

Alibaba Cloud

ApsaraDB for RDS
Proprietary AliPG

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Document conventions

Style	Description	Example
 Danger	A danger notice indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	 Danger: Resetting will result in the loss of user configuration data.
 Warning	A warning notice indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	 Warning: Restarting will cause business interruption. About 10 minutes are required to restart an instance.
 Notice	A caution notice indicates warning information, supplementary instructions, and other content that the user must understand.	 Notice: If the weight is set to 0, the server no longer receives new requests.
 Note	A note indicates supplemental instructions, best practices, tips, and other content.	 Note: You can use Ctrl + A to select all files.
>	Closing angle brackets are used to indicate a multi-level menu cascade.	Click Settings> Network> Set network type .
Bold	Bold formatting is used for buttons, menus, page names, and other UI elements.	Click OK .
<code>Courier font</code>	Courier font is used for commands	Run the <code>cd /d C:/window</code> command to enter the Windows system folder.
<i>Italic</i>	Italic formatting is used for parameters and variables.	<code>bae log list --instanceid</code> <i>Instance_ID</i>
[] or [a b]	This format is used for an optional value, where only one item can be selected.	<code>ipconfig [-all -t]</code>
{ } or {a b}	This format is used for a required value, where only one item can be selected.	<code>switch {active stand}</code>

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1. AliPG benefits

This topic describes the background information and benefits of AliPG.

Background information

PostgreSQL is an advanced open source enterprise-grade database service. PostgreSQL won the DBMS of the Year in the DB-Engines ranking in 2017 and 2018. In 2019, PostgreSQL won the O'Reilly Open Source Convention award (OSCON). In 2020, PostgreSQL once again was awarded as the DBMS of the Year.

Alibaba Cloud offers two PostgreSQL-compatible database services that run AliPG: ApsaraDB RDS and ApsaraDB for MyBase. AliPG is a unified database engine that is developed by Alibaba Cloud. Since the commercial rollout of AliPG in 2015, AliPG has been running stably for years and processed a large volume of workloads within Alibaba Group and for Alibaba Cloud customers. AliPG supports the following major PostgreSQL versions: 9.4, 10, 11, 12, 13 and 14.

AliPG-running Alibaba Cloud database services

- ApsaraDB RDS
- ApsaraDB for MyBase

Major PostgreSQL versions supported

- PostgreSQL 14
- PostgreSQL 13
- PostgreSQL 12
- PostgreSQL 11
- PostgreSQL 10
- PostgreSQL 9.4

Benefits

AliPG is developed based on insights into the industry requirements and helps customers expand business boundaries.

AliPG has the following advantages over open source PostgreSQL:

- Faster speed
 - Image recognition and vector similarity-based searches are tens of thousands of times faster on AliPG than on open source PostgreSQL. For more information, see [Image recognition, similarity-based retrieval, and similarity-based audience spotting](#).
 - Marketing and user profiling in real time are thousands of times faster on AliPG than on open source PostgreSQL. For more information, see [Real-time precision marketing \(user selection\)](#).
 - The GIS-based Mod operator on AliPG processes mobile objects 50 times faster than the Mod operator on open source PostGIS. For more information, see [Overview](#).

- Higher stability

AliPG uses the Platform as a Service (PaaS) architecture. This architecture allows you to transform traditional software from license-based services to subscription-based services. You can manage a large amount of metadata, optimize connections, and efficiently isolate resources. In addition, each RDS instance supports tens of thousands of schemas.

- Higher security
 - AliPG is certified based on leading national and international security standards, which empowers enterprises to increase institutional security scores in the financing and listing phases.
 - AliPG provides the following security enhancements:
 - Encrypts sensitive data that contains passwords. The sensitive data includes dynamic views, shared memory, the dblink plug-in, historical commands, and audit logs.
 - Fixes the function-related bugs that are found in open source PostgreSQL.
 - Supports fully encrypted databases. For more information, see [Fully encrypted databases](#).
 - Supports the semi-synchronous mode. This mode allows you to specify one of the following protection levels for your RDS instance: maximum protection, maximum availability, and maximum performance. For more information, see [Set the protection level of an ApsaraDB RDS for PostgreSQL instance](#).
 - Supports the failover slot feature. This feature prevents primary/secondary switchovers from affecting the reliability of logical replication. For more information, see [Logical Replication Slot Failover](#).
- Higher flexibility and controllability. For more information, see [What is ApsaraDB for MyBase?](#)
 - AliPG grants you the permissions to manage the operating systems on hosts in dedicated clusters.
 - AliPG allows you to customize overcommit ratios in the development, test, and staging environments. For example, you can specify 128 cores for a host that provides only 64 cores. This way, you can exclusively occupy resources in the production environment to reduce the overall costs.

2. Release notes for AliPG

This topic describes the release notes for AliPG and provides links to the relevant references.

If users want to use the features that are provided by a later minor AliPG version, they must update the minor AliPG version of their ApsaraDB RDS instance to that later minor AliPG version. For more information, see [Update the minor engine version of an ApsaraDB RDS for PostgreSQL instance](#).

PostgreSQL 14

Minor AliPG version	Description
20220228	<p>PostgreSQL 14.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 1.0.2 of the sequential-uuids plug-in is supported. Version 1.1.9 of the EncDB plug-in is supported. Version 4.6 of Ganos is supported. For more information, see Release notes for Ganos. <ul style="list-style-type: none"> Raster data can be accessed by using self-managed MinIO servers. For more information, see Object storage paths. The ST_PointValues raster function is added. This function is used to return the pixel values of all bands. Standard accounts are granted the permissions to execute the LOAD statement to load the index_adviser and pg_hint_plan plug-ins. Privileged accounts are granted the permissions to configure the BYPASSRLS parameter in the CREATE ROLE statement. Bug fixes: <ul style="list-style-type: none"> The bug that causes missing parameter values in slow SQL logs is fixed.
20220130	<p>PostgreSQL 14.1 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> Version 2.0 of the index_adviser plug-in is supported. Version 1.3.1 of the hypopg plug-in is supported. Version 4.5 of Ganos is supported. For more information, see Release notes for Ganos. Version 1.1.7 of the EncDB plug-in is supported. Version 1.1 of the pg_cron plug-in is supported. Version 0.5 of the roaringbitmap plug-in is supported.


