FUJITSU

Fujitsu Enterprise Postgres 17

Release Notes

November 2024

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Linux

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Preface

Purpose of this document

This document provides release information for Fujitsu Enterprise Postgres.

Structure of this document

This document is structured as follows:

Chapter 1 New Features and Improvements

Explains the new features and improvements in this version.

Chapter 2 Compatibility Information

Provides information regarding compatibility.

Chapter 3 Program Updates

Explains updates incorporated in this version.

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Issue date and version

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Contents

Chapter 1 New Features and Improvements

This chapter explains Fujitsu Enterprise Postgres new features and improvements added in this version.

Table 1.1 New features and improvements

Version and level	Classification	Feature	Provided in AE	Provided in SE
17	OSS	PostgreSQL Rebase	Y	Y
		OSS Updates Provided	Y	Y
	Performance	Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)	Y	Y
	Operation	Vector-enabled database	Y	Y
	Monitoring	Operational Database Monitoring with Amazon CloudWatch	Y	Y
	Security	Privileged User Management with CyberArk Privileged Access Manager	Y	N

1.1 Features Added in 17

This section explains new features and improvements in Fujitsu Enterprise Postgres 17.

1.1.1 OSS

This section explains the new feature related to OSS:

- PostgreSQL Rebase
- OSS Updates Provided

1.1.1.1 PostgreSQL Rebase

The PostgreSQL version that Fujitsu Enterprise Postgres is based on is 17.0.

1.1.1.2 OSS Updates Provided

The OSS provided by Fujitsu Enterprise Postgres has been updated.

See

Refer to "OSS Supported by Fujitsu Enterprise Postgres" in the General Description for details.

1.1.2 Performance

This section describes new features related to Performance.

- Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)

1.1.2.1 Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)

The following functions have been added.

- Add vacuum freezing statistics to help schedule aggressive freeze for tuples (VACUUM FREEZE) to avoid work stoppages when autovacuum does not perform freezing of transaction IDs in time.
- Provide scripts to perform efficient aggressive freeze for tuples (VACUUM FREEZE).

See

Refer to "Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)" in the Operation Guide.

1.1.3 Operation

This section describes new features related to Operation.

- Vector-enabled database

1.1.3.1 Vector-enabled database

It captures the peripheral OSS pgvector, allowing vector storage and similarity searching to work.

See

Refer to "OSS Supported by Fujitsu Enterprise Postgres" in the General Description for details.

1.1.4 Monitoring

This section describes new features related to Monitoring.

- Operational Database Monitoring with Amazon CloudWatch

1.1.4.1 Operational Database Monitoring with Amazon CloudWatch

You can use Amazon CloudWatch, a monitoring tool provided by Amazon Web Services, to collect metrics and logs about your databases, and use the collected information to monitor database operations.

See

Refer to "Operational Database Monitoring with Amazon CloudWatch" in the Operation Guide.

1.1.5 Security

This section describes new features related to Security.

- Privileged User Management with CyberArk Privileged Access Manager

1.1.5.1 Privileged User Management with CyberArk Privileged Access Manager

It works with CyberArk Privileged Access Manager (PAM) to protect and monitor privileged users.

See

Refer to "List of Features" in the General Description for details.

Chapter 2 Compatibility Information

This chapter explains incompatible items and actions required when migrating from an earlier version to Fujitsu Enterprise Postgres 17. Check compatibility before migrating and take the appropriate action.

2.1 Installation/Setup Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Removing Old llvm Support for JIT compilation	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Removing Operating System Support for Client Feature	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Removing Operating System Support for Server Feature	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Removing Operating System Support for Server Assistant Feature	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Python Version Changes Required When Using PL/Python	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Modifying the Installation of pgBackRest	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
Removing Operating System Support for Client Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Removing Operating System Support for Server Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
How max_wal_senders is calculated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
How max_worker_processes is calculated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
Removing Operating System Support for Client Feature	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N
Removing Operating System Support for Client Feature	N	N	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Removing Operating System Support for Server Feature	N	N	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N
Changing kernel parameter settings when an instance is created with WebAdmin	Y	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N
Removing Operating System Support for Client Feature	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Removing Operating System Support for Server Feature	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the way OSS is set up	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Modifying Pgpool-II Installation Handling	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing Core and Log File Paths when Instance is Created with WebAdmin	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Renaming WebAdmin Services	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the features targeted for installation in a 64-bit environment	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the access permissions of the Windows client installation folder	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the WebAdmin installation method	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.1.1 Removing Old llvm Support for JIT compilation

Incompatibility

In Fujitsu Enterprise Postgres 17, the following llvm which JIT compilation can use have been removed.

[RHEL8]

- llvm version 9
- llvm version 10

- llvm version 11
- llvm version 12

[SLES 15]

- llvm version 7

Action method

None.

2.1.2 Removing Operating System Support for Client Feature

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, the following operating systems have been removed.

- RHEL8.5 or earlier
- SLES 15 SP3 or earlier

Action method

None.

2.1.3 Removing Operating System Support for Server Feature

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, the following operating systems have been removed.

- RHEL8.5 or earlier
- SLES 15 SP3 or earlier

Action method

None.

2.1.4 Removing Operating System Support for Server Assistant Feature

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, the following operating systems have been removed.

- RHEL8.5 or earlier
- SLES 15 SP3 or earlier

Action method

None.

2.1.5 Python Version Changes Required When Using PL/Python

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, when operating on RHEL8, changes the required Python version to 3.9.x when using PL/Python based on the Python 3 language.

Action method

None.

2.1.6 Modifying the Installation of pgBackRest

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, pgBackRest is not automatically installed during server and client installation.

Action method

If you want to use pgBackRest, install pgBackRest separately from the server or client installation.

If you want to use pgBackRest on the same server as the database server, refer to "Setting Up and Removing OSS" in the Installation and Setup Guide for Server.

If you want to use pgBackRest on a different server than the database server, refer to "Setting Up and Removing OSS" in the Installation and Setup Guide for Client.

2.1.7 Removing Operating System Support for Client Feature

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, the following operating systems have been removed.

- RHEL7
- SLES 12

Action method

None.

2.1.8 Removing Operating System Support for Server Feature

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, the following operating systems have been removed.

- RHEL7
- SLES 12

Action method

None.

2.1.9 How max_wal_senders is calculated

Incompatibility

In Fujitsu Enterprise Postgres 15 SP1 or later, Fujitsu Enterprise Postgres uses the following values from the value set for the max_wal_senders parameter:

Policy-based password management in a streaming replication environment : Number of direct downstream hot standby servers

Action method

If necessary add a value for the max_wal_senders parameter.

2.1.10 How max_worker_processes is calculated

Incompatibility

In Fujitsu Enterprise Postgres 15 SP1 or later, Fujitsu Enterprise Postgres uses the following values from the value set for the max_worker_processes parameter:

Default value to use : 1

Policy-based password management in a streaming replication environment with a hot standby server : 1

Action method

If necessary add a value for the max_worker_processes parameter.

2.1.11 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 SP1 or later, the following operating systems have been removed.

- Windows Server(R) 2012
- Windows Server(R) 2012 R2

Action method

None.

2.1.12 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 13 or later, the following operating systems have been removed.

- SLES 12 SP4 or earlier

Action method

None.

2.1.13 Removing Operating System Support for Server Feature

Incompatibility

In FUJITSU Enterprise Postgres 13 or later, the following operating systems have been removed.

- SLES 12 SP4 or earlier

Action method

None.

2.1.14 Changing kernel parameter settings when an instance is created with WebAdmin

Incompatibility

For FUJITSU Enterprise Postgres 13 and later, changes kernel parameter settings for WebAdmin instance creation.

FUJITSU Enterprise Postgres 12 or earlier

Kernel Parameters	Value	Calculated Value
SHMMAX	If *currentValue* < *calculatedValue*, configure the calculated value	`((1800 + 270 * max_locks_per_transaction) * max_connections + (1800 + 270 * max_locks_per_transaction) * autovacuum_max_workers + (770 + 270 * max_locks_per_transaction) * max_prepared_transactions +`

Kernel Parameters	Value	Calculated Value
		(shared_buffer) + (16 * 1024 * 1024) + (770 * 1024)) * 1.05
SHMALL	Specify *currentValue* + *calculatedValue*	(SHMMAX / PAGESIZE) + 1 PAGESIZE = 4K
SEMMNI	Specify *currentValue* + *calculatedValue*	ceil((max_connections + autovacuum_max_workers + 4) / 16)
SEMMNS	Specify *currentValue* + *calculatedValue*	ceil((max_connections + autovacuum_max_workers + 4) / 16) * 17

FUJITSU Enterprise Postgres 13 or later

Kernel Parameters	Value	Calculated Value
SHMMAX	Do not change value	-
SHMALL	Do not change value	-
SEMMNI	Specify *currentValue* + *calculatedValue*	- For instances of FUJITSU Enterprise Postgres 9.5 to 11: ceil((max_connections + autovacuum_max_workers + max_worker_processes + 5) / 16) - For Fujitsu Enterprise Postgres 12 and later instances: ceil((max_connections + autovacuum_max_workers + max_wal_senders + max_worker_processes + 5) / 16)
SEMMNS	Specify *currentValue* + *calculatedValue*	- For instances of FUJITSU Enterprise Postgres 9.5 to 11: ceil((max_connections + autovacuum_max_workers + max_worker_processes + 5) / 16) * 17 - For Fujitsu Enterprise Postgres 12 and later instances: ceil((max_connections + autovacuum_max_workers + max_wal_senders + max_worker_processes + 5) / 16) * 17

Action method

None.

2.1.15 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, the following operating systems have been removed.

- Windows(R) 7

- Windows Server(R) 2008
- RHEL6

Also, the 32 bit Linux client can no longer be installed because RHEL 6 has been removed from the operating system.

Action method

None.

2.1.16 Removing Operating System Support for Server Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, the following operating systems have been removed.

- RHEL6

Action method

None.

2.1.17 Changing the Way OSS is Set Up

Incompatibility

FUJITSU Enterprise Postgres 12 or later do not place OSS extension modules in the executable directory. The OSS extension modules must be placed in the executable directory when you set up OSS.

Refer to "Setting Up and Removing OSS" in the Installation and Setup Guide for Server for details.

Action method

None.

2.1.18 Modifying Pgpool-II Installation Handling

Incompatibility

For FUJITSU Enterprise Postgres 12 or later, Pgpool-II is not automatically installed when you install the server. Therefore, if you want to take advantage of Pgpool-II, install it separately from the server installation.

The extension modules required for the database server are shipped with the server program. You should set up Pgpool-II on the database server side, even if Pgpool-II is to be used on a different server than the database server.

Refer to "Setting Up and Removing OSS" in the Installation and Setup Guide for Server for details.

Action method

None.

2.1.19 Changing Core and Log File Paths when Instance is Created with WebAdmin

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, change the core and log file paths when creating an instance in WebAdmin.

FUJITSU Enterprise Postgres 11 or earlier

Log File Path: /var/tmp/fsep_*version*/*instanceAdminUser_instanceNamePortNumber*/log

Core File Path: /var/tmp/fsep_*version*/*instanceAdminUser_instanceNamePortNumber*/core

version: product version_edition_architecture

［Example］

Log File Path: /var/tmp/fsep_110_AE_64/naomi_myinst27599/log

Core File Path: /var/tmp/fsep_110_AE_64/naomi_myinst27599/core

FUJITSU Enterprise Postgres 12

Log File Path: /var/tmp/fsep_*version*/*instanceAdminUser_instanceNamePortNumber*/log

Core File Path: /var/tmp/fsep_*version*/*instanceAdminUser_instanceNamePortNumber*/core

version: product version_WA_architecture

［Example］

Log File Path: /var/tmp/fsep_120_WA_64/naomi_myinst27599/core

Core File Path: /var/tmp/fsep_120_WA_64/naomi_myinst27599/log

Action method

None.

2.1.20 Renaming WebAdmin Services

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, change the service name registered when you set up WebAdmin.

FUJITSU Enterprise Postgres 11 or earlier

fsep_*x*SP*z*_*edition*_64_WebAdmin_Port1

fsep_*x*SP*z*_*edition*_64_WebAdmin_Port2

FUJITSU Enterprise Postgres 12 or later

fsep_xSPz_WA_64_WebAdmin_Port1

fsep_xSPz_WA_64_WebAdmin_Port2

Action method

None.

2.1.21 Changing the Features Targeted for Installation in a 64-bit Environment

Incompatibility

32 bit Linux client can no longer be installed on RHEL7 in FUJITSU Enterprise Postgres 10 or later.

Note: 32 bit Linux client can install on RHEL6 in FUJITSU Enterprise Postgres 11 or earlier.

Action method

None.

2.1.22 Changing the Access Permissions of the Windows Client Installation Folder

Incompatibility

When changed for install folder the Windows client from default, the access permissions of the installed files and folder changes to read and execute.

The above changes apply to non-administrators.

This incompatibility occurs with all supported Windows client operating systems. Refer to "Required Operating System" in the Installation and Setup Guide for Client for information on the operating environment.

Action method

This change was made simply to enhance security, therefore, no action is normally required.

However, if existing access permissions are required, this change can be reverted by running *installDir*\setup\revert_cacls.bat as an administrator after installation.

