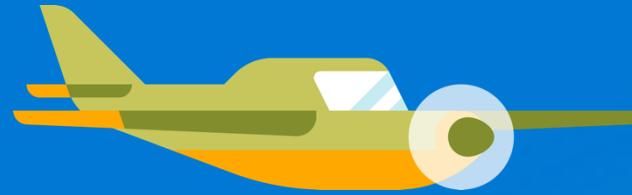




Microsoft Azure



PostgreSQL For SQL Server Professionals

Silvano Coriani

Product @ Azure Postgres

Demos will be published here:

<https://github.com/scoriani/postgres-for-sqlserver-professionals>



Session evaluations

Please submit your evaluations!

Delegates who submit at least one feedback response every day will be entered into a prize draw.

Delegate feedback prizes will be announced at the end of day prize draw (Thursday, Friday and Saturday) and the speaker awards will be announced on the Saturday prize draw.

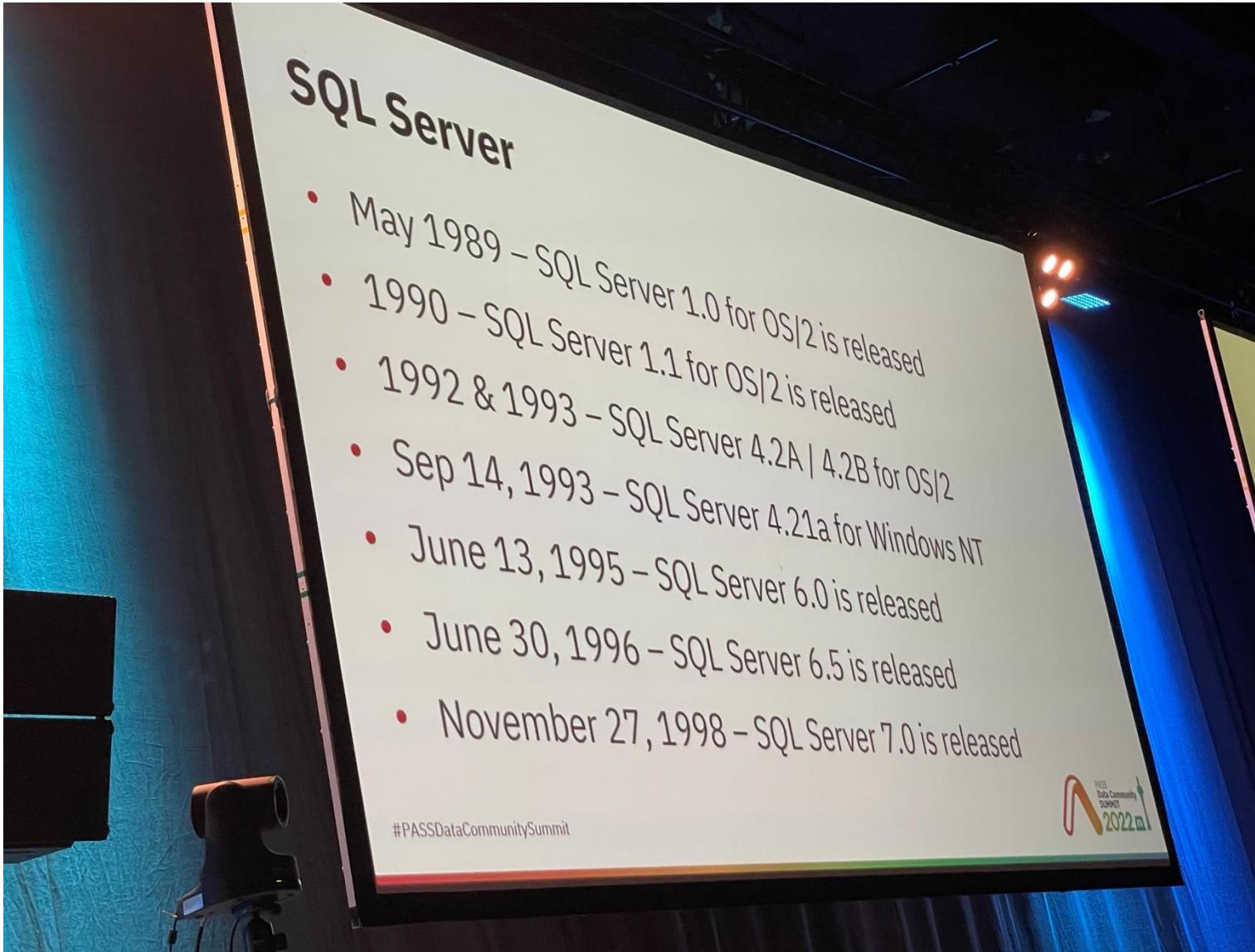
Short URL: <https://sqlb.it/?12732>



Agenda

-
- Historical notes
 - Architectures & Fundamentals
 - Deployment options
 - Data types & Indexes
 - Management
 - BCDR
 - Programmability
 - Security
 - App Development
 - Cloud Services: Azure Database for PostgreSQL

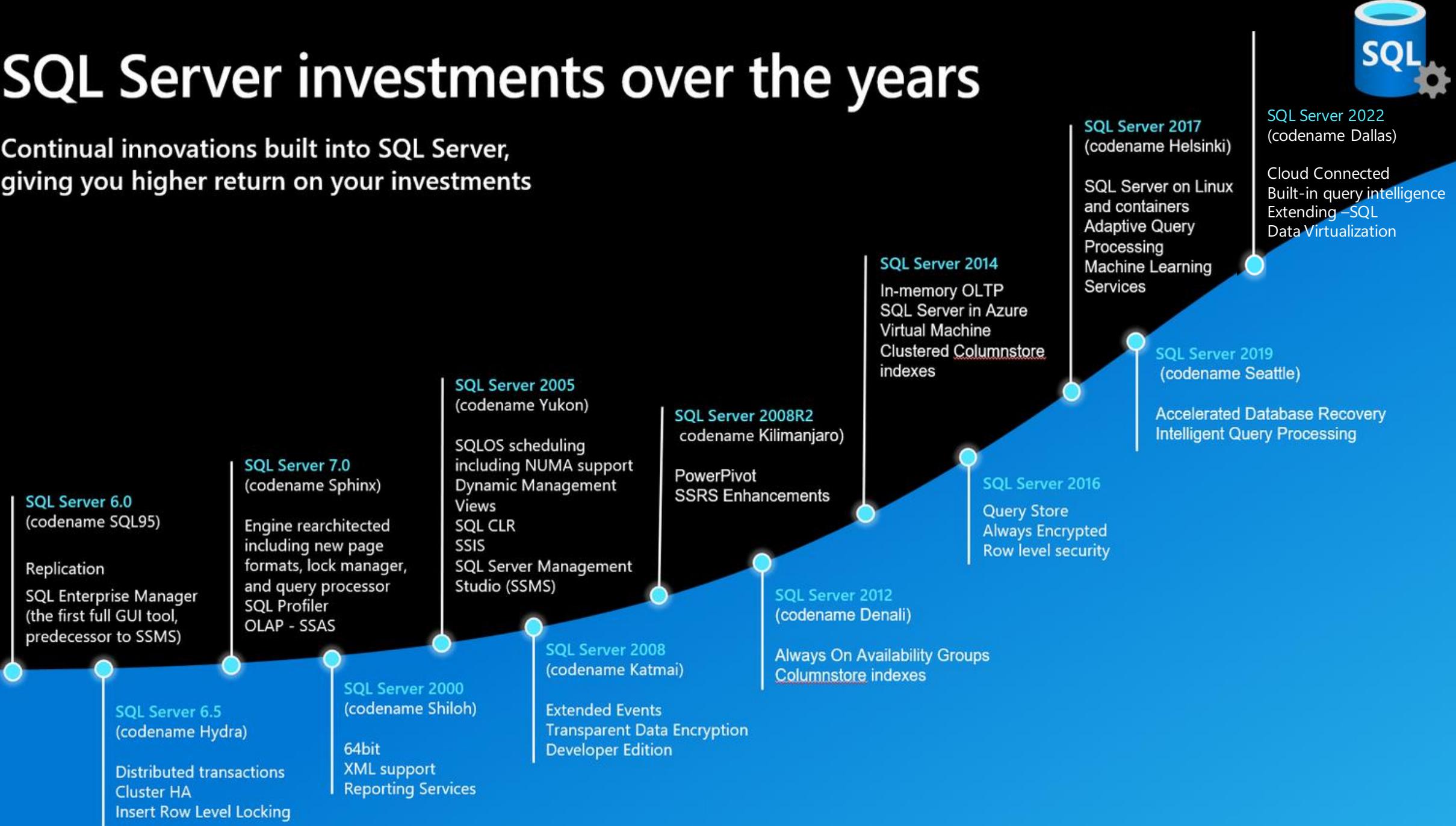
SQL Server history



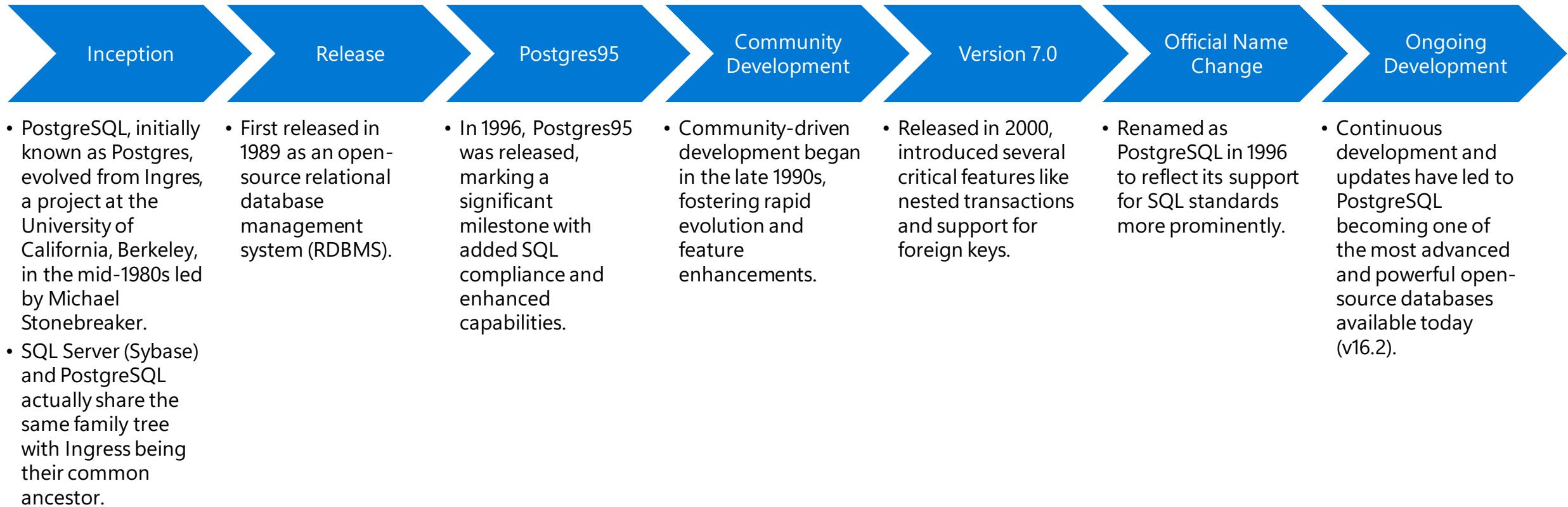
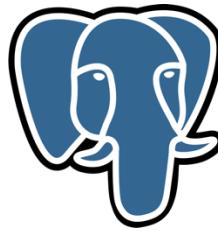


SQL Server investments over the years

Continual innovations built into SQL Server,
giving you higher return on your investments



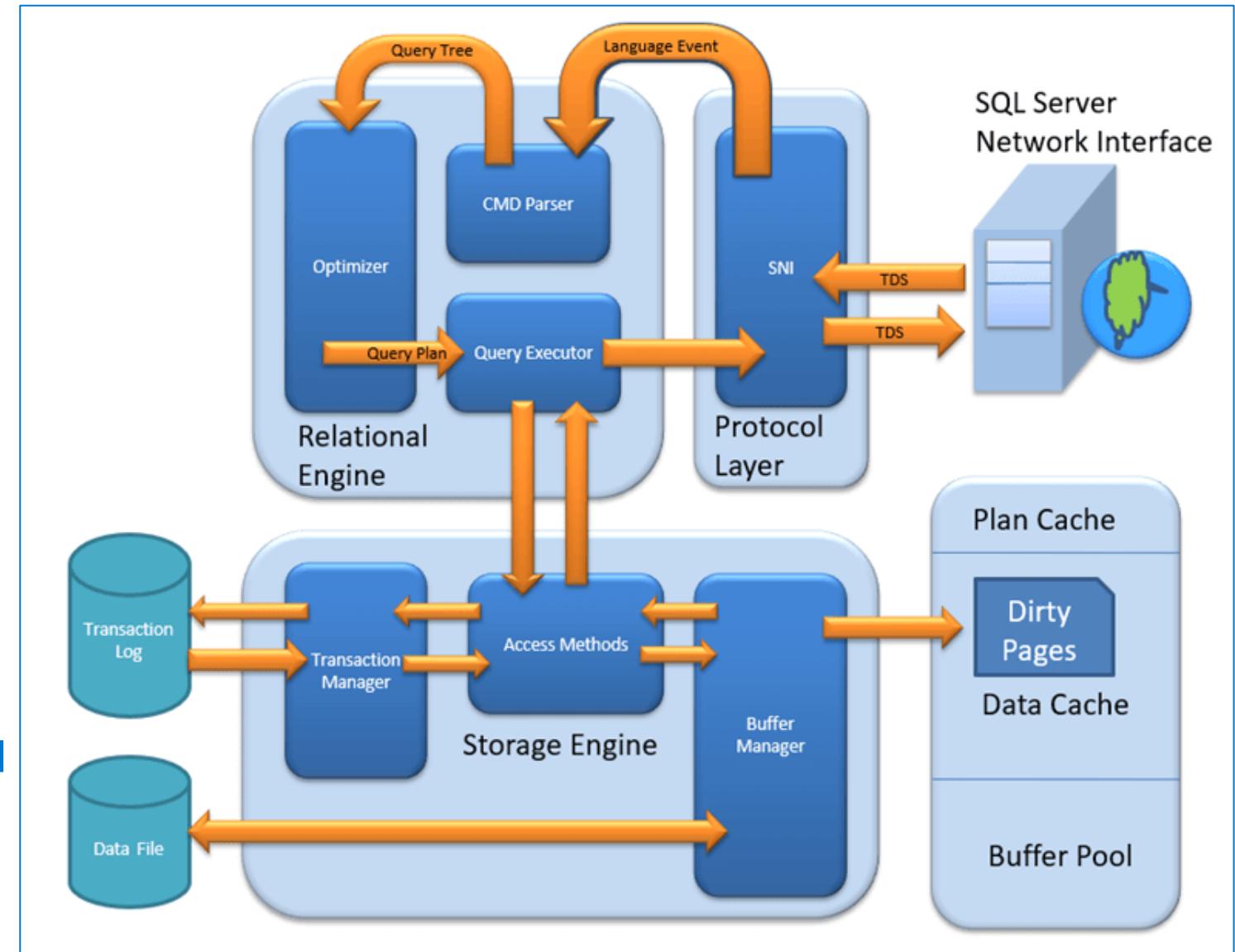
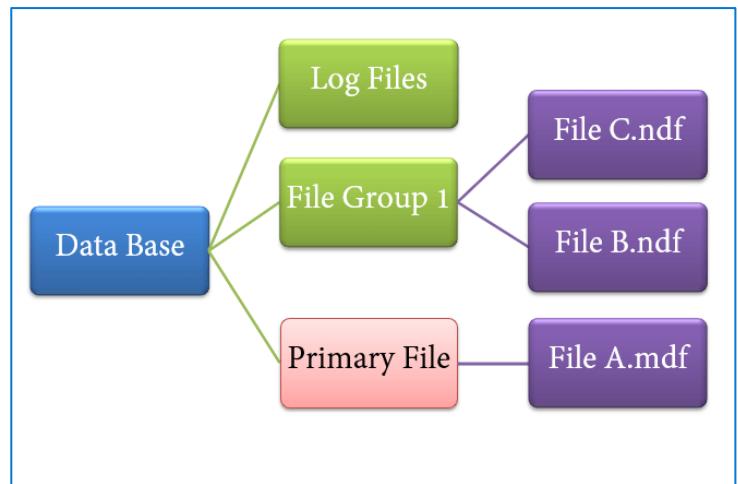
PostgreSQL History