PostgreSQL 13

Minor AliPG version	Description
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Minor AlPG version	Description
20220228	<p>PostgreSQL 13.5 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 1.0.2 of the sequential-uuids plug-in is supported. Version 1.1.9 of the EncDB plug-in is supported. Version 4.6 of Ganos is supported. For more information, see Release notes for Ganos. <ul style="list-style-type: none"> Raster data can be accessed by using self-managed MinIO servers. For more information, see Object storage paths. The ST_PointValues raster function is added. This function is used to return the pixel values of all bands. Standard accounts are granted the permissions to execute the LOAD statement to load the index_adviser and pg_hint_plan plug-ins. Privileged accounts are granted the permissions to configure the BYPASSRLS parameter in the CREATE ROLE statement. Bug fixes: <ul style="list-style-type: none"> The bug that causes missing parameter values in slow SQL logs is fixed.
20220130	<p>PostgreSQL 13.5 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> Version 2.0 of the index_adviser plug-in is supported. Version 1.3.1 of the hypopg plug-in is supported. Version 4.5 of Ganos is supported. For more information, see Release notes for Ganos. Version 1.1 of the pg_cron plug-in is supported. Version 0.5 of the roaringbitmap plug-in is supported.

Minor AliPG version	Description
20211130	<p>PostgreSQL 13.5 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.4 of Ganos is supported. For more information, see Release notes for Ganos. Version 3.1.4 of PostGIS is supported. The pg_jieba plug-in is supported. This plug-in is used for Chinese tokenization. The pldebugger plug-in is supported. This plug-in is used to debug stored procedures. Version 2.5.0 of the TimescaleDB plug-in is supported. The <code>log_statement</code> parameter can be configured for a session, a user, or a database. Bug fixes: <ul style="list-style-type: none"> The bug due to which privileged accounts do not have permissions to execute the <code>SHOW SHARED_PRELOAD_LIBRARIES</code> statement is fixed. The bug due to which standard accounts have the permissions to call the <code>pg_stat_reset()</code> function is fixed.
20211031	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <p>The fully encrypted database feature can identify the versions of the EncDB SDK and EncJDBC. For more information, see Overview.</p> Performance improvements: <ul style="list-style-type: none"> The audit log feature is optimized. After the optimization, the audit log feature is enabled by default. Ganos is optimized. After the optimization, the plug-ins of Ganos can be identified based on their descriptions and can be updated. For more information, see How do I update the plug-ins of Ganos?. Bug fixes: <p>The bug due to which the plug-ins of Ganos report errors when functions are invoked is fixed. This bug is triggered if the plug-ins of Ganos are not updated at the earliest opportunity.</p>

Minor AliPG version	Description
20210930	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.1 of Ganos is supported. In version 4.1, some functions are added, and some functions are enhanced. For more information, see Release notes for Ganos. The rdsutils plug-in is provided. This plug-in is a proprietary plug-in of Alibaba Cloud and provides the failove_slots view. Version 1.3.8 of the RUM plug-in is supported. Version 2.4.0 of the pglogical plug-in is supported. Version 2.3.15 of the PLV8 plug-in is supported. Performance improvements: <ul style="list-style-type: none"> GCC is updated to version 9.2, and glibc is updated to version 2.30. After the updates, LTO is supported. If LTO is enabled, the overall performance can be improved by 5%. The audit log feature is optimized. If the log_statement parameter is set to all, database performance can be improved by approximately four times in scenarios in which more than 50 active connections are established. The default value of the <code>rds_failover_slot_mode</code> parameter is changed to <code>async</code>. This default value specifies that the Logical Replication Slot Failover feature is enabled. For more information, see Logical Replication Slot Failover. Bug fixes: <ul style="list-style-type: none"> The bug due to which the mysql_fdw plug-in causes memory leaks in some scenarios is fixed. The bug due to which the pg_cron plug-in causes memory leaks in some scenarios is fixed.

Minor AliPG version	Description
20210531	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.8 of Ganos is supported. <ul style="list-style-type: none"> The ST_AsDatasetFile function is added. This function is used to convert a specified part of a raster into a BYTEA-type file. The ST_RasterDrivers function is added. This function is used to query all drivers that are supported by raster data sources in Ganos. The bug due to which the ST_Clip function encounters reprojection failures when a spatial reference system is specified is fixed. The pglogical plug-in is supported. This plug-in provides logical streaming replication by using a publish/subscribe pattern. The pgAudit plug-in is supported. This plug-in is used to generate audit logs. Performance improvements: <ul style="list-style-type: none"> Permission management is optimized. When the <code>GRANT role1 TO role2</code> statement is executed, role2 does not carry over the CREATEDB or CREATEROLE permission from role1. <div style="background-color: #e6f2ff; padding: 10px; border: 1px solid #d9e1f2;"> <p> Notice The CREATEDB and CREATEROLE permissions are removed from the roles to which the GRANT statement is executed to grant these permissions.</p> </div> <ul style="list-style-type: none"> Privileged accounts are granted the permissions to call the <code>pg_ls_waldir()</code> function. The scanning method that is used by the monitoring and alerting feature is optimized to improve CPU performance. The major version upgrade feature is optimized. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. This feature can be used to update plug-ins such as postgis and pgRouting with no downtime. This feature can also be used to update account permissions from PostgreSQL 9.4 to a later version with no downtime. The maximum length per log record is increased from 1,024 bytes to 4,096 bytes when SQL statements cause insufficient memory or unexpected exits. Bug fixes: <p>The bug due to which the oss_fdw plug-in accesses memory out of bounds in some scenarios is fixed.</p>

Minor AlPG version	Description
20210331	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.7 of Ganos is supported. The pg_repack plug-in is supported. This plug-in is used to clear tablespaces and mitigate table bloats. Version 1.1 of the mysql_fdw plug-in is supported. The major version upgrade feature is provided to migrate the user permissions, the mysql_fdw and oss_fdw plug-ins, and the permissions on these plug-ins with no downtime. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. Bug fixes: <p>The bug due to which the oss_fdw plug-in cannot be used after a minor engine version update or a major engine version upgrade is fixed.</p>
20210228	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.6 of Ganos is supported. The decoderbufs plug-in is supported. This plug-in is used to generate data that is compatible with the Debezium platform based on Protocol Buffers. The pg_pathman plug-in is supported. This plug-in is used to improve the performance of partitioned tables. The PLV8 plug-in is supported. This plug-in is a trusted JavaScript extension. The oss_fdw plug-in is supported. This plug-in is used to read data from and write data to OSS buckets. The mysql_fdw plug-in is supported. This plug-in is used to read data from and write data to ApsaraDB RDS for MySQL instances or self-managed MySQL databases. Privileged accounts are granted the permissions to create event triggers and specify the maximum length per log record. Bug fixes: <ul style="list-style-type: none"> The bug due to which ApsaraDB RDS cannot display slow query logs in an expected manner is fixed. The bug due to which privileged accounts cannot use the zhparser plug-in to customize word libraries is fixed. The bug that triggers log-related online alerts if the archive_mode parameter is set to on is fixed.