2.1.23 Changing the WebAdmin Installation Method

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or later, WebAdmin is not installed automatically during server installation. Therefore, install WebAdmin separately.

Action method

None.

2.2 Application Migration Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing the OID of the Data Type (NCHAR type) that Handles National Characters	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Changed the Specification Method of the Application Connection Switch Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Changes in ecpg/ecobpg Handling of Zero-Length Unicode Identifiers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Changing the display result when data masking is applied to NaN, infinity, -infinity	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Changing the Valid Range of Identifiers Defined by the DECLARE STATEMENT statement	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing Precompile Results	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Changing the Trigger Replacement Process	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Adding a TAP Test Framework	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Change the "elif" Statement Behavior in ecobpg	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Changed to Error when Running an Operator or Function that Returns non Data Types for Masking Type	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the method of specifying the application connection switch feature	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
PostgreSQL compatibility of embedded SQL applications in C and COBOL	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing Vertical Clustered Index (VCI)	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing how to use the features compatible with Oracle databases	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.2.1 Changing the OID of the Data Type (NCHAR type) that Handles National Characters

Incompatible

In Fujitsu Enterprise Postgres 15, OIDs for national character data types (NCHAR types) have changed.

Action method

If you are using a national character data type (NCHAR type), recompile the application and run it with Fujitsu Enterprise Postgres 15 or later clients.

2.2.2 Changed the Specification Method of the Application Connection Switch Feature

Incompatible

In Fujitsu Enterprise Postgres 15, the name of the "target server" specified by the application connection switch feature will be changed.

Action method

For applications that specify a target server as the application connection switch feature, change the target server according to the table below, recompile, and then execute using a client of Fujitsu Enterprise Postgres 15 or later.

Table 2.1 Specified name of the target server.

Target of use	Before modification	After modification
Leverage .NET Data Provider	TargetServerType	TargetSessionAttributes

2.2.3 Changes in ecpg/ecobpg Handling of Zero-Length Unicode Identifiers

Incompatible

In Fujitsu Enterprise Postgres 15, if the SQL statement contains a zero-length Unicode identifier, Change precompilation to fail.

Action method

None.

2.2.4 Changing the display result when data masking is applied to NaN, infinity, -infinity

Incompatibility

In FUJITSU Enterprise Postgres 14, the display result when data masking is applied to NaN, infinity, and -infinity will be changed.

FUJITSU Enterprise Postgres 13 SP1 or earlier

If the float type NaN, infinity, and -infinity are partially masking with (9,1,2), the following will be displayed.

```
NaN : 99
Infinity : 99
-Infinity : 99
```

FUJITSU Enterprise Postgres 14 or later

If the float type NaN, infinity, and -infinity are partially masking with (9,1,2), the following will be displayed.

```
NaN : NaN
Infinity : Infinity
-Infinity : -Infinity
```

Action method

If the application is analyzing the SQL masking output result, please consider the non-numeric output result and correct it.

2.2.5 Changing the Valid Range of Identifiers Defined by the DECLARE STATEMENT statement

Incompatibility

In FUJITSU Enterprise Postgres 14 will change the valid range of identifiers defined by a DECLARE STATEMENT statement in ecpg/ecobpg.

FUJITSU Enterprise Postgres 13 SP1 or earlier

The valid range is now per process.

FUJITSU Enterprise Postgres 14 or later

The valid range is now per file.

Action method

None.

2.2.6 Changing Precompile Results

Incompatibility

In FUJITSU Enterprise Postgres 14 removed the ECPGdeclare/ECPGopen function. Therefore, results precompiled from earlier versions of FUJITSU Enterprise Postgres will not be available in FUJITSU Enterprise Postgres 14.

Action method

Rebuild the application.

2.2.7 Changing the Trigger Replacement Process

Incompatibility

In FUJITSU Enterprise Postgres 14 will change restricted triggers to not be supported by replace operations (OR REPLACE).

FUJITSU Enterprise Postgres 13 SP1 or earlier

You can replace a constraint trigger.

[Example]

```
=# CREATE OR REPLACE CONSTRAINT TRIGGER my_constraint_trigger AFTER DELETE ON my_table
-# FOR EACH ROW
-# EXECUTE PROCEDURE funcA();
CREATE TRIGGER
```

FUJITSU Enterprise Postgres 14 or later

It does not support replacing a constraint trigger.

[Example]

```
=# CREATE OR REPLACE CONSTRAINT TRIGGER my_constraint_trigger AFTER DELETE ON my_table
-# FOR EACH ROW
-# EXECUTE PROCEDURE funcA();
ERROR:  CREATE OR REPLACE CONSTRAINT TRIGGER is not supported
```

Action method

None.

2.2.8 Adding a TAP Test Framework

Incompatibility

In FUJITSU Enterprise Postgres 13, the TAP testing framework allows users to create and run TAP tests for their own extensions.

TAP test framework stored in:

```
<FUJITSU Software Enterprise Postgres installation directory>/lib/pgxs/src/test/perl/PostgreSQL/Test
```

Action method

None.

2.2.9 Change the "elif" Statement Behavior in ecobpg

Incompatibility

The "elif" statement now works correctly with FUJITSU Enterprise Postgres 13.

FUJITSU Enterprise Postgres 12 or earlier

The decision of the "elif" statement is made whether or not the "ifdef/ifndef" condition is met.

[Example]

```
000000     EXEC SQL ifdef DEF1 END-EXEC.
000000     Operation (1).
000000     EXEC SQL elif DEF2 END-EXEC.
000000     Operation (2).
000000     EXEC SQL else END-EXEC.
000000     Operation (3).
```

If "DEF1" and "DEF2" are true, both "Operation (1)" and "Operation (2)" are executed.

FUJITSU Enterprise Postgres 13 or later

If the condition "ifdef/ifndef" is met, the judgment of the "elif" statement is not enforced.

[Example]

```
000000     EXEC SQL ifdef DEF1 END-EXEC.
000000     Operation (1).
000000     EXEC SQL elif DEF2 END-EXEC.
000000     Operation (2).
000000     EXEC SQL else END-EXEC.
000000     Operation (3).
```

If "DEF1" and "DEF2" are true, only "Operation (1)" is executed.

Action method

Check your existing application and fix the elif statement to work correctly.

2.2.10 Changed to Error when Running an Operator or Function that Returns non Data Types for Masking Type

Incompatibility

In FUJITSU Enterprise Postgres 12, changed to error when running an operator or function that returns non Data Types for Masking type.

FUJITSU Enterprise Postgres 11 or earlier

In the following cases, the operator or function in 3) may be executed without masking.

This is an incorrect result because the data containing the masking column is performed without masking.

1) Create a Masking policy. and

2) Execute a SELECT statement. and

3) Execute an operator or function in the SELECT statement of 2). and

4) The operator or function argument of 3) includes a subquery. and

5) The operator or function argument of 3) contains the column to be protected created in 1). and

6) The operator or function of 3) returns a type not listed in "Data Types for Masking" in "Operation Guide".

FUJITSU Enterprise Postgres 12 or later

Operator or function results of 3) in the following error.

```
ERROR:  The output data type is incompatible with the confidential policy.
HINT:  Data type of the result value(s) produced by expression/function using confidential columns
is not supported by Data masking module. Consider removing confidential columns from such
expressions/functions.
```

This is correct because the operator or function returns a data type not listed in "Data Types for Masking" in "Operation Guide".

Action method

Do one of the following to ensure that the results are identical to those of FUJITSU Enterprise Postgres 11 and earlier:

1) Modify the Masking policy to prevent masking from being performed for the user executing the SQL.

2) Modify SQL to not use operators or functions that return types not listed in "Data Types for Masking" in "Operation Guide".

2.2.11 Changing the Method of Specifying the Application Connection Switch Feature

Incompatibility

The target server specified using the application connection switch feature is changed to the same name as that of PostgreSQL.

Action method

Use the FUJITSU Enterprise Postgres 10 or later client to execute applications that have the target server specified as the application connection switch feature after changing the target server and specified value as listed below and recompiling.

Specified name of the target server

Usage target	Before correction	After correction
JDBC driver	No change	
ODBC driver	TargetServer	target_session_attrs
.NET Data Provider	target_server	TargetServerType
Connection service file	target_server	target_session_attrs
Library (libpq) for C	target_server Environment variable (PGXTARGETSERVER)	target_session_attrs Environment variable (PGTARGETSESSIONATTRS)
Embedded SQL	target_server	target_session_attrs
psql	Environment variable (PGXTARGETSERVER)	Environment variable (PGTARGETSESSIONATTRS)

Specified value for the target server

Server selection order	JDBC driver	.NET Data Provider		Other driver	
		Before correction	After correction	Before correction	After correction
Primary server	No change	primary	master	primary	read-write
Standby server	No change	-	slave	-	-
Priority given to a standby server	No change	prefer_standby	preferSlave	prefer_standby	prefer-read
Any	No change	-	any	-	any

2.2.12 PostgreSQL Compatibility of Embedded SQL Applications in C and COBOL

Incompatibility

Embedded SQL applications in C and COBOL that were compiled with FUJITSU Enterprise Postgres 9.6 or earlier cannot be used in the FUJITSU Enterprise Postgres 10 client.

Action method

Use the FUJITSU Enterprise Postgres 10 or later client to execute the applications only after recompiling them with the FUJITSU Enterprise Postgres 10 or later client.

2.2.13 Changing Vertical Clustered Index (VCI)

Incompatibility

The functions below have been added to the functions for which VCI is not used.

Type	Function
Date/time functions	age(timestamp) current_date current_timestamp current_time localtime localtimestamp
Session information functions	current_user current_role

Action method

To use VCI, specify the second argument when using the age function, and specify other functions as subqueries.

[Example]

Before: select age(column A), current_date from table

After: select age(column A, **now()**), **(select current_date)** from table

2.2.14 Changing how to Use the Features Compatible with Oracle Databases

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or later, to use the features compatible with Oracle databases, create a new instance and execute the following command for the "postgres" and "template1" databases:

CREATE EXTENSION oracle_compatible

Action method

None.

2.3 Operation Migration Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Deprecation of Some Encryption Algorithms in pgcrypto	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Deprecation of Certificates Signed Using SHA1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Abolition of Message Numbers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Adding the key_name Column to the View pgx_tde_master_key	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N
Changing the Output of the Status Mode of the cm_ctl Command	N	N	N	N	Y	Y	Y	Y	N	N	N	N	N	N	N
Rename column "master_pid" in pgx_loader_state to "leader_pid"	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Adding a Message to Output when the Database Server watchdog detects that the Connection Manager is down	N	N	N	N	Y	Y	N	Y	Y	Y	Y	N	N	N	N
Change the Error Information when the Connection Manager re-executes SQL on the Failed Connection	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N
Changing the Value of the Category Column in the pg_settings view	N	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing pgx_stat_lwlock of the Statistics View	N	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the Behavior of pgx_rcvall	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Mirroring Controller no longer retries to monitor database processes when they are detected as down	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the Name and Parameter Name of the Mirroring Controller Post-Promote Command	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing Mirroring Controller User Command Input Values	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the maximum number of connections per server	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the encryption settings using the ALTER TABLESPACE statement	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the default configuration of the cluster system using database multiplexing	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the default operation when mc_ctl command options are omitted	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the connection settings when Mirroring Controller connects to an instance	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the status display of the Mirroring Controller server	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing the operation when the synchronous_standby_names parameter is changed during database multiplexing operation	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Changing masking policy definition for unsupported data types	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.3.1 Deprecation of Some Encryption Algorithms in pgcrypto

Incompatibility

In Fujitsu Enterprise Postgres 15 SP2 and later, the PostgreSQL extension pgcrypto does not support the use of the encryption algorithm, which has become a legacy algorithm in the OpenSSL3 family, by default.

The encryption algorithms that are no longer available by default are:

- BF
- CAST5
- DES-ECB
- DES-CBC
- MD4
- Whirlpool

Action method

If you use a legacy OpenSSL provider, create an OpenSSL configuration file and set the parameters in postgresql.conf. Refer to "Settings for Using Legacy OpenSSL Providers" in the Installation and Setup Guide for Server for information .

2.3.2 Deprecation of Certificates Signed Using SHA1

Incompatibility

In Fujitsu Enterprise Postgres 15 SP2 and later, you cannot connect to a database server using a certificate signed using SHA1.

Action method

Resubmit the certificate used for certificate authentication with SHA2 or higher.

2.3.3 Abolition of Message Numbers

Incompatibility

In Fujitsu Enterprise Postgres 15, the message number output at the end of the message is abolished.

Message numbers are output for messages output by Mirroring Controller.

For FUJITSU Enterprise Postgres 14 SP1 or earlier

The message number was printed at the end of the message.

[example]

```
3D000: 2017-07-10 19:41:05 JST[13899]: [1-1] user=fepuser,db=fep,remote=127.0.0.1(51902)
app=[unknown] FATAL: database "fep" does not exist (10571)
```

For Fujitsu Enterprise Postgres 15

No message number is output at the end of the message.

[example]

```
3D000: 2023-04-10 19:41:05 JST [13899]: [1-1] user = fepuser,db = fep,remote = 127.0.0.1(51902)
app = [unknown] FATAL: database "fep" does not exist
```

Action method

None.