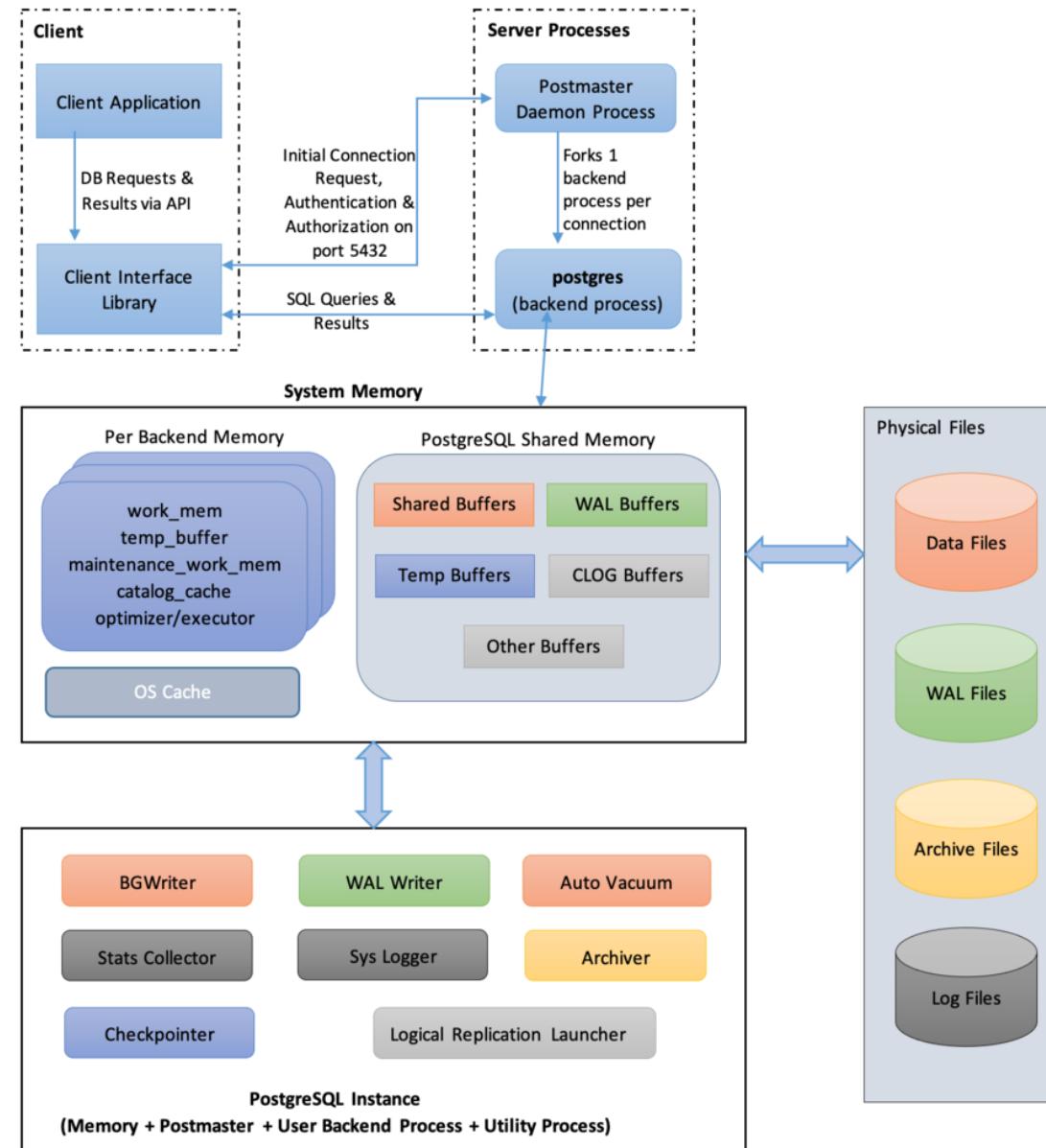
Core engines



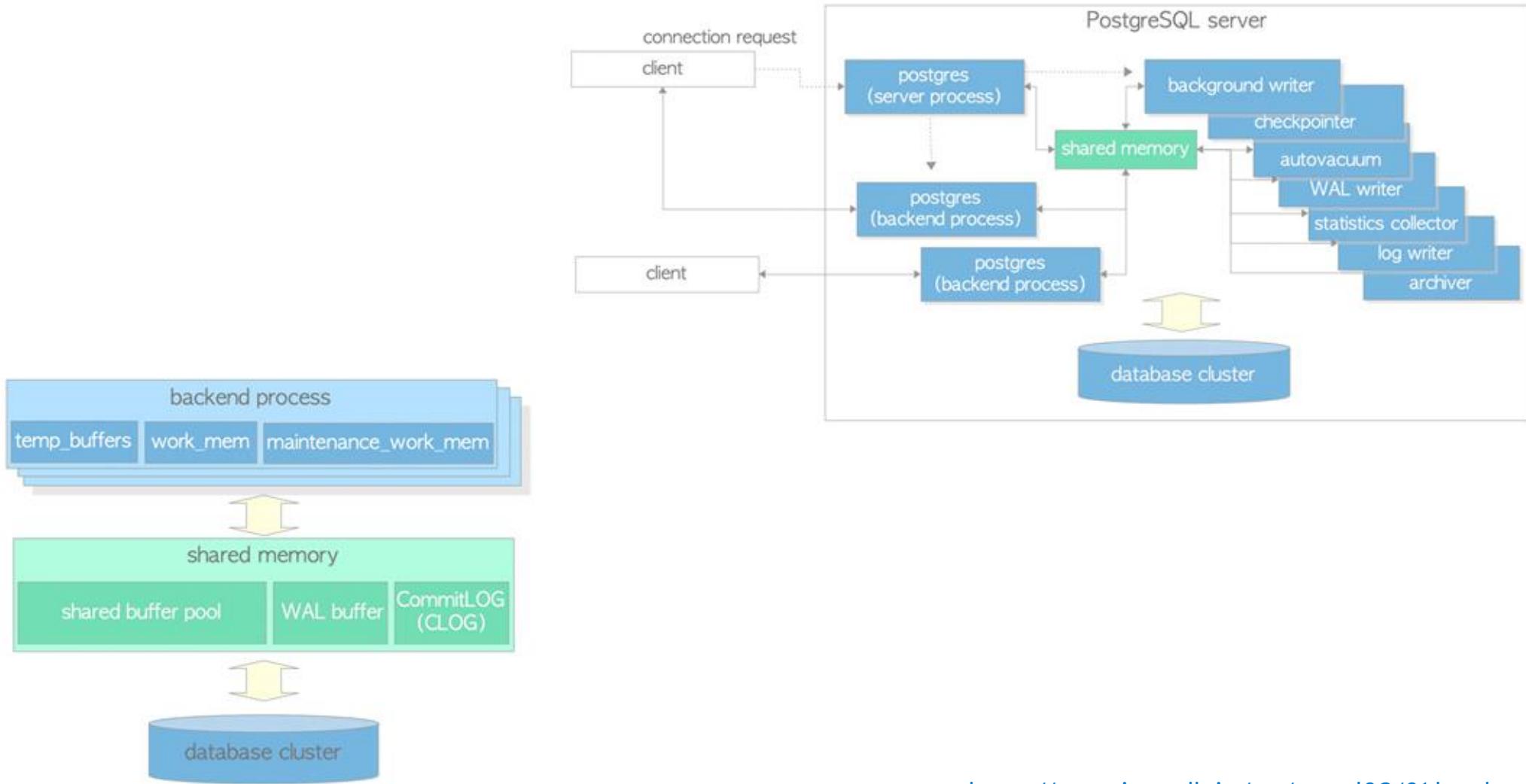
SQL Server architecture



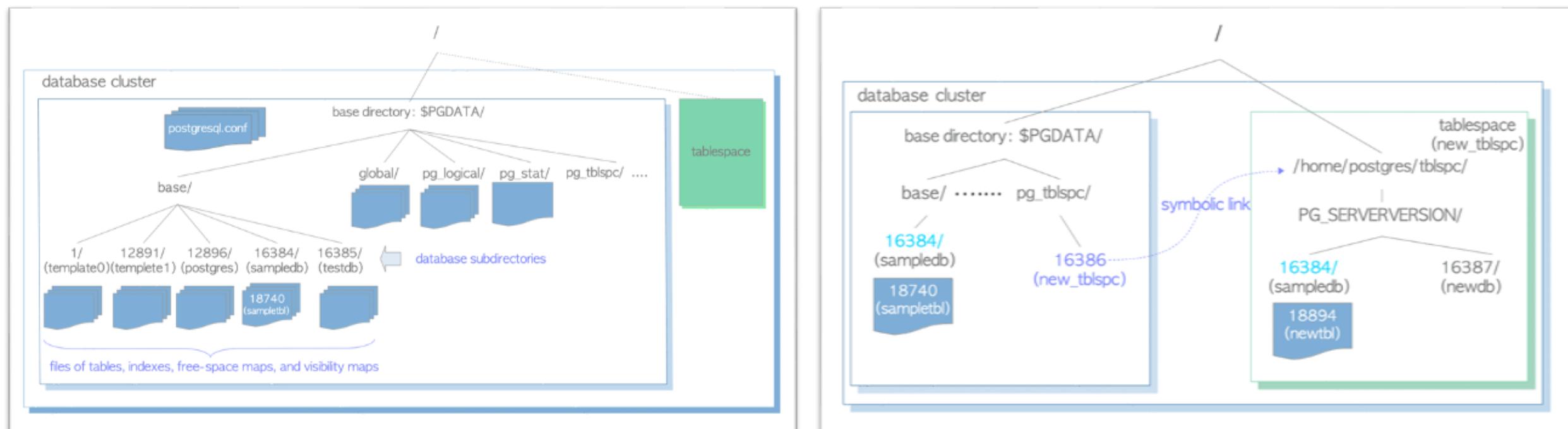
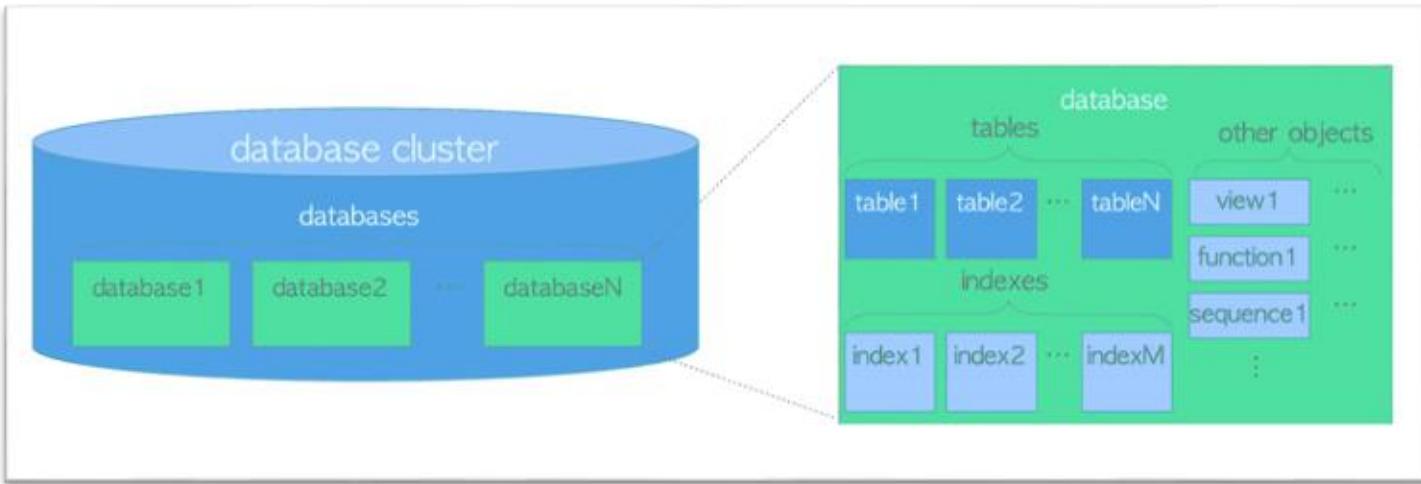
PostgreSQL architecture



PostgreSQL process and memory architecture



PostgreSQL storage architecture



Key fundamentals (1/2)

SQL Server (proprietary)

- Designed for Windows
- Ported on Linux in 2017 through a Platform Abstraction Layer (PAL)
- Supported on x64 proc architectures only
- Multi-threaded
- Built on a concept called SQL Operating System (SQLOS) for
 - user mode thread scheduling
 - memory management
 - synchronization
 - diagnostics/DMVs

PostgreSQL (open source)

- Community driven OSS , portable
 - Great Community Support and resources
 - Standard compliance
- Designed on Linux/Unix
 - “works” on Windows
 - Multi-process, shared memory
- Runs on all major proc architectures
- Extensibility by design from the core
 - Well-defined APIs to plug-in new implementations (types, operators, etc.)

Key fundamentals (2/2)

SQL Server (proprietary)

- Security / Encryption
- AlwaysON Availability Groups
- AlwaysON Failover Clustering
- Transactional, Merge, P2P replication
- Analysis Services
- Integration Services
- Reporting Services
- SQL Server Management Studio

PostgreSQL (open source)

- Multi Version Concurrency Control (MVCC)
- Advanced data types (arrays, JSONB, geo, vectors etc.)
- Advanced indexing (GiST, GIN, BRIN, Bloom, etc.)
- Advanced programmability (PL/pgSQL, Perl, Python, Java, etc.)
- High availability with streaming replication
- Logical replication for data integration scenarios

Deployment options (1/2)

SQL Server	PostgreSQL
<ul style="list-style-type: none">• Windows Server<ul style="list-style-type: none">• Native service• Unlimited cores and up to 48TB RAM• Windows 11 dev/test<ul style="list-style-type: none">• Native service• Docker containers• <u>Linux</u><ul style="list-style-type: none">• Supported on RH, SUSE and Ubuntu• <u>Containers</u>• <u>Kubernetes</u>	<ul style="list-style-type: none">• Supported natively on any operating system and proc architecture<ul style="list-style-type: none">• Service or Daemons• <u>Containers</u>• <u>Kubernetes</u>• Config files<ul style="list-style-type: none">• General service• Authentication• Identities

Deployment options (2/2)

SQL Server

- Trace flags
- sp_configure
- Cloud Services
 - **Azure SQL**
 - Amazon RDS
 - GCP CloudSQL
 - AliCloud ApisaraDB
 - Others

PostgreSQL

- Cloud Services
 - **Azure Database for PostgreSQL**
 - **Azure CosmosDB for PostgreSQL**
 - Amazon RDS
 - Amazon Aurora
 - GCP AlloyDB
 - CockroachDB
 - Neon
 - Others

Data types

SQL Server

- Exact numerics
- (Unicode) character strings
- Approximate numerics
- Binary strings
- Date and time
- Spatial
- Hierarchyid
- Rowversion
- UUID

PostgreSQL

- Numeric
- Monetary
- Character
- Binary Data
- Date/Time
- Boolean
- Enumerated
- Geometric
- Network Address
- Bit String
- Text Search
- UUID
- XML
- JSON
- Arrays
- Composite
- Range
- Domain
- Object Identifier
- pg_lsn
- Pseudo-Types

Indexes

SQL Server	PostgreSQL
<ul style="list-style-type: none">• Btree<ul style="list-style-type: none">• Clustered• Non-clustered• ColumnStore<ul style="list-style-type: none">• Clustered• Non-clustered• Hash (in memory)• Filtered• Computed• Included columns• Spatial• Full-text• XML	<ul style="list-style-type: none">• Indexing & Advanced Indexing<ul style="list-style-type: none">• Btree• Hash• GIN• GiST, SP-GiST• BRIN• Partial indexes• Index on expressions• Extensions can overload access methods to “extend” indexing to other data types <u>(PostgreSQL: Documentation:16: 38.16. Interfacing Extensions to Indexes)</u>• pg_trgm - fast searching for similar strings<ul style="list-style-type: none">• gist_trgm_ops• gin_trgm_ops

Management

SQL Server

- Known for ease maintenance efforts
- Maintenance plans
 - Index and stats
 - Backup/restore
 - Consistency checks
- Row versioning (mostly self managing)
 - Snapshot isolation
 - Read Committed Snapshot Isolation (RCSI)
 - Advanced Database Recovery
 - PVS
- SQL Agent

PostgreSQL

- Routine maintenance tasks
 - Vacuuming
 - Reindexing
 - Backup/restore
 - Log management
- Multi Version Concurrency Control
 - The need for Vacuum process
- Vacuum
 - Concurrent vs full
 - After data load
 - Row changes (including non modification updates)
 - Impact on indexes
 - Autovacuum
 - Autovacuum budget
 - Change thresholds per table
- HOT UPDATES
 - Inline vacuum
- pgCron

Monitoring & troubleshooting

SQL Server

- Activity monitor
- Performance dashboard
- Dynamic Management Views
- Query Store
- Perfmon
- XEvents/Tracing
- Database Tuning Advisor
- Query Tuning Assistant
- Tons of 3rd party tools

PostgreSQL

- Standard Unix/Linux tools
- Cumulative Statistics System
 - Collection configuration parameters
 - Control functions
 - Predefined views
- Lock contention: pg_locks
- Progress reporting
- pg_stat_statement extension
- Troubleshooting
 - Log analyzer: pgBadger

BCDR

SQL Server

- Backup/Restore options
 - Full/Diff/Log
 - Files & Filegroups
 - Compression/Encryption
 - Backup to cloud
- Availability Group topologies
- Failover Clustering
- Log shipping
- Logical Replication
 - Transactional
 - Merge

PostgreSQL

- Backup/Restore
 - pg_dump
 - file system backup
- Continuous Archiving and Point-in-Time Recovery
- Log shipping to standby server
- Failover process
- Logical replication
 - Works for data integration scenarios as well

Programmability

SQL Server

- Procedures, functions and triggers
- Spatial data types
- Graph
- .NET CLR
- Language extensibility
- Data virtualization / Linked servers
- Full-text search
- CDC/Change Tracking

PostgreSQL

- Procedures, functions and triggers
- Schema and Programmability
 - Table inheritance
 - Declarative partitioning
 - Pattern matching ILIKE/SIMILAR TO Regex/ POSIX Regex.
- JSON
 - Rich Set of JSON operators
 - Expansive JSON functions
 - Indexing to support pattern matching
- Spatial data types
 - Geometry, geography, raster
- Indexes
 - Rtree, quadtree
- Functions
 - ST_Distance, ST_Area, ST_GeometryType, ST_Intersection....
- Related extensions
- Foreign Data Wrappers
 - SQL Server
 - Oracle
 - ...