Minor AliPG version	Description
20201230	<p>PostgreSQL 13.1 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Indexes can be deleted in parallel. More types of data from different data sources are supported. An enhanced partitioning feature is provided. This feature can directly join partitioned tables to reduce the overall amount of time that is required to run a query. In addition, this feature supports row-level BEFORE triggers and full logical replications. An advanced hash aggregation feature is released. This feature is used to aggregate and group various types of data. This way, a query that requires ApsaraDB RDS to aggregate a large amount of data does not need to run only in the memory. The Logical Replication Slot Failover feature is supported. For more information, see Logical Replication Slot Failover. Performance improvements: <p>The indexing and search features are optimized to adapt to large database systems.</p> <p>For more information about PostgreSQL 13, see the PostgreSQL documentation.</p>

PostgreSQL 12

Minor AliPG version	Description
20220228	<p>PostgreSQL 12.8 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 1.0.2 of the sequential-uuids plug-in is supported. Version 1.18.0 of the MADlib plug-in is supported. Version 1.1.9 of the EncDB plug-in is supported. Version 4.6 of Ganos is supported. For more information, see Release notes for Ganos. <ul style="list-style-type: none"> Raster data can be accessed by using self-managed MinIO servers. For more information, see Object storage paths. The ST_PointValues raster function is added. This function is used to return the pixel values of all bands. Standard accounts are granted the permissions to execute the LOAD statement to load the index_adviser and pg_hint_plan plug-ins. Privileged accounts are granted the permissions to configure the BYPASSRLS parameter in the CREATE ROLE statement. Bug fixes: <p>The bug that causes missing parameter values in slow SQL logs is fixed.</p>

Minor AlPG version	Description
20220130	<p>PostgreSQL 12.8 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> • Version 2.0 of the index_adviser plug-in is supported. • Version 1.3.1 of the hypopg plug-in is supported. • Version 4.5 of Ganos is supported. For more information, see Release notes for Ganos.
20211130	<p>PostgreSQL 12.8 is supported.</p> <ul style="list-style-type: none"> • New features: <ul style="list-style-type: none"> ◦ Version 4.4 of Ganos is supported. For more information, see Release notes for Ganos. ◦ Version 3.1.4 of PostGIS is supported. ◦ The pg_jieba plug-in is supported. This plug-in is used for Chinese tokenization. ◦ The pldebugger plug-in is supported. This plug-in is used to debug stored procedures. ◦ The log_statement parameter can be configured for a session, a user, or a database. • Bug fixes: <ul style="list-style-type: none"> ◦ The bug due to which the pg_cron plug-in causes memory leaks when users view the task records in the cron.job_log data table is fixed. ◦ The bug due to which privileged accounts do not have permissions to execute the <code>SHOW SHARED_PRELOAD_LIBRARIES</code> statement is fixed. ◦ The bug due to which standard accounts have the permissions to call the <code>pg_stat_reset()</code> function is fixed.
20211031	<p>PostgreSQL 12.8 is supported.</p> <ul style="list-style-type: none"> • New features: <p>The fully encrypted database feature can identify the versions of the EncDB SDK and EncJDBC. For more information, see Overview.</p> • Performance improvements: <ul style="list-style-type: none"> ◦ The audit log feature is optimized. After the optimization, the audit log feature is enabled by default. ◦ Ganos is optimized. After the optimization, the plug-ins of Ganos can be identified based on their descriptions and can be updated. For more information, see How do I update the plug-ins of Ganos?. • Bug fixes: <p>The bug due to which the plug-ins of Ganos report errors when functions are invoked is fixed. This bug is triggered if the plug-ins of Ganos are not updated at the earliest opportunity.</p>

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20210930	<p>PostgreSQL 12.8 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.1 of Ganos is supported. In version 4.1, some functions are added, and some functions are enhanced. For more information, see Release notes for Ganos. The rdsutils plug-in is provided. This plug-in is a proprietary plug-in of Alibaba Cloud and provides the <code>failove_slots</code> view. Version 1.3.8 of the RUM plug-in is supported. Version 1.5.12 of the pg_pathman plug-in is supported. Version 2.4.0 of the pglogical plug-in is supported. Version 2.3.15 of the PLV8 plug-in is supported. The RDKit plug-in is updated to version 2020_09_05. Performance improvements: <ul style="list-style-type: none"> GCC is updated to version 9.2, and glibc is updated to version 2.30. After the updates, LTO is supported. If LTO is enabled, the overall performance can be improved by 5%. The audit log feature is optimized. If the <code>log_statement</code> parameter is set to all, database performance can be improved by approximately four times in scenarios in which more than 50 active connections are established. The default value of the <code>rds_failover_slot_mode</code> parameter is changed to <code>async</code>. This default value specifies that the Logical Replication Slot Failover feature is enabled. For more information, see Logical Replication Slot Failover. Bug fixes: <ul style="list-style-type: none"> The bug due to which TimescaleDB loses the metadata of system tables after the <code>VACUUM FULL pg_catalog.pg_attribute</code> statement is executed is fixed. The bug due to which the mysql_fdw plug-in causes memory leaks in some scenarios is fixed. The bug due to which the pg_cron plug-in causes memory leaks in some scenarios is fixed.

Minor AliPG version	Description
20210531	<p>PostgreSQL 12.4 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.8 of Ganos is supported. <ul style="list-style-type: none"> The ST_AsDatasetFile function is added. This function is used to convert a specified part of a raster into a BYTEA-type file. The ST_RasterDrivers function is added. This function is used to query all drivers that are supported by raster data sources in Ganos. The bug due to which the ST_Clip function encounters reprojection failures when a spatial reference system is specified is fixed. The pglogical plug-in is supported. This plug-in provides logical streaming replication by using a publish/subscribe pattern. The pgAudit plug-in is supported. This plug-in is used to generate audit logs. Performance improvements: <ul style="list-style-type: none"> Permission management is optimized. When the <code>GRANT role1 TO role2</code> statement is executed, role2 does not carry over the CREATEDB or CREATEROLE permission from role1. <div style="background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p> Notice The CREATEDB and CREATEROLE permissions are removed from the roles to which the GRANT statement is executed to grant these permissions.</p> </div> <ul style="list-style-type: none"> Privileged accounts are granted the permissions to use the <code>pg_ls_waldir()</code> function. The scanning method that is used by the monitoring and alerting feature is optimized to improve CPU performance. The major version upgrade feature is optimized. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. This feature can be used to update plug-ins such as postgis and pgRouting with no downtime. This feature can also be used to update account permissions from PostgreSQL 9.4 to a later version with no downtime. The maximum length per log record is increased from 1,024 bytes to 4,096 bytes when SQL statements cause insufficient memory or unexpected exits. Bug fixes: <p>The bug due to which the oss_fdw plug-in accesses memory out of bounds in some scenarios is fixed.</p>