2.3.4 Adding the key_name Column to the View pgx_tde_master_key

Incompatibility

In Fujitsu Enterprise Postgres 15, add a key_name column to the view pgx_tde_master_key.

Action method

None.

2.3.5 Changing the Output of the Status Mode of the cm_ctl Command

Incompatibility

Changes the display of the output of the status mode of the cm_ctl command.

(If it has been modified by the P number PH21029, and you have applied an urgent fix that includes it, FUJITSU Enterprise Postgres 14 will work.)

When the cm_ctl command was executed in status mode, there was omission of the output of the header "pid" displayed in "application_information" which outputs the information of the application.

Correct the following in PH21029.

- Add ':' to 'application_information' to output application information
  Output "application_information:"
- Add the header "pid" output to "application_information"
  Outputs "pid" whose header information is missing.
- Changes the number of digits in the numeric portion of connected_time
  Change the display start position of the date and time connected to the conmgr process to correct the gap between the start position of the header and the numeric part. (5 digits backward)

This fix causes the following incompatibilities when running the cm_ctl command in status mode:

- Add ":" to the display of "application_information"
- Display the header "pid" in "application_information"
- Change the output start position of the "connected_time" header of "application_information"
- Change the start of the date and time output of "connected_time" in "application_information" to 5 digits later.

FUJITSU Enterprise Postgres 13 SP1 or earlier

```
application_information
addr         port  connected_time
10.xxx.x.xx  99999 21655 2021-10-20 09:18:51
```

FUJITSU Enterprise Postgres 14

```
application_information:
addr         port  pid       connected_time
10.xxx.x.xx  99999 21655     2021-10-20 09:18:51
```

When analyzing the output of the cm_ctl command in status mode in a batch or shell script, it may not work correctly if the header is referenced and the third is "connected_time".

For example, when identifying a row of data (numeric part), a string up to the header "addr", "port", and "connected_time" one row before is searched for and identified.

Action method

If you are using a batch or shell script to parse the output of the cm_ctl command in status mode, modify it to take into account the number of digits in the header and numeric part of the output.

2.3.6 Rename column "master_pid" in pgx_loader_state to "leader_pid"

Incompatibility

In FUJITSU Enterprise Postgres 14 renames column "master_pid" to "leader_pid" in the pgx_loade_state table.

Action method

None.

2.3.7 Adding a Message to Output when the Database Server watchdog detects that the Connection Manager is down

Incompatibility

When using the Connection Manager, if the database server watchdog detects that the Connection Manager is down, it will output a message to the database server.

Incompatibilities may occur if:

1) The application server is using the Connection Manager. and

2) The database server is running the watchdog process. and

3) 1) Application server or Connection Manager goes down.

FUJITSU Enterprise Postgres 12, 13, 13SP1, 14, 14SP1, 15

If the database server watchdog detects that the Connection Manager is down, the following message is not output.

```
WARNING:  watchdog: error in heartbeat connection (20331): host=xxx.xxx.xxx.xxx port=xxxxx
pid=xxxxx
```

FUJITSU Enterprise Postgres 12 SP1, 15SP1 or later

If the database server watchdog detects that the Connection Manager is down, the following message may be output.

```
WARNING:  watchdog: error in heartbeat connection (20331): host=xxx.xxx.xxx.xxx port=xxxxx
pid=xxxxx
```

Action method

If you are monitoring the database log for watchdog messages, change the monitoring setting to one that takes into account the possible output of these messages.

2.3.8 Change the Error Information when the Connection Manager re-executes SQL on the Failed Connection

Incompatibility

In FUJITSU Enterprise Postgres 12 SP1 allows an application using the Connection Manager to change the error information when attempting to execute SQL again on a connection that the Connection Manager has determined to be in error due to a database error.

The changed error information is included in the error presented in "Errors when an Application Connection Switch Occurs and Corresponding Actions" for each client driver in "Application Development Guide".

Incompatibilities may occur if the following conditions are met:

1) The application uses one of the following drivers. and

-libpq (C Library)

-ECPG (Embedded SQL in C)

2) You are using the Connection Manager. and

3) The database server to which the application in 1) was connected goes down. and

4) The Connection Manager notifies the application in 1) of an error when the database is down in 3). and

5) The application in 1) does not disconnect from the database server that is down, but executes SQL using the connection.

FUJITSU Enterprise Postgres 12, 13 or later

The error information returned depends on the actual database server error condition.

FUJITSU Enterprise Postgres 12 SP1

The following error information is returned:

- For libpq (C Library): CONNECTION_BAD (PQstatus () return value)
- For ECPG (Embedded SQL in C): 57P02 (SQLSTATE return value)

Action method

Consider that the above error may be returned during the SQL error determination process.

Also, if you encounter an error about switching application destinations as described in "Errors when an Application Connection Switch Occurs and Corresponding Actions" for each client driver in "Application Development Guide", you should explicitly disconnect and reconnect or rerun the application.

2.3.9 Changing the Value of the Category Column in the pg_settings view

Incompatibility

For FUJITSU Enterprise Postgres 13, change the value of the category column in the pg_settings view.

FUJITSU Enterprise Postgres 12 or earlier

Original value	wrong value
Preset Options	Fujitsu Enterprise Postgres Parameters
Customized Options	Preset Options
Developer Options	Customized Options

This is an incorrect result because it is different from the original value.

FUJITSU Enterprise Postgres 13 or later

The correct value is the category column in the pg_settings view.

Action method

Replaces the category column in the pg_settings view with the values before migration, so that the results are the same as before migration.

2.3.10 Changing pgx_stat_lwlock of the Statistics View

Incompatibility

In FUJITSU Enterprise Postgres 13, change the wait event name displayed in the lwlock_name column of the statistics view pgx_stat_lwlock.

Wait Event Name

FUJITSU Enterprise Postgres 12 or earlier	FUJITSU Enterprise Postgres 13
clog (*1)	XactBuffer
commit_timestamp (*1)	CommitTSBuffer
subtrans (*1)	SubtransBuffer
multixact_offset (*1)	MultiXactOffsetBuffer
multixact_member (*1)	MultiXactMemberBuffer
async (*1)	NotifyBuffer

FUJITSU Enterprise Postgres 12 or earlier	FUJITSU Enterprise Postgres 13
oldserxid (*1)	SerialBuffer
wal_insert (*1)	WALInsert
buffer_content (*1)	BufferContent
buffer_io (*1)	BufferIO
replication_origin (*1)	ReplicationOriginState
replication_slot_io (*1)	ReplicationSlotIO
proc (*1)	LockFastPath
buffer_mapping (*1)	BufferMapping
lock_manager (*1)	LockManager
predicate_lock_manager (*1)	PredicateLockManager
parallel_hash_join (*3)	ParallelHashJoin
parallel_query_dsa (*2)	ParallelQueryDSA
session_dsa (*3)	PerSessionDSA
session_record_table (*3)	PerSessionRecordType
session_typmod_table (*3)	PerSessionRecordTypmod
shared_tuplestore (*3)	SharedTupleStore
tbm (*2)	SharedTidBitmap
parallel_append (*3)	ParallelAppend
serializable_xact (*4)	PerXactPredicateList
shared_mcxt (*4)	SharedMcxt
meta_cache_map (*4)	MetaCacheMap
global_metacache (*4)	GlobalCatcache
cached_buf_tranche_id (*4)	CachedBufTranche

*1）Events added in FUJITSU Enterprise Postgres 9.6.

*2）Events added in FUJITSU Enterprise Postgres 10.

*3）Events added in FUJITSU Enterprise Postgres 11.

*4）Events added in FUJITSU Enterprise Postgres 12.

Action method

None.

2.3.11 Changing the Behavior of pgx_rcvall

Incompatibility

In FUJITSU Enterprise Postgres 13, change the pgx_rcvall command to fail if the -e option of the pgx_rcvall command specifies a future time or if the -n option specifies a list appointment that does not exist.

FUJITSU Enterprise Postgres 12 or earlier

All archived WALs are applied for recovery if the -e option of the pgx_rcvall command specifies a time in the future, or if the -n option specifies a list appointment that does not exist.

FUJITSU Enterprise Postgres 13 or later

The pgx_rcvall command fails if the -e option of the pgx_rcvall command specifies a time in the future, or if the -n option specifies a list appointment that does not exist.

Action method

Specify recovery objectives correctly, if necessary.

2.3.12 Mirroring Controller no Longer Retries to Monitor Database Processes when they are Detected as Down

Incompatibility

For the FUJITSU Enterprise Postgres Mirroring Controller, change the heartbeat monitoring of the database process so that it does not retry monitoring when it detects down.

Action method

None.

2.3.13 Changing the Name and Parameter Name of the Mirroring Controller Post-Promote Command

Incompatibility

In the FUJITSU Enterprise Postgres 12 Mirroring Controller, change the name of the post-promote command, which is the state transition command, and the parameter name in the server configuration file that specifies the post-promote command.

FUJITSU Enterprise Postgres 11 or earlier

- Command Name

  post-promote command

- The parameter name in the server configuration file that specifies the post-promote command

  post_promote_command

FUJITSU Enterprise Postgres 12 or later

- Command Name

  post-switch command

- The parameter name in the server configuration file that specifies the post-promote command

  post_switch_command

Action method

The post_promote_command parameter in the server configuration file continues to be available in FUJITSU Enterprise Postgres 12 or later.If specified in the server configuration file, it acts as a post-switch command.You cannot specify the post_promote_command and post_switch_command parameters at the same time.

2.3.14 Changing Mirroring Controller User Command Input Values

Incompatibility

Arguments (Fixed value: primarycenter) have been added to the following user commands:

- Fencing command of the database server
- Arbitration command

- Post-switch command
- Pre-detach command
- Post-attach command

Action method

If you are checking the number of arguments in a user command, increase the number of arguments by one.

2.3.15 Changing the Maximum Number of Connections per Server

Incompatibility

The maximum number of connections per server is changed from 262,143 to 65,535.

Action method

None.

2.3.16 Changing the Encryption Settings Using the ALTER TABLESPACE Statement

Incompatibility

The ALTER TABLESPACE statement can be used to change the tablespace encryption settings if data is not stored in the tablespace.

Action method

None.

2.3.17 Changing the Default Configuration of the Cluster System Using Database Multiplexing

Incompatibility

In FUJITSU Enterprise Postgres 10, a split brain will not occur if heartbeat monitoring using an admin network times out, so the default is changed to a system configuration requiring an arbitration server acting as a third party.

FUJITSU Enterprise Postgres 9.6 or earlier

A cluster system comprises two database servers.

FUJITSU Enterprise Postgres 10 or later

By default, a cluster system comprises two database servers and an arbitration server.

Action method

If selecting the same system configuration as that in FUJITSU Enterprise Postgres 9.6 or earlier, set the parameters below in the server configuration file to perform automatic degradation unconditionally when a heartbeat abnormality is detected during OS/server heartbeat monitoring.

- Parameter: heartbeat_error_action
- Value: fallback

2.3.18 Changing the Default Operation when mc_ctl Command Options are Omitted

Incompatibility

In FUJITSU Enterprise Postgres 10, the default operation when the mc_ctl command options below are omitted has been changed:

- The -f option during start mode
- The -w option during start mode

FUJITSU Enterprise Postgres 9.6 or earlier

- If the -f option is omitted, automatic switching and disconnection immediately after the startup of Mirroring Controller will not be enabled.
- If the -w option is omitted, the system will not wait for operations to finish.

FUJITSU Enterprise Postgres 10 or later

- Even if the -f option is omitted, automatic switching and disconnection immediately after the startup of Mirroring Controller will be enabled.
- Even if the -w option is omitted, the system will wait for operations to finish.

Action method

If selecting the same operation as that in FUJITSU Enterprise Postgres 9.6 or earlier, take the action below when executing start mode of the mc_ctl command.

- If the -f option is omitted, specify the -F option.
- If the -w option is omitted, specify the -W option.

2.3.19 Changing the Connection Settings when Mirroring Controller Connects to an Instance

Incompatibility

In FUJITSU Enterprise Postgres 10, Mirroring Controller changes the connection setting below when connecting to an instance to detect failure of each database element.

- Application name

FUJITSU Enterprise Postgres 9.6 or earlier

- The application name is an empty string.

FUJITSU Enterprise Postgres 10 or later

- The application name is 'mc_agent'.

Action method

There is no method for changing the application name.

Therefore, if there is an application that identifies a database connection session of Mirroring Controller with the application name being an empty string, modify the process so that identification is performed using 'mc_agent'.

2.3.20 Changing the Status Display of the Mirroring Controller Server

Incompatibility

In FUJITSU Enterprise Postgres 10, the condition for displaying an abnormality for the process (WAL receive process) that receives transaction logs has been changed in regard to the server status display performed in status mode of the mc_ctl command of Mirroring Controller.

- Role of the applicable server (host_role): standby (standby)
- Display item: DBMS process status (db_proc_status)

- Display content: abnormal (abnormal process name)
  The applicability for incompatibility is determined based on whether 'wal_receiver' is included in the abnormality process name.

FUJITSU Enterprise Postgres 9.6 or earlier

Displays an abnormality when Mirroring Controller detects that the WAL send process has stopped.

FUJITSU Enterprise Postgres 10 or later

Displays an abnormality when Mirroring Controller detects that a streaming replication connection has not been established with the primary server using the WAL receive process.