Security

SQL Server	PostgreSQL
<ul style="list-style-type: none">• Users and Principals• Ownership and user-schema separation• Server-level and database-level roles• Permission hierarchy• Windows and Azure Active Directory integration• Encryption<ul style="list-style-type: none">• Column• Storage• Always Encrypted• Auditing• Ledger	<ul style="list-style-type: none">• Robust access-control system• Client Authentication: GSSAPI, SSPI, LDAP, SCRAM-SHA-256, Certificate, and more• Database Roles<ul style="list-style-type: none">• Users• Groups• Membership• Column and row-level security• Encryption<ul style="list-style-type: none">• Columns• Partitions• Storage• Multi-factor authentication with certificates and an additional method• pgAudit

Tools

SQL Server

- Microsoft
 - “new” go-sqlcmd
 - SQL Server Management Studio
 - Azure Data Studio
 - VS Code Extensions
- 3rd party
 - Dev & test
 - Monitoring
 - Management
 - HammerDB
 - ...

PostgreSQL

- Client tools
 - psql
 - pgAdmin
 - Azure Data Studio
 - DBeaver
- PostgreSQL client and server apps
 - reindexdb, vacuumdb, pg_dump, pg_waldump, etc
- Benchmarking
 - pgbench
 - HammerDB
- 3rd party
 - Dev & test
 - Monitoring
 - Management

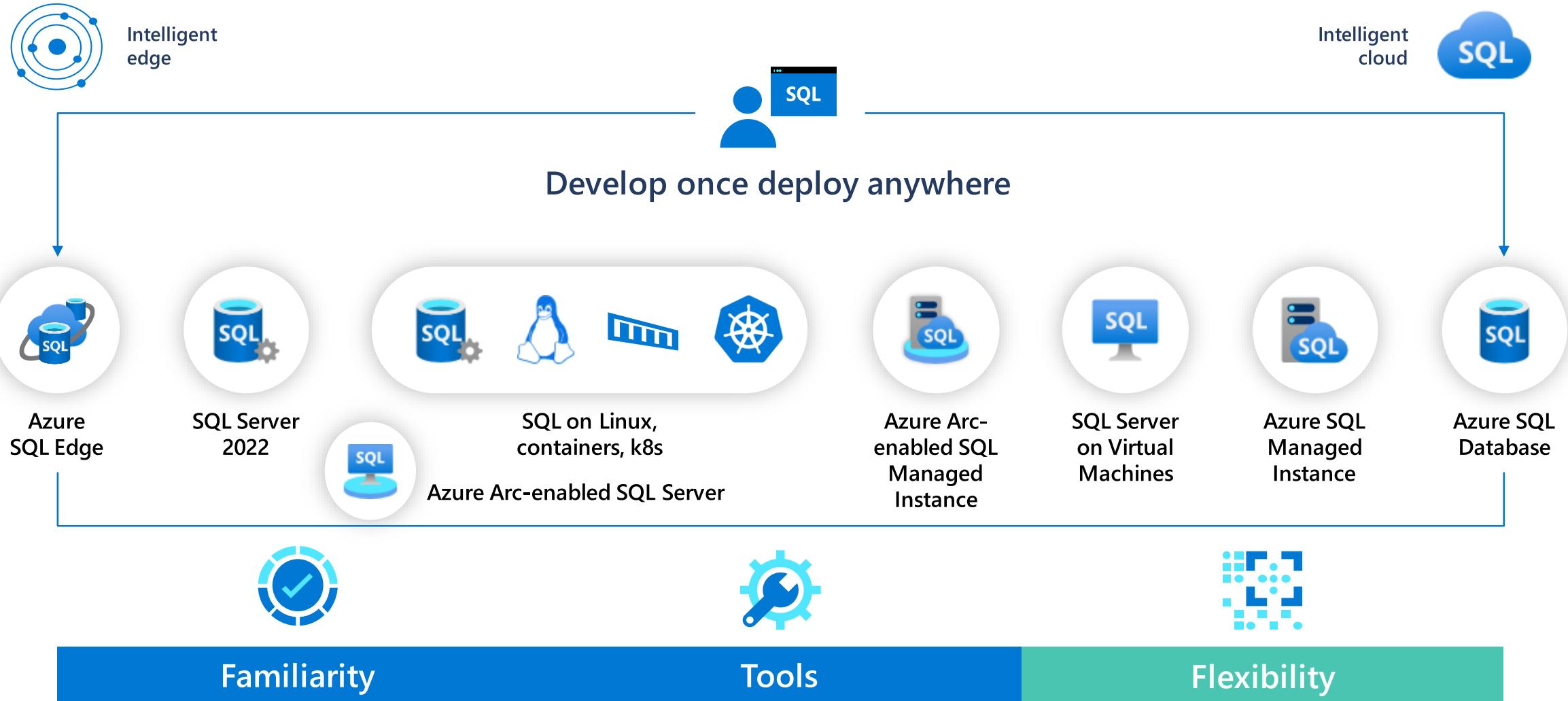
App development: drivers and frameworks

SQL Server	PostgreSQL
<ul style="list-style-type: none">• .NET SqlClient• Entity Framework Core• Java<ul style="list-style-type: none">• JDBC Driver• Hibernate• Spring Data• Python<ul style="list-style-type: none">• pyODBC• SQLAlchemy• Node<ul style="list-style-type: none">• Tedious• Sequelize• Go<ul style="list-style-type: none">• go-mssqlldb• GoORM• Data API Builder	<ul style="list-style-type: none">• <u>libpq — C Library</u>• <u>libpqxx — C++</u>• <u>psycopg — Python, SQLAlchemy, Django</u>• <u>psqlODBC</u> - ODBC• <u>pJDBC</u> – Java, Hibernate and Spring• <u>R2DBC</u> – Reactive Spring• <u>Npgsql</u> - .NET and Entity Framework Core• <u>node-postgres</u> – Node.js• <u>Sequelize and pg</u>• 3rd party<ul style="list-style-type: none">• <u>Prisma</u>• Devart• <u>Debezium</u>• Many others• Data API Builder

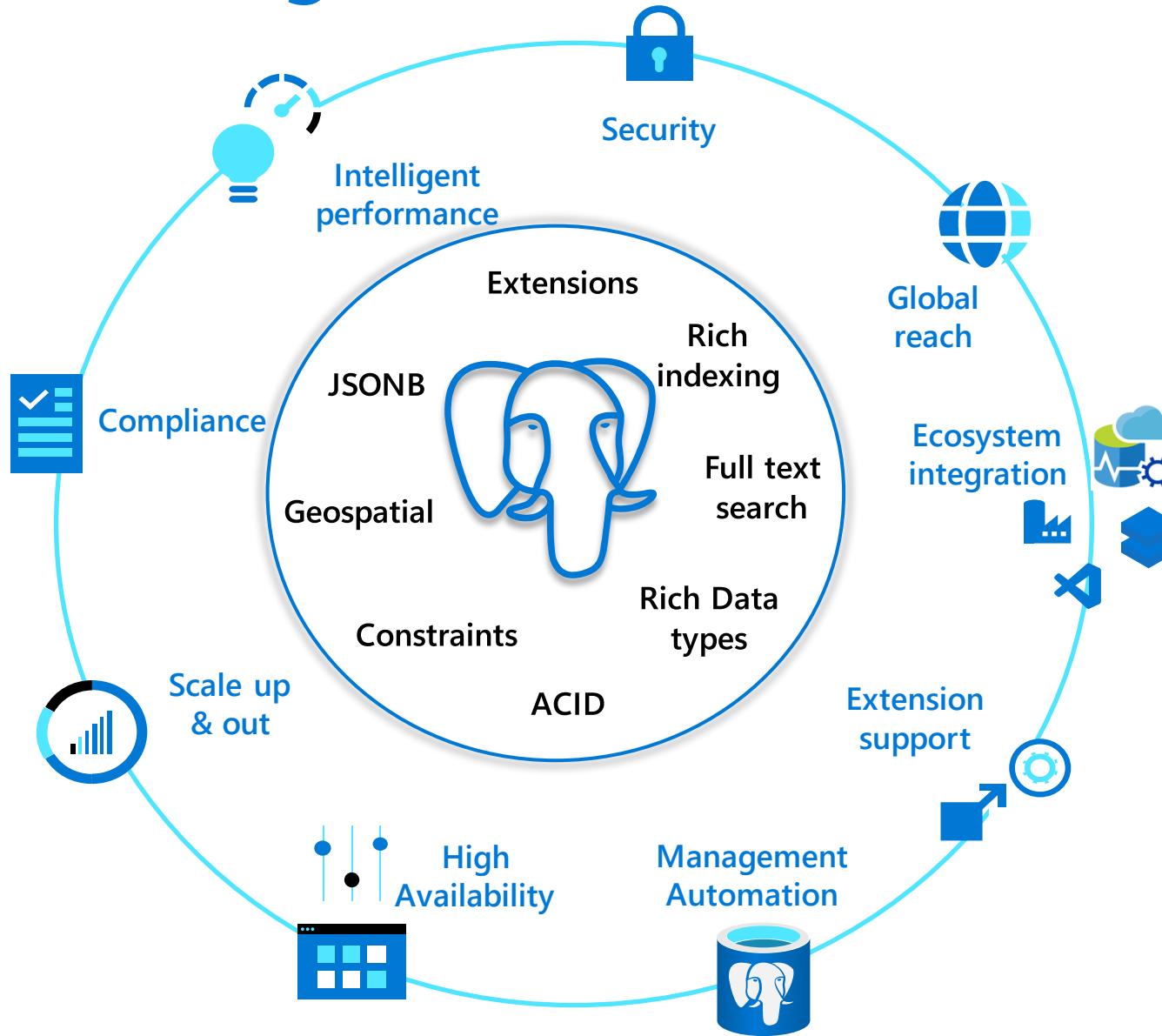
Cloud services



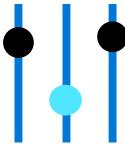
SQL from edge to cloud



Azure Database for PostgreSQL



Azure Database for PostgreSQL



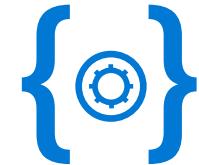
Maximum control for your databases

- Network isolation with [VNET integration](#)
- [More server parameters](#) for fine-grained tuning
- [Custom](#) maintenance windows



Build resilient apps across availability zones

- Zone redundant HA
- Fast failover with [zero data loss](#)
- [Co-locate](#) app & database in same zone



Simplified developer experience

- [Simple end-to-end deployment](#)
- Fully compatible with [community PostgreSQL](#)
- Easy cost optimization with [Stop/Start](#) & [Burstable servers](#)

Azure Database for PostgreSQL – Nov '23

Enterprise Security

Microsoft Entra ID

Self-Managed Encryption

Private Link

Mission-Critical Availability

High Availability

Geo-redundant Backup

Multi-Region Geo DR

Highly Scalable

Up to 96 vCores

Up to 64TB and 80K IOPS

<20 seconds to scale

Cloud Native AI App Ready

Native OpenAI Integration

Built-in Vector support

Cost-Effective Development

Flexible Server Architecture

Region – East US

Availability Zone 1



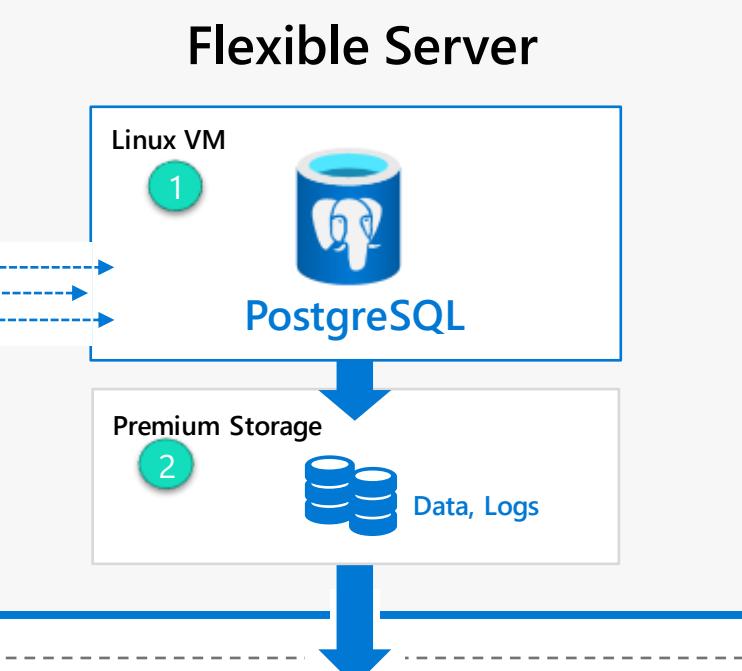
Azure VM



AKS



App Service

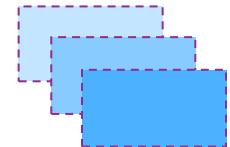


3

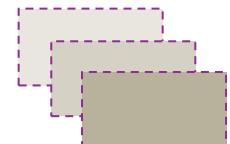
Zone-redundant backup storage



Availability Zone 2



Availability Zone 3



North Europe

West US 2

AZ1

AZ2

AZ3

1 Linux VM

2 Premium managed disks (3 copies)

3 AZ co-location with applications

4 Zone-redundant backup storage



Compute + storage

...

X

Compute

Compute resources are pre-allocated and billed per hour based on vCores configured.

Note that high availability is supported for only General purpose and Memory optimized tiers.

Compute tier

- Burstable (1-20 vCores) - Best for workloads that don't need the full CPU continuously
- General Purpose (2-96 vCores) - Balanced configuration for most common workloads
- Memory Optimized (2-96 vCores) - Best for workloads that require a high memory to CPU ratio

Compute Processor

- AMD
- Intel

Compute size

Standard_D4ds_v5 (4 vCores, 16 GiB memory)



Storage

The storage you provision is the amount of storage capacity available to your flexible server and is billed GiB/month.

Note that storage cannot be scaled down once the server is created.

Save

Estimated costs



Compute Sku	USD 259.88/month
Standard_D4ds_v5 (4 vCores, USD 64.97 per vCore)	4 x 64.97
Storage	USD 14.72/month
Storage selected 128 GiB (USD 0.12 per GiB)	128 x 0.12
Bandwidth	
For outbound data transfer across services in different regions will incur additional charges. Any inbound data transfer is free. Learn more	



Compute + storage

...

X

Storage

The storage you provision is the amount of storage capacity available to your flexible server and is billed GiB/month.

Note that storage cannot be scaled down once the server is created.

Storage type (i)

Premium SSD v2



Storage size (in GiB) * (i)

5000



The value must be between 32 and 65536

IOPS (operations/sec) * (i)

4000



The value must be between 3000 and 80000

Throughput (MB/sec) * (i)

1000



The value must be between 125 and 1000

Storage Auto-growth (i)



i Storage Auto-grow is not supported for servers with Premium SSD V2

High availability

Save

operations/sec (i)

USD 0.02

Throughput USD 70.00/month

Throughput selected 1000 MB/sec 875 x 0.08

Bandwidth

For outbound data transfer across services in different regions will incur additional charges. Any inbound data transfer is free. [Learn more](#)

Estimated total USD 794.94/month

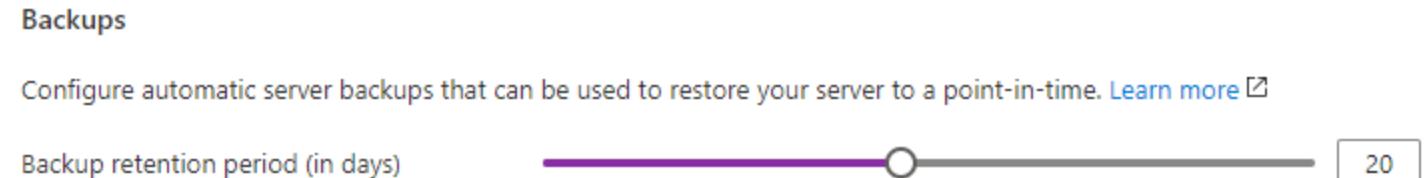
Prices reflects an estimates only. [View Azure pricing calculator](#)

Final charges will appear in your local currency in cost analysis and billing views.