Minor AliPG version	Description
20210331	<p>PostgreSQL 12.4 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.7 of Ganos is supported. The pg_repack plug-in is supported. This plug-in is used to clear tablespaces and mitigate table bloats. Version 1.1 of the mysql_fdw plug-in is supported. The major version upgrade feature is provided to migrate the user permissions, the mysql_fdw and oss_fdw plug-ins, and the permissions on these plug-ins with no downtime. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. Bug fixes: <ul style="list-style-type: none"> The bug due to which the oss_fdw plug-in cannot be used after a minor engine version update or a major engine version upgrade is fixed.
20210228	<p>PostgreSQL 12.4 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.6 of Ganos is supported. The decoderbufs plug-in is supported. This plug-in is used to generate data that is compatible with the Debezium platform based on Protocol Buffers. The pg_pathman plug-in is supported. This plug-in is used to improve the performance of partitioned tables. The PLV8 plug-in is supported. This plug-in is a trusted JavaScript extension. The oss_fdw plug-in is supported. This plug-in is used to read data from and write data to OSS buckets. Bug fixes: <ul style="list-style-type: none"> The bug due to which privileged accounts cannot use the zhparser plug-in to customize word libraries is fixed. The bug that triggers log-related online alerts if the archive_mode parameter is set to on is fixed.

Minor AliPG version	Description
20201230	<p>PostgreSQL 12.4 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.3 of Ganos is supported. The pg_hint_plan plug-in is supported. This plug-in is used to add hints, which are used to change the query plans that are provided. The zhparser plug-in is supported. The RUM plug-in is supported. This plug-in is used to run full-text searches at high speeds. The Bloom plug-in is supported. The Logical Replication Slot Failover feature is supported. For more information, see Logical Replication Slot Failover. Bug fixes: <p>The bug that is caused by the conflict between the tds_fdw plug-in and the plan cache is fixed.</p>
20201130	<p>PostgreSQL 12.4 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Privileged accounts are granted the permissions to create accounts that have the REPLICATION permission on data streams. Privileged accounts are granted the permissions to create event triggers. The rds_auditlog_max_query_length parameter is added. This parameter specifies the maximum length per audit log record. An updated pg_cron plug-in is provided. After the update, this plug-in can be used to create and run cross-instance tasks. In addition, this plug-in provides a data table named cron.job_log from which users can view task records. The pg_freespacemap plug-in is supported. Spatio-temporal memory topology indexes are supported by Ganos. Version 3.2 of Ganos is supported. Bug fixes: <ul style="list-style-type: none"> The bug due to which DTS reports check errors when more than one child transaction is started or committed during data migration is fixed. The CVE-2020-14349 vulnerability is fixed. This vulnerability prevents ApsaraDB RDS from cleaning search paths in an expected manner during logical replications. The CVE-2020-14350 vulnerability is fixed. This vulnerability allows the <code>CREATE EXTENSION</code> statement to contain uncontrolled search path elements. The CVE-2020-25695 vulnerability is fixed. Attackers can exploit this vulnerability to create permanent objects and call all SQL functions by using the credentials of a superuser account.

Minor AliPG version	Description
20200830	<p>PostgreSQL 12.2 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.0 of Ganos is supported. The sql_firewall plug-in is supported. This plug-in is used to prevent malicious injection of SQL statements. The pg_bigm plug-in is supported. This plug-in is used to support fuzzy match. Bug fixes: <ul style="list-style-type: none"> The bug due to which the backend cannot identify the <code>rds_</code> prefix in parameters is fixed. The bug due to which the pg_cron plug-in cannot be installed or used in an expected manner is fixed. The bug due to which the RDKit plug-in cannot be loaded when dependencies are not provided is fixed.
20200421	<p>PostgreSQL 12.2 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 2.7 of Ganos is supported. Version 2.14 of the hll plug-in is supported. Version 2.9.0 of the PL/Proxy plug-in is supported. Version 1.0 of the tsm_system_rows plug-in is supported. Version 1.0 of the tsm_system_time plug-in is supported. Version 1.0 of the smlar plug-in is supported. Version 1.0 of the tds_fdw plug-in is supported. Bug fixes: <p>The bug due to which RDS instances restart when logical subscriptions time out is fixed.</p>
20200221	<ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> A specified number of connections can be reserved for the rds_superuser role. If users assume this role, they can log on to an RDS instance to troubleshoot issues even if the number of established connections to the RDS instance reaches the upper limit. The wal2json plug-in is supported. Version 2.6 of Ganos is supported. Bug fixes: <p>Some permission-related bugs are fixed.</p>


Minor AlPG version	Description
20191230	<p>New features:</p> <ul style="list-style-type: none"> The pg_roaringbitmap plug-in, RDKit plug-in, mysql_fdw plug-in, and Ganos are supported. Privileged accounts are granted the permissions to publish all tables at a time and create subscriptions.

PostgreSQL 11

Minor AlPG version	Description
20220228	<p>PostgreSQL 11.13 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 1.0.2 of the sequential-uuids plug-in is supported. Version 1.18.0 of the MADlib plug-in is supported. Version 1.1.9 of the EncDB plug-in is supported. Version 4.6 of Ganos is supported. For more information, see Release notes for Ganos. <ul style="list-style-type: none"> Raster data can be accessed by using self-managed MinIO servers. For more information, see Object storage paths. The ST_PointValues raster function is added. This function is used to return the pixel values of all bands. Standard accounts are granted the permissions to execute the LOAD statement to load the index_adviser and pg_hint_plan plug-ins. Privileged accounts are granted the permissions to configure the BYPASSRLS parameter in the CREATE ROLE statement. Bug fixes: <ul style="list-style-type: none"> The bug that causes missing parameter values in slow SQL logs is fixed.
20220130	<p>PostgreSQL 11.13 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> Version 2.0 of the index_adviser plug-in is supported. Version 1.3.1 of the hypopg plug-in is supported. Version 4.5 of Ganos is supported. For more information, see Release notes for Ganos.

