

Unleashing the power of PostgreSQL® in the cloud

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Instacluster by NetApp



Picture this...

*It's Monday morning and your manager has just sent you an email about a decision to **migrate your busiest application from on-premises to the cloud***

*You have some **reservations**. You know this application is one of the **busiest PostgreSQL services** in your environment.*

How can you support this migration without our application users suffering from performance issues post migration?

What do you do?

Let's do some testing!!

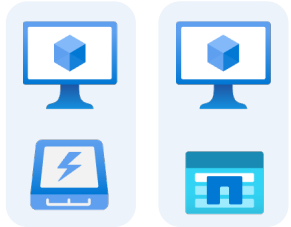


What do we need to test



PostgreSQL database running

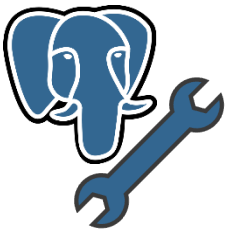
Instaclustr Managed Platform for PostgreSQL



Instance types

DS13_v2 (8vCPU 56GB RAM 2TB Storage) using **Microsoft Azure Premium SSD**

E8s_v4 (8vCPU 64GB RAM 2TB Storage) using **Azure NetApp Files**



Benchmark testing tool PGBench

What is ANF?

Azure NetApp Files is a Microsoft Azure native, **highly available, high performance file storage service** for your business applications.

Performance tiers:

- **Standard** (16 MiB/s per 1TiB quota)
- **Premium** (64 MiB/s per 1TiB quota)
- **Ultra** (128 MiB/s per 1TiB quota)