Action method

If there is an application that determines the WAL receive process status from the display content retrieved using status mode of the mc_ctl command, modify as below to determine at the same level of accuracy as previously. However, this is not recommended due to incompatibilities accompanying the improvement in accuracy.

- If 'wal_sender' is included in the abnormal process name displayed in the 'abnormal' db_proc_status item of the 'primary' host_role, it is determined that an abnormality has occurred in the WAL receive process.
- If 'wal_sender' is not included in the abnormal process name displayed in the 'abnormal' db_proc_status item of the 'primary' host_role, it is determined that an abnormality has not occurred in the WAL receive process.

2.3.21 Changing the Operation when the synchronous_standby_names Parameter is Changed during Database Multiplexing Operation

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or earlier, Mirroring Controller periodically accesses the database to retrieve the synchronous_standby_names parameter value using the SHOW command, and automatically recovers if changes are detected, in case the user accidentally changes the synchronous_standby_names parameter in postgresql.conf during database multiplexing mode. However, because this process uses the CPU of the database server for redundancy and SQL statements are executed with high frequency, these processes are not executed by default in FUJITSU Enterprise Postgres 10.

FUJITSU Enterprise Postgres 9.6 or earlier

Mirroring Controller checks if the synchronous_standby_names parameter in postgresql.conf has been mistakenly changed by the user.

FUJITSU Enterprise Postgres 10 or later

By default, Mirroring Controller does not check if the synchronous_standby_names parameter in postgresql.conf has been mistakenly changed by the user.

Action method

If selecting the same operation as that in FUJITSU Enterprise Postgres 9.6 or earlier, set the parameter below in the server definition file.

- Parameter: check_synchronous_standby_names_validation
- Value: 'on'

2.3.22 Changing Masking Policy Definition for Unsupported Data Types

Incompatibility

The data masking feature of FUJITSU Enterprise Postgres is updated so that an error occurs when a masking policy is defined for a column of an unsupported data type (array type or timestamp with timezone type).

FUJITSU Enterprise Postgres 9.5

The definition of a masking policy for a column of array type or timestamp with timezone type ends normally, but an error occurs when accessing a column of a table for which the policy is defined.

FUJITSU Enterprise Postgres 9.6 or later

An error occurs when defining a masking policy for a column of array type or timestamp with timezone type.

Action method

If a policy that was defined in FUJITSU Enterprise Postgres 9.5 includes masking of a column of an unsupported data type (array type or timestamp with timezone type), perform one of the following in FUJITSU Enterprise Postgres 9.6 or later:

- Ignore the error if the masking policy contains columns of only these data types, or delete the policy with the pgx_drop_confidential_policy system administration function.
- If the masking policy target contains columns of these data types and a supported data type, delete the problematic columns with the pgx_alter_confidential_policy system function.

2.4 JDBC Driver Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing the targetServerType Value	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the Statement Cache Limit Setting Method	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.4.1 Changing the targetServerType Value

Incompatibility

In FUJITSU Enterprise Postgres 13, the value of targetServerType specified in the connection string was changed. Therefore, the previously used values are no longer available.

Action method

If you specified a value for targetServerType, change the value as follows:

Table 2.2 Specified values for the target server

Server Selection Order	FUJITSU Enterprise Postgres 12 or earlier	FUJITSU Enterprise Postgres 13
Primary Server	master	primary
Standby Server	slave	secondary
Prefer Standby Server	preferSlave	preferSecondary
Any	any	any

2.4.2 Changing the Statement Cache Limit Setting Method

Incompatibility

FUJITSU Enterprise Postgres 9.6 changes the way the statement cache cap is set.

FUJITSU Enterprise Postgres 9.5 or earlier

The maxStatements parameter of the connection string or the setMaxStatements method.

FUJITSU Enterprise Postgres 9.6 or later

Specified in the connection string or property by the preparedStatementCacheQueries and preparedStatementCacheSizeMiB parameters.

Action method

None.

2.5 ODBC Driver Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Cannot specify prefer-read for target_session_attrs	Y	*Y*	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.5.1 Cannot specify prefer-read for target_session_attrs

Incompatibility

FUJITSU Enterprise Postgres 14 users will not see the "prefer-read" radio button in the "Target_Session_Attrs" item of the data source option selection screen.

Action method

Select prefer-standby.

2.6 .NET Data Provider Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing the Specification Method and Specified Values for the Application Connection Switch Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing the Behavior of the Application Connection Switch Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Behavior Change when Multiple Host Information is Specified in the Connection String	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
Changing the TargetServerType Value	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the Server Explorer View in Visual Studio Integration with .NET Data Provider	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.6.1 Changing the Specification Method and Specified Values for the Application Connection Switch Feature

Incompatibility

In Fujitsu Enterprise Postgres 15, the name of the "target server" specified by the connection switching function will be changed from "TargetServerType" to "TargetSessionAttributes", and the specified value will also be changed.

Action method

If the target server is specified, change the target server and specified value as follows.

Table 2.3 How to specify the connection destination switching function of the application and the specified value

Fujitsu Enterprise Postgres version		FUJITSU Enterprise Postgres 9.6 or earlier	FUJITSU Enterprise Postgres 10/11/12	FUJITSU Enterprise Postgres 13/14	Fujitsu Enterprise Postgres 15
Keywords to specify in the connection string		target_server	TargetServerType	TargetServerType	TargetSessionAttributes
Server selection order	Primary Server	primary(*1)	master(*1)	primary(*1)	read-write(*1) primary(*2)
	Standby Server	-	slave(*2)	standby(*2)	standby read-only(*2)
	Prefer Primary Server	-	-	-	prefer-primary

Fujitsu Enterprise Postgres version		FUJITSU Enterprise Postgres 9.6 or earlier	FUJITSU Enterprise Postgres 10/11/12	FUJITSU Enterprise Postgres 13/14	Fujitsu Enterprise Postgres 15
	Prefer Standby Server	prefer_standby	preferSlave	preferStandby	prefer-standby
	Any	-	any	any	any

*1: A primary server whose default transaction mode is read-only are not selected.

*2: A primary server whose default transaction mode is read-only is also selected.

2.6.2 Changing the Behavior of the Application Connection Switch Feature

Incompatibility

In Fujitsu Enterprise Postgres 15, when only one Host keyword is specified in the connection string, if a target server other than Any is specified, an exception will occur.

FUJITSU Enterprise Postgres 14 SP1 earlier

For example, if the connection string specifies "Host=host1, TargetServerType=primary", it will connect to host1 if host1 is the appropriate connection target.

Fujitsu Enterprise Postgres 15

For example, if "Host=host1, TargetSessionAttributes=primary" is specified in the connection string, an exception will always occur because the target server other than Any is specified for the specification of only one host information.

Action method

None.

2.6.3 Behavior Change when Multiple Host Information is Specified in the Connection String

Incompatibility

In Fujitsu Enterprise Postgres 15, when multiple hosts are specified in the connection string, even if one of them has an empty string specified, if another connectable connection destination is specified, that connection destination will be connected. In the old version, if there was even one host with an empty string, an exception would occur at that point.

FUJITSU Enterprise Postgres 14 SP1 earlier

For example, if "Host = host1," is specified in the connection string, an exception will always occur because the second host information is an empty string.

Fujitsu Enterprise Postgres 15

For example, if the connection string specifies "Host = host1," and if host1 is reachable, it will connect to host1 without throwing an exception.

Action method

None.

2.6.4 Changing the TargetServerType Value

Incompatibility

In FUJITSU Enterprise Postgres 13, the value of TargetServerType specified in the connection string was changed. Therefore, the previously used values are no longer available.

Action method

If you specified a value for TargetServerType, change the value as follows:

Table 2.4 Specified values for the target server

Server Selection Order	FUJITSU Enterprise Postgres 9.6 or earlier	FUJITSU Enterprise Postgres 10/11/12	FUJITSU Enterprise Postgres 13
Primary Server	primary	master	primary
Standby Server	-	slave	standby
Prefer Standby Server	prefer_standby	preferSlave	preferStandby
Any	-	any	any

2.6.5 Changing the Server Explorer View in Visual Studio Integration with .NET Data Provider

Incompatibility

FUJITSU Enterprise Postgres 10 or later, the following changes occur when you view database resources in Server Explorer.

- "Schema Name.Table Name" display under the Tables folder.
- The Indexes folder is not displayed.
- The Triggers folder does not displayed.
- The Sequences folder is not displayed.
- The Procedures folder does not displayed.

Action method

None.

2.7 C Library (libpq) Migration Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing when "prefer-read" is Specified for the target_session_attrs Parameter	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.7.1 Changing when "prefer-read" is Specified for the target_session_attrs Parameter

Incompatibility

In FUJITSU Enterprise Postgres 14 changes the attach server priority if any of the following servers are specified simultaneously with "prefer-read" as the target_session_attrs parameter:

- Primary server (default_transaction_read_only = ON)
- Standby server

FUJITSU Enterprise Postgres 13 SP1 or earlier

The primary server (default_transaction_read_only = ON) and standby servers have the same priority.

FUJITSU Enterprise Postgres 14 or later

Standby servers connect in preference to primary servers (default_transaction_read_only = ON).

Action method

None.

2.8 oracle_fdw Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing the Oracle Client Version	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.8.1 Changing the Oracle Client Version

Incompatibility

FUJITSU Enterprise Postgres 12 change the version of the Oracle client used to build oracle_fdw to 11.2.

Action method

Use Oracle client version 11.2 or later.

Also,if a file named libclntsh.so.11.1 does not exist in OCI library, create a symbolic link named libclntsh.so.11.1.

2.9 pg_statsinfo Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changing Simple Report Items	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Change the Contents of the bgwriter Table in the statsrepo Schema	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rename Columns in statement Table in statsrepo Schema	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Change the Default Value of the stattarget Column of the column Table in the statsrepo Schema	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y: Incompatibility exists

N: Incompatibility does not exist

2.9.1 Changing Simple Report Items

Incompatibility

In Fujitsu Enterprise Postgres 17, the following items have been removed from the BGWriter Statistics items output by the simple report function.

- Written Buffers By Backend (Average)
- Written Buffers By Backend (Maximum)
- Backend Executed fsync (Average)
- Backend Executed fsync (Maximum)

Action method

None.

2.9.2 Change the Contents of the bgwriter Table in the statsrepo Schema

Incompatibility

In Fujitsu Enterprise Postgres 17, remove buffers_backend and buffers_backend_fsync from the columns in the bgwriter table in the statsrepo schema.

Action method

None.

2.9.3 Rename Columns in statement Table in statsrepo Schema

Incompatibility

In Fujitsu Enterprise Postgres 17, rename the blk_read_time column to shared_blk_read_time and the blk_write_time column to shared_blk_write_time in the statement table of the statsrepo schema.

Action method

None.

2.9.4 Change the Default Value of the stattarget Column of the column Table in the statsrepo Schema

Incompatibility

In Fujitsu Enterprise Postgres 17, change the default value of the ststtarget column of the column table in the statsrepo schema from "-1" to "NULL".

Action method

None.

2.10 pgaudit Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Repairing Unwanted Output in the Audit Log	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Changing to Output Extra NEW and OLD Values in the Audit Log when the Trigger Function Executes	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.10.1 Repairing Unwanted Output in the Audit Log

Incompatibility

In Fujitsu Enterprise Postgres 16, we changed the audit log so that it no longer contains unwanted information at the end.

Fujitsu Enterprise Postgres 15 SP2 or earlier

Some audit logs contain unwanted content at the end.

[Example]

```
Input: INSERT INTO trig_test VALUES ('new value');
Part of the audit log: NOTICE:  AUDIT: SESSION,WRITE,,[local],,pg_regress/class,,baz,,
11,2,INSERT,,TABLE,public.trig_audit,,"INSERT INTO trig_audit SELECT 'I', now(), user, NULL,
NEW.*","(""new value"")  trig_audit AFTER ROW INSERT 16484 trig_test trig_test public 0  f"
```

Fujitsu Enterprise Postgres 16

Prevent unwanted from being output to the audit log.

[Example]

```
Input: INSERT INTO trig_test VALUES ('new value');
Part of the audit log: NOTICE:  AUDIT: SESSION,WRITE,,[local],,pg_regress/class,,baz,,
11,2,INSERT,,TABLE,public.trig_audit,,"INSERT INTO trig_audit SELECT 'I', now(), user, NULL,
NEW.*","(""new value"")"
```

Action method

None.

2.10.2 Changing to Output Extra NEW and OLD Values in the Audit Log when the Trigger Function Executes

Incompatibility

In FUJITSU Enterprise Postgres 13, the trigger function additionally outputs NEW and OLD values to the audit log when the pgaudit.log_parameter is set to on.

FUJITSU Enterprise Postgres 12 or earlier

The following (18) does not output the values of NEW, OLD.

[Example]

```
AUDIT: SESSION,WRITE,2020-09-03 07:07:39 UTC,
        (1)    (2)   (3)
[local],9775,psql,k5user,postgres,3/536, 1, 2, INSERT, ,
(4)     (5)  (6)  (7)    (8)      (9)   (10)(11)(12)(13)
TABLE,public.trig_audit, ,
(14)  (15)    (16)
 "INSERT INTO trig_audit SELECT 'U', now(), user, OLD.*, NEW.*",
(17)
trig_audit AFTER ROW UPDATE 92027 trig_test trig_test public 0  f aaaa
(18)
```

FUJITSU Enterprise Postgres 13 or later

NEW, OLD values are output.

