

# PSQL v13

## *What's New in PSQL v13 R2*

**An Overview of New Features and Changed Behavior**



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## **What's New in PSQL**

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# *About This Document*

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This document contains information about the features and enhancements in this release of PSQL. It does not provide comprehensive usage instructions for the software. Its purpose is to summarize what is new and different from the previous release.

The PSQL v13 family of products includes three editions of the database engine:

- PSQL Server
- PSQL Vx Server
- PSQL Workgroup

Throughout the PSQL documentation, all content covers all three editions unless differences are explicitly called out. For example, you will occasionally encounter topics that apply only to PSQL Workgroup. Unless stated otherwise, anything that applies to PSQL Server also applies to PSQL Vx Server.

In addition to the three database engines, PSQL has two client editions that provide application access to remote engines:

- PSQL Client
- PSQL Client Reporting Engine

Throughout the PSQL documentation, all content concerning access methods applies to both client and engine editions unless differences are explicitly called out

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# What's New in PSQL v13 R2

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## *An Overview of New and Changed Features*

The General Availability release of PSQL v13 R2, version 13.30, includes new features and changes covered in the following topics:

- [New File Format](#)
- [Larger Data Buffers](#)
- [BTRVEX](#)
- [AES-192 Encryption](#)
- ["UPSERT"](#)
- [Reporting Engine Remote Clients](#)
- [SQL BIGIDENTITY Support for 8-byte AUTOINCREMENT](#)
- [ADO.NET Standard Driver](#)

This document may be updated after the release. Download the latest version at the [Actian website](#).

### ***New File Format***

The PSQL v13 R2 engine supports a new file format that increases the file size limit to 64 TB and record counts beyond 4 billion. The new file format version is called 13.0.

To fully access a large 13.0 format file – larger in size and record count than 9.5 format files allow – applications must be prepared to handle 8-byte record addresses by use of a new pair of Btrieve entry points: BTRVEX and BTRVEXID.

Applications that use existing BTRV or BTRCALL entry points can continue to use 4-byte record addresses and fully use either 9.5 and 13.0 format files up to the 9.5 format limits. Unmodified BTRV applications can also access 13.0 format files that are larger than the 9.5 format limits so long as the operation does not require explicit record addresses.

The default file format setting for the PSQL v13 R2 engine remains 9.5.

13.0 format files do not support 2GB segmentation.

### **Client-Server Compatibility**

In environments that mix different versions of PSQL, the following things hold true:

- A PSQL v13 SP2 or earlier client can access a 13.0 format file on a PSQL v13 R2 engine if the file is at or below the 9.5 format 256 GB size limit.
- A PSQL v13 SP2 or earlier cache engine or client reporting engine cannot open a 13.0 format file of any size.
- A PSQL v13 R2 cache engine or client reporting engine cannot open files on a PSQL v13 SP2 or earlier engine.

## **Larger Data Buffers**

The new BTRVEX entry points can now support data buffers up to 252 KB. The older BTRV and BTRVCALL entry points are still limited to data buffers less than 64 KB. The larger buffer size is especially useful for Extended Get and Insert operations. Please note that these operations involve record addresses, so you must account for data buffer layout changes when you convert them to BTRVEX.

The descriptors for Get Direct Chunk are still limited to 64 KB, but you can request multiple 64KB chunks in one large data buffer.

## **BTRVEX**

The potentially large size of 13.0 format files and the use of larger data buffers requires run-time values larger than what older Btrieve interfaces have provided. PSQL 13.30 introduces two new entry points: BTRVEX and BTRVEXID. These are very similar to BTRCALL and BTRCALLID, except that some of the function arguments use wider types, and some of the data buffers are laid out differently. The declarations are in `btrvexid.h` and the implementations are in the same files as BTRCALL. See the latest SDK and *Btrieve API Guide* for the details about using the new entry points.

For a Btrieve operation that uses a BTRVEX entry point, some values passed in data buffers are wider, such as 8-byte record addresses and record counts. Please note that the 8-byte behavior is due to the BTRVEX entry points and does not depend on the format version of the file being accessed. The following operations require changed data buffer layouts:

- Create (14), Create Index (31)
- Stat (15)
- Get Position (22)
- Get Direct (23)
- Get Next Extended (36), Get Previous Extended (37)
- Step Next Extended (38), Step Previous Extended (39)
- Insert Extended (40)
- Find Percentage (45)
- Stat Extended (65) subfunctions 3 and 8
- Unlock (27)

The choice of entry point does not affect record data.