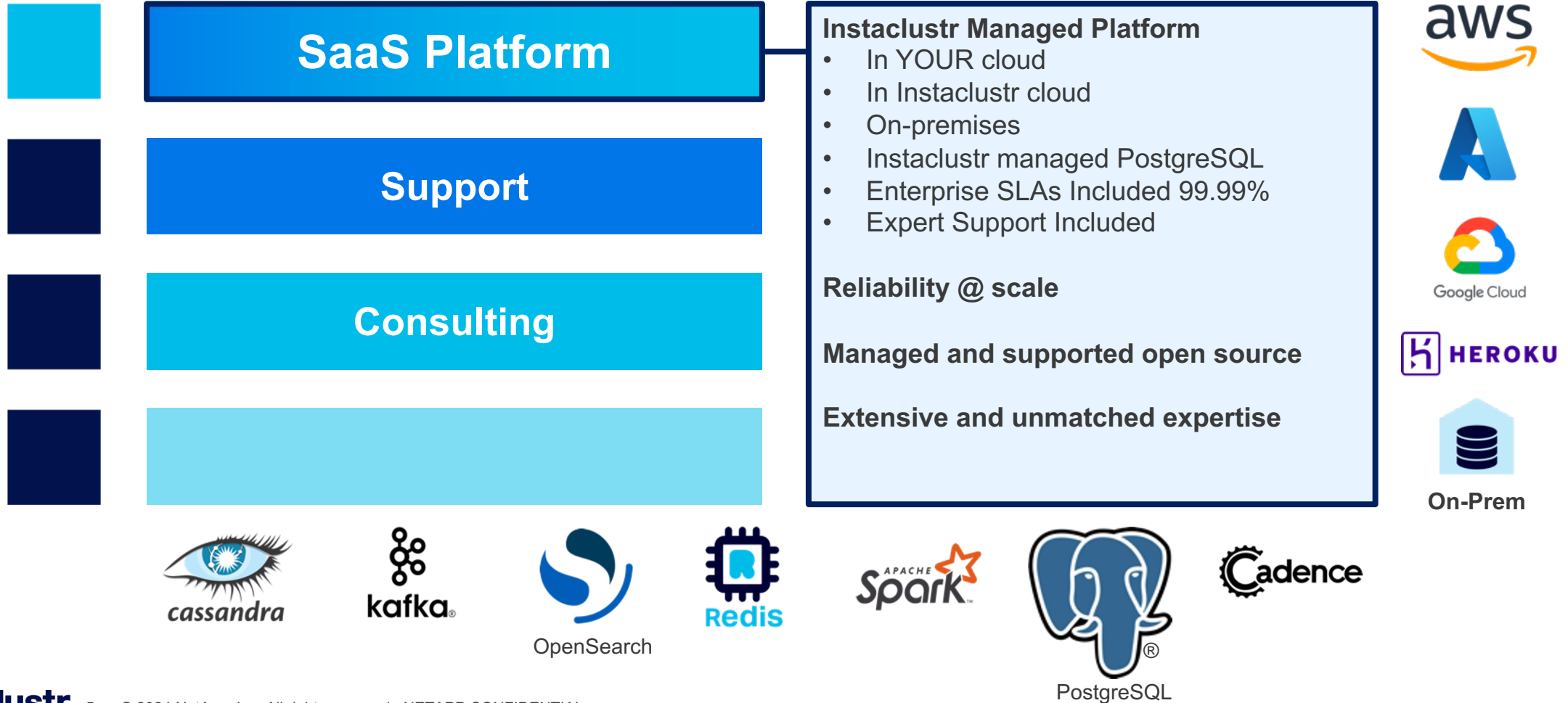


Capabilities:

- 99.99% Availability by default
- Multi-protocol support (NFSv3, NFSv4.1, SMB 3.0, SMB 3.1.1, and simultaneous dual-protocol)
- Instantaneous snapshots
- Cross region and cross-zone replication



Instaclustr Managed Platform for PostgreSQL





Let's build a PostgreSQL® service

The Instaclustr advantage

Welcome to your console!

Now let's get you started

Create your first cluster



AWS, GCP, Azure and On-premises hosting is available for Apache Cassandra, Apache Kafka, Apache Kafka Connect, Apache ZooKeeper, OpenSearch, Redis and Cadence Clusters.

Create Cluster

Read our docs



Want to do some reading first?
We have comprehensive documentation.

Read Documentation

View our pricing



Learn about our pricing for different applications, cloud providers, and data centres.

View Pricing

Chat

Create New Cluster

CLUSTER NAME *
Postgres-ANF

SLA TIER *
Non-Production

Application Selection

Application Selection options:

- Apache Cassandra
- Apache Kafka
- Apache Kafka Connect
- OpenSearch
- Redis
- PostgreSQL** (highlighted)
- Apache ZooKeeper
- Cadence
- Apache Spark

Provider Selection

Provider Selection options:

- Amazon Web Services
- Microsoft Azure AZ** (highlighted)
- Google Cloud Platform
- instaclustr
On-premises, client provided

Enterprise Features

Selecting an enterprise feature enables the enterprise pricing plan which adds 20% to standard costs. Read more about [enterprise features](#).

Enterprise Features options:

- Private Network Cluster
- PCI Compliance Mode
- PrivateLink

PCI compliance mode is not available because:

- PCI Compliance Mode is currently not enabled on your account. You can enable it on the [security settings page](#).
- PCI compliance mode is not compatible with PostgreSQL.
- PCI compliance mode is only available on AWS and GCP.

Next

Chat

 Application PostgreSQL Setup Data Centre Secondary Data Centre Confirmation

PostgreSQL Setup

VERSION *

PostgreSQL 16.1

PostgreSQL Options

 Add your current IP (203.221.235.191) to cluster firewall allowed addresses Client to Cluster Encryption

REPLICATION MODE *

SYNCHRONOUS

Synchronous mode will enforce a minimum 2-nodes cluster. Please read more about the options for [Replication mode](#) as it will affect data retention on primary failover.

 Synchronous Mode Strict
Please read more about the options for [Synchronous Mode Strict](#), as it will affect SLA availability options.

PostgreSQL Extensions

 PgVector

Enterprise Add-Ons

Selecting an enterprise add-on enables the enterprise pricing plan which adds 20% to standard costs. Read more about [PostgreSQL Add-Ons](#).



Back

Next

 Chat

Data Centre Options

DATA CENTRE *
 Central US (Iowa) ▾

CUSTOM NAME *
 AZURE_AZ_CENTRAL_US

CLUSTER NETWORK *
 10.0.0.0/16

PostgreSQL Node Selection

NUMBER OF NODES
 2

PGS-PRD-Standard_E8s_v4-ANF-2048 Instance size	2048 GiB (Azure NetApp Files Premium NFSv3) Data disk	64 GiB RAM	8 Cores CPU	\$2,816.11 / month / node
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Change Node Size

The selected node size utilises Azure NetApp Files storage over NFSv3. The NFS traffic travels over a private Azure Virtual Network, and it is not encrypted due to performance considerations. To learn more about where and how encryption is utilised on ANF Clusters, please see [Understanding Encryption on your ANF cluster](#).