Minor AlPG version	Description
20211130	<p>PostgreSQL 11.13 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.4 of Ganos is supported. For more information, see Release notes for Ganos. Version 3.1.4 of PostGIS is supported. The pg_jieba plug-in is supported. This plug-in is used for Chinese tokenization. The pldebugger plug-in is supported. This plug-in is used to debug stored procedures. The <code>log_statement</code> parameter can be configured for a session, a user, or a database. Bug fixes: <ul style="list-style-type: none"> The bug due to which the pg_cron plug-in causes memory leaks when users view the task records in the <code>cron.job_log</code> data table is fixed. The bug due to which privileged accounts do not have permissions to execute the <code>SHOW SHARED_PRELOAD_LIBRARIES</code> statement is fixed. The bug due to which standard accounts have the permissions to call the <code>pg_stat_reset()</code> function is fixed.
20211031	<p>PostgreSQL 11.13 is supported.</p> <ul style="list-style-type: none"> New features: <p>The fully encrypted database feature can identify the versions of the EncDB SDK and EncJDBC. For more information, see Overview.</p> Performance improvements: <ul style="list-style-type: none"> The audit log feature is optimized. After the optimization, the audit log feature is enabled by default. Ganos is optimized. After the optimization, the plug-ins of Ganos can be identified based on their descriptions and can be updated. For more information, see How do I update the plug-ins of Ganos?. Bug fixes: <p>The bug due to which the plug-ins of Ganos report errors when functions are invoked is fixed. This bug is triggered if the plug-ins of Ganos are not updated at the earliest opportunity.</p>

Minor AlPG version	Description
20210930	<p>PostgreSQL 11.13 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.1 of Ganos is supported. In version 4.1, some functions are added, and some functions are enhanced. For more information, see Release notes for Ganos. The rdsutils plug-in is provided. This plug-in is a proprietary plug-in of Alibaba Cloud and provides the <code>failove_slots</code> view. Version 1.3.8 of the RUM plug-in is supported. Version 1.5.12 of the pg_pathman plug-in is supported. Version 2.4.0 of the pglogical plug-in is supported. Version 2.3.15 of the PLV8 plug-in is supported. Performance improvements: <ul style="list-style-type: none"> GCC is updated to version 9.2, and glibc is updated to version 2.30. After the updates, LTO is supported. If LTO is enabled, the overall performance can be improved by 5%. The audit log feature is optimized. If the <code>log_statement</code> parameter is set to all, database performance can be improved by approximately four times in scenarios in which more than 50 active connections are established. The default value of the <code>rds_failover_slot_mode</code> parameter is changed to <code>async</code>. This default value specifies that the Logical Replication Slot Failover feature is enabled. For more information, see Logical Replication Slot Failover. The logging mechanism is optimized. ApsaraDB RDS no longer provides <code>incomplete startup packet</code> log records that are triggered by empty packets. Bug fixes: <ul style="list-style-type: none"> The bug due to which the mysql_fdw plug-in causes memory leaks in some scenarios is fixed. The bug due to which the pg_cron plug-in causes memory leaks in some scenarios is fixed.

Minor AliPG version	Description
20210531	<p>PostgreSQL 11.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.8 of Ganos is supported. <ul style="list-style-type: none"> The ST_AsDatasetFile function is added. This function is used to convert a specified part of a raster into a BYTEA-type file. The ST_RasterDrivers function is added. This function is used to query all drivers that are supported by raster data sources in Ganos. The bug due to which the ST_Clip function encounters reprojection failures when a spatial reference system is specified is fixed. The pglogical plug-in is supported. This plug-in provides logical streaming replication by using a publish/subscribe pattern. The pgAudit plug-in is supported. This plug-in is used to generate audit logs. The fully encrypted database feature is supported. This feature is used to encrypt data on the user side before the data is transmitted to RDS instances. This feature helps defend against security threats inside and outside the cloud to protect user data at all times. Performance improvements: <ul style="list-style-type: none"> Permission management is optimized. When the <code>GRANT role1 TO role2</code> statement is executed, role2 does not carry over the CREATEDB or CREATEROLE permission from role1. <div style="background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p> Notice The CREATEDB and CREATEROLE permissions are removed from the roles to which the GRANT statement is executed to grant these permissions.</p> </div> <ul style="list-style-type: none"> Privileged accounts are granted the permissions to call the <code>pg_ls_waldir()</code> function. The scanning method that is used by the monitoring and alerting feature is optimized to improve CPU performance. The major version upgrade feature is optimized. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. This feature can be used to update plug-ins such as postgis and pgRouting with no downtime. This feature can also be used to update account permissions from PostgreSQL 9.4 to a later version with no downtime. The maximum length per log record is increased from 1,024 bytes to 4,096 bytes when SQL statements cause insufficient memory or unexpected exits. <ul style="list-style-type: none"> Bug fixes: <ul style="list-style-type: none"> The bug that causes the PASE plug-in to index data out of bounds is fixed. The bug due to which the oss_fdw plug-in accesses memory out of bounds in some scenarios is fixed.

Minor AlPG version	Description
20210331	<p>PostgreSQL 11.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.7 of Ganos is supported. The pg_repack plug-in is supported. This plug-in is used to clear tablespaces and mitigate table bloats. Version 1.1 of the mysql_fdw plug-in is supported. The major version upgrade feature is provided to migrate the user permissions, the mysql_fdw and oss_fdw plug-ins, and the permissions on these plug-ins with no downtime. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. Bug fixes: <p>The bug due to which the oss_fdw plug-in cannot be used after a minor engine version update or a major engine version upgrade is fixed.</p>
20210228	<p>PostgreSQL 11.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.6 of Ganos is supported. The mysql_fdw plug-in is supported. This plug-in is used to read data from and write data to ApsaraDB RDS for MySQL instances or self-managed MySQL databases. Bug fixes: <p>The bug that triggers log-related online alerts if the archive_mode parameter is set to on is fixed.</p>
20201230	<p>PostgreSQL 11.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.3 of Ganos is supported. The pg_hint_plan plug-in is supported. This plug-in is used to add hints, which are used to change the query plans that are provided. The Bloom plug-in is supported. Bug fixes: <ul style="list-style-type: none"> The bug that causes data loss in synchronous mode is fixed by optimizing the Logical Replication Slot Failover feature. This feature can help prevent data loss even in extreme circumstances. For more information, see Logical Replication Slot Failover. The bug that is caused by the conflict between the tds_fdw plug-in and the plan cache is fixed.