As noted above, the data buffer size argument for BTRVEX is a pointer to a 32-bit integer, where BTRCALL uses a 16-bit integer. Thus, data buffers can be larger than 64 KB.

If you are migrating to the new file format, keep in mind that the position block and client ID values can be used with both BTRCALL and BTRVEX, so it is not necessary to convert all code to BTRVEX at once.

The key number argument for BTRVEX is a 32-bit integer, where BTRCALL uses an 8-bit signed integer. To make it easier to convert existing code to BTRVEX, the BTRVEX entry point remaps key values 128 through 255 to -128 through -1. This accommodates constants that were specified as unsigned bytes (e.g., 0xFE) instead of as signed bytes (e.g., -2).



## **Client-Server Compatibility**

A PSQL v13 R2 client application using BTRVEX can access a PSQL v13 SP2 or earlier engine, except that operations involving explicit record addresses or widened data structures will fail with a status code 137 API mismatch error.

## **AES-192 Encryption**

The 13.0 file format uses AES-192 for long owner name encryption.

## **"UPSERT"**

The INSERT statement has been extended with an ON DUPLICATE KEY UPDATE clause, which implements the behavior popularly known as an “upsert.” If an inserted row matches a unique key already in the table, the ON DUPLICATE KEY clause is invoked for that row. The UPDATE clause has access to both old and new values.

For example, the following query inserts rows with new keys and merges values for rows with existing keys:

```
INSERT INTO inventory (id, amount) (SELECT id, amount FROM new_stock)
ON DUPLICATE KEY UPDATE inventory.amount = inventory.amount + VALUES(amount)
```

If an insert is changed to an update, any insert triggers are rolled back before doing the update.

## **Reporting Engine Remote Clients**

The PSQL v13 R2 Reporting Engine now supports remote SQL clients and manages their licenses on the storage engine.

## **SQL BIGIDENTITY Support for 8-byte AUTOINCREMENT**

The Btrieve type 8-byte AUTOINCREMENT, which was introduced in PSQL v13 SP2, is now also supported as the SQL column type BIGIDENTITY.

In addition, PSQL v13 R2 provides the new global variable @@BIGIDENTITY of type BIGINT.

## **ADO.NET Standard Driver**

A new ADO.NET SDK contains an ADO.NET provider meant to work with .NET Standard 2.0 systems, such as .NET Core.

The current release does not offer an EF Core provider at this time.



# What Was New in PSQL v13 SP2

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## *An Overview of New and Changed Features*

The General Release of PSQL v13 SP2, version 13.20, included new features and changes covered in the following topics:

- [New Platform Support](#)
- [Workgroup Engine Cache and Purge Options](#)
- [PSQL Client Reporting Engine](#)
- [Btrieve](#)
- [Btrieve 2](#)
- [Delphi 10.2 Support in PSQL Direct Access Components \(PDAC\)](#)
- [TRY\\_CAST and TRY\\_CONVERT Functions](#)
- [Remote PowerShell to Manage PSQL Engine](#)

This document may be updated after the release. Download the latest version at the [Actian website](#).

### ***New Platform Support***

PSQL v13 SP2 supports the following new platforms and editions:

- PSQL Client 32-bit for Raspbian ARM32
- PSQL Client 32-bit for Windows IoT Core x86 and ARM32
- Zen Core for Android embedded database (contact Actian for more information)

### ***Workgroup Engine Cache and Purge Options***

The butil options `-cache` and `-purge` now apply to the local client cache of a Workgroup Engine. Previously, the command applied to the cache on a remote engine if a file on that system was the one specified in the command. Client cache must be enabled on the Workgroup Engine.

### ***PSQL Client Reporting Engine***

In the previous release, the Client Reporting Engine responded to SQL connections from remote systems running PSQL clients. In this release, the engine accepts only local connections.

In this release, PSQL automatically handles differences between the default encoding of the Client Reporting Engine and that of the PSQL Server configured as the storage server. Previously, if a PSQL Server database used the default setting for its code page, meaning the operating system code page, then the operating system where Client Reporting Engine was installed had to use that same code page for query results to display record data properly.

As a consequence, in addition to Windows installations of PSQL Server, you can now configure PSQL Server on Linux as a storage server for PSQL Client Reporting Engine on Windows systems. The Client Reporting Engine itself remains supported only on Windows.

### ***Btrieve***

In Btrieve operations, the length of the AUTOINC data type can now be 8 bytes as well as 2 or 4 bytes. The new length is available in files using 9.5 format and later. Btrieve files using the new 8-byte AUTOINC segment cannot be opened by engines from earlier releases.

