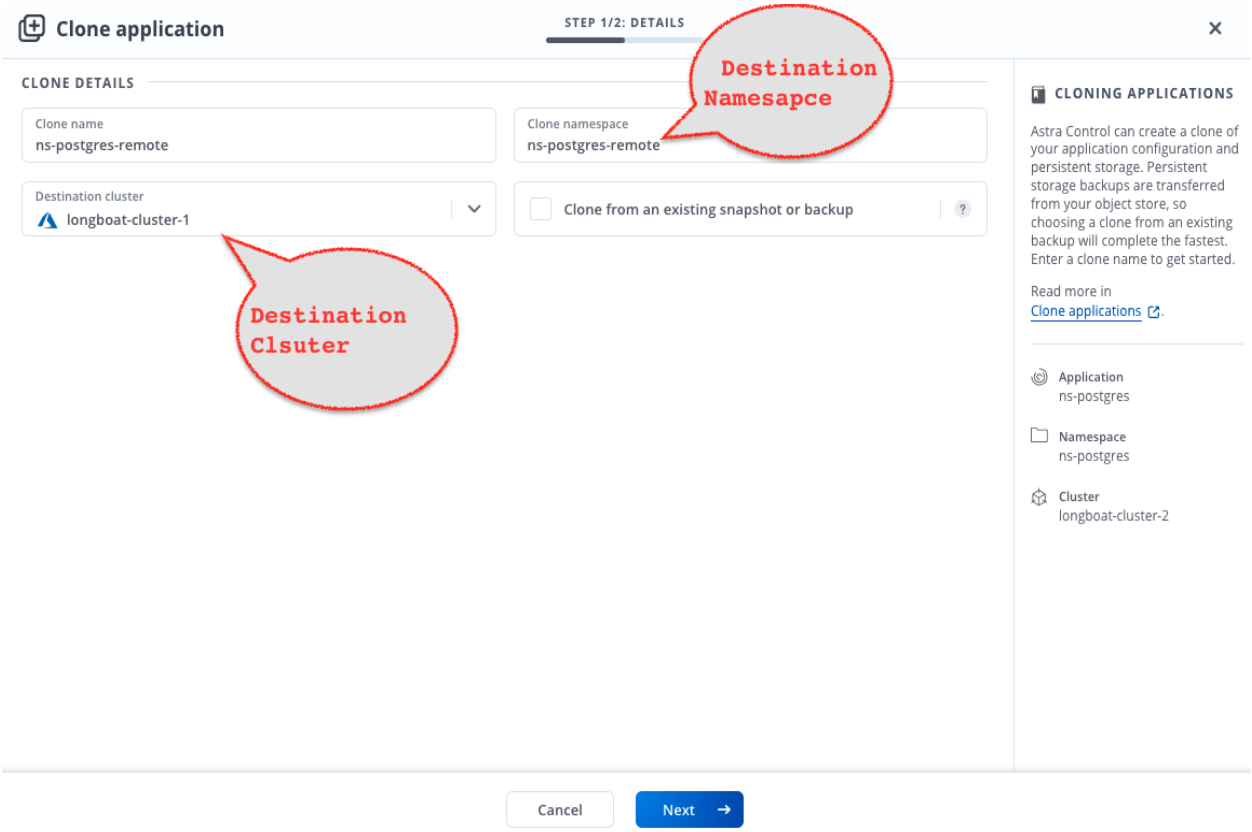

Figure 11b) Migrating PostgreSQL from the current state.

A new PostgreSQL clone is provisioned in the destination AKS cluster, and the application is automatically managed by Astra Control.

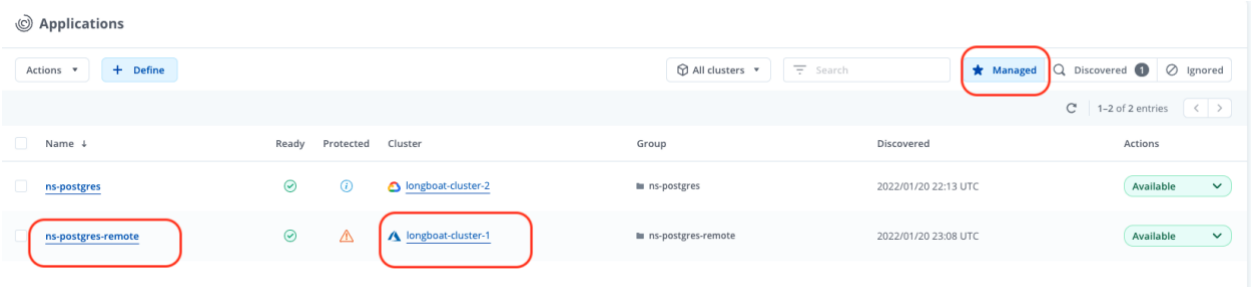

Figure 13) PostgreSQL migrated to the destination cluster.

After the migration, the PostgreSQL application has the same Kubernetes resources and data as in the source cluster.

Summary

This solution guide provided a step-by-step guide for validating the following key benefits NetApp Astra Control provides to PostgreSQL:

- Automatic storage provisioning and Storage Class setup
- Rich set of application-aware data management functionality (snapshot revert, backup and restore, activity log, and active cloning) for data protection, disaster recovery, data audit, and migration use-cases.
- Consistent data management UI.
- Clear visualization of data protection status.
- Simple data protection management.
- Seamless portability and migration.

Start your free trial of NetApp Astra Control today by registering at https://cloud.netapp.com/astra-register.

Where can I learn more?

To learn more, visit the NetApp Astra website and the documentation.

About NetApp

In a world full of generalists, NetApp is a specialist. We're focused on one thing, helping your business get the most out of your data. NetApp brings the enterprise-grade data services you rely on into the cloud, and the simple flexibility of the cloud into the data center. Our industry-leading solutions work across diverse customer environments and the world's biggest public clouds.

As a cloud-led, data-centric software company, only NetApp can help build your unique data fabric, simplify, and connect your cloud, and securely deliver the right data, services, and applications to the right people — anytime, anywhere.

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