Minor AlPG version	Description
20201130	<p>PostgreSQL 11.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Privileged accounts are granted the permissions to create accounts that have the <code>REPLICATION</code> permission on data streams. Privileged accounts are granted the permissions to create event triggers. The <code>rds_auditlog_max_query_length</code> parameter is added. This parameter specifies the maximum length per audit log record. An updated <code>pg_cron</code> plug-in is provided. After the update, this plug-in can be used to create and run cross-instance tasks. In addition, this plug-in provides a table named <code>cron.job_log</code> from which users can view task records. The <code>pg_freespacemap</code> plug-in is supported. Spatio-temporal memory topology indexes are supported by <code>Ganos</code>. Version 3.2 of <code>Ganos</code> is supported. Bug fixes: <ul style="list-style-type: none"> The bug due to which DTS reports check errors when more than one child transaction is started or committed during data migration is fixed. The CVE-2020-14349 vulnerability is fixed. This vulnerability prevents ApsaraDB RDS from cleaning search paths in an expected manner during logical replications. The CVE-2020-14350 vulnerability is fixed. This vulnerability allows <code>CREATE EXTENSION</code> statements to contain uncontrolled search path elements. The CVE-2020-25695 vulnerability is fixed. Attackers can exploit this vulnerability to create permanent objects and call all SQL functions by using the credentials of a superuser account.
20200830	<ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.0 of <code>Ganos</code> is supported. The <code>sql_firewall</code> plug-in is supported. This plug-in is used to prevent malicious injection of SQL statements. The <code>pg_bigm</code> plug-in is supported. This plug-in is used to support fuzzy match. The <code>ZomboDB</code> plug-in is supported. This plug-in is used to support text search and analysis. Bug fixes: <ul style="list-style-type: none"> The bug due to which the backend cannot identify the <code>rds_</code> prefix in parameters is fixed. The bug due to which a secondary RDS instance unexpectedly exits when the failover slot has the same name as the streaming replication slot is fixed. The bug due to which the <code>pg_cron</code> plug-in cannot be installed or used in an expected manner is fixed. The bug in a global variable of the <code>PASE</code> plug-in is fixed.

Minor AlPG version	Description
20200610	<p>New features:</p> <ul style="list-style-type: none"> The pageinspect plug-in is supported by the rds_superuser role. The rds_superuser role can grant the REPLICATION permission to other users.
20200511	<ul style="list-style-type: none"> New features: <p>Version 2.8 of Ganos is supported.</p> Bug fixes: <p>The bug due to which the PASE plug-in executes the INSERT statement at a low speed based on Hierarchical Navigable Small World (HNSW) indexes is fixed.</p>
20200421	<p>New features:</p> <ul style="list-style-type: none"> The Logical Replication Slot Failover feature is supported. For more information, see Logical Replication Slot Failover. Version 2.9.0 of the PL/Proxy plug-in is supported. Version 1.0 of the tsm_system_rows plug-in is supported. Version 1.0 of the tsm_system_time plug-in is supported. Version 1.0 of the smlar plug-in is supported.
20200402	<ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 2.14 of the hll plug-in is supported. This plug-in is used to support the HLL data type, respond to queries in milliseconds, and analyze approximate data at low costs and high speeds. For example, users can query page views (PVs) and unique visitors (UVs) in real time and check whether the approximate data that they analyze contains specified characteristic tags. Version 1.1 of the oss_fdw plug-in is supported. This plug-in is used to store infrequently requested historical data to OSS buckets to reduce storage costs. Version 2.0.1 of the tds_fdw plug-in is supported. This plug-in allows users to initiate requests on an RDS instance to query data from a Sybase or SQL Server database without the need to perform extract, transform and load (ETL) operations. This plug-in is also used to migrate data between an RDS instance and a Sybase or SQL Server database. Plug-in updates: <ul style="list-style-type: none"> The plug-ins of Ganos are updated to version 2.7. The wal2json plug-in is updated to version 2.2. Performance improvements: <p>The <code>shutdown -m fast</code> command is optimized.</p>


Minor AliPG version	Description
20191218	<p>New features:</p> <ul style="list-style-type: none"> • The PASE plug-in is supported. This plug-in provides indexes that are used to recognize images. • Privileged accounts are granted the permissions to publish all tables at a time and create subscriptions.

PostgreSQL 10

Minor AliPG version	Description
20220228	<p>PostgreSQL 10.19 is supported.</p> <ul style="list-style-type: none"> • New features: <ul style="list-style-type: none"> ◦ Version 1.0.2 of the sequential-uuids plug-in is supported. ◦ Version 1.1.9 of the EncDB plug-in is supported. ◦ Version 4.6 of Ganos is supported. For more information, see Release notes for Ganos. <ul style="list-style-type: none"> ■ Raster data can be accessed by using self-managed MinIO servers. For more information, see Object storage paths. ■ The ST_PointValues raster function is added. This function is used to return the pixel values of all bands. ◦ Standard accounts are granted the permissions to execute the LOAD statement to load the index_adviser and pg_hint_plan plug-ins. ◦ Privileged accounts are granted the permissions to configure the BYPASSRLS parameter in the CREATE ROLE statement. • Bug fixes: <ul style="list-style-type: none"> The bug that causes missing parameter values in slow SQL logs is fixed.
20220130	<p>PostgreSQL 10.19 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> • Version 2.0 of the index_adviser plug-in is supported. • Version 1.3.1 of the hypopg plug-in is supported. • Version 4.5 of Ganos is supported. For more information, see Release notes for Ganos.

Minor AlPG version	Description
20211130	<p>PostgreSQL 10.19 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.4 of Ganos is supported. For more information, see Release notes for Ganos. PostGIS is updated to version 3.1.4, which supports ApsaraDB RDS for PostgreSQL. For more information, visit the PostGIS page The pg_jieba plug-in is supported. This plug-in is used for Chinese tokenization. The pldebugger plug-in is supported. This plug-in is used to debug stored procedures. The log_statement parameter can be configured for a session, a user, or a database. Bug fixes: <ul style="list-style-type: none"> The bug due to which the pg_cron plug-in causes memory leaks when users view the task records in the cron.job_log data table is fixed. The bug due to which standard accounts have the permissions to call the <code>pg_stat_reset()</code> function is fixed.
20211031	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <p>The fully encrypted database feature can identify the versions of the EncDB SDK and EncJDBC. For more information, see Overview.</p> Performance improvements: <ul style="list-style-type: none"> The audit log feature is optimized. After the optimization, the audit log feature is enabled by default. Ganos is optimized. After the optimization, the plug-ins of Ganos can be identified based on their descriptions and can be updated. For more information, see How do I update the plug-ins of Ganos?. Bug fixes: <p>The bug due to which the plug-ins of Ganos report errors when functions are invoked is fixed. This bug is triggered if the plug-ins of Ganos are not updated at the earliest opportunity.</p>

Minor AliPG version	Description
20210930	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 4.1 of Ganos is supported. In version 4.1, some functions are added, and some functions are enhanced. For more information, see Release notes for Ganos. The rdsutils plug-in is provided. This plug-in is a proprietary plug-in of Alibaba Cloud and provides the failove_slots view. Version 1.3.8 of the RUM plug-in is supported. Version 2.4.0 of the pglogical plug-in is supported. Version 2.3.15 of the PLV8 plug-in is supported. Performance improvements: <ul style="list-style-type: none"> GCC is updated to version 9.2, and glibc is updated to version 2.30. After the updates, LTO is supported. If LTO is enabled, the overall performance can be improved by 5%. The audit log feature is optimized. If the log_statement parameter is set to all, database performance can be improved by approximately four times in scenarios in which more than 50 active connections are established. The default value of the <code>rds_failover_slot_mode</code> parameter is changed to <code>async</code>. This default value specifies that the Logical Replication Slot Failover feature is enabled. For more information, see Logical Replication Slot Failover. The logging mechanism is optimized. ApsaraDB RDS no longer provides <code>incomplete startup packet</code> log records that are triggered by empty packets. Bug fixes: <ul style="list-style-type: none"> The bug due to which the mysql_fdw plug-in causes memory leaks in some scenarios is fixed. The bug due to which the pg_cron plug-in causes memory leaks in some scenarios is fixed.