### ***Btrieve 2***

In Btrieve 2 for PSQL v13 SP2, the CursorPosition type has been widened from integer to long long. Applications using the Btrieve 2 API in previous releases need to be recompiled for use with the new release.

In addition, the methods RecordRetrieveChunk, RecordAppendChunk, and RecordUpdateChunk are no longer limited to chunk lengths of Btrieve::MAXIMUM\_RECORD\_LENGTH. The removal of this restriction also applies to the related C and SWIG-generated functions. The change is backward compatible and does not require recompilation of previously implemented code.

Btrieve 2 adds the ability for Btrieve queries to use the LIKE operator in bulk operations to pattern-match data. The new feature operates on character-based data.

### ***Delphi 10.2 Support in PSQL Direct Access Components (PDAC)***

PSQL PDAC now supports RAD Studio 10.2 and Delphi 10.2.

### ***TRY\_CAST and TRY\_CONVERT Functions***

The new functions TRY\_CAST and TRY\_CONVERT have been added in this release. TRY\_CAST and TRY\_CONVERT are identical to CAST and CONVERT except for handling of data values that cannot be converted. For CAST and CONVERT the entire query fails, but for TRY\_CAST and TRY\_CONVERT the columns in the query result that fail are returned as NULL.

### ***Remote PowerShell to Manage PSQL Engine***

You can now use a remote PowerShell session to verify that the PSQL engine is running and to stop and start it. See [Verifying That the Database Engine is Running from a Remote PowerShell Session](#) in *PSQL User's Guide*.

# What Was New in PSQL v13 SP1

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## *An Overview of New and Changed Features*

The General Release of PSQL v13 SP1, version 13.10, includes new features and changes covered in the following topics:

- [Support for New Platforms](#)
- [Domain Security with Active Directory](#)
- [Distributed Tuning Guide \(DTI\) Support for Domain Authentication](#)
- [LIKE Operator in Btrieve Extended Operations](#)
- [Table Schema Export and Import in PCC](#)
- [ISR and ICU in SQL COLLATE Clauses](#)
- [JDBC 4](#)
- [ADO.NET SDK](#)
- [Managing the Page Cache for Files](#)
- [Deprecated Features](#)

This document may be updated after the release. Download the latest version at the [Actian website](#).

### **Support for New Platforms**

PSQL v13 SP1 runs on the following new platforms:

- Windows 10 IoT Core for small devices on x86 and ARM32 – Pervasive PSQL Server only
- Windows Nano Server on x86-64 – Pervasive PSQL Server, Client, Client Reporting Engine
- Linux on ARM64 – Pervasive PSQL Server, Vx Server, Client (32-bit Client Access not supported)
- Raspbian on ARM32 – PSQL Server
- Linux on x86-64
- OS X 10.10 and 10.11

In this release, support for these platforms has the following limitations:

- Installation on Windows IoT Core and Nano Server uses a .zip archive and a script.
- Installation on Raspbian is a .tar file and a script. Installation steps are the same as for Pervasive PSQL on Linux.
- On Windows Nano Server and IoT Core, Pervasive PSQL supports only CLI utilities, and local access methods are Btrieve, ODBC by direct link (without driver manager), and DTI.
- On Raspbian, Pervasive PSQL does not support PCC or DDF Builder.

PSQL v13 SP1 installation has been tested successfully with Docker for Windows.

We recommend updating all operating systems to their latest service packs.

## **Domain Security with Active Directory**

PSQL v13 SP1 users can use Microsoft Active Directory (AD) authentication to validate access to a secure Pervasive PSQL database. The new AD-based feature in Pervasive PSQL is called Windows domain authentication, while the original Pervasive PSQL database security feature has been renamed local database authentication.

To use domain authentication, a network administrator creates AD rights groups with names matching those of groups created in Pervasive PSQL for the secure database. The network administrator then assigns group members who need access to the Pervasive PSQL database. Permissions are configured within Pervasive PSQL at the group level. When Pervasive PSQL uses domain authentication, it queries AD to approve logins based on network user name and password and matches the user's AD group to a Pervasive PSQL group to determine access rights.

When you enable domain authentication for a particular database, any Pervasive PSQL users previously created for that database are disabled and the Users folder is hidden because user-level permission settings are no longer active. The use of domain authentication is specific to each database, but AD rights groups can be used by more than one database.

Classic Btrieve-level security is not affected by the new domain security capability.