Backup/Restore

- Backup (local and geo-backup)

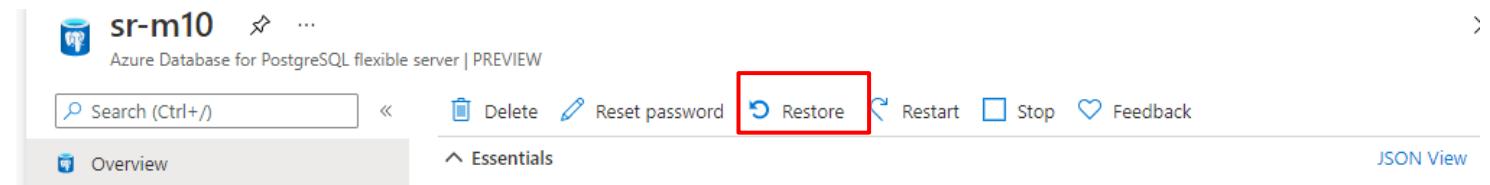
- 7-35 days of retention
 - Can be changed in any time
- Daily data disk snapshots
- WAL archival to BLOB



- Restore

- Point-in-time

- Latest time or custom time
- To the same AZ or a different AZ
- See next slide for details



- Fast restore (new)

- Ability to choose a backup and restore it without requiring recovery

- Geo-Restore

- Restore to the last data (up to 1 hr of RPO)

PITR

- Restored in the same
 - Subscription/RG/Region/PG version
 - Same VNET (if configured)
- Latest or a custom time
- Different server name
- Can choose AZ
- Snapshot is restored (done by the storage)
- WAL is restored and replayed
 - This could take a while depending on the last backup time and the time chosen to restore to

Create Azure Database for PostgreSQL Flexible server - Restore server

Microsoft - preview

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription ⓘ DS Data Magnet Incubations ▾

Resource group ⓘ sridhar-rg ▾

Source details

Select a backup source and detail. Additional settings will be defaulted where possible based on the backup selected.

Source server ⓘ sr-m10

Earliest restore point ⓘ 2021-05-04T00:17:00.000Z UTC

Point-in-time-restore (PITR) ⓘ Latest restore point (Now) Select a custom restore point

Server details

Enter required settings for this server, including picking a location and configuring the compute and storage resources.

Name * ⓘ Enter server name

Location * ⓘ East US 2 EUAP ▾

PostgreSQL version ⓘ 12 ▾

Availability zone ⓘ 2 ▾

Compute + storage ⓘ General Purpose, D2s_v3
2 vCores, 8 GiB RAM, 128 GiB storage
Estimated cost per month **162.74 USD**

Review + create **Next : Tags >**

Control your planned maintenance

Save Discard

Maintenance schedule

Select a preferred time for service updates to be applied. Outside of critical security updates, updates will be applied no more frequently than every 30 days. [Learn more](#)

Maintenance schedule

System-managed schedule

Custom schedule

Day of week ⓘ

Sunday

Start time ⓘ

00:00 - 01:00 (UTC)

00:00 - 01:00 (UTC)

01:00 - 02:00 (UTC)

02:00 - 03:00 (UTC)

03:00 - 04:00 (UTC)

04:00 - 05:00 (UTC)

05:00 - 06:00 (UTC)

06:00 - 07:00 (UTC)

07:00 - 08:00 (UTC)

08:00 - 09:00 (UTC)

09:00 - 10:00 (UTC)

10:00 - 11:00 (UTC)

11:00 - 12:00 (UTC)

12:00 - 13:00 (UTC)

Choose the Day & Time

- **System defined** schedule or **Custom** schedule for patching
- Schedule your maintenance **per server**
- **1-hour** maintenance window
- Expected downtime to be less than **60 seconds**
- Next planned maintenance schedule only **after 30 days**
- **5 days** advance notification



Flexible server

...

X

Microsoft

Server names, networking connectivity method and backup redundancy cannot be changed after server is created. Review these options carefully before provisioning.

Network connectivity

You can connect to your server by specifying a public IP address, creating private endpoints or from within a selected virtual network.

Connectivity method

- Public access (allowed IP addresses) and Private endpoint
- Private access (VNet Integration)

Connections from the IP addresses configured in the Firewall rules section below will have access to this server. By default, no public IP addresses are allowed. [Learn more](#)

Public access

Allow public access to this resource through the internet using a public IP address

Firewall rules

Estimated costs



Compute Sku **USD 259.88/month**

Standard_D4ds_v5 (4 vCores, 4 x USD 64.97 per vCore) **64.97**

Storage **USD 14.72/month**

Storage selected 128 GiB (USD 0.12 per GiB) **128 x 0.12**

Bandwidth

For outbound data transfer across services in different regions will incur additional charges. Any inbound data

Review + create

< Previous

Next : Security >

Control over authentication method

- SCRAM-SHA-256 and MD5 authentication methods
 - Ability to choose the password encryption
 - Ability to enforce the auth method
- SSL TSLV1.2/1.3 protocol support
 - Ability to enforce the version

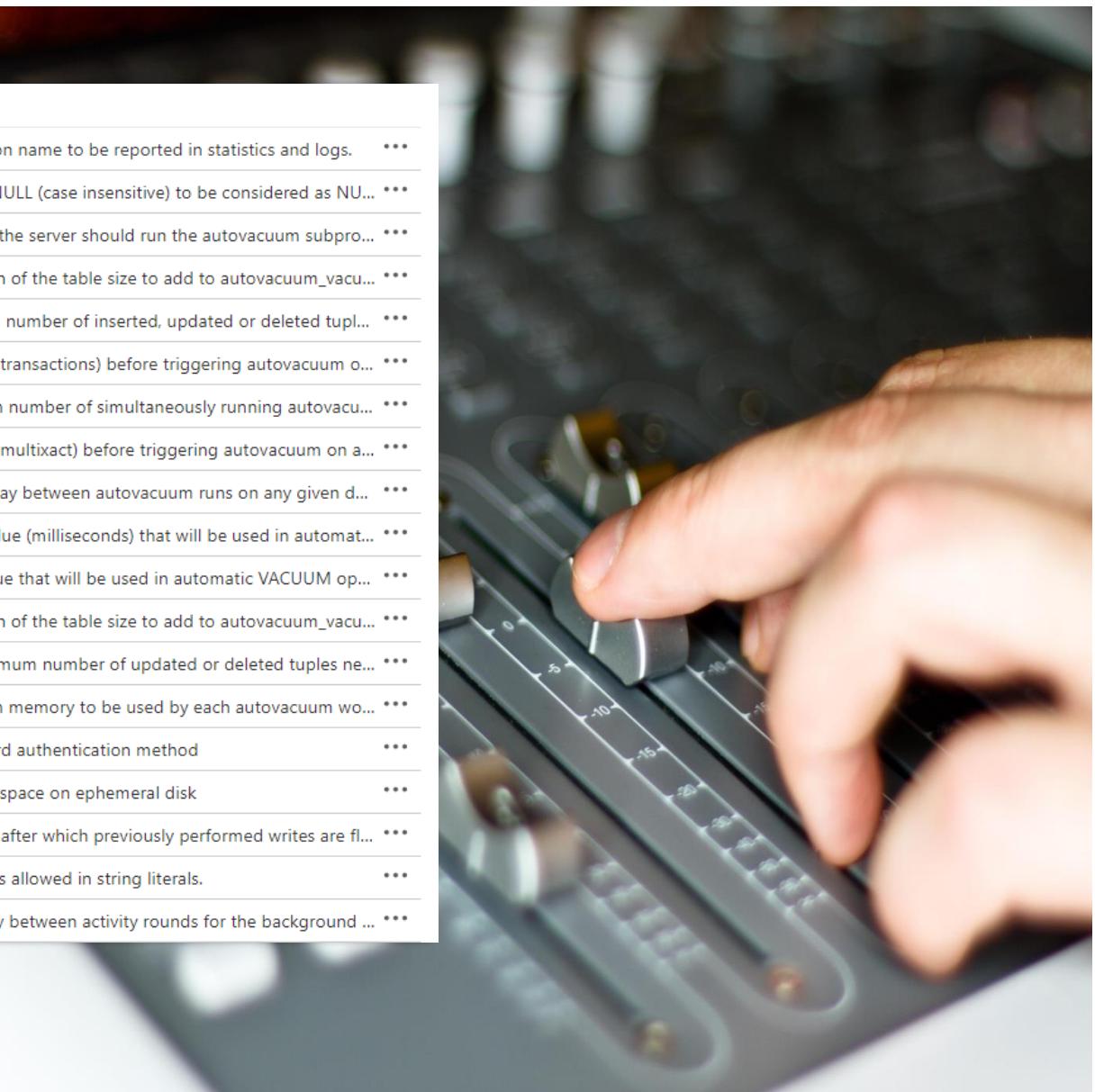
password_encryption	MD5	Determines the algorithm to use to encrypt the password..
	MD5	
	SCRAM-SHA-256	

Parameter name	VALUE	Description
azure.accepted_password_auth_method	SCRAM-SHA-256	Accepted password authentication method
	<input type="checkbox"/> MD5	
	<input checked="" type="checkbox"/> SCRAM-SHA-256	

Parameter name	VALUE	Description
ssl_max_protocol_version	TLSV1.3	Sets the maximum SSL/TLS protocol version to use.
ssl_min_protocol_version	TLSV1.2	Sets the minimum SSL/TLS protocol version to use.
	TLSV1.2	
	TLSV1.3	

More Server Parameter Control

Parameter name	↑↓	VALUE	Parameter type	↑↓	Description
application_name		<input type="text"/>	(i)	Dynamic	Sets the application name to be reported in statistics and logs.
array_nulls		<input checked="" type="button"/> ON <input type="button"/> OFF	(i)	Dynamic	Enables input of NULL (case insensitive) to be considered as NU...
autovacuum		<input checked="" type="button"/> ON <input type="button"/> OFF	(i)	Dynamic	Controls whether the server should run the autovacuum subpro...
autovacuum_analyze_scale_factor		<input type="text"/> 0.1	(i)	Dynamic	Specifies a fraction of the table size to add to autovacuum_vacu...
autovacuum_analyze_threshold		<input type="text"/> 50	(i)	Dynamic	Sets the minimum number of inserted, updated or deleted tupl...
autovacuum_freeze_max_age		<input type="text"/> 200000000	(i)	Static	Maximum age (in transactions) before triggering autovacuum o...
autovacuum_max_workers		<input type="text"/> 1	(i)	Static	Sets the maximum number of simultaneously running autovacu...
autovacuum_multixact_freeze_max_age		<input type="text"/> 400000000	(i)	Static	Maximum age (in multixact) before triggering autovacuum on a...
autovacuum_naptime		<input type="text"/> 60	(i) seconds	Dynamic	Sets minimum delay between autovacuum runs on any given d...
autovacuum_vacuum_cost_delay		<input type="text"/> 2	(i) millisecor	Dynamic	Sets cost delay value (milliseconds) that will be used in automat...
autovacuum_vacuum_cost_limit		<input type="text"/> -1	(i)	Dynamic	Sets cost limit value that will be used in automatic VACUUM op...
autovacuum_vacuum_scale_factor		<input type="text"/> 0.2	(i)	Dynamic	Specifies a fraction of the table size to add to autovacuum_vacu...
autovacuum_vacuum_threshold		<input type="text"/> 50	(i)	Dynamic	Specifies the minimum number of updated or deleted tuples ne...
autovacuum_work_mem		<input type="text"/> -1	(i) kilobytes	Dynamic	Sets the maximum memory to be used by each autovacuum wo...
azure.accepted_password_auth_method		<input type="text"/> MD5	(i)	Dynamic	Accepted password authentication method
azure.enable_temp_tablespaces_on_local_...		<input checked="" type="button"/> ON <input type="button"/> OFF	(i)	Dynamic	Create temp tablespace on ephemeral disk
backend_flush_after		<input type="text"/> 256	(i) 8kilobyte:	Dynamic	Number of pages after which previously performed writes are fl...
backslash_quote		<input type="text"/> SAFE_ENCODING	(i)	Dynamic	Sets whether "\\" is allowed in string literals.
bgwriter_delay		<input type="text"/> 50	(i) millisecor	Dynamic	Specifies the delay between activity rounds for the background





1. Zone Redundant High Availability



A standby replica deployed in a different availability zone within the same region (User can choose Primary and Standby AZ)



Replicated in Synchronous mode offering zero data loss in the event of a planned or unplanned failover



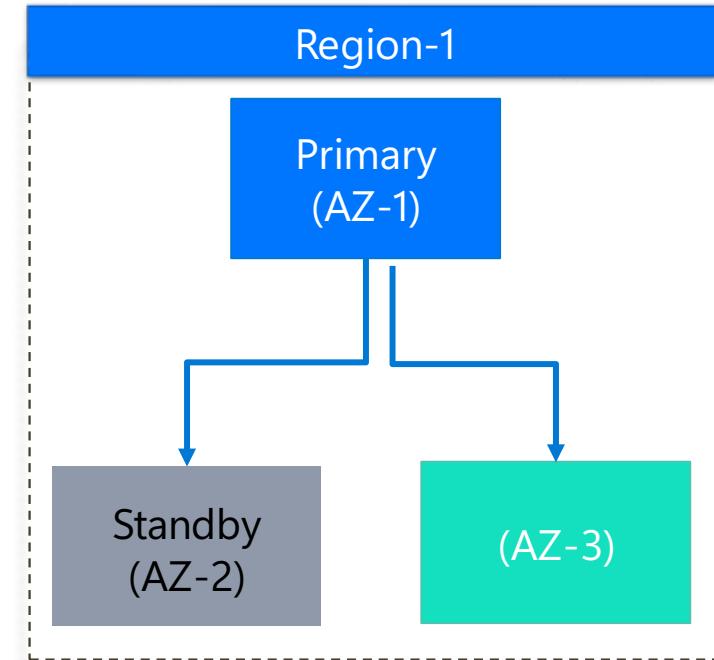
Physically separate synchronous copy of data maintained in another AZ that protects from AZ-level faults



Automatic failure detection and failovers using internal monitoring mechanisms



High uptime during planned and unplanned outages



Uptime SLA: 99.99%



Same Zone High Availability



A standby replica deployed **in the same availability zone** as the primary server



Replicated in **Synchronous** mode offering **zero data loss** in the event of a planned or unplanned failover



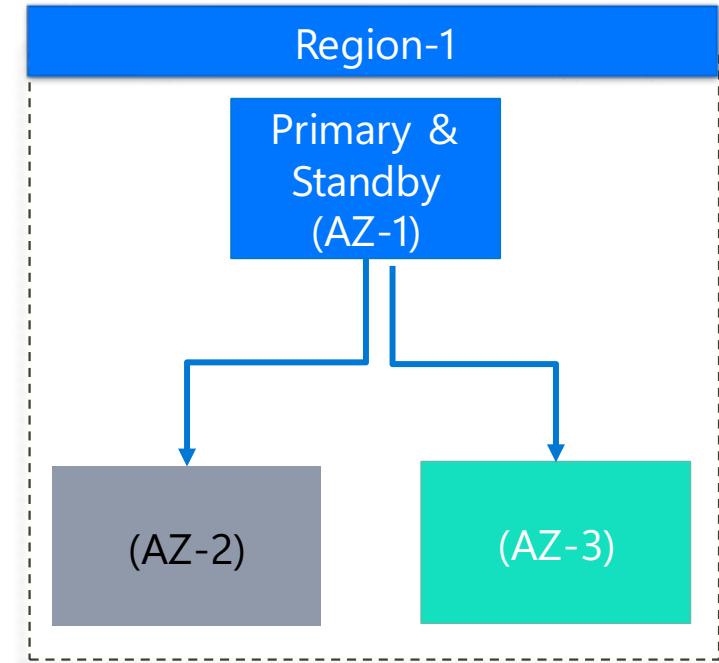
Physically separate synchronous copy of data maintained that protects from server/node level faults