STORAGE SUBNET *
 10.1.0.0/24

Displayed pricing and discounts are based on standard Instaclustr contract terms. In the event of any discrepancy, terms defined in your contract will apply.


Back Next

Chat

PostgreSQL Chris C

Application PostgreSQL Setup Data Centre Confirmation

PostgreSQL



Cluster Name :	Postgres-ANF
SLA Tier :	Non-Production
Provider :	Microsoft Azure AZ

Version :	PostgreSQL 15.4
Cluster firewall rule to add :	163.53.144.4
Client to Cluster Encryption :	Disabled
Replication Mode :	SYNCHRONOUS
Synchronous Mode Strict :	Disabled

Enterprise Features and Add Ons :	None
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Provider Account :	INSTACLUSTER
Data Centre :	Central US (Iowa)
Data Centre Custom Name :	AZURE_AZ_CENTRAL_US
Cluster Network :	10.0.0/16
Storage Network :	10.1.0.0/24
Number of Nodes :	2
Node Size :	PGS-PRD-Standard_E8s_v4-ANF-2048

Displayed pricing and discounts are based on standard Instaclustr contract terms. In the event of any discrepancy, terms defined in your contract will apply.

I accept the Instaclustr [terms and conditions](#)

Back Create Cluster

Chat

Graphs Lists

METRICS Synthetic Write Requests Synthetic Read Requests Summary [type here to select metrics...]

[Metric Definitions](#)

ORDER * Highest NODES TO DISPLAY * 6

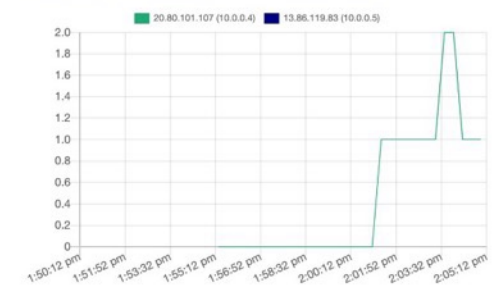
PERIOD * 15 minutes ENDING AT * Now

Synthetic Write Requests

Number of Write request errors

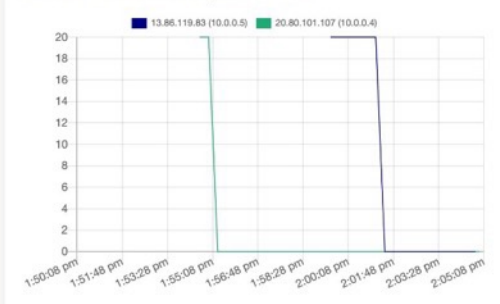


Average write latency in milliseconds



Synthetic Read Requests

Number of Read request errors



Average read latency in milliseconds



Summary

Chat

PostgreSQL Connection Info

Node Addresses (Per Data Centre)

Provide the node address to your PostgreSQL client to connect to your PostgreSQL services.

AZURE_AZ_CENTRAL_US Central US (Iowa) - Microsoft Azure AZ

Name: **AZURE_AZ_CENTRAL_US**

Public: **"20.80.101.107", "13.86.119.83"**

Node addresses accessible from outside the Data Centre.
Ensure your client's IP address is added to the [cluster firewall](#).

Private: **"10.0.0.4", "10.0.0.5"**

Node addresses accessible from *within* a VPC Peered network.

Port: **5432**

Use this port to connect to PostgreSQL.

Client-to-Cluster Encryption: Disabled

Password **Authn**: Clients will need to provide credentials to connect.

Default Credentials for Password Authentication

This cluster has one or more data centres with Password Authentication enabled. Clients must provide credentials to connect.

IMPORTANT

If you drop the **icpostgresql** user without clicking the "Remove Stored Password" button, we may re-create it. This password will be automatically removed from our management system, 5 days after cluster provisioning.

A default user has been pre-created (see below).

The *default* user credentials are:

Username: **icpostgresql**

Password: **2527025bd10b3b1e6e325da6d7254ea1**

It is *highly recommended* that as part of configuring your cluster you:

- Change the password for the **icpostgresql** user to something other than **2527025bd10b3b1e6e325da6d7254ea1**
- Create a *non-superuser* account for your client.

The default user password can be changed via the [PostgreSQL Users](#) page.

Refer to the [PostgreSQL](#) documentation for details on how to change passwords and add additional users.

Refer to the client driver documentation and the examples below for details on how to provide credentials when establishing a connection.

[Remove Stored Password](#)

For additional security, confirm that you have recorded the default password for the **icpostgresql** user, to **remove** it from our records.