## **Distributed Tuning Guide (DTI) Support for Domain Authentication**

Use of the new Active Directory security feature is supported in the Pervasive PSQL Distributed Tuning Interface (DTI) by the new function `PvSecureDatabase2()` and an updated function `PvIsDatabaseSecured()`.

Note that you must be connecting to a Windows server. Calls to Linux, and OS X servers return a general failure (status code 7004), since Active Directory is Windows only.

## **LIKE Operator in Btrieve Extended Operations**

PSQL v13 SP1 adds the ability for Btrieve queries to use the LIKE operator in extended operations to pattern-match data. The new feature operates on character-based data. The following Btrieve operations now support LIKE:

- Get Next Extended (36)
- Get Previous Extended (37)
- Step Next Extended (38)
- Step Previous Extended (39)

Use of the LIKE operator in Pervasive PSQL SQL scripts is unchanged.

## **Table Schema Export and Import in PCC**

PSQL v13 SP1 extends schema management capabilities by adding table-level exporting of all metadata to a SQL script. Importing this script into a new database allows you to do several useful things:

- Recreate one or more tables.
- Identify and troubleshoot metadata issues in the original tables.

## ***ISR and ICU in SQL COLLATE Clauses***

PSQL v13 SP1 supports the use of International Sort Rules (ISR) in SQL COLLATE clauses, including International Components for Unicode (ICU) collations. Previously, only Alternate Collating Sequence (ACS) collations were supported in SQL COLLATE clauses.

## ***JDBC 4***

PSQL v13 SP1 adds support for JDBC 4. Applications that use JDBC 2 drivers remain compatible. The names of .jar files remain unchanged.

## ***ADO.NET SDK***

PSQL v13 SP1 updates the Pervasive PSQL ADO.NET SDK with support for Visual Studio 2017 in ADO.NET Entity Framework Provider 4.3.



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**Note** PSQL v13 SP1 ADO.NET Entity Framework Provider 4.2.0.6 supports Microsoft Entity Framework 6.0, 6.0.1, and 6.0.2. PSQL v13 SP1 ADO.NET Entity Framework Provider 4.3.0.6 supports Microsoft Entity Framework versions 6.0, 6.0.1, 6.0.2, 6.1, 6.1.1, and 6.1.2

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## ***Managing the Page Cache for Files***

To improve performance, the butil utility allows you to manage page caching for a file using cache and purge commands. When butil -cache and -purge commands are executed from a client cache or reporting engine, their actions apply only to the file in the local cache. Previously, these operations were passed through to the engine that owned the file.

In order for a file to remain in the client cache, one of two things must be true:

- No other machines must try to write to the file while it is closed.
- At least one application must keep the file open on the client machine.

When the client cache engine is installed as an application, it shuts down and empties the cache shortly after the client closes all files. This is not an issue for the client cache engine installed as a service or for the reporting engine.

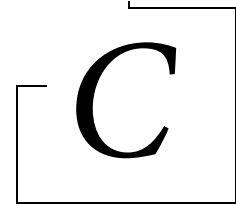
## ***Deprecated Features***

PSQL v13 SP1 does not support upgrading of systems with previous versions of Backup Agent, AuditMaster, or DataExchange. These products must be uninstalled before upgrading to PSQL v13. We recommend that you back up your data and save configuration settings from these three products before removing them.





# What Was New in PSQL v13



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## *An Overview of Features in PSQL v13*

The General Release of PSQL v13, version 13.00, included new features and changes covered in the following topics:

- [Client Reporting Engine](#)
  - [Reporting Engine Configuration](#)
  - [New and Revised Performance Counters](#)
- [New Btrieve API](#)
- [Beta Release for New Platforms](#)
- [New Schema Export and Import in PCC](#)
- [Cache Management](#)
- [SDK Access Methods](#)
  - [ADO.NET](#)
- [SQL Syntax Enhancements](#)
- [Deprecated Features](#)

These release notes may be updated after the product release. You can download the latest version from the [Actian website](#).

## Client Reporting Engine

Big report queries can impose a large load on Pervasive PSQL Server, competing for resources with the normal stream of smaller transactions. To reduce the load on Pervasive PSQL Server for report execution, you can set up Pervasive PSQL Client Reporting Engine as a proxy server. This specialized 64-bit engine combines features of Pervasive PSQL Relational Engine and Pervasive PSQL Client Cache Engine to enable offloading of SQL reporting jobs to lessen their impact on server activity. When big report queries run on the reporting engine instead of on the server, server performance for normal production operations can improve.