[Example]

```
AUDIT: SESSION,WRITE,2020-09-03 07:07:39 UTC,
[local],9775,psql,k5user,postgres,3/536,1,2,INSERT,,TABLE,public.
trig_audit,,
"INSERT INTO trig_audit SELECT 'U', now(), user, OLD.*, NEW.*",
(bbb) (aaa) trig_audit AFTER ROW UPDATE 92027 trig_test trig_test
public 0  f aaaa
```

Action method

If you are using an application that works by monitoring the string that the trigger function output to the audit log, modify the application to work with the NEW and OLD values.

2.11 pg_dbms_stats Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Change in Execution Plan due to Fixed Height of Btree index	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Incompatibility of Import Features with Fixed Height of Btree index	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.11.1 Change in Execution Plan due to Fixed Height of Btree index

Incompatibility

Fixing statistics with the following features may change the execution plan because the height of the Btree index is now fixed as well:

- dbms_stats.lock_*
- dbms_stats.restore_*
- dbms_stats.import_*

Action method

If you want to run compatibility with Fujitsu Enterprise Postgres 15 SP2 and earlier, configure the following:

- pg_dbms_stats.use_tree_height
- pg_dbms_stats.lock_tree_height

2.11.2 Incompatibility of Import Features with Fixed Height of Btree index

Incompatibility

Statistics exported by the export function in pg_dbms_stats prior to Fujitsu Enterprise Postgres 15 SP2 cannot be imported using the legacy import function.

Action method

When importing statistics exported by the export function in pg_dbms_stats prior to Fujitsu Enterprise Postgres 15 SP2, use a function with the suffix "_no_tree_height" appended to its name.

2.12 orafce Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Interface changes due to enhancements to the DBMS_SQL package	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y: Incompatibility exists

N: Incompatibility does not exist

2.12.1 Interface changes due to enhancements to the DBMS_SQL package

Incompatibility

In Fujitsu Enterprise Postgres 17, includes enhancements to the DBMS_SQL package. The I/O interfaces of some functions have changed accordingly.

Refer to "Compatibility with Oracle Databases" in Application Development Guide.

Action method

If you are using the DBMS_SQL package, you will need to switch to the same procedures as Fujitsu Enterprise Postgres 16 SP1 or earlier for Oracle database compatibility enhancements, or modify your application.

Refer to "Compatibility with Oracle Databases" in Application Development Guide.

2.13 WebAdmin Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Linux server behavior changes for login authentication	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Changing the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options'	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Cannot specify prefer-read for target_session_attrs	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.13.1 Linux server behavior changes for login authentication

Incompatibility

In Fujitsu Enterprise Postgres 16 SP1, the security policy for accounts in the OS is now also in effect upon login authentication from WebAdmin.

As a result, the following events may occur:

- If the number of authentication failures exceeds the login failure limit, the OS account is also locked.

Action method

If your account is locked due to an authentication failure, ask your system administrator to unlock it.

To check whether a login failure occurred in WebAdmin, see the WebAdmin log in the following folder, and check whether a log containing "password is incorrect" was output.

/opt/fsepv<x>webadmin/log

2.13.2 Changing the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options'

Incompatibility

In Fujitsu Enterprise Postgres 16, the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options' in the view 'PostgreSQL configuration' is changed in order to match the default value of PostgreSQL.

Fujitsu Enterprise Postgres 15 SP2 or earlier

0

Fujitsu Enterprise Postgres 16 or later

1

Action method

Change the value of the item 'Number of digits for floating values', if necessary.

2.13.3 Cannot specify prefer-read for target_session_attrs

Incompatibility

FUJITSU Enterprise Postgres 14 will no longer allow prefer-read to target_session_attrs as a connection method to an upstream server that is specified when creating an instance of a standby server.

Action method

Specify prefer-standby.

2.14 Connection Manager Incompatibility

Item	Pre-migration version										
	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Behavior change when "read-write" is specified for the target_session_attrs parameter	Y	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.14.1 Behavior change when "read-write" is specified for the target_session_attrs parameter

Incompatibility

FUJITSU Enterprise Postgres 13 SP1 or earlier

May be connected to primary server (default_transaction_read_only = ON).

FUJITSU Enterprise Postgres 14 or later

It is not connected to the primary server (default_transaction_read_only = ON).

Action method

For FUJITSU Enterprise Postgres 13 SP1 and earlier, specify "primary" for the target_session_attrs parameter.

2.15 Confidentiality Management Incompatibility

Item	Pre-migration version														
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	14 SP1	15	15 SP1	15 SP2	16	16 SP1
Changes due to Changes in the pg_dump Specification	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N
Changing Permission Settings by Changing the CREATEROLE Permission	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N
Change due to Restriction of CREATEROLE Privilege	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.15.1 Changes due to Changes in the pg_dump Specification

Incompatibility

If you are using multiple non-superuser sensitivity confidentiality management role to manage the sensitivity matrix, run the product-provided policy configuration script to define a row-level security feature policy on the table provided by the sensitivity support feature to make the sensitivity management roles independent of each other.

In Fujitsu Enterprise Postgres 15 SP2 or earlier, the effects of this script could be retained and backed up by pg_dump, but as of Fujitsu Enterprise Postgres 16, policy settings can no longer be backed up.

Action method

In Fujitsu Enterprise Postgres 16 or later, if you are managing a sensitivity matrix using more than one confidentiality management role other than superuser, then immediately after restoring a clear-text dump file using pg_dump, run the following command as superuser to reapply the confidentiality management feature policy:

```
psql -f ${install_dir}/share/extension/pgx_confidential_management_support_policy.sql
```

2.15.2 Changing Permission Settings by Changing the CREATEROLE Permission

Incompatibility

In Fujitsu Enterprise Postgres 16, if you want to use a non-superuser role as a confidentiality management role, you may need to set additional permissions for the confidentiality management role.

Action method

The confidentiality management role must already have the privileges it expects to operate on, other than the CREATEROLE privilege.

[Example]

If the confidentiality management role "manager_role" is also going to work with CREATEDB privileges, it will also set CREATEDB privileges when the role is created, like this:

```
CREATE ROLE manager_role LOGIN CREATEROLE CREATEDB;
```

If the required permissions are not set, the sensitivity management API terminates abnormally with a message similar to the following:

```
ERROR:  permission denied to create role
DETAIL:  Only roles with the CREATEDB attribute may create roles with the CREATEDB attribute.
```

2.15.3 Change due to Restriction of CREATEROLE Privilege

Incompatibility

In Fujitsu Enterprise Postgres 16, if you want to use a non-superuser role as a secret management role, the permissions on the roles that can be set in the secret group are different, and the roles that you set in the secret group must be granted ADMIN OPTION permission on the secret confidentiality management role before they can be used.

Action method

Take one of the following actions:

- A role created with the privileges of the confidentiality management role is to be managed in the confidential group. This creates a role that grants only the ADMIN OPTIN privilege to the sensitive confidentiality management role.
- Grant ADMIN OPTION permission on the role to the sensitive management role before setting the managed role to the sensitive group.

[Example]

You want to grant only the ADMIN OPTION privilege for role "user _role1" to the confidentiality management role "manager_role".

```
GRANT user_role1 TO manager_role WITH ADMIN TRUE, INHERIT FALSE, SET FALSE;
```

If the required permissions are not set, the sensitivity management API terminates abnormally with a message similar to the following:

```
ERROR:  permission denied to alter role
DETAIL:  Only roles with the CREATEROLE attribute and the ADMIN option on role "user_role1" may
alter this role.
```

Chapter 3 Program Updates

This version incorporates the following fixes:

- PostgreSQL 17

See

Refer to the PostgreSQL Global Development Group website for information on the updates implemented in the following releases:

[PostgreSQL 17]

```
https://www.postgresql.org/docs/17/release-17.html
```

In addition, issues that occurred in previous versions are also fixed.

Refer to the following for details of the program fixes included in this version and level.

Table 3.1 Fujitsu Enterprise Postgres 17 Program Updates

P number	Update summary	AE	SE
PH24153	When Mirroring Controller uses an arbitration server, the mc_ctl status command might terminate abnormally.	Y	-
PH24157	Starting the cluster application causes the database cluster to fail to start.	Y	Y
PH24182	When TCP communication such as connection connection is performed, communication may fail.	Y	Y
PH24183	The pgx_stat_lwlock system view shows incorrect contents in the lwlock_name column.	Y	Y
PH24217	A security flaw (CVE-2024-43485) when using Npgsql makes it vulnerable to algorithmic complexity attacks, which can lead to denial of service.	Y	Y
PH24224	Update security bug fixes absorbed by PostgreSQL17.1 to Fujitsu Enterprise Postgres. - CVE-2024-10976 - CVE-2024-10977 - CVE-2024-10978 - CVE-2024-10979	Y	Y
PH24249	Update security bug fixes absorbed by PostgreSQL 17.2 to Fujitsu Enterprise Postgres. - When CVE-2024-10978, which was absorbed in PostgreSQL 17.1, is applied, the role specified in SET ROLE does not take effect in the SQL command ALTER ROLE.	Y	Y

Y : Fixed
- : Not relevant to this product

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FUJITSU

Fujitsu
Enterprise Postgres 17

Release Notes

Windows

B1WS-1491-01ENZ0(00)
November 2024

Preface

Purpose of this document

This document provides release information for Fujitsu Enterprise Postgres.

Structure of this document

This document is structured as follows:

Chapter 1 New Features and Improvements

Explains the new features and improvements in this version.

Chapter 2 Compatibility Information

Provides information regarding compatibility.

Chapter 3 Program Updates

Explains updates incorporated in this version.

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Issue date and version

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Contents

Chapter 1 New Features and Improvements

This chapter explains Fujitsu Enterprise Postgres new features and improvements added in this version.

Table 1.1 New features and improvements

Version and level	Classification	Feature	Provided in AE	Provided in SE
17	OSS	PostgreSQL Rebase	Y	Y
		OSS Updates Provided	Y	Y
	Performance	Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)	Y	Y
	Operation	Vector-enabled database	Y	Y
	Monitoring	Operational Database Monitoring with Amazon CloudWatch	Y	Y
	Security	Privileged User Management with CyberArk Privileged Access Manager	Y	N

1.1 Features Added in 17

This section explains new features and improvements in Fujitsu Enterprise Postgres 17.

1.1.1 OSS

This section explains the new feature related to OSS:

- PostgreSQL Rebase
- OSS Updates Provided

1.1.1.1 PostgreSQL Rebase

The PostgreSQL version that Fujitsu Enterprise Postgres is based on is 17.0.

1.1.1.2 OSS Updates Provided

The OSS provided by Fujitsu Enterprise Postgres has been updated.

See

Refer to "OSS Supported by Fujitsu Enterprise Postgres" in the General Description for details.

1.1.2 Performance

This section describes new features related to Performance.

- Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)

1.1.2.1 Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)

The following functions have been added.

- Add vacuum freezing statistics to help schedule aggressive freeze for tuples (VACUUM FREEZE) to avoid work stoppages when autovacuum does not perform freezing of transaction IDs in time.
- Provide scripts to perform efficient aggressive freeze for tuples (VACUUM FREEZE).

See

Refer to "Scheduling of an aggressive freeze for tuples (VACUUM FREEZE)" in the Operation Guide.

1.1.3 Operation

This section describes new features related to Operation.

- Vector-enabled database

1.1.3.1 Vector-enabled database

It captures the peripheral OSS pgvector, allowing vector storage and similarity searching to work.

See

Refer to "OSS Supported by Fujitsu Enterprise Postgres" in the General Description for details.

1.1.4 Monitoring

This section describes new features related to Monitoring.

- Operational Database Monitoring with Amazon CloudWatch

1.1.4.1 Operational Database Monitoring with Amazon CloudWatch

You can use Amazon CloudWatch, a monitoring tool provided by Amazon Web Services, to collect metrics and logs about your databases, and use the collected information to monitor database operations.

See

Refer to "Operational Database Monitoring with Amazon CloudWatch" in the Operation Guide.

1.1.5 Security

This section describes new features related to Security.

- Privileged User Management with CyberArk Privileged Access Manager

1.1.5.1 Privileged User Management with CyberArk Privileged Access Manager

It works with CyberArk Privileged Access Manager (PAM) to protect and monitor privileged users.

See

Refer to "List of Features" in the General Description for details.

Chapter 2 Compatibility Information

This chapter explains incompatible items and actions required when migrating from an earlier version to Fujitsu Enterprise Postgres 17. Check compatibility before migrating and take the appropriate action.