Minor AliPG version	Description
20210531	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.8 of Ganos is supported. <ul style="list-style-type: none"> The ST_AsDatasetFile function is added. This function is used to convert a specified part of a raster into a BYTEA-type file. The ST_RasterDrivers function is added. This function is used to query all drivers that are supported by raster data sources in Ganos. The bug due to which the ST_Clip function encounters reprojection failures when a spatial reference system is specified is fixed. The pglogical plug-in is supported. This plug-in provides logical streaming replication by using a publish/subscribe pattern. The pgAudit plug-in is supported. This plug-in is used to generate audit logs. Performance improvements: <ul style="list-style-type: none"> Permission management is optimized. When the <code>GRANT role1 TO role2</code> statement is executed, role2 does not carry over the CREATEDB or CREATEROLE permission from role1. <div>  Notice The CREATEDB and CREATEROLE permissions are removed from the roles to which the GRANT statement is executed to grant these permissions. </div> Privileged accounts are granted the permissions to call the <code>pg_ls_waldir()</code> function. The scanning method that is used by the monitoring and alerting feature is optimized to improve CPU performance. The major version upgrade feature is optimized. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. This feature can be used to update plug-ins such as postgis and pgRouting with no downtime. This feature can also be used to update account permissions from PostgreSQL 9.4 to a later version with no downtime. The maximum length per log record is increased from 1,024 bytes to 4,096 bytes when SQL statements cause insufficient memory or unexpected exits. <ul style="list-style-type: none"> Bug fixes: <p>The bug due to which the oss_fdw plug-in accesses memory out of bounds in some scenarios is fixed.</p>

Minor AlPG version	Description
20210331	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.7 of Ganos is supported. The pg_repack plug-in is supported. This plug-in is used to clear tablespaces and mitigate table bloats. PostgreSQL 10 is supported by the mysql_fdw plug-in. The mysql_fdw plug-in is updated to version 1.1. The major version upgrade feature is provided to migrate the user permissions, the mysql_fdw and oss_fdw plug-ins, and the permissions on these plug-ins with no downtime. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. Bug fixes: <p>The bug due to which the oss_fdw plug-in cannot be used after a minor engine version update or a major engine version upgrade is fixed.</p>
20210228	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <p>The plug-ins of Ganos are updated to version 3.6.</p> Bug fixes: <p>The bug that triggers log-related online alerts if the <code>archive_mode</code> parameter is set to on is fixed.</p>
20201230	<p>PostgreSQL 10.14 is supported.</p> <p>New features:</p> <ul style="list-style-type: none"> The plug-ins of Ganos are updated to version 3.3. The Bloom plug-in is supported. The Logical Replication Slot Failover feature is supported. For more information, see Logical Replication Slot Failover.

Minor AlPG version	Description
20201130	<p>PostgreSQL 10.14 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Privileged accounts are granted the permissions to create accounts that have the <code>REPLICATION</code> permission on data streams. Privileged accounts are granted the permissions to create event triggers. The <code>rds_auditlog_max_query_length</code> parameter is added. This parameter specifies the maximum length per audit log record. An updated <code>pg_cron</code> plug-in is provided. After the update, this plug-in can be used to create and run cross-instance tasks. In addition, this plug-in provides a table named <code>cron.job_log</code> from which users can view task records. The <code>pg_freespacemap</code> plug-in is supported. Spatio-temporal memory topology indexes are supported by <code>Ganos</code>. Version 3.2 of <code>Ganos</code> is supported. Bug fixes: <ul style="list-style-type: none"> The bug due to which DTS reports check errors when more than one child transaction is started or committed during data migration is fixed. The CVE-2020-14349 vulnerability is fixed. This vulnerability prevents ApsaraDB RDS from cleaning search paths in an expected manner during logical replications. The CVE-2020-14350 vulnerability is fixed. This vulnerability allows <code>CREATE EXTENSION</code> statements to contain uncontrolled search path elements. The CVE-2020-25695 vulnerability is fixed. Attackers can exploit this vulnerability to create permanent objects and call all SQL functions by using the credentials of a superuser account.
20200830	<p>PostgreSQL 10.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 3.0 of <code>Ganos</code> is supported. The <code>sql_firewall</code> plug-in is supported. This plug-in is used to prevent malicious injection of SQL statements. The <code>pg_bigm</code> plug-in is supported. This plug-in is used to support fuzzy match. Bug fixes: <p>The bug due to which the <code>pg_cron</code> plug-in cannot be installed or used in an expected manner is fixed.</p>

Minor AlPG version	Description
20200212	<p>PostgreSQL 10.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> A specified number of connections can be reserved for the <code>rds_superuser</code> role. If users assume this role, they can log on to an RDS instance to troubleshoot issues even if the number of established connections to the RDS instance reaches the upper limit. The plug-ins of Ganos are updated to version 2.6. Bug fixes: <ul style="list-style-type: none"> The bug that triggers long waits during streaming replication is fixed.
20190703	<p>PostgreSQL 10.9 is supported.</p> <ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> AlPG is upgraded to adapt to PostgreSQL 10.9. The synchronous replication mode can be demoted to the asynchronous replication mode when the ongoing replication times out. Bug fixes: <ul style="list-style-type: none"> The bug due to which the <code>pg_hint_plan</code> plug-in cannot be installed is fixed.

PostgreSQL 9.4

Minor AlPG version	Description
20210531	<p>Performance improvements:</p> <p>The major version upgrade feature is optimized. For more information, see Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance. This feature can be used to update plug-ins such as <code>postgis</code> and <code>pgRouting</code> with no downtime. This feature can also be used to update account permissions from PostgreSQL 9.4 to a later version with no downtime.</p>
20201130	<p>Bug fixes:</p> <ul style="list-style-type: none"> The CVE-2020-25694 vulnerability is fixed. This vulnerability may cause ApsaraDB RDS to lose security parameters when RDS instances are switched over to other connections. If security parameters are lost, these RDS instances are vulnerable to attacks. The CVE-2020-25695 vulnerability is fixed. Attackers can exploit this vulnerability to create permanent objects and call all SQL functions by using the credentials of a superuser account. The CVE-2020-25696 vulnerability is fixed. This vulnerability allows the <code>gset</code> command to overwrite the variables that are processed based on specified conditions.