### Reporting Engine Configuration

A Client Reporting Engine is configured with the name of a Pervasive PSQL Server as its “storage engine,” where the master copy of all data continues to reside. Once configured, the reporting engine presents to SQL clients all of the same databases as the server, and all SQL queries can then be submitted to the reporting engine. Use of reporting engine requires you to make changes in your design so that queries and other supporting requests are sent to this client instead of to the server.

For more information, see [Installing the Client Reporting Engine for Windows](#) and [Setting Up a Client Reporting Engine](#) in *Getting Started With Pervasive PSQL*.

### New and Revised Performance Counters

Pervasive PSQL Client Reporting Engine has Windows performance counters to track cache usage. Pervasive PSQL Server and Vx Server now have Windows performance counters that distinguish between direct application use and use by remote cache engines, such as the reporting engine. In addition, the counter for cache-hit-ratio has been changed to reflect recent activity instead of cumulative.



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**Note** Although most database operations could successfully execute on this specialized engine, it is designed for read-mostly reporting jobs. The Reporting Engine may be used by Btrieve applications as an always-on Client Cache Engine.

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### New Btrieve API

PSQL v13 provides a new and simplified C/C++ API for Btrieve. The Windows DLLs needed for this API are automatically installed with Pervasive PSQL.

The SDK for this new Btrieve API also includes SWIG files for use with scripting languages such as Python, perl, and PHP to enable the API to serve as native objects in those environments.

To learn more, see the Pervasive PSQL Data Access Methods documentation at [docs.actian.com](http://docs.actian.com).

### Beta Release for New Platforms

PSQL v13 runs on the following new platforms:

- Windows IoT Core on x86 and 32-bit ARM
- Windows Nano Server
- Raspbian (32-bit ARM)

In this release, support for these platforms is beta and has the following limitations:

- Available only for Server and Client editions.
- Installation on Windows uses a .zip archive and a script.
- Installation on Raspbian is a .tar file and a script. Installation steps are the same as for Pervasive PSQL on Linux.
- Licensing uses license keys instead of product keys.
- On Windows IoT Core, Pervasive PSQL supports only CLI utilities, and local access methods are Btrieve, ODBC by direct link (without driver manager), and DTI.
- On Windows Nano Server, Pervasive PSQL supports only CLI utilities, and local access methods are Btrieve, ODBC by direct link (without driver manager), and DTI.
- On Raspbian, Pervasive PSQL does not support PCC or DDF Builder.
- The new Pervasive PSQL Client Reporting Engine is supported on Windows Nano Server.

Pervasive PSQL installation has also been tested successfully with Docker for Windows.

### ***New Schema Export and Import in PCC***

PSQL v13 extends schema management capabilities by adding database-level exporting of all metadata to a SQL script. Importing this script into a new database allows you to do several useful things:

- Recreate an entire database.
- Migrate from V1 to V2 format.
- Identify and troubleshoot metadata issues in the original database.

### ***Cache Management***

PSQL v13 provides the butil utility with two new command options:

- -cache, which preloads pages for a file into cache, returning when either the file is fully cached or the cache is full.
- -purge, which flushes all unneeded cached pages for a file. It returns immediately if the file has open handles.

These two commands are complementary. Their actions apply only to the server engine cache rather than to the cache of any client or reporting engine.

### ***SDK Access Methods***

The following access method has been updated in this release.

#### **ADO.NET**

PSQL v13 has updated the Pervasive PSQL ADO.NET SDK with ADO.NET Entity Framework Provider 4.3, adding support for Microsoft Entity Framework 6.1 and skip() syntax.



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**Note** ADO.NET Entity Framework Provider 4.0 is no longer supported in this release.

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## **DTI**

To address a conflict with the Microsoft Windows header file security.h, the file by this name in the PSQL v13 DTI SDK has been renamed dtisecurity.h. Its behavior is unchanged.

## **SQL Syntax Enhancements**

PSQL v13 extends its support for SQL with the following new features:

- As an alternative to TOP, LIMIT... OFFSET... syntax is now supported to extract a set of rows from a query result.
- DROP IF EXISTS syntax is now supported for all database objects, such as views and procedures.
- ORDER BY is now supported in expression subqueries in addition to table subqueries.

## **Deprecated Features**

PSQL v13 no longer supports the following items:

- Windows Vista and Windows Server 2008. Support continues for Windows Server 2008 R2
- ADO.NET Entity Framework Provider 4.0
- PSQL v13 does not currently support upgrading of systems with previous versions of Backup Agent, AuditMaster, or DataExchange. These products must be uninstalled before upgrading to PSQL v13. We recommend that you back up your data and save configuration settings from these three products before removing them.