Automatic failure detection and failovers using internal monitoring mechanisms



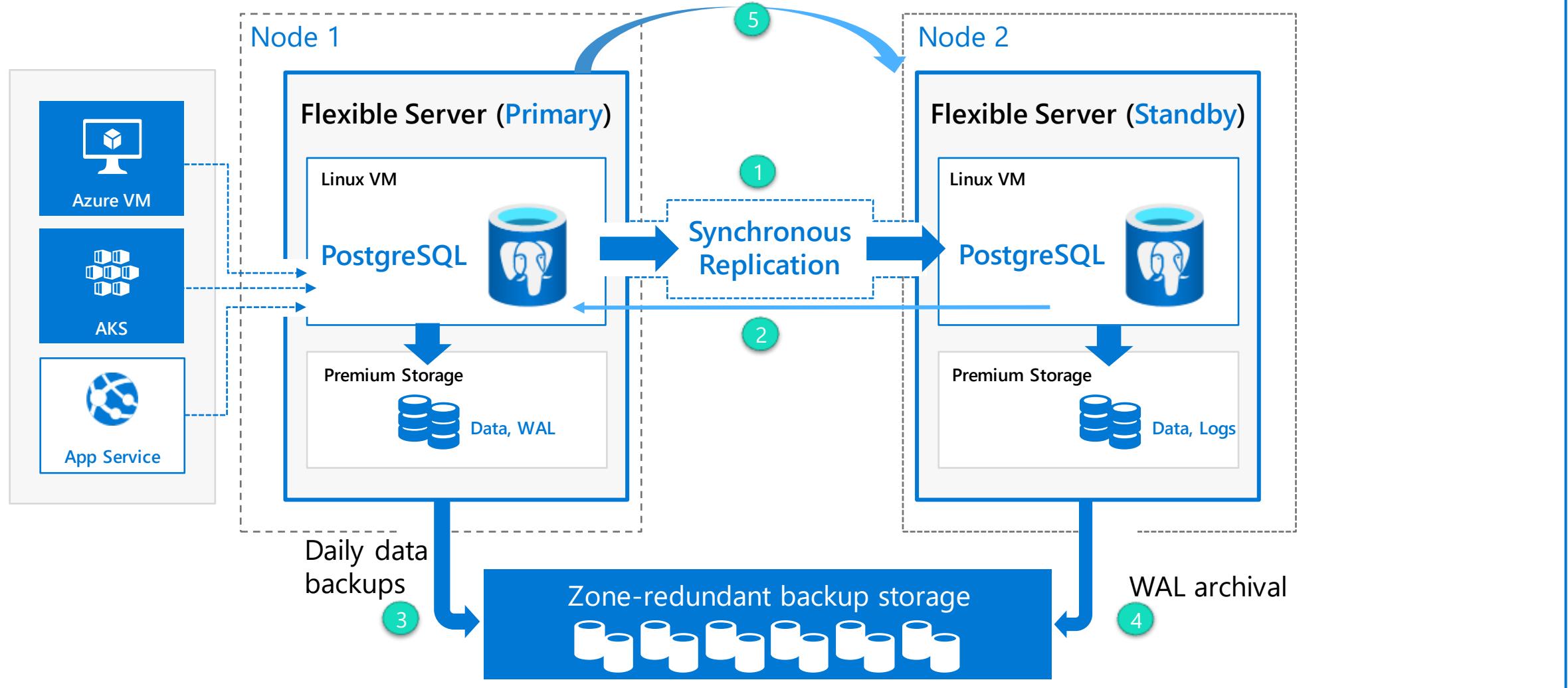
High uptime during planned and unplanned outages



Uptime SLA: 99.95%

Same-zone HA architecture

Region-1 / Availability Zone 1



1 Postgres streaming replication

2 Ack once the logs are persisted on disk

3 Snapshot backups from primary

4 Continuous WAL archival to BLOB

5 Automatic failover

High Availability



If provisioned in a VNET, both primary and standby will be in the same VNET



High data resiliency with physically separate synchronous copy of data with 3 data block copies in each site



Automatic failover to standby during unplanned outages and during managed maintenance window updates



Zero data loss after a failover



Ability to withstand server / AZ-level failures depending on the HA deployment model



Planned operations like scale compute/storage to take advantage of standby-first post-GA



Restrictions – no support for unlogged tables, Burstable SKUs. Limited support with logical replication (see doc)

At the time of create

Availability zone ⓘ

2

High availability

Zone redundant high availability deploys a standby replica in a different zone with automatic failover capability. You can also specify high availability options in 'Compute + storage'.

Enable high availability ⓘ



High availability mode ⓘ



Same zone - a standby server is always available within the same zone as the primary server



Zone redundant - a standby server is always available within another zone in the same region as the primary server

Standby availability zone ⓘ

1

Administrator account

1

3

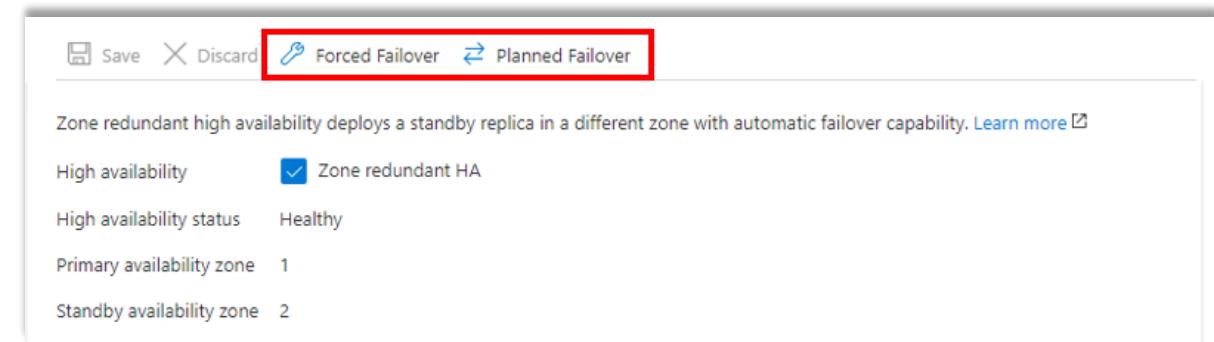
On-demand Failover

- **Forced Failover**

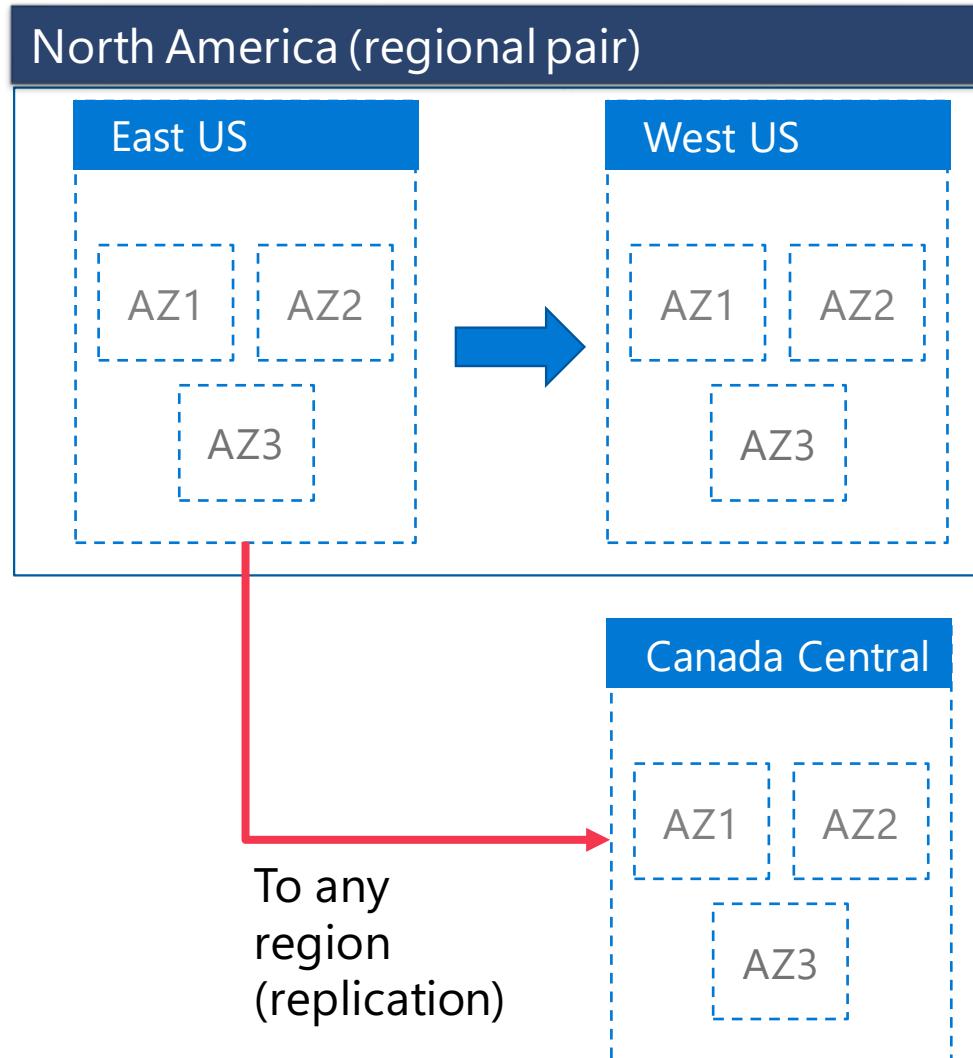
- To simulate a fault in the primary
- Failover is triggered
- Observe the application downtime during the failover process
- The end-to-end operations reported includes new standby creation & establishing a steady-state
 - So, you may see the failover taking very long
 - But check the application downtime. That is usually < 2 minutes.

- **Planned Failover**

- Use this option if you want to bring the server to the preferred Availability zone.
- Provides much lesser overall downtime
- The overall end-to-end operations may show longer.



Disaster recovery – protection from regional failures



Geo-redundant backup / restore

- DR across selected paired region
- Low-cost DR
- Higher RTO/RPO
- On-demand DR instance creation

Logical replication-based DR

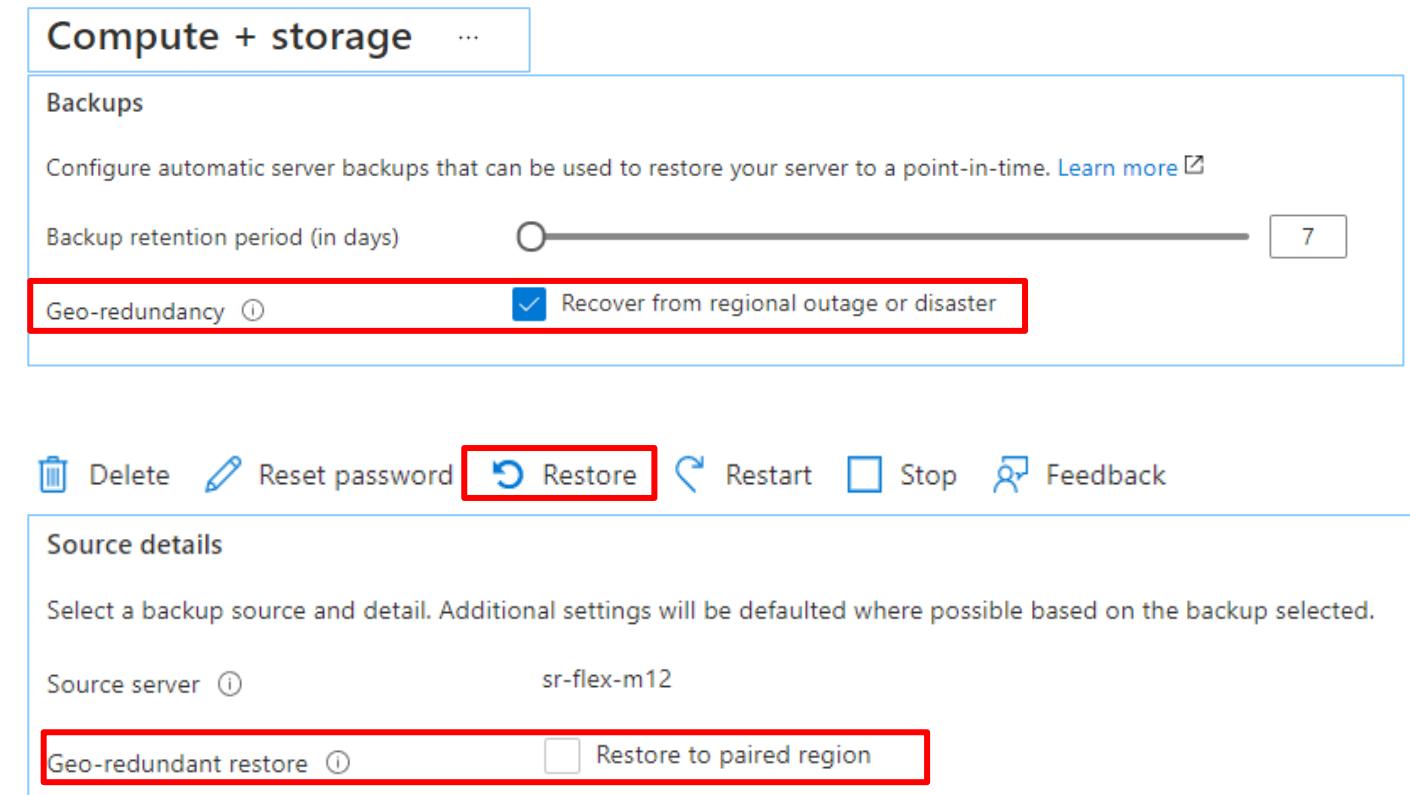
- Customer managed
- Replicate to same or any region
- Lower RTO/RPO
- Logical repl. restrictions apply

Replica - Physical replication

- Fully managed service
- Replicate to same or any region
- Low RTO/RPO

Geo-Redundant Backup

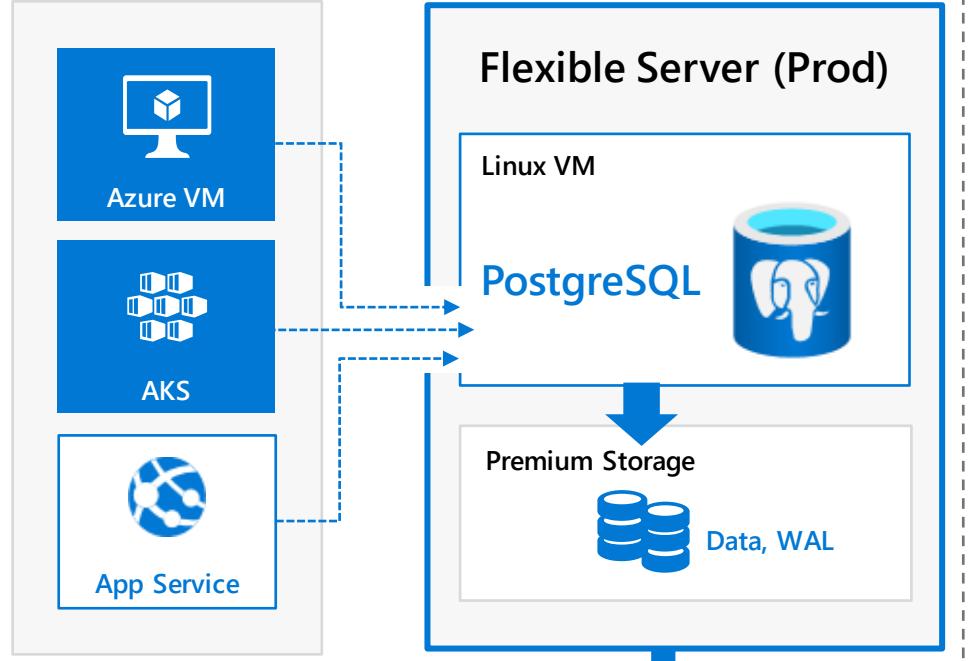
- Geo-Redundant backups
 - Initially will be available in limited regions in Preview
 - Provides low-cost DR capability
 - No servers running at the DR location
- Geo-Backup
 - Currently only create-time experience
 - Backup to a paired region
 - Daily full backups + WAL files shipped to paired region
 - Delay could be up to 1 hr (RPO)
- Geo-Restore
 - On-demand restore at the paired region
 - RPO with up to 1hr of potential data loss



Geo Redundant Backup

Region – East US 2

Availability Zone 1



Daily data
backups and
continuous
WAL backup

1

Region – Central US

Geo-backup configured
at the time of
provisioning



Paired region DR

Geo Redundant Backup

Region – East US 2

Availability Zone 1

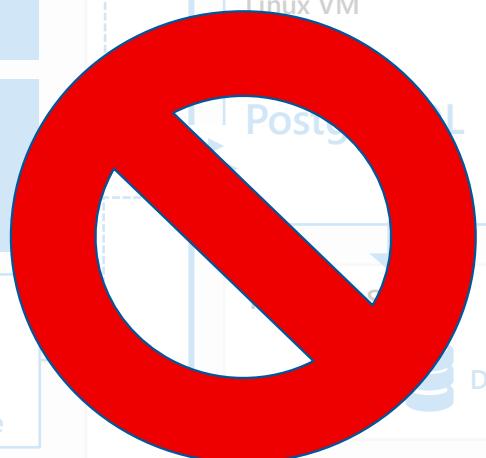


Flexible Server (Prod)

Linux VM

PostgreSQL

Data, WAL



Region – Central US

Availability Zone 2

Flexible Server (DR)