Let's start benchmarking

How did we test?



Before testing, we loaded the databases with 1.5TB of data to ensure this was a good simulation of a production real world performance workload. (*Watch out for cached memory results!*)



Looped over different client counts to research scalability. The test was performed 3 times per configuration and the results averaged.



Minimal variance was seen between repeated runs. In our pgbench configuration, scale was set to 10,000, clients were looped through 4, 8, 16, 32, 64, and 96.

Full scripts we used for testing can be found on our GitHub (<https://github.com/instaclustr/Postgres-ANF>).



Performance tuning



Initial testing showed that the **Postgres-ANF** server performed very well when **clients=cores** **BUT** performance would drop off unexpectedly beyond that.



Investigation and metric logging showed that bottlenecks were being created in the **WAL compression** and **bgwriter_delay**.

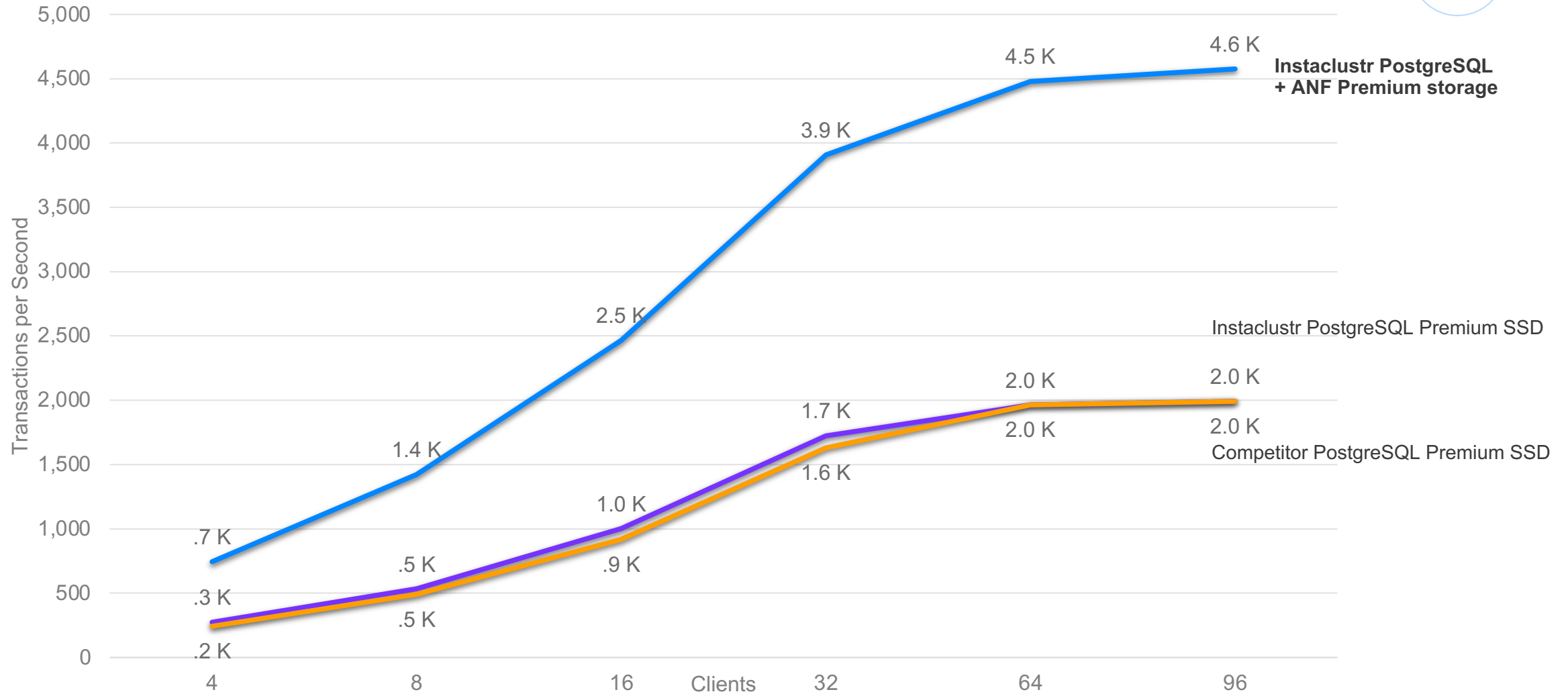


Adjusting these parameters allowed us to push **well past the 8-client count** and get the results.