2.1 Installation/Setup Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Removing Operating System Support for Client Feature	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Removing Operating System Support for Server Assistant Feature	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Perl Version Changes Required When Using PL/Perl	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tcl Version Changes Required When Using PL/Tcl	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Removing Operating System Support for Client Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
How max_wal_senders is calculated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
How max_worker_processes is calculated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Removing Operating System Support for Client Feature	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Removing Operating System Support for Server Feature	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Removing Operating System Support for Client Feature	N	N	Y	Y	Y	N	Y	N	N	N	N	N
Removing Operating System Support for Client Feature	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Removing Operating System Support for Server Feature	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Changing the way OSS is set up	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Changing Core and Log File Paths when Instance is Created with WebAdmin	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Renaming WebAdmin Services	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Changing the features targeted for installation in a 64-bit environment	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the access permissions of the Windows client installation folder	Y	Y	N	N	N	N	N	N	N	N	N	N

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the WebAdmin installation method	Y	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.1.1 Removing Operating System Support for Client Feature

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, the following operating systems have been removed.

- RHEL8.5 or earlier
- SLES 15 SP3 or earlier

Action method

None.

2.1.2 Removing Operating System Support for Server Assistant Feature

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, the following operating systems have been removed.

- RHEL8.5 or earlier
- SLES 15 SP3 or earlier

Action method

None.

2.1.3 Perl Version Changes Required When Using PL/Perl

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, change the required Perl version to 5.40.0 when using PL/Perl.

Action method

None.

2.1.4 Tcl Version Changes Required When Using PL/Tcl

Incompatibility

In Fujitsu Enterprise Postgres 17 or later, changes the required Tcl version to 9.0 when using PL/Tcl based on the Python 3 language.

Action method

None.

2.1.5 Removing Operating System Support for Client Feature

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, the following operating systems have been removed.

- RHEL7
- SLES 12

Action method

None.

2.1.6 How max_wal_senders is calculated

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, Fujitsu Enterprise Postgres uses the following values from the value set for the max_wal_senders parameter:

Policy-based password management in a streaming replication environment : Number of direct downstream hot standby servers

Action method

If necessary add a value for the max_wal_senders parameter.

2.1.7 How max_worker_processes is calculated

Incompatibility

In Fujitsu Enterprise Postgres 16 or later, Fujitsu Enterprise Postgres uses the following values from the value set for the max_worker_processes parameter:

Default value to use : 1

Policy-based password management in a streaming replication environment with a hot standby server : 1

Action method

If necessary add a value for the max_worker_processes parameter.

2.1.8 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 SP1 or later, the following operating systems have been removed.

- Windows Server(R) 2012
- Windows Server(R) 2012 R2

Action method

None.

2.1.9 Removing Operating System Support for Server Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 SP1 or later, the following operating systems have been removed.

- Windows Server(R) 2012

- Windows Server(R) 2012 R2

Action method

None.

2.1.10 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 13 or later, the following operating systems have been removed.

- SLES 12 SP4 or earlier

Action method

None.

2.1.11 Removing Operating System Support for Client Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, the following operating systems have been removed.

- Windows(R) 7
- Windows Server(R) 2008
- RHEL6

Also, the 32 bit Linux client can no longer be installed because RHEL 6 has been removed from the operating system.

Action method

None.

2.1.12 Removing Operating System Support for Server Feature

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, the following operating systems have been removed.

- Windows Server(R) 2008

Action method

None.

2.1.13 Changing the Way OSS is Set Up

Incompatibility

FUJITSU Enterprise Postgres 12 or later do not place OSS extension modules in the executable directory. The OSS extension modules must be placed in the executable directory when you set up OSS.

Refer to "Setting Up and Removing OSS" in the Installation and Setup Guide for Server for details.

Action method

None.

2.1.14 Changing Core and Log File Paths when Instance is Created with WebAdmin

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, change the core and log file paths when creating an instance in WebAdmin.

FUJITSU Enterprise Postgres 11 or earlier

Log File Path: *userProfileFolder**localSettingsFolder*\Fujitsu\fsep_*version**instanceNamePortNumber*\log

Core File Path: *userProfileFolder**localSettingsFolder*\Fujitsu\fsep_*version**instanceNamePortNumber*\core

version: product version_edition_architecture

［Example］

Log File Path: C:\Users\naomi\AppData\Local\Fujitsu\fsep_110_AE_64\myinst27599\log

Core File Path: C:\Users\naomi\AppData\Local\Fujitsu\fsep_110_AE_64\myinst27599\core

FUJITSU Enterprise Postgres 12

*userProfileFolder**localSettingsFolder*\Fujitsu\fsep_*version**instanceNamePortNumber*\log

Core File Path: *userProfileFolder**localSettingsFolder*\Fujitsu\fsep_*version**instanceNamePortNumber*\core

version: product version_WA_architecture

［Example］

Log File Path: C:\Users\naomi\AppData\Local\Fujitsu\fsep_120_WA_64\myinst27599\log

Core File Path: C:\Users\naomi\AppData\Local\Fujitsu\fsep_120_WA_64\myinst27599\core

Action method

None.

2.1.15 Renaming WebAdmin Services

Incompatibility

In FUJITSU Enterprise Postgres 12 or later, change the service name registered when you set up WebAdmin.

FUJITSU Enterprise Postgres 11 or earlier

fsep_*x*SP*z*_*edition*_64_WebAdmin_Port1

fsep_*x*SP*z*_*edition*_64_WebAdmin_Port2

FUJITSU Enterprise Postgres 12 or later

fsep_xSPz_WA_64_WebAdmin_Port1

fsep_xSPz_WA_64_WebAdmin_Port2

Action method

None.

2.1.16 Changing the Features Targeted for Installation in a 64-bit Environment

Incompatibility

32 bit Linux client can no longer be installed on RHEL7 in FUJITSU Enterprise Postgres 10 or later.

Note: 32 bit Linux client can install on RHEL6 in FUJITSU Enterprise Postgres 11 or earlier.

Action method

None.

2.1.17 Changing the Access Permissions of the Windows Client Installation Folder

Incompatibility

When changed for install folder the Windows client from default, the access permissions of the installed files and folder changes to read and execute.

The above changes apply to non-administrators.

This incompatibility occurs with all supported Windows client operating systems. Refer to "Required Operating System" in the Installation and Setup Guide for Client for information on the operating environment.

Action method

This change was made simply to enhance security, therefore, no action is normally required.

However, if existing access permissions are required, this change can be reverted by running *installDir*\setup\revert_cacls.bat as an administrator after installation.

2.1.18 Changing the WebAdmin Installation Method

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or later, WebAdmin is not installed automatically during server installation. Therefore, install WebAdmin separately.

Action method

None.

2.2 Application Migration Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the OID of the Data Type (NCHAR type) that Handles National Characters	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Changed the Specification Method of the Connection Destination Switching Function of the Application	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Changes in ecpg/ecobpg Handling of Zero-Length Unicode Identifiers	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the display result when data masking is applied to NaN, infinity, -infinity	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
Changing the Valid Range of Identifiers Defined by the DECLARE STATEMENT statement	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
Changing Precompile Results	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
Changing the Trigger Replacement Process	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
Change the "elif" Statement Behavior in ecobpg	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Changed to Error when Running an Operator or Function that Returns non Data Types for Masking Type	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Removing UTL_FILE for Oracle Database Compatibility Features	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Changing the method of specifying the application connection switch feature	Y	Y	N	N	N	N	N	N	N	N	N	N
PostgreSQL compatibility of embedded SQL applications in C and COBOL	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing Vertical Clustered Index (VCI)	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing how to use the features compatible with Oracle databases	Y	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.2.1 Changing the OID of the Data Type (NCHAR type) that Handles National Characters

Incompatible

In Fujitsu Enterprise Postgres 15, OIDs for national character data types (NCHAR types) have changed.

Action method

If you are using a national character data type (NCHAR type), recompile the application and run it with Fujitsu Enterprise Postgres 15 or later clients.

2.2.2 Changed the Specification Method of the Application Connection Switch Feature

Incompatible

In Fujitsu Enterprise Postgres 15, the name of the "target server" specified by the application connection switch feature will be changed.

Action method

For applications that specify a target server as the application connection switch feature, change the target server according to the table below, recompile, and then execute using a client of Fujitsu Enterprise Postgres 15 or later.

Table 2.1 Specified name of the target server.

Target of use	Before modification	After modification
Leverage .NET Data Provider	TargetServerType	TargetSessionAttributes

2.2.3 Changes in ecpg/ecobpg Handling of Zero-Length Unicode Identifiers

Incompatible

In Fujitsu Enterprise Postgres 15, if the SQL statement contains a zero-length Unicode identifier, Change precompilation to fail.

Action method

None.

2.2.4 Changing the display result when data masking is applied to NaN, infinity, -infinity

Incompatibility

In FUJITSU Enterprise Postgres 14, the display result when data masking is applied to NaN, infinity, and -infinity will be changed.

FUJITSU Enterprise Postgres 13 SP1 or earlier

If the float type NaN, infinity, and -infinity are partially masking with (9,1,2), the following will be displayed.

```
NaN : 99
Infinity : 99
-Infinity : 99
```

FUJITSU Enterprise Postgres 14 or later

If the float type NaN, infinity, and -infinity are partially masking with (9,1,2), the following will be displayed.

```
NaN : NaN
Infinity : Infinity
-Infinity : -Infinity
```

Action method

If the application is analyzing the SQL masking output result, please consider the non-numeric output result and correct it.

2.2.5 Changing the Valid Range of Identifiers Defined by the DECLARE STATEMENT statement

Incompatibility

In FUJITSU Enterprise Postgres 14 will change the valid range of identifiers defined by a DECLARE STATEMENT statement in ecpg/ecobpg.

FUJITSU Enterprise Postgres 13 SP1 or earlier

The valid range is now per process.

FUJITSU Enterprise Postgres 14 or later

The valid range is now per file.

Action method

None.

2.2.6 Changing Precompile Results

Incompatibility

In FUJITSU Enterprise Postgres 14 removed the ECPGdeclare/ECPGopen function. Therefore, results precompiled from earlier versions of FUJITSU Enterprise Postgres will not be available in FUJITSU Enterprise Postgres 14.

Action method

Rebuild the application.

2.2.7 Changing the Trigger Replacement Process

Incompatibility

In FUJITSU Enterprise Postgres 14 will change restricted triggers to not be supported by replace operations (OR REPLACE).

FUJITSU Enterprise Postgres 13 SP1 or earlier

You can replace a constraint trigger.

[Example]

```
=# CREATE OR REPLACE CONSTRAINT TRIGGER my_constraint_trigger AFTER DELETE ON my_table
-# FOR EACH ROW
-# EXECUTE PROCEDURE funcA();
CREATE TRIGGER
```

FUJITSU Enterprise Postgres 14 or later

It does not support replacing a constraint trigger.

[Example]

```
=# CREATE OR REPLACE CONSTRAINT TRIGGER my_constraint_trigger AFTER DELETE ON my_table
-# FOR EACH ROW
-# EXECUTE PROCEDURE funcA();
ERROR:  CREATE OR REPLACE CONSTRAINT TRIGGER is not supported
```

Action method

None.

2.2.8 Change the "elif" Statement Behavior in ecobpg

Incompatibility

The "elif" statement now works correctly with FUJITSU Enterprise Postgres 13.

FUJITSU Enterprise Postgres 12 or earlier

The decision of the "elif" statement is made whether or not the "ifdef/ifndef" condition is met.

[Example]

```
000000     EXEC SQL ifdef DEF1 END-EXEC.
000000     Operation (1).
000000     EXEC SQL elif DEF2 END-EXEC.
000000     Operation (2).
000000     EXEC SQL else END-EXEC.
000000     Operation (3).
```

If "DEF1" and "DEF2" are true, both "Operation (1)" and "Operation (2)" are executed.

FUJITSU Enterprise Postgres 13 or later

If the condition "ifdef/ifndef" is met, the judgment of the "elif" statement is not enforced.

[Example]

```
000000     EXEC SQL ifdef DEF1 END-EXEC.
000000     Operation (1).
000000     EXEC SQL elif DEF2 END-EXEC.
000000     Operation (2).
000000     EXEC SQL else END-EXEC.
000000     Operation (3).
```

If "DEF1" and "DEF2" are true, only "Operation (1)" is executed.

Action method

Check your existing application and fix the elif statement to work correctly.

2.2.9 Changed to Error when Running an Operator or Function that Returns non Data Types for Masking Type

Incompatibility

In FUJITSU Enterprise Postgres 12, changed to error when running an operator or function that returns non Data Types for Masking type.

FUJITSU Enterprise Postgres 11 or earlier

In the following cases, the operator or function in 3) may be executed without masking.

This is an incorrect result because the data containing the masking column is performed without masking.

1) Create a Masking policy. and

2) Execute a SELECT statement. and

3) Execute an operator or function in the SELECT statement of 2). and

4) The operator or function argument of 3) includes a subquery. and

5) The operator or function argument of 3) contains the column to be protected created in 1). and

6) The operator or function of 3) returns a type not listed in "Data Types for Masking" in "Operation Guide".

FUJITSU Enterprise Postgres 12 or later

Operator or function results of 3) in the following error.

```
ERROR:  The output data type is incompatible with the confidential policy.
HINT:  Data type of the result value(s) produced by expression/function using confidential columns
is not supported by Data masking module. Consider removing confidential columns from such
expressions/functions.
```

This is correct because the operator or function returns a data type not listed in "Data Types for Masking" in "Operation Guide".

Action method

Do one of the following to ensure that the results are identical to those of FUJITSU Enterprise Postgres 11 and earlier:

1) Modify the Masking policy to prevent masking from being performed for the user executing the SQL.