Linux VM

PostgreSQL

Premium Storage



Data, Logs

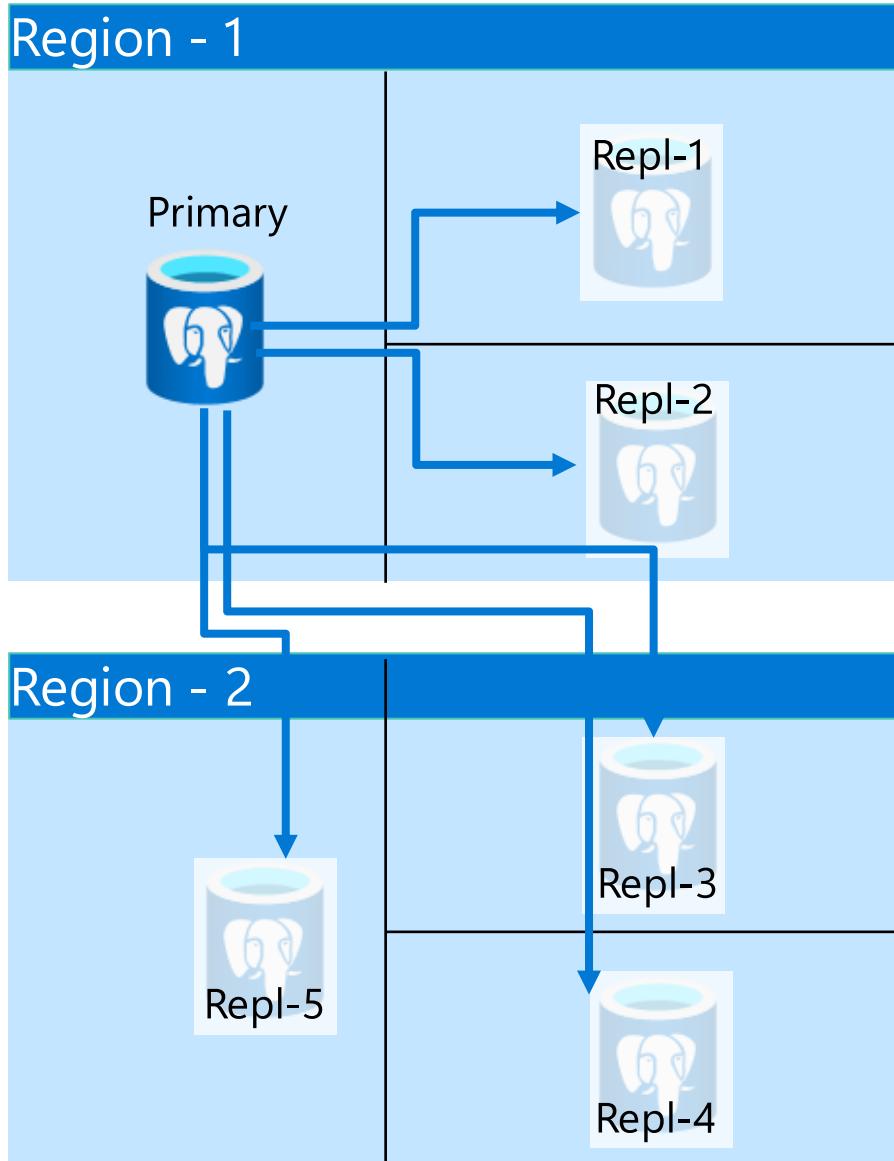
Regular backup
2

1 On-Demand
Restore performed



Paired region DR

Read replica



- Read replica
 - Ability to deploy within the same region or across regions
 - Up to 5 read replicas (cannot be used for writes)
 - Asynchronous replication (may lag primary)
 - All replicated from the same source
 - Ability to choose AZ for the replica
 - Each server has different end points
 - Supports if the primary is configured in HA or non-HA
- Use cases
 - Read offloads
 - Disaster recovery (cross-region)
 - Low performance impact due to async while having a replica in another AZ
 - Configure replica on the 3rd AZ for zone-redundant HA-enabled server

Multi-Region Disaster Recovery (GeoDR)

- Manual failover to a different region
 - Planned (Zero data loss)
 - Forced (Risk of data loss due to async replication)
- Virtual Endpoint – no application change required
 - Automatically redirects traffic from original to new primary/secondary

Demo: Multi-Region DR

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Home > PostgreSQLFlexibleServer_4e11916c6a0a4e978f59b89d73780af2 | Overview >

geodr

Azure Database for PostgreSQL flexible server

Search

Connect Delete Reset password Restore Restart Upgrade Stop Refresh CLI / PS Feedback

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Migration

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Compute + storage

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Replication

Maintenance

High availability

Backup and restore

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Locks

Power Platform

Power BI (preview)

Security

Essentials

Subscription (move) : Orcas PM team

Subscription ID :

Resource group (move) : charlesf_rg

Status : Available

Location : East US 2 EUAP

Server name : geodr.postgres.database.azure.com

Server admin login name : cfadmin

Configuration : General Purpose, D4ds v5, 4 vCores, 16 GiB RAM, 128 storage, 500 IOPS

PostgreSQL version : 15.4

Availability zone : 1

High availability : Not Enabled

Created On : 2023-11-10 21:51:08.2017428 UTC

Tags (edit) : Add tags

Getting started Properties Recommendations Monitoring Tutorials

Start your project

Connect to your database for the first time with a few simple steps.

Allow access Configure network access to your PostgreSQL database [Configure Networking](#)

Connect View connection string to learn how to connect with the application driver you use (.NET, PSQL, Python, JDBC, PHP, Node.js, Ruby, PHP, C++) [View connection strings](#)

Samples Setup a sample database schema to get started [Samples in Github](#)

Configure your database for production use

Setup configuration for your PostgreSQL Flexible server by scheduling maintenance, update server parameters and configure high availability.

Maintenance schedule Select a preferred time for service updates to

Server parameters Configure and tune PostgreSQL Flexible

High availability High availability deploys a standby replica

JSON View

geodr | Replication ...

Search

<<

Refresh Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

Create endpoint

Endpoint name

Full endpoint domain

Target server

No endpoints found.

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

Create replica

Name

Role

Compute + storage

Location

Server status

geodr.postgres.database.azure.com

None

General Purpose, 4 vCore(s), 128 GB

East US 2 EUAP

Available

Power Platform

Power BI (preview)

Security



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Create endpoints

Name

Endpoint name *

geodrep

**Read/Write**

Writer endpoint

geodrep.writer.postgres.database.azure.com



Writer server

Primary server (geodr)

Read-only

Reader endpoint

geodrep.reader.postgres.database.azure.com



Reader server *

geodr

**Virtual endpoints (Preview)**

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution.

Create endpoint

Endpoint name	Full endpoint domain
No endpoints found.	

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against hardware failure.

Create replica

Name	Role	Compute + storage
geodr.postgres.database.azure.com	None	General Purpose, 4 vCore(s), 1 GB memory

Create

Cancel

geodr | Replication

Azure Database for PostgreSQL flexible server

Search

Refresh Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution.

[Learn more ↗](#)[+ Create endpoint](#)

Endpoint name

Full endpoint domain

Target server

No endpoints found.

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more ↗](#)

[+ Create replica](#)

Name

Role

Compute + storage

Location

Server stat

geodr.postgres.database.azure.com

None

General Purpose, 4 ...

East US 2 E...

Available

Power Platform

[Power BI \(preview\)](#)

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Notifications

[More events in the activity log →](#)

Dismiss all

... Creating PostgreSQL virtual endpoint

Running X

Creating new virtual endpoint: geodrep

a few seconds ago

 geodr-rep | Replication
Azure Database for PostgreSQL flexible server

Azure Database for PostgreSQL flexible server



 Refresh Feedback

Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#) 

 Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	  geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	  geodr.postgres.database.azure.com geodr.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

 Create replica

Name	Role	Compute + storage	Location	Server status
geodr.postgres.database.azure.com	None	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available

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Home > geodr | Replication >

Add Replica server to Azure Database for PostgreSQL

Microsoft - preview

Basics Networking Security Tags Review + create

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription: Orcas PM team

Resource group: charlesf_rg

[Create new](#)

Server details

Enter required settings for this server, including picking a location and configuring the compute and storage resources.

Primary server name: geodr

Server name*: geodr-repl

Location*: East US 2 EUAP

Compute + storage: General Purpose, D4ds_v5
4 vCores, 32 GiB RAM, 128 GiB storage
[Configure server](#)

Availability zone: No preference

Authentication

Enabling Microsoft Entra authentication allows you to create ROLES based on your Microsoft Entra accounts and generate an authentication token with which to authenticate. [Learn more](#)

Estimated costs

USD 259.88/month

Compute Sku: Standard_D4ds_v5 (4 vCores, USD 64.97 per vCore) 4 x 64.97

Storage: USD 14.72/month

Storage selected 128 GiB 128 x 0.12 (USD 0.12 per GiB)

Bandwidth

For outbound data transfer across services in different regions will incur additional charges. Any inbound data transfer is free. [Learn more](#)

Estimated total: USD 274.60/month

Prices reflects an estimates only. [View Azure pricing calculator](#). Final charges will appear in your local currency in cost analysis and billing views.

[Review + create](#) [Next : Networking >](#)

Home >

 PostgreSQLFlexibleServer_8dfdf52d60b4487e977e2bf558a0a274 | Deployment Search

Delete

Cancel

Redeploy

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Refresh

... Deployment is in progress



Deployment name : PostgreSQLFlexibleServer_8dfdf52d60b4487e977e2bf558a0a274

Subscription : Orcas PM team

Resource group : charlesf_rg

Start time : 11/10/2023, 2:22:34 PM

Correlation ID : b3884630-499d-45af-bd87-b1adc22a4e72

Deployment details

Resource	Type	Status	Operation details
 geodr-repl	 Azure Database for PostgreSQL	Accepted	Operation details



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... Deployment in progress...

Running 

Deployment to resource group 'charlesf_rg' is in progress.

a few seconds ago

 geodr-repl | Replication



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 Search

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 Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

+ Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	  geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	  geodr.postgres.database.azure.com geodr.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

 Create replic

Name	Role	Compute + storage	Location	Server status	Replication state	Read replica lag
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	8 seconds

One small problem...

geodr-repl | Replication

Azure Database for PostgreSQL flexible server

 Search

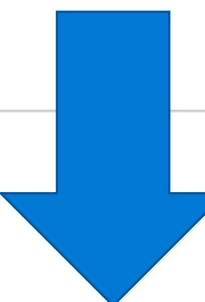
Refresh Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

[+ Create endpoint](#)

Endpoint name	Full endpoint domain	Target server
geodrep	geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	geodr.postgres.database.azure.com geodr.postgres.database.azure.com



Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

[+ Create replica](#)

Name	Role	Compute + storage	Location	Server status	Replication state	Read replica lag
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	8 seconds

Settings

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geodr-repl | Replication

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Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

[+ Create endpoint](#)

Endpoint name	Full endpoint domain	Target server
geodrep	geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	geodr.postgres.database.azure.com geodr.postgres.database.azure.com

Servers

Replicas are copies of your database that run on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

[+ Create replica](#)

Name	Role	Compute + storage	Location	Server status	Replication state	Read replica lag
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	8 seconds



Settings

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geodr | Replication

Azure Database for PostgreSQL flexible server

Search Refresh Feedback

Virtual endpoints (Preview)
These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation.

+ Create endpoint

Endpoint name	Full endpoint domain
geodrep	Edit ... geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect

+ Create replica

Name	Role	Compute + storage
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore

Create endpoints

Name

Endpoint name *

geodrep

Read/Write

Writer endpoint

Writer server

Primary server (geodr)

geodrep.writer.postgres.database.azure.com

Read-only

Reader endpoint

Reader server *

geodrep.reader.postgres.database.azure.com

geodr

Save Cancel

geodr | Replication

Azure Database for PostgreSQL flexible server

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Create endpoints

Name

Endpoint name *

geodrep

Read/Write

Writer endpoint

geodrep.writer.postgres.database.azure.com

Writer server

Primary server (geodr)

Read-only

Reader endpoint

geodrep.reader.postgres.database.azure.com

Reader server *

geodr

geodr

geodr-repl

Save

Cancel

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geodr | Replication

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Virtual endpoints (Preview)
These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation.

+ Create endpoint

Endpoint name	Full endpoint domain
geodrep	Edit ... geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect

+ Create replica

Name	Role	Compute + storage
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore

Create endpoints

Name: geodrep

Read/Write:
Writer endpoint: geodrep.writer.postgres.database.azure.com

Writer server: Primary server (geodr)

Read-only:
Reader endpoint: geodrep.reader.postgres.database.azure.com

Reader server: geodr-repl (highlighted with a red box)

Save Cancel

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Home > Azure Database for PostgreSQL flexible servers > geodr

geodr | Replication

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Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution.

[Learn more](#)

+ Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	Edit ... geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	Edit Delete geodr.postgres.database geodr.postgres.database

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

+ Create replica

Name	Role	Compute + storage	Location	Server stat
geodr.postgres.database.azure.com	Primary	General Purpose, 4 ...	East US 2 E...	Available
geodr-repl.postgres.database.azure.com.	Edit ...	Replica	General Purpose, 4 ...	East US 2 E... Available

Notifications

More events in the activity log → Dismiss all

Updating PostgreSQL virtual endpoint Running X

Updating existing virtual endpoint: geodrep a few seconds ago

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Azure Database for PostgreSQL flexible server

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Virtual endpoints (Preview)
These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

+ Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	Edit ... geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	geodr.postgres.database.azure.com geodr-repl.postgres.database.azure.com

Servers
Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

+ Create replica

Name	Role	Compute + storage	Location	Server stat...	Replication state	Read replica lag
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	8 seconds

geodr | Overview | Activity log | Access control (IAM) | Tags | Diagnose and solve problems | Migration | Compute + storage | Networking | Databases | Connect | Server parameters | Replication | Maintenance | High availability | Backup and restore | Advisor recommendations | Locks | Power Platform | Power BI (preview) | Security



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geodr | Replication

Azure Database for PostgreSQL flexible server

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Virtual endpoints (Preview)
These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

+ Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	Edit ... geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	Edit Delete geodr.postgres.database.azure.com geodr-repl.postgres.database.azure.com

Servers
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Name	Role	Compute + storage	Location	Server stat...	Replication state	Read replica lag
geodr.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr-repl.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	8 seconds

Power Platform

Power BI (preview)

Security



geodr | Replication

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Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation.

Create endpoint

Endpoint name

geodrep

Full endpoint domain

geodrep.writer.postgres.database.azure.com
geodrep.reader.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect

Create replica

Name

geodr.postgres.database.azure.com

Role

Primary

Compute + storage

General Purpose, 4 vCore

geodr-repl.postgres.database.azure.com

Replica

General Purpose, 4 vCore

Promote geodr-repl

Promote this read replica. Choose to make it the primary server or an independent server.

[Learn more](#)

Promoting to primary server option will fail if there is no virtual endpoint, or if the replica to be promoted is not the reader endpoint target server.

Replica server to promote

Server	geodr-repl.postgres.database.azure.com
Action	<input checked="" type="radio"/> Promote to primary server. (Preview) <input type="radio"/> Promote to independent server and remove from replication. This won't impact the primary server. <input checked="" type="radio"/> Planned - sync data before promoting. <input type="radio"/> Forced - don't sync data, promote as soon as possible. (Preview)
Data sync	

Primary server to demote

Server	geodr.postgres.database.azure.com
Action	Planned demotion to read replica server

Promote

Cancel



geodr | Replication

Azure Database for PostgreSQL flexible server

 Search[Refresh](#) [Feedback](#)

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution.

[Learn more](#)[Create endpoint](#)

Endpoint name

Full endpoint domain

Target server

geodrep



...

geodrep.writer.postgres.database.azure.com

geodrep.reader.postgres.database.azure.com



geodr.postgres.database.azure.com

geodr-repl.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

[Create replica](#)

Name

Role

Compute + storage

Location

Server stat

geodr.postgres.database.azure.com

Primary

General Purpose, 4 ...

East US 2 E...

Available

geodr-repl.postgres.database.azure.com



...

Replica

General Purpose, 4 ...

East US 2 E...

Available

Notifications

[More events in the activity log](#) [Dismiss all](#)

☰ Promoting PostgreSQL replica server

Running [X](#)

Promoting geodr-repl

a few seconds ago

✓ Successfully updated virtual endpoint

Successfully updated virtual endpoint geodrep

a minute ago

Microsoft Azure | Search resources, services, and docs (G+)

Copilot | Copilot | 🔍 | 🌐 | 🚫 | 🚧 | 🛡️ | 🎯 | charlesf@microsoft.com
MICROSOFT (MICROSOFT.ONM...)