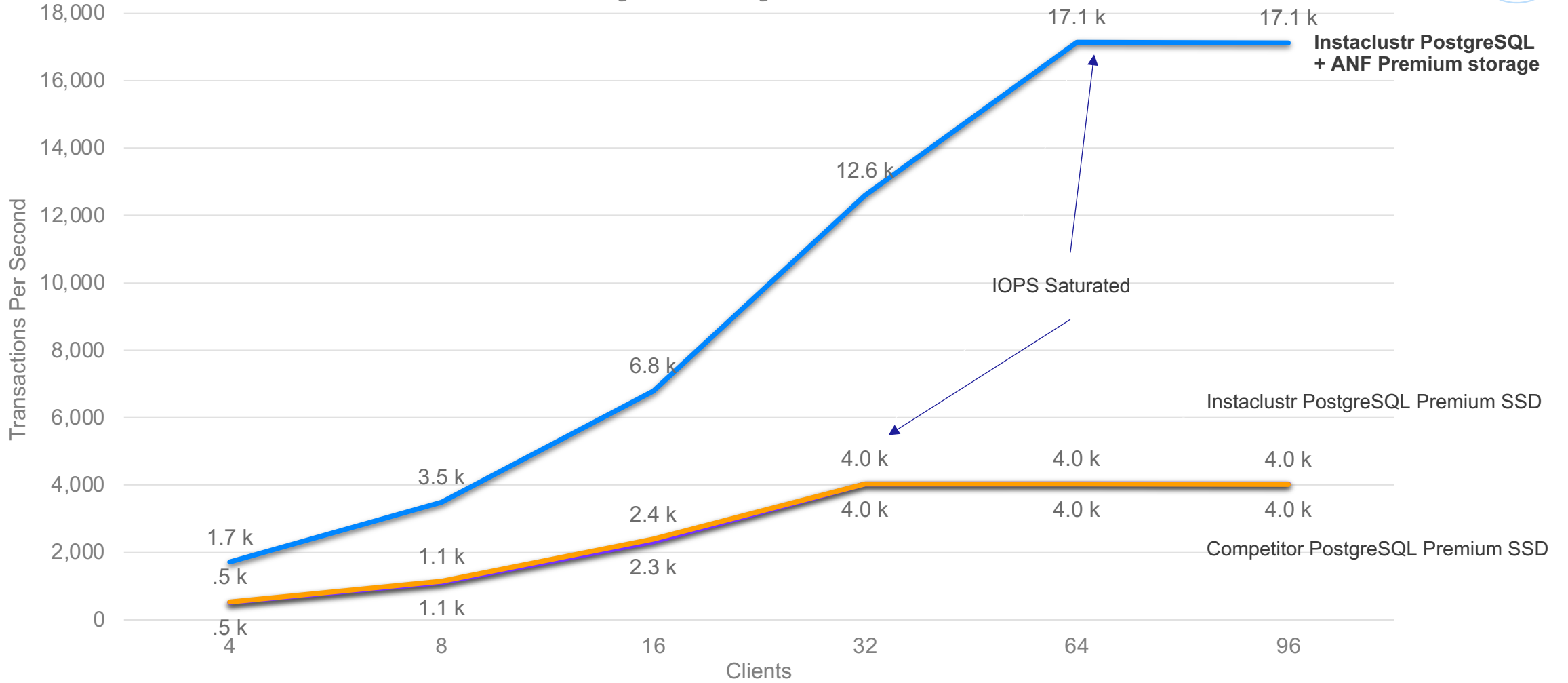


Results

Read/Write TPS by Client Count



Read Only TPS by Client Count





Analysis

Price vs. performance



	DS13_v2-2000 (Azure Premium SSD)	E8s_v4-ANF-2048 (Azure NetApp Files)
TPS (Read only)	4,030	17,140
TPS (Read/Write)	1,963	4,479
Management Price	\$1,500	\$1,500
Instance Cost (On-Demand)	\$541.3	\$368.17
Storage Cost (On-Demand)	\$259.05	\$602.50
Network Cost (estimated)	\$340	\$348.16
Backup Cost	\$52.8	\$54.07
Price per month	\$2,693.15	\$2,872.90
\$/TPS (Read only)	\$0.67	\$0.17
\$/TPS (Read/Write)	\$1.37	\$0.64