Minor AliPG version	Description
20200623	<ul style="list-style-type: none"> New features: <ul style="list-style-type: none"> Version 2.2 of the wal2json plug-in is supported. Version 1.0 of the xml2 plug-in is supported. Bug fixes: <p>The bug due to which memory resources are exhausted when the wal2json plug-in runs is fixed.</p>
20200210	<p>New features:</p> <p>A specified number of connections can be reserved for the rds_superuser role. If users assume this role, they can log on to an RDS instance to troubleshoot issues even if the number of established connections to the RDS instance reaches the upper limit.</p>
20190601	<p>AliPG is upgraded to adapt to PostgreSQL 9.4.19.</p>

3.Functional modules of AliPG

This topic describes the functional modules that are provided by AliPG.

Overview

Category	Functional module	Description
Account permission	<code>rds_superuser</code>	The <code>rds_superuser</code> role is a type of intermediate account between standard accounts and superuser accounts. The accounts that are assigned the <code>rds_superuser</code> role are called privileged accounts. To ensure security on the cloud, AliPG does not provide superuser accounts. However, AliPG provides the <code>rds_superuser</code> role. The <code>rds_superuser</code> role does not have the sensitive security permissions that superuser accounts have. The <code>rds_superuser</code> role has the permissions to create and delete plug-ins, create and delete standard and privileged accounts, access and manage all of the tables that are created by standard accounts, and close connections.
Spatio-temporal database engine	<code>Ganos</code>	Ganos is a spatio-temporal database engine that is developed by Alibaba Cloud. Ganos provides a series of data types, functions, and stored procedures to efficiently store, index, query, analyze, and compute spatio-temporal data.
External data reads and writes	<code>oss_fdw</code>	The <code>oss_fdw</code> plug-in supports data migration and hot and cold data separation. You can load data from Alibaba Cloud Object Storage Service (OSS) buckets to RDS instances. You can also write data from RDS instances to OSS buckets.
Concurrency control (CCL)	<code>pg_concurrency_control</code>	The <code>pg_concurrency_control</code> plug-in controls the concurrency of transactions, SQL queries, stored procedures, and data manipulation language (DML) operations. This plug-in allows you to customize large queries, which expedites the execution of highly concurrent workloads.
Failover slot	<code>Failover Slot</code>	In open source PostgreSQL, logical slots cannot be automatically switched over to the new primary RDS instance in the event of a primary/secondary switchover. As a result, logical subscriptions are disconnected. In AliPG, the failover slot feature allows ApsaraDB RDS to synchronize all logical slots from the primary RDS instance to the secondary RDS instance. This prevents the disconnection of logical subscriptions.
Bitmap function extension	<code>varbitx</code>	The <code>varbit</code> plug-in of open source PostgreSQL supports only simple BIT-type operation functions. The <code>varbit</code> plug-in is an extension of the <code>varbit</code> plug-in. The <code>varbit</code> plug-in is provided in AliPG to support more BIT-type operations in more scenarios. These scenarios include real-time user profile recommendation, access control advertising, and ticketing.

Category	Functional module	Description
Vector search	PASE	PASE is a high-performance vector search index plug-in that is developed for AlPG. The PASE plug-in uses IVFFlat and Hierarchical Navigable Small World (HNSW), which are well-developed, stable, and efficient approximate nearest neighbor (ANN) search algorithms. These algorithms are used to query vectors from PostgreSQL databases at high speeds. The PASE plug-in does not support the extraction or output of feature vectors. You must retrieve the feature vectors of the entities that you want to query. The PASE plug-in only implements a similarity search among a large number of vectors that are identified based on retrieved feature vectors.
Log query	log_fdw	The log_fdw plug-in queries logs from external tables.
Availability	Protection levels	You can set the protection level of an ApsaraDB RDS instance based on your business requirements. This setting allows you to improve the availability and performance of your RDS instance.
Security	Security hardening	A security hardening module is built-in to improve custom views, enhance the security of the functions that you call, prevent security traps, and avoid the security vulnerabilities that are detected in open source PostgreSQL.

References

Supported plug-ins

4.AliPG kernel feature


4.1. Logical Replication Slot Failover

This topic describes the Logical Replication Slot Failover feature of ApsaraDB RDS for PostgreSQL. If the primary RDS instance of your database system fails, this feature can synchronize all logical replication slots to the secondary RDS instance.

Prerequisites


The primary RDS instance runs the following database engine versions.

Major engine version	Minor engine version
PostgreSQL 10	20201230 and later versions
PostgreSQL 11	20200421 and later versions
PostgreSQL 12	20201230 and later versions
PostgreSQL 13	20201230 and later versions
PostgreSQL 14	20211130 and later versions

 **Note** For more information about how to view and update the minor engine version, see [Update the minor engine version of an ApsaraDB RDS for PostgreSQL instance](#).

Context

The logical replication slots that are created in the primary RDS instance are not synchronized to the secondary RDS instance in compliance with the streaming replication protocol. In the event of a primary/secondary switchover, the logical replication slots are lost, and consequently the logical subscriptions are interrupted. The Logical Replication Slot Failover feature can synchronize all logical replication slots from the primary RDS instance to the secondary RDS instance.

-  **Note**
- The Logical Replication Slot Failover feature is enabled for ApsaraDB RDS for PostgreSQL instances by default. Failovers are supported for logical replication slots. However, failovers are not supported for physical replication slots.
 - For more information, see [Logical Decoding Concepts](#).

View the status of the Logical Replication Slot Failover feature

You can execute the following SQL statement to check whether the Logical Replication Slot Failover feature is enabled:

```
SHOW rds_failover_slot_mode;
```

The following result is returned:

```
rds_failover_slot_mode
-----
async
(One row of result)
```

One of the following results can be returned:

- **async**: The Logical Replication Slot Failover feature is enabled.
- **off**: The Logical Replication Slot Failover feature is supported but is not enabled. You must submit a to request Alibaba Cloud technical support to set the `rds_failover_slot_mode` parameter to `async`.
- **ERROR: unrecognized configuration parameter "rds_failover_slot_mode"**: The Logical Replication Slot Failover feature is not supported. Make sure that the major engine version and minor engine version that you use are included in the preceding table. If you are not using the major engine version and minor engine version that are supported by the Logical Replication Slot Failover feature, upgrade your RDS instance. For more information, see [Upgrade the major engine version of an ApsaraDB RDS for PostgreSQL instance](#) and [Update the minor engine version of an ApsaraDB RDS for PostgreSQL instance](#).