Home > Azure Database for PostgreSQL flexible servers > geodr

geodr | Replication

Azure Database for PostgreSQL flexible server

Search | Refresh | Feedback

Virtual endpoints (Preview)

These logical domains simplify interactions with the underlying servers, ensuring efficient routing and operation distribution. [Learn more](#)

+ Create endpoint

Endpoint name	Full endpoint domain	Target server
geodrep	geodrep.writer.postgres.database.azure.com geodrep.reader.postgres.database.azure.com	geodr-repl.postgres.database.azure.com geodr.postgres.database.azure.com

Servers

Replicas are copies of your database that reside on a different logical server from the primary. Replicas protect against regional failures or prolonged data center outage. [Learn more](#)

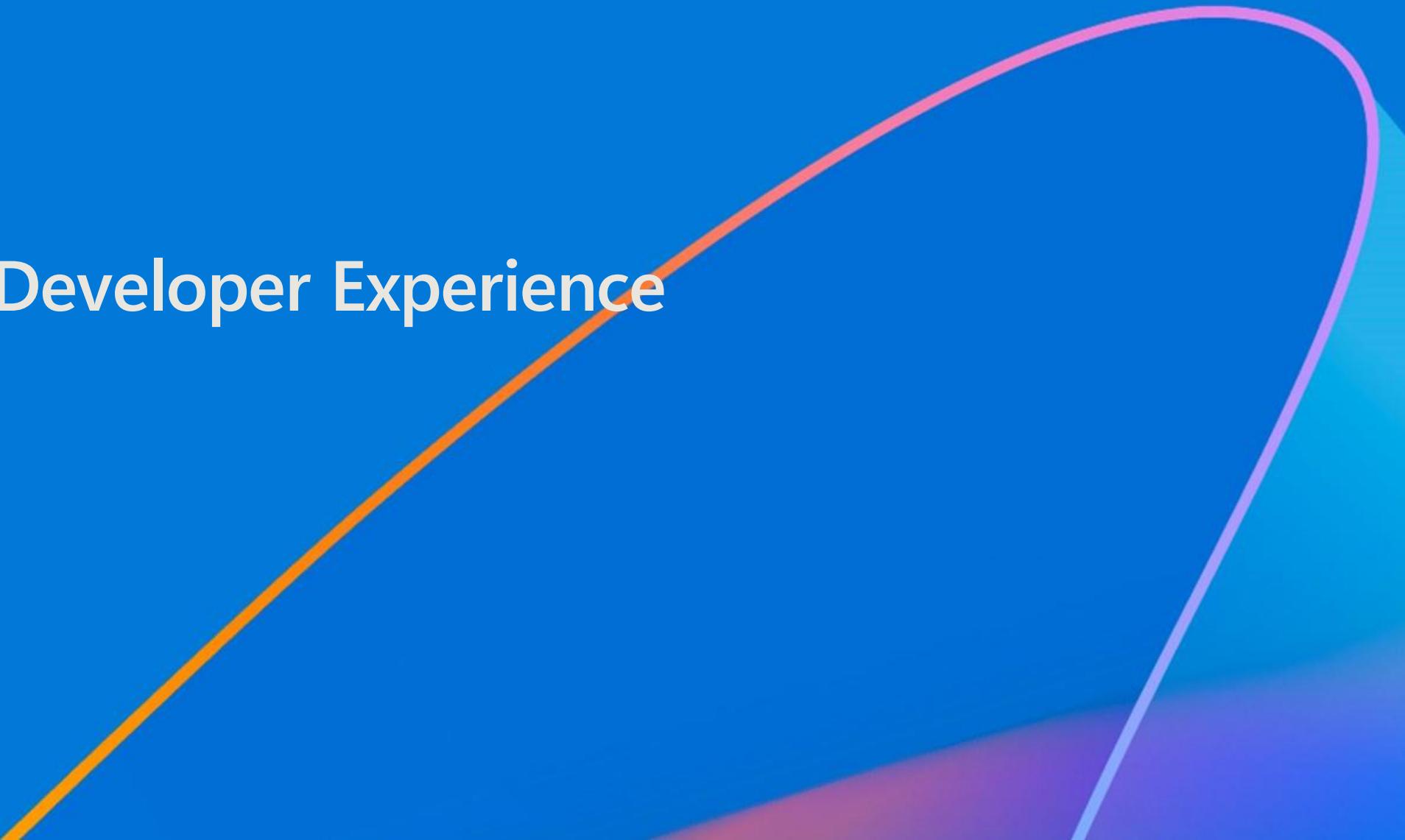
+ Create replica

Name	Role	Compute + storage	Location	Server stat...	Replication state	Read replica lag
geodr-repl.postgres.database.azure.com	Primary	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	--	--
geodr.postgres.database.azure.com	Replica	General Purpose, 4 vCore(s), 128 GB	East US 2 EUAP	Available	Active	--

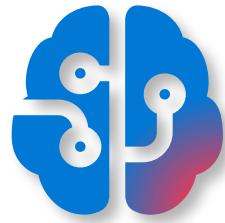
Server roles reversed

The screenshot shows the Azure portal interface for managing an Azure Database for PostgreSQL flexible server named "geodr". The "Replication" section is active. It displays two virtual endpoints: "geodrep" and "geodr". The "geodrep" endpoint is highlighted with a red box, showing its target servers as "geodr-repl.postgres.database.azure.com" and "geodr.postgres.database.azure.com". In the "Servers" section, it lists two replicas: "geodr-repl.postgres.database.azure.com" (Primary) and "geodr.postgres.database.azure.com" (Replica). The "geodr" server is also highlighted with a red box. A large red watermark "Server roles reversed" is overlaid across the right side of the page.

Simplified Developer Experience



Azure Database for PostgreSQL—Intelligent apps



Azure AI extension

SQL Interface to Azure OpenAI
Create embeddings from SQL Statements
SQL interface to Azure AI Language services
Complimentary to vector data type

[Azure AI Extension](#)



Vector data type

Pg Vector extension update—0.5.1 GA
Vector data type—natively store embeddings
Vector indexing for performant searches
Efficient similarity searches within the DB

[How to enable and use pgvector](#)

Scenarios enabled



Natural Language
Processing

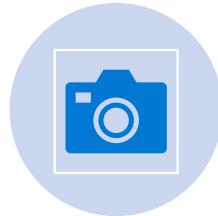
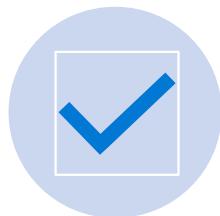


Image Analysis



Recommendation
Systems



Chatbots



Clustering



Anomaly
detection

Azure AI extension – Azure Open AI



Application

```
SELECT title FROM recipes  
order by  
recipe_embedding <#>  
azure_openai.create_embeddings  
( 'Deployment', 'high protein  
recipes' )::vector
```

title	cosine_similarity_score
Chicken Bake(Low Calorie)	0.8125699032035647
Oatmeal breakfast bars	0.8116828687002345
Hot Chicken Salad	0.8066745034844333



Vector Extension
Efficient similarity searches

```
POST {Endpoint}/depolments/{deployment-id}/embeddings  
{  
  "operationId": "embeddings_create"  
  ...  
  "requestBody": {  
    "input" : "High protein recipes.."  
  }  
  ....  
}
```

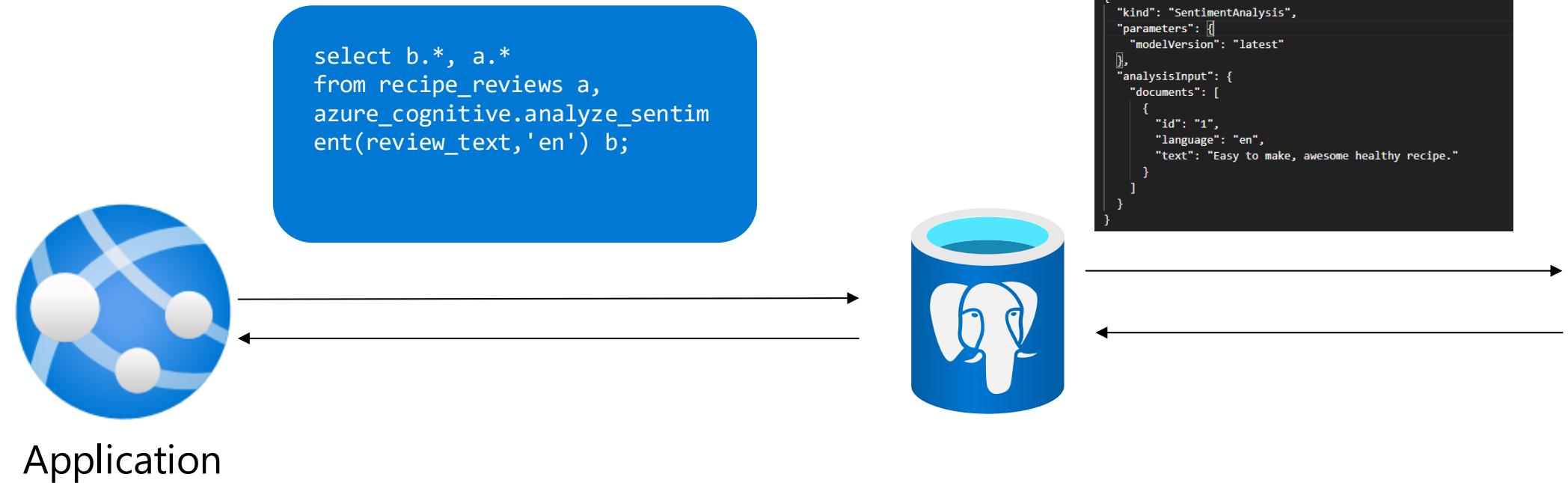
Azure OpenAI



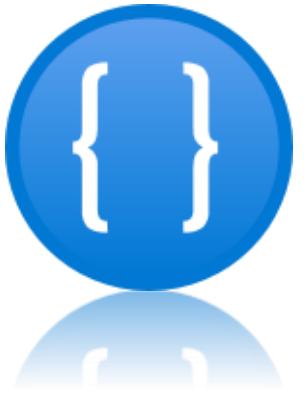
```
[0.01665339,-0.00458135,-0.00493248,-0.00530701,  
-0.00034506, 0.00672823,-0.01681390,-0.02811681,  
-0.00896206,-0.02639127,-0.00998534, 0.02411732,  
-0.02094715, 0.00103080, 0.00453119, 0.01050033,  
0.02910665, 0.03346729, 0.02641803,-0.03475141,  
-0.01490110, 0.00411987,-0.01630561,-0.02398355,  
-0.01812477,-0.00369518, 0.02870536,-0.02080001,  
0.04023566,-0.02189686, 0.00957737,-0.00053713,  
...  
]
```

Vector

Azure AI extension – Language Services



Azure AI Language Services



- Sentiment Analysis
- Summarization
- Language detection
- Key phrase extraction
- PII/PHI detection

Azure AI Language Services integration

sentiment	positive_score	neutral_score	negative_score	review_text
positive	0.99	0	0	This was delicious, I loved it and so very easy
negative	0.25	0.1	0.65	I did not care for it, there are better recipes
neutral	0.33	0.63	0.04	I cannot decide, it is easy to make, but was ave

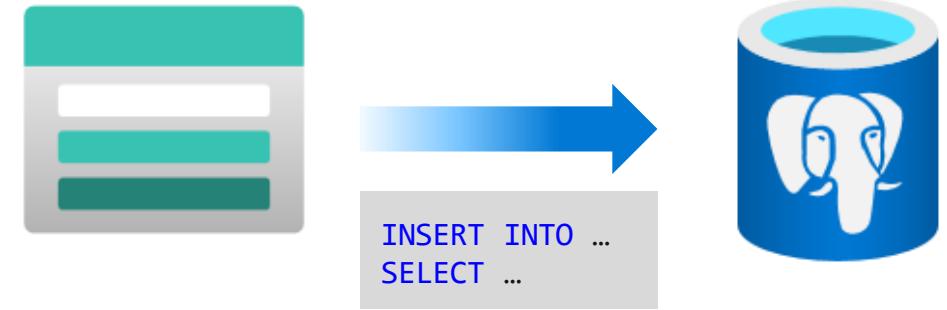
Azure_storage extension

- Enables import/export data from Azure Storage

```
CREATE EXTENSION azure_storage;
```

```
SELECT azure_storage.account_add (
    account_name_p text ,
    user_p regrole);
```

```
INSERT INTO <table name>
SELECT azure_storage.blog_get(... )
```



Azure_storage extension

- Enables import/export data from Azure Storage
- Data transformations as loading data from storage

```
INSERT INTO github_users
SELECT user_id, url, UPPER(login), avatar_url, gravatar_id, display_login FROM
azure_storage.blob_get(
    'pgquickstart',
    'github',
    'users.csv.gz', NULL::github_users) WHERE gravatar_id IS NOT NULL;
```

Easy Create – Smart defaults

Flexible server (Preview)



Microsoft - preview

Server name *

Enter server name

Region *

East US

Workload type

- Production (Small / Medium-size)
- Production (Large-size)
- Development



Suitable for small databases or personal projects with few user connections requirements.

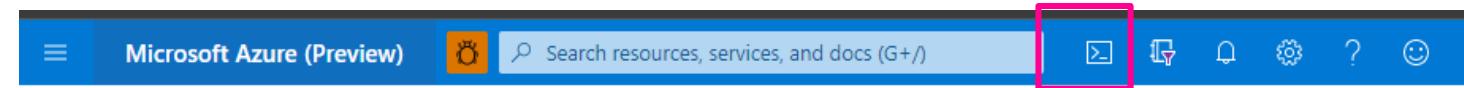
Compute + storage

Burstable, B1ms

1 vCores, 2 GiB RAM, 10 GiB storage

[Configure server](#)

Easy CLI Experience



1. Setup Environment

```
$ az account set --subscription "Your Azure subscription name"  
$ az group create --name resource-group-name --location southeastasia
```

2a. Provision a new Flexible Server with all details

```
$ az postgres flexible-server create --resource-group resource-group-name --name  
servername --admin-username user --admin-password "password" --version 12 --sku-name  
Standard_B1ms --public-access <your external client IP address>
```

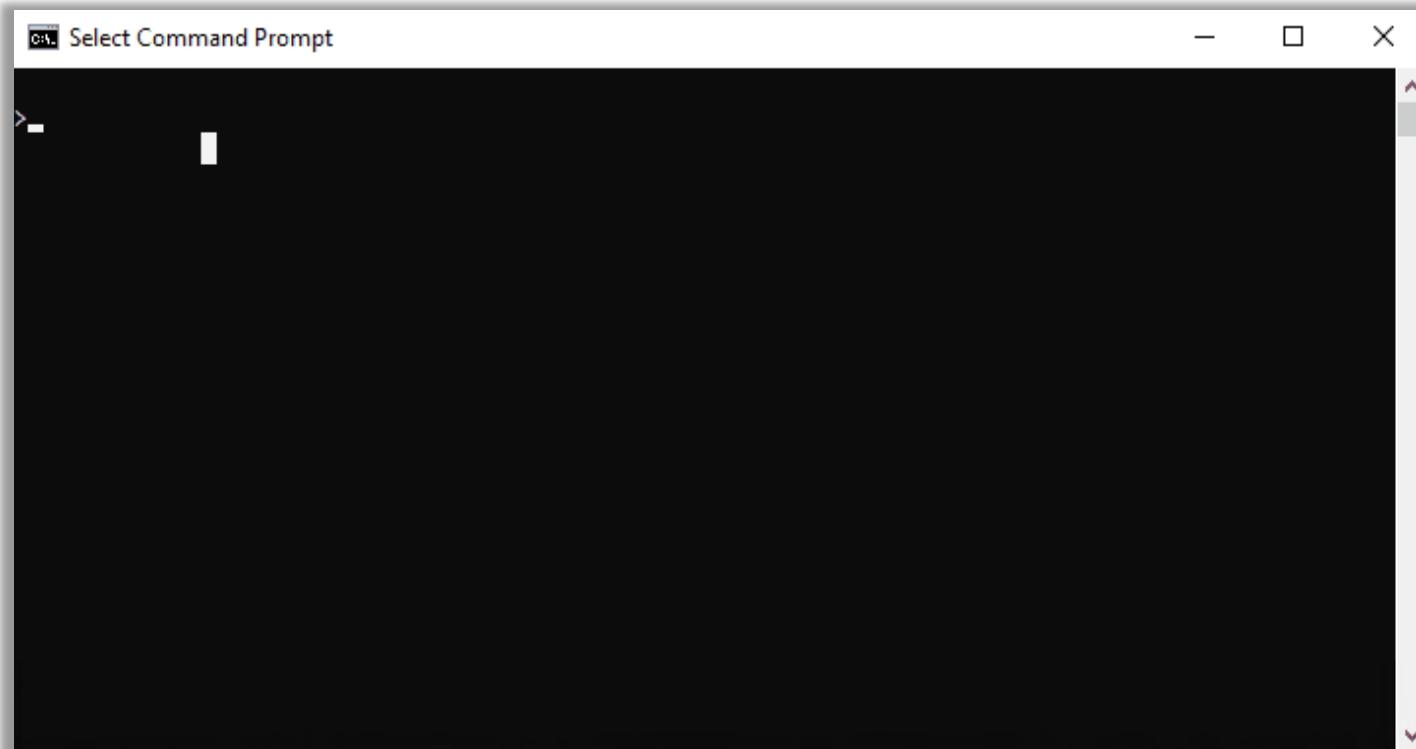
2b. Or create a server using defaults

```
$ az postgres flexible-server create
```