Reduce compute costs by choosing the right storage

75%

Reduce compute costs by
choosing the right storage

Reduce TCO

Reduction in \$/TPS

PostgreSQL Azure NetApp Files roadmap

Exciting things to come



Ultra-fast backups



Database forking

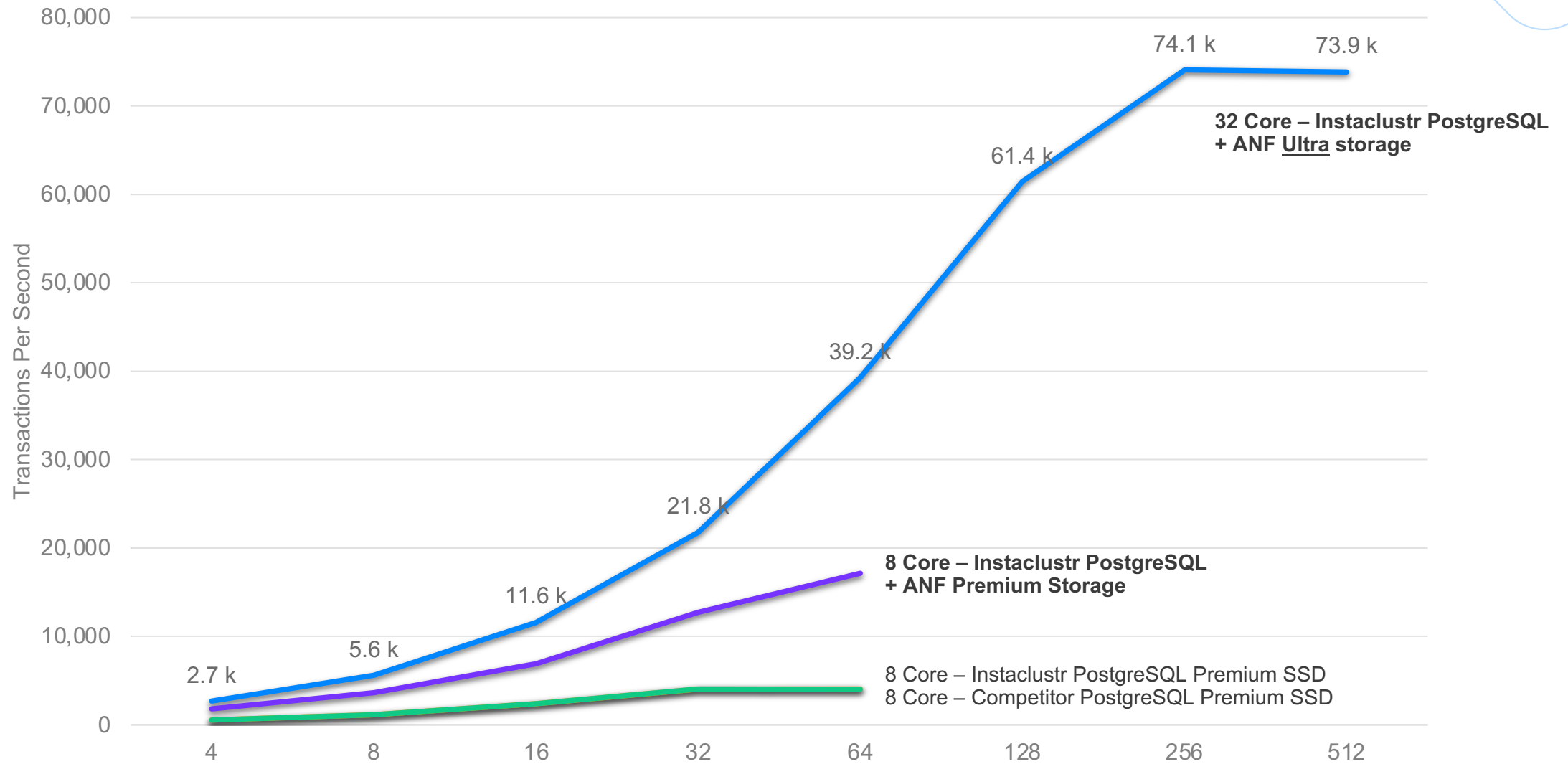


Disaster recovery



One more test

Read Only TPS by Client Count





Summary

Scenario Wrap Up

Application Users

- ✓ High Performance
- ✓ Highly Available

Your Manager

- ✓ Application migrated to the cloud
- ✓ No performance complaints from application users

You

- ✓ More time back in your day
- ✓ Access to experts when it matters



Chance to win



Instaclustr by NetApp Survey





Thank you