2) Modify SQL to not use operators or functions that return types not listed in "Data Types for Masking" in "Operation Guide".

2.2.10 Removing UTL_FILE for Oracle Database Compatibility Features

Incompatibility

In FUJITSU Enterprise Postgres 12, remove the Oracle database compatibility UTL_FILE.

Action method

None.

2.2.11 Changing the Method of Specifying the Application Connection Switch Feature

Incompatibility

The target server specified using the application connection switch feature is changed to the same name as that of PostgreSQL.

Action method

Use the FUJITSU Enterprise Postgres 10 or later client to execute applications that have the target server specified as the application connection switch feature after changing the target server and specified value as listed below and recompiling.

Specified name of the target server

Usage target	Before correction	After correction
JDBC driver	No change	
ODBC driver	TargetServer	target_session_attrs
.NET Data Provider	target_server	TargetServerType
Connection service file	target_server	target_session_attrs
Library (libpq) for C	target_server Environment variable (PGXTARGETSERVER)	target_session_attrs Environment variable (PGTARGETSESSIONATTRS)
Embedded SQL	target_server	target_session_attrs
psql	Environment variable (PGXTARGETSERVER)	Environment variable (PGTARGETSESSIONATTRS)

Specified value for the target server

Server selection order	JDBC driver	.NET Data Provider		Other driver	
		Before correction	After correction	Before correction	After correction
Primary server	No change	primary	master	primary	read-write
Standby server	No change	-	slave	-	-
Priority given to a standby server	No change	prefer_standby	preferSlave	prefer_standby	prefer-read
Any	No change	-	any	-	any

2.2.12 PostgreSQL Compatibility of Embedded SQL Applications in C and COBOL

Incompatibility

Embedded SQL applications in C and COBOL that were compiled with FUJITSU Enterprise Postgres 9.6 or earlier cannot be used in the FUJITSU Enterprise Postgres 10 client.

Action method

Use the FUJITSU Enterprise Postgres 10 or later client to execute the applications only after recompiling them with the FUJITSU Enterprise Postgres 10 or later client.

2.2.13 Changing Vertical Clustered Index (VCI)

Incompatibility

The functions below have been added to the functions for which VCI is not used.

Type	Function
Date/time functions	age(timestamp) current_date current_timestamp current_time localtime localtimestamp
Session information functions	current_user current_role

Action method

To use VCI, specify the second argument when using the age function, and specify other functions as subqueries.

[Example]

Before: select age(column A), current_date from table

After: select age(column A, **now()**), **(select current_date)** from table

2.2.14 Changing how to Use the Features Compatible with Oracle Databases

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or later, to use the features compatible with Oracle databases, create a new instance and execute the following command for the "postgres" and "template1" databases:

CREATE EXTENSION oracle_compatible

Action method

None.

2.3 Operation Migration Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Deprecation of Some Encryption Algorithms in pgcrypto	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Deprecation of Certificates Signed Using SHA1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Abolition of Message Numbers	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Rename column "master_pid" in pgx_loader_state to "leader_pid"	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N
Changing the Value of the Category Column in the pg_settings view	N	Y	Y	Y	Y	N	N	N	N	N	N	N
Changing pgx_stat_lwlock of the Statistics View	N	Y	Y	Y	Y	N	N	N	N	N	N	N
Changing the Behavior of pgx_rcvall	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Mirroring Controller no longer retries to monitor database processes when they are detected as down	Y	N	Y	Y	N	N	N	N	N	N	N	N
Changing the Name and Parameter Name of the Mirroring Controller Post-Promote Command	N	N	Y	Y	N	N	N	N	N	N	N	N
Changing Mirroring Controller User Command Input Values	N	N	Y	Y	N	N	N	N	N	N	N	N
Changing the maximum number of connections per server	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the encryption settings using the ALTER TABLESPACE statement	Y	Y	N	N	N	N	N	N	N	N	N	N
Changing the default configuration of the cluster system using database multiplexing	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the default operation when mc_ctl command options are omitted	Y	N	N	N	N	N	N	N	N	N	N	N

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the connection settings when Mirroring Controller connects to an instance	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the status display of the Mirroring Controller server	Y	N	N	N	N	N	N	N	N	N	N	N
Changing the operation when the synchronous_standby_names parameter is changed during database multiplexing operation	Y	N	N	N	N	N	N	N	N	N	N	N
Changing masking policy definition for unsupported data types	Y	N	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.3.1 Deprecation of Some Encryption Algorithms in pgcrypto

Incompatibility

In Fujitsu Enterprise Postgres 16 and later, the PostgreSQL extension pgcrypto does not support the use of the encryption algorithm, which has become a legacy algorithm in the OpenSSL3 family, by default.

The encryption algorithms that are no longer available by default are:

- BF
- CAST5
- DES-ECB
- DES-CBC
- MD4
- Whirlpool

Action method

If you use a legacy OpenSSL provider, create an OpenSSL configuration file and set the parameters in postgresql.conf. Refer to "Settings for Using Legacy OpenSSL Providers" in the Installation and Setup Guide for Server for information .

2.3.2 Deprecation of Certificates Signed Using SHA1

Incompatibility

In Fujitsu Enterprise Postgres 16 and later, you cannot connect to a database server using a certificate signed using SHA1.

Action method

Resubmit the certificate used for certificate authentication with SHA2 or higher.

2.3.3 Abolition of Message Numbers

Incompatibility

In Fujitsu Enterprise Postgres 15, the message number output at the end of the message is abolished.

Message numbers are output for messages output by Mirroring Controller.

For FUJITSU Enterprise Postgres 14 or earlier

The message number was printed at the end of the message.

[example]

```
3D000: 2017-07-10 19:41:05 JST[13899]: [1-1] user=fepuser,db=fep,remote=127.0.0.1(51902)
app=[unknown] FATAL: database "fep" does not exist (10571)
```

For Fujitsu Enterprise Postgres 15

No message number is output at the end of the message.

[example]

```
3D000: 2023-04-10 19:41:05 JST [13899]: [1-1] user = fepuser,db = fep,remote = 127.0.0.1(51902)
app = [unknown] FATAL: database "fep" does not exist
```

Action method

None.

2.3.4 Rename column "master_pid" in pgx_loader_state to "leader_pid"

Incompatibility

In FUJITSU Enterprise Postgres 14 renames column "master_pid" to "leader_pid" in the pgx_loade_state table.

Action method

None.

2.3.5 Changing the Value of the Category Column in the pg_settings view

Incompatibility

For FUJITSU Enterprise Postgres 13, change the value of the category column in the pg_settings view.

FUJITSU Enterprise Postgres 12 or earlier

Original value	wrong value
Preset Options	Fujitsu Enterprise Postgres Parameters
Customized Options	Preset Options
Developer Options	Customized Options

This is an incorrect result because it is different from the original value.

FUJITSU Enterprise Postgres 13 or later

The correct value is the category column in the pg_settings view.

Action method

Replaces the category column in the pg_settings view with the values before migration, so that the results are the same as before migration.

2.3.6 Changing pgx_stat_lwlock of the Statistics View

Incompatibility

In FUJITSU Enterprise Postgres 13, change the wait event name displayed in the lwlock_name column of the statistics view pgx_stat_lwlock.

Wait Event Name

FUJITSU Enterprise Postgres 12 or earlier	FUJITSU Enterprise Postgres 13
clog (*1)	XactBuffer
commit_timestamp (*1)	CommitTSBuffer
subtrans (*1)	SubtransBuffer
multixact_offset (*1)	MultiXactOffsetBuffer
multixact_member (*1)	MultiXactMemberBuffer
async (*1)	NotifyBuffer
oldserxid (*1)	SerialBuffer
wal_insert (*1)	WALInsert
buffer_content (*1)	BufferContent
buffer_io (*1)	BufferIO
replication_origin (*1)	ReplicationOriginState
replication_slot_io (*1)	ReplicationSlotIO
proc (*1)	LockFastPath
buffer_mapping (*1)	BufferMapping
lock_manager (*1)	LockManager
predicate_lock_manager (*1)	PredicateLockManager
parallel_hash_join (*3)	ParallelHashJoin
parallel_query_dsa (*2)	ParallelQueryDSA
session_dsa (*3)	PerSessionDSA
session_record_table (*3)	PerSessionRecordType
session_typmod_table (*3)	PerSessionRecordTypmod
shared_tuplestore (*3)	SharedTupleStore
tbm (*2)	SharedTidBitmap
parallel_append (*3)	ParallelAppend
serializable_xact (*4)	PerXactPredicateList
shared_mcxt (*4)	SharedMcxt
meta_cache_map (*4)	MetaCacheMap
global_metacache (*4)	GlobalCatcache
cached_buf_tranche_id (*4)	CachedBufTranche

*1) Events added in FUJITSU Enterprise Postgres 9.6.

*2) Events added in FUJITSU Enterprise Postgres 10.

*3) Events added in FUJITSU Enterprise Postgres 11.

*4) Events added in FUJITSU Enterprise Postgres 12.

Action method

None.

2.3.7 Changing the Behavior of pgx_rcvall

Incompatibility

In FUJITSU Enterprise Postgres 13, change the pgx_rcvall command to fail if the -e option of the pgx_rcvall command specifies a future time or if the -n option specifies a list appointment that does not exist.

FUJITSU Enterprise Postgres 12 or earlier

All archived WALs are applied for recovery if the -e option of the pgx_rcvall command specifies a time in the future, or if the -n option specifies a list appointment that does not exist.

FUJITSU Enterprise Postgres 13 or later

The pgx_rcvall command fails if the -e option of the pgx_rcvall command specifies a time in the future, or if the -n option specifies a list appointment that does not exist.

Action method

Specify recovery objectives correctly, if necessary.

2.3.8 Mirroring Controller no Longer Retries to Monitor Database Processes when they are Detected as Down

Incompatibility

For the FUJITSU Enterprise Postgres Mirroring Controller, change the heartbeat monitoring of the database process so that it does not retry monitoring when it detects down.

Action method

None.

2.3.9 Changing the Name and Parameter Name of the Mirroring Controller Post-Promote Command

Incompatibility

In the FUJITSU Enterprise Postgres 12 Mirroring Controller, change the name of the post-promote command, which is the state transition command, and the parameter name in the server configuration file that specifies the post-promote command.

FUJITSU Enterprise Postgres 11 or earlier

- Command Name

  post-promote command

- The parameter name in the server configuration file that specifies the post-promote command

  post_promote_command

FUJITSU Enterprise Postgres 12 or later

- Command Name

  post-switch command

- The parameter name in the server configuration file that specifies the post-promote command

  post_switch_command

Action method

The post_promote_command parameter in the server configuration file continues to be available in FUJITSU Enterprise Postgres 12 or later.If specified in the server configuration file, it acts as a post-switch command.You cannot specify the post_promote_command and post_switch_command parameters at the same time.

2.3.10 Changing Mirroring Controller User Command Input Values

Incompatibility

Arguments (Fixed value: primarycenter) have been added to the following user commands:

- Fencing command of the database server
- Arbitration command
- Post-switch command
- Pre-detach command
- Post-attach command

Action method

If you are checking the number of arguments in a user command, increase the number of arguments by one.

2.3.11 Changing the Maximum Number of Connections per Server

Incompatibility

The maximum number of connections per server is changed from 262,143 to 65,535.

Action method

None.

2.3.12 Changing the Encryption Settings Using the ALTER TABLESPACE Statement

Incompatibility

The ALTER TABLESPACE statement can be used to change the tablespace encryption settings if data is not stored in the tablespace.

Action method

None.

2.3.13 Changing the Default Configuration of the Cluster System Using Database Multiplexing

Incompatibility

In FUJITSU Enterprise Postgres 10, a split brain will not occur if heartbeat monitoring using an admin network times out, so the default is changed to a system configuration requiring an arbitration server acting as a third party.

FUJITSU Enterprise Postgres 9.6 or earlier

A cluster system comprises two database servers.

FUJITSU Enterprise Postgres 10 or later

By default, a cluster system comprises two database servers and an arbitration server.

Action method

If selecting the same system configuration as that in FUJITSU Enterprise Postgres 9.6 or earlier, set the parameters below in the server configuration file to perform automatic degradation unconditionally when a heartbeat abnormality is detected during OS/server heartbeat monitoring.

- Parameter: heartbeat_error_action
- Value: fallback

2.3.14 Changing the Default Operation when mc_ctl Command Options are Omitted

Incompatibility

In FUJITSU Enterprise Postgres 10, the default operation when the mc_ctl command options below are omitted has been changed:

- The -f option during start mode
- The -w option during start mode

FUJITSU Enterprise Postgres 9.6 or earlier

- If the -f option is omitted, automatic switching and disconnection immediately after the startup of Mirroring Controller will not be enabled.
- If the -w option is omitted, the system will not wait for operations to finish.

FUJITSU Enterprise Postgres 10 or later

- Even if the -f option is omitted, automatic switching and disconnection immediately after the startup of Mirroring Controller will be enabled.
- Even if the -w option is omitted, the system will wait for operations to finish.

Action method

If selecting the same operation as that in FUJITSU Enterprise Postgres 9.6 or earlier, take the action below when executing start mode of the mc_ctl command.

- If the -f option is omitted, specify the -F option.
- If the -w option is omitted, specify the -W option.