Post Provision: Native connection experience

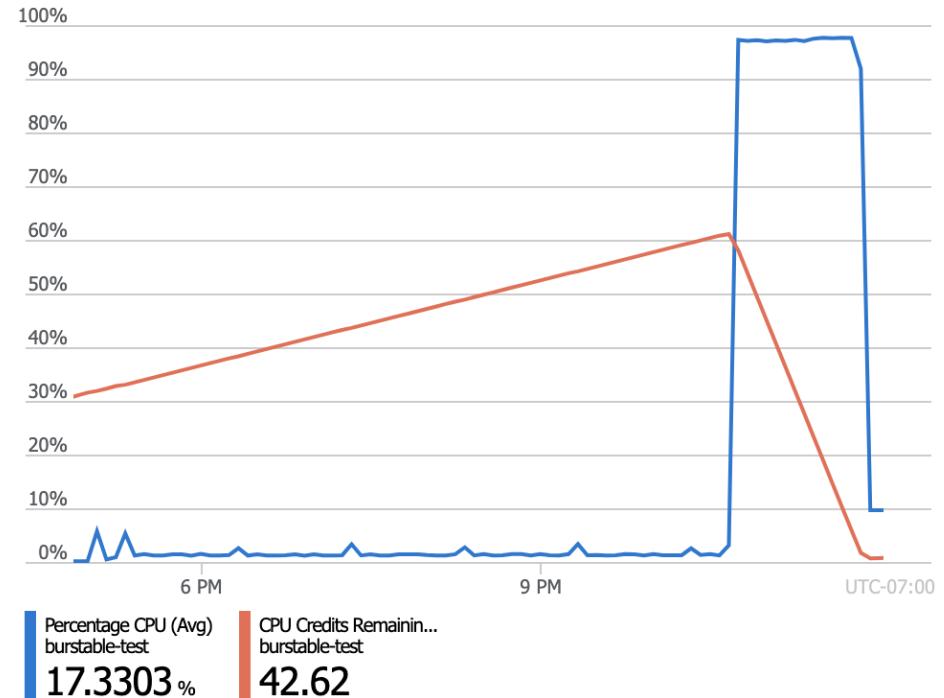


```
$ psql -h mydemoserver.postgres.database.azure.com -U mydemouser
```



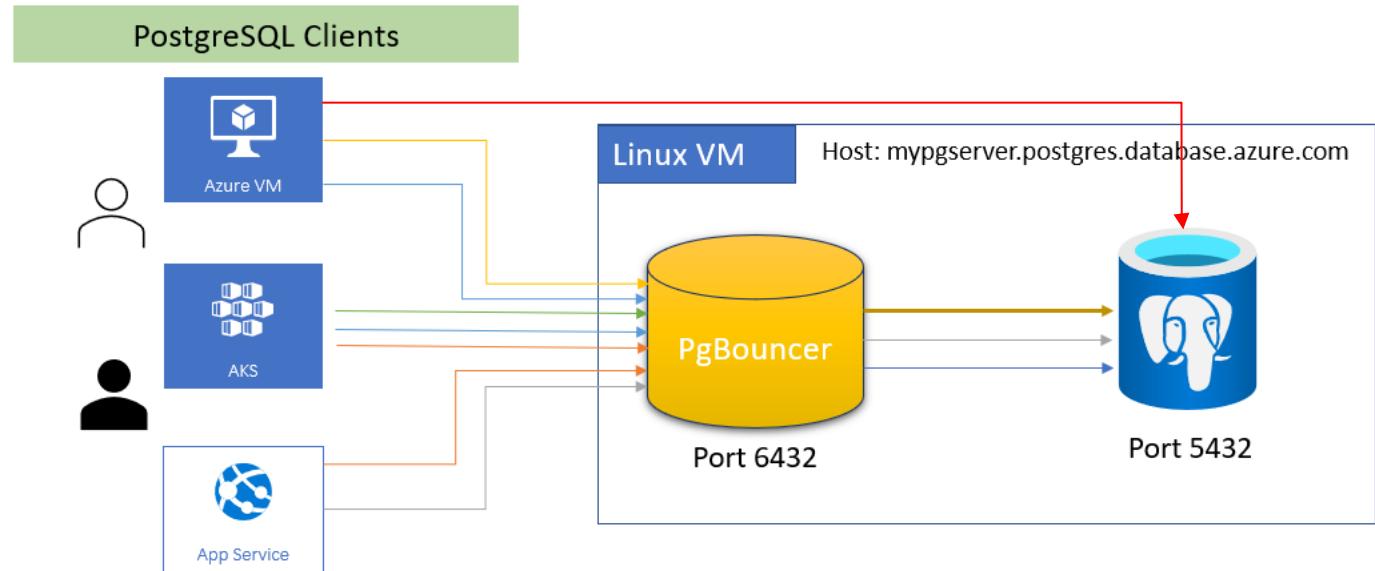
Simple Cost Optimization for development needs

- Use **low-cost Burstable SKU** starting < \$15 per month for all development needs.
- **Stop the Server** when not in use.
 - Pay for storage only while the server is stopped
 - Restarted after 7 days (backups/maintenance)



Connection Pooling - Built-in PgBouncer

- Postgres connections are expensive
- Support for managed connection pooler – PgBouncer
 - General Purpose & Memory optimized SKUs only
- Opt-in feature
- No need to restart
 - Dynamic
- Connection to the database server via port 6432 routes via PgBouncer
- You can connect to 5432 as well



Parameter name	VALUE	Description
pgbouncer.default_pool_size	50	How many server connections to allow per user/database pair.
pgbouncer.enabled	TRUE	Denotes if PgBouncer service is enabled.
pgbouncer.ignore_startup_parameters		Comma-separated list of parameters that PgBouncer can ignore because they are going ..
pgbouncer.max_client_conn	5000	Maximum number of client connections allowed.
pgbouncer.min_pool_size	0	Add more server connections to pool if below this number.
pgbouncer.pool_mode	TRANSACTION	Specifies when a server connection can be reused by other clients.
pgbouncer.query_wait_timeout	120	Maximum time (in seconds) queries are allowed to spend waiting for execution. If the qu..
pgbouncer.stats_users		Comma-separated list of database users that are allowed to connect and run read-only ...

Performance Insights – Long running queries

Refresh Reset Feedback

Long running queries Wait Statistics

Number of Queries Selected by Time period:
5 avg Last 24 hrs

Top 5 Queries By

DURATION



Aggregation Window

15 MINUTES

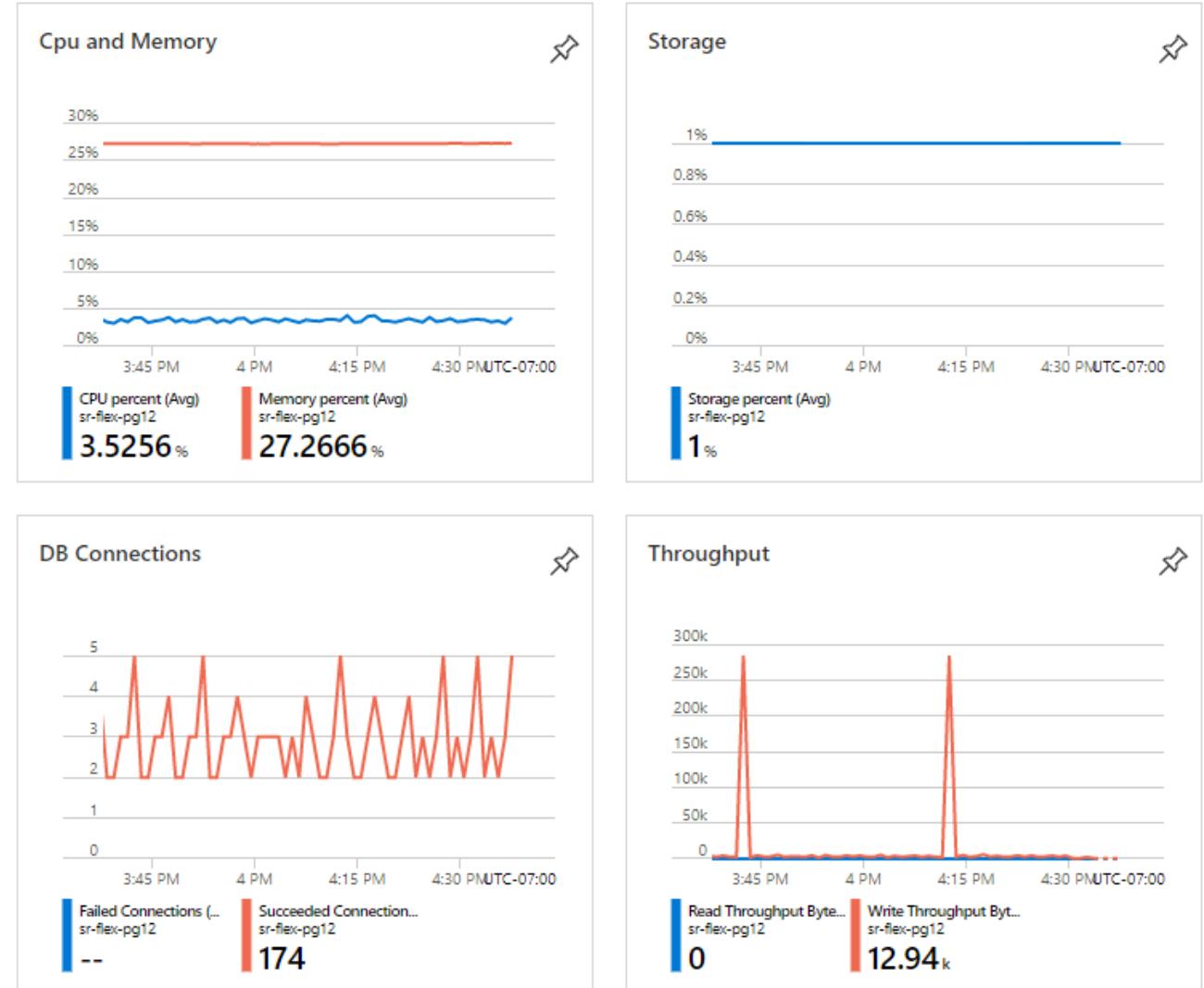
Time Range

6/24/2021, 8:15:00 PM - 6/25/2021, 8:30:00 AM

QUERY ID	Query Text	↑↓	DURATION [hh:mm:ss.mmmm]	↑↓	EXECUTIONS COU..↑↓	Database Name	↑↓
-2695571992795217...	select count(*) from pgbench_branches		00:00:00.150	↑	1	bench10gb	
-8617639074358654...	vacuum pgbench_branches		00:00:00.037	↑	1	bench10gb	
-6590470274589558...	vacuum pgbench_tellers		00:00:00.035	↑	1	bench10gb	
52215671553416880...	truncate pgbench_history		00:00:00.006	↑	1	bench10gb	
-3205292528737028...	UPDATE pgbench_accounts SET abalance = abalance + -966 WHERE aid = 34302415;		00:00:00.005	↑	28379	bench10gb	

Monitoring - Metrics

- Metrics shown in the overview page →
- See additional details in the metrics page
 - Traffic
 - Connections, network In/out, etc.
 - Saturation
 - CPU, memory, storage, IOPS, throughput etc.
 - Errors
 - Failed connections



Monitoring – Postgres logs

- Configure in Diagnostic Settings in the Portal
- Ability to choose the retention days
- Flexibility to
 - Send to Log analytics workspace
 - Archive to storage account
 - Stream to event hub
 - Send to partner solution
 - Apache Kafka
 - Datadog
 - Elastic
- Use Azure Storage Explorer to view the logs

The screenshot shows the 'Diagnostic setting' blade in the Azure portal. At the top, there are navigation links: 'Monitoring' (selected), 'Alerts', 'Metrics', and 'Diagnostic settings'. The 'Diagnostic settings' link is highlighted with a red box.

The main area is titled 'Diagnostic setting ...' and contains the following fields:

- Diagnostic setting name ***: demo-diag (highlighted with a green box)
- Category details**:
 - log**:
 - PostgreSQLLogs (checked)
 - Retention (days): 0
 - metric**:
 - AllMetrics (checked)
 - Retention (days): 0
- Destination details**:
 - Send to Log Analytics workspace
 - Archive to a storage account (highlighted with a red box)
- Informational notes**:
 - You'll be charged normal data rates for storage and transactions when you send diagnostics to a storage account.
 - Showing all storage accounts including classic storage accounts
- Location**: East US
- Subscription**: Orcas PM team
- Storage account ***: srlogtest
- Other options**:
 - Stream to an event hub
 - Send to partner solution

Alerts

- Define condition & action
- Condition
 - CPU, storage, memory, IOPS etc.
 - Example: CPU exceeds %
- Action
 - Create action group
 - Email/SMS/Push/Voice

Configure signal logic

Chart period ⓘ
Over the last 6 hours

Over the last 6 hours
Over the last 12 hours
Over the last 24 hours
Over the last 3 days
Over the last week

CPU percent (Max)
sr-flex-pg12
12.88 %

Alert logic

Threshold ⓘ
Static Dynamic

Operator ⓘ
Greater than

Aggregation type * ⓘ
Maximum

Threshold value * ⓘ
50 %

Condition preview

Whenever the maximum cpu percent is greater than 50%

Evaluated based on

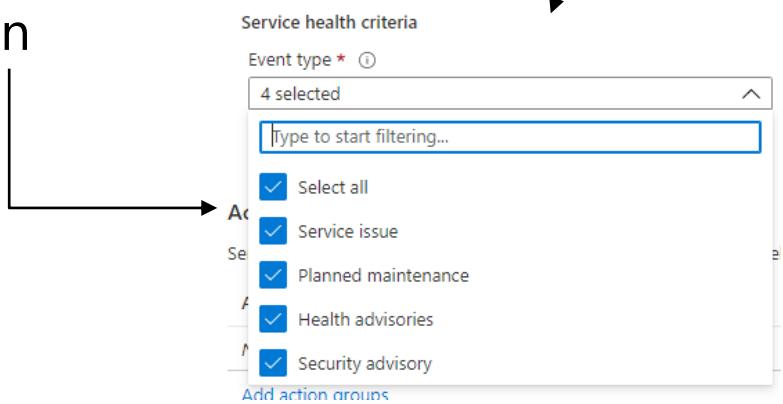
Aggregation granularity (Period) * ⓘ

Frequency of evaluation ⓘ

Done

Service health

- Information on upcoming maintenance notifications
- Add Health alerts to get notification
 - For specific subscription, service, and region



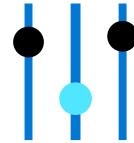
The screenshot shows the 'Service Health | Planned maintenance (2)' page. On the left, there's a sidebar with links: 'ACTIVE EVENTS' (Service issues, Planned maintenance (2), Health advisories (2), Security advisories), 'HISTORY' (Health history), 'RESOURCE HEALTH' (Resource health), and 'ALERTS' (Health alerts, highlighted with a red box). The main area displays two planned maintenance items in a table:

Issue Name	Tracking ID	Service(s)	Region(s)	Maintenance Start Time
Notification for Scheduled Maintenance to Azure D...	1M33-99G	Azure Database for PostgreSQL	West Europe	2021-05-27T04:34:00Z
SQL Server IaaS Extension Registration for Linux	4L97-LCZ	Virtual Machines	Global	2021-05-20T00:00:00Z

On the right, a detailed view of the first notification is shown under 'Summary'. It includes:

- Tracking ID: 1M33-99G
- Shareable link: <https://app.azure.com/h/1M33-99G/7fe596>
- Impacted service(s): Azure Database for PostgreSQL
- Impacted region(s): West Europe
- Impacted subscription(s): DS Data Magnet Incubations (7fec3109-5b78-4a24-b834-5d47d63e2596)
- Last update: 2021-05-22T04:34:19.6918409Z
- Description: This notification is for previously scheduled maintenance to your Azure Database for PostgreSQL Flexible Server instance **b1ms-vnet-inject-server-03** in West Europe. This maintenance event is now completed. Feel free to refer to

Flexible Server: Key Takeaway



Maximum control for your databases

- Network isolation with VNET integration
- More server parameters for fine-grained tuning
- Custom maintenance windows



Build resilient apps across availability zones

- Zone redundant HA
- Fast failover with zero data loss
- Co-locate app & database in same zone



Simplified developer experience

- Simple end-to-end deployment
- Fully compatible with community MySQL & Postgres
- Easy cost optimization with Stop/Start & Burstable servers

Session evaluations

Please submit your evaluations!

Delegates who submit at least one feedback response every day will be entered into a prize draw.

Delegate feedback prizes will be announced at the end of day prize draw (Thursday, Friday and Saturday) and the speaker awards will be announced on the Saturday prize draw.

Short URL: <https://sqlb.it/?12732>





Thank you