2.3.15 Changing the Connection Settings when Mirroring Controller Connects to an Instance

Incompatibility

In FUJITSU Enterprise Postgres 10, Mirroring Controller changes the connection setting below when connecting to an instance to detect failure of each database element.

- Application name

FUJITSU Enterprise Postgres 9.6 or earlier

- The application name is an empty string.

FUJITSU Enterprise Postgres 10 or later

- The application name is 'mc_agent'.

Action method

There is no method for changing the application name.

Therefore, if there is an application that identifies a database connection session of Mirroring Controller with the application name being an empty string, modify the process so that identification is performed using 'mc_agent'.

2.3.16 Changing the Status Display of the Mirroring Controller Server

Incompatibility

In FUJITSU Enterprise Postgres 10, the condition for displaying an abnormality for the process (WAL receive process) that receives transaction logs has been changed in regard to the server status display performed in status mode of the mc_ctl command of Mirroring Controller.

- Role of the applicable server (host_role): standby (standby)
- Display item: DBMS process status (db_proc_status)
- Display content: abnormal (abnormal process name)
  The applicability for incompatibility is determined based on whether 'wal_receiver' is included in the abnormality process name.

FUJITSU Enterprise Postgres 9.6 or earlier

Displays an abnormality when Mirroring Controller detects that the WAL send process has stopped.

FUJITSU Enterprise Postgres 10 or later

Displays an abnormality when Mirroring Controller detects that a streaming replication connection has not been established with the primary server using the WAL receive process.

Action method

If there is an application that determines the WAL receive process status from the display content retrieved using status mode of the mc_ctl command, modify as below to determine at the same level of accuracy as previously. However, this is not recommended due to incompatibilities accompanying the improvement in accuracy.

- If 'wal_sender' is included in the abnormal process name displayed in the 'abnormal' db_proc_status item of the 'primary' host_role, it is determined that an abnormality has occurred in the WAL receive process.
- If 'wal_sender' is not included in the abnormal process name displayed in the 'abnormal' db_proc_status item of the 'primary' host_role, it is determined that an abnormality has not occurred in the WAL receive process.

2.3.17 Changing the Operation when the synchronous_standby_names Parameter is Changed during Database Multiplexing Operation

Incompatibility

In FUJITSU Enterprise Postgres 9.6 or earlier, Mirroring Controller periodically accesses the database to retrieve the synchronous_standby_names parameter value using the SHOW command, and automatically recovers if changes are detected, in case the user accidentally changes the synchronous_standby_names parameter in postgresql.conf during database multiplexing mode. However, because this process uses the CPU of the database server for redundancy and SQL statements are executed with high frequency, these processes are not executed by default in FUJITSU Enterprise Postgres 10.

FUJITSU Enterprise Postgres 9.6 or earlier

Mirroring Controller checks if the synchronous_standby_names parameter in postgresql.conf has been mistakenly changed by the user.

FUJITSU Enterprise Postgres 10 or later

By default, Mirroring Controller does not check if the synchronous_standby_names parameter in postgresql.conf has been mistakenly changed by the user.

Action method

If selecting the same operation as that in FUJITSU Enterprise Postgres 9.6 or earlier, set the parameter below in the server definition file.

- Parameter: check_synchronous_standby_names_validation
- Value: 'on'

2.3.18 Changing Masking Policy Definition for Unsupported Data Types

Incompatibility

The data masking feature of FUJITSU Enterprise Postgres is updated so that an error occurs when a masking policy is defined for a column of an unsupported data type (array type or timestamp with timezone type).

FUJITSU Enterprise Postgres 9.5

The definition of a masking policy for a column of array type or timestamp with timezone type ends normally, but an error occurs when accessing a column of a table for which the policy is defined.

FUJITSU Enterprise Postgres 9.6 or later

An error occurs when defining a masking policy for a column of array type or timestamp with timezone type.

Action method

If a policy that was defined in FUJITSU Enterprise Postgres 9.5 includes masking of a column of an unsupported data type (array type or timestamp with timezone type), perform one of the following in FUJITSU Enterprise Postgres 9.6 or later:

- Ignore the error if the masking policy contains columns of only these data types, or delete the policy with the pgx_drop_confidential_policy system administration function.
- If the masking policy target contains columns of these data types and a supported data type, delete the problematic columns with the pgx_alter_confidential_policy system function.

2.4 JDBC Driver Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the targetServerType Value	Y	Y	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.4.1 Changing the targetServerType Value

Incompatibility

In FUJITSU Enterprise Postgres 13, the value of targetServerType specified in the connection string was changed. Therefore, the previously used values are no longer available.

Action method

If you specified a value for targetServerType, change the value as follows:

Table 2.2 Specified values for the target server

Server Selection Order	FUJITSU Enterprise Postgres 12 or earlier	FUJITSU Enterprise Postgres 13
Primary Server	master	primary
Standby Server	slave	secondary
Prefer Standby Server	preferSlave	preferSecondary
Any	any	any

2.5 ODBC Driver Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Cannot specify prefer-read for target_session_attrs	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.5.1 Cannot specify prefer-read for target_session_attrs

Incompatibility

FUJITSU Enterprise Postgres 14 users will not see the "prefer-read" radio button in the "Target_Session_Attrs" item of the data source option selection screen.

Action method

Select prefer-standby.

2.6 .NET Data Provider Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the Specification Method and Specified Values for the Application Connection Switch Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Changing the Behavior of the Application Connection Switch Feature	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Behavior Change when Multiple Host Information is Specified in the Connection String	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Changing the TargetServerType Value	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
Changing the Server Explorer View in Visual Studio Integration with .NET Data Provider	Y	Y	N	N	N	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.6.1 Changing the Specification Method and Specified Values for the Application Connection Switch Feature

Incompatibility

In Fujitsu Enterprise Postgres 15, the name of the "target server" specified by the connection switching function will be changed from "TargetServerType" to "TargetSessionAttributes", and the specified value will also be changed.

Action method

If the target server is specified, change the target server and specified value as follows.

Table 2.3 How to specify the connection destination switching function of the application and the specified value

Fujitsu Enterprise Postgres version		**FUJITSU Enterprise Postgres 9.6 or earlier**	**FUJITSU Enterprise Postgres 10/11/12**	**FUJITSU Enterprise Postgres 13/14**	**Fujitsu Enterprise Postgres 15**
Keywords to specify in the connection string		target_server	TargetServerType	TargetServerType	TargetSessionAttributes
Server selection order	Primary Server	primary(*1)	master(*1)	primary(*1)	read-write(*1) primary(*2)
	Standby Server	-	slave(*2)	standby(*2)	standby read-only(*2)
	Prefer Primary Server	-	-	-	prefer-primary
	Prefer Standby Server	prefer_standby	preferSlave	preferStandby	prefer-standby
	Any	-	any	any	any

*1: A primary server whose default transaction mode is read-only are not selected.

*2: A primary server whose default transaction mode is read-only is also selected.

2.6.2 Changing the Behavior of the Application Connection Switch Feature

Incompatibility

In Fujitsu Enterprise Postgres 15, when only one Host keyword is specified in the connection string, if a target server other than Any is specified, an exception will occur.

FUJITSU Enterprise Postgres 14 earlier

For example, if the connection string specifies "Host=host1, TargetServerType=primary", it will connect to host1 if host1 is the appropriate connection target.

Fujitsu Enterprise Postgres 15

For example, if "Host=host1, TargetSessionAttributes=primary" is specified in the connection string, an exception will always occur because the target server other than Any is specified for the specification of only one host information.

Action method

None.

2.6.3 Behavior Change when Multiple Host Information is Specified in the Connection String

Incompatibility

In Fujitsu Enterprise Postgres 15, when multiple hosts are specified in the connection string, even if one of them has an empty string specified, if another connectable connection destination is specified, that connection destination will be connected. In the old version, if there was even one host with an empty string, an exception would occur at that point.

FUJITSU Enterprise Postgres 14 earlier

For example, if "Host = host1," is specified in the connection string, an exception will always occur because the second host information is an empty string.

Fujitsu Enterprise Postgres 15

For example, if the connection string specifies "Host = host1," and if host1 is reachable, it will connect to host1 without throwing an exception.

Action method

None.

2.6.4 Changing the TargetServerType Value

Incompatibility

In FUJITSU Enterprise Postgres 13, the value of TargetServerType specified in the connection string was changed. Therefore, the previously used values are no longer available.

Action method

If you specified a value for TargetServerType, change the value as follows:

Table 2.4 Specified values for the target server

Server Selection Order	FUJITSU Enterprise Postgres 9.6 or earlier	FUJITSU Enterprise Postgres 10/11/12	FUJITSU Enterprise Postgres 13
Primary Server	primary	master	primary

Server Selection Order	FUJITSU Enterprise Postgres 9.6 or earlier	FUJITSU Enterprise Postgres 10/11/12	FUJITSU Enterprise Postgres 13
Standby Server	-	slave	standby
Prefer Standby Server	prefer_standby	preferSlave	preferStandby
Any	-	any	any

2.6.5 Changing the Server Explorer View in Visual Studio Integration with .NET Data Provider

Incompatibility

FUJITSU Enterprise Postgres 10 or later, the following changes occur when you view database resources in Server Explorer.

- "Schema Name.Table Name" display under the Tables folder.
- The Indexes folder is not displayed.
- The Triggers folder does not displayed.
- The Sequences folder is not displayed.
- The Procedures folder does not displayed.

Action method

None.

2.7 C Library (libpq) Migration Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing when "prefer-read" is Specified for the target_session_attrs Parameter	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.7.1 Changing when "prefer-read" is Specified for the target_session_attrs Parameter

Incompatibility

In FUJITSU Enterprise Postgres 14 changes the attach server priority if any of the following servers are specified simultaneously with "prefer-read" as the target_session_attrs parameter:

- Primary server (default_transaction_read_only = ON)
- Standby server

FUJITSU Enterprise Postgres 13 SP1 or earlier

The primary server (default_transaction_read_only = ON) and standby servers have the same priority.

FUJITSU Enterprise Postgres 14 or later

Standby servers connect in preference to primary servers (default_transaction_read_only = ON).

Action method

None.

2.8 pgaudit Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Repairing Unwanted Output in the Audit Log	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Changing to Output Extra NEW and OLD Values in the Audit Log when the Trigger Function Executes	N	N	Y	Y	Y	N	N	N	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.8.1 Repairing Unwanted Output in the Audit Log

Incompatibility

In Fujitsu Enterprise Postgres 16, we changed the audit log so that it no longer contains unwanted information at the end.

Fujitsu Enterprise Postgres 15 or earlier

Some audit logs contain unwanted content at the end.

[Example]

```
Input: INSERT INTO trig_test VALUES ('new value');
Part of the audit log: NOTICE:  AUDIT: SESSION,WRITE,,[local],,pg_regress/class,,baz,,
11,2,INSERT,,TABLE,public.trig_audit,,"INSERT INTO trig_audit SELECT 'I', now(), user, NULL,
NEW.*","(""new value"")  trig_audit AFTER ROW INSERT 16484 trig_test trig_test public 0  f"
```

Fujitsu Enterprise Postgres 16

Prevent unwanted from being output to the audit log.

[Example]

```
Input: INSERT INTO trig_test VALUES ('new value');
Part of the audit log: NOTICE:  AUDIT: SESSION,WRITE,,[local],,pg_regress/class,,baz,,
```

```
11,2,INSERT,,TABLE,public.trig_audit,,"INSERT INTO trig_audit SELECT 'I', now(), user, NULL,
NEW.*","(""new value"")"
```

Action method

None.

2.8.2 Changing to Output Extra NEW and OLD Values in the Audit Log when the Trigger Function Executes

Incompatibility

In FUJITSU Enterprise Postgres 13, the trigger function additionally outputs NEW and OLD values to the audit log when the pgaudit.log_parameter is set to on.

FUJITSU Enterprise Postgres 12 or earlier

The following (18) does not output the values of NEW, OLD.

[Example]

```
AUDIT: SESSION,WRITE,2020-09-03 07:07:39 UTC,
        (1)    (2)   (3)
[local],9775,psql,k5user,postgres,3/536, 1, 2, INSERT, ,
(4)     (5)  (6)  (7)    (8)      (9)   (10)(11)(12)(13)
TABLE,public.trig_audit, ,
(14)  (15)    (16)
 "INSERT INTO trig_audit SELECT 'U', now(), user, OLD.*, NEW.*",
(17)
trig_audit AFTER ROW UPDATE 92027 trig_test trig_test public 0  f aaaa
(18)
```

FUJITSU Enterprise Postgres 13 or later

NEW, OLD values are output.

[Example]

```
AUDIT: SESSION,WRITE,2020-09-03 07:07:39 UTC,
[local],9775,psql,k5user,postgres,3/536,1,2,INSERT,,TABLE,public.
trig_audit,,
"INSERT INTO trig_audit SELECT 'U', now(), user, OLD.*, NEW.*",
(bbb) (aaa) trig_audit AFTER ROW UPDATE 92027 trig_test trig_test
public 0  f aaaa
```

Action method

If you are using an application that works by monitoring the string that the trigger function output to the audit log, modify the application to work with the NEW and OLD values.

2.9 pg_dbms_stats Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Change in Execution Plan due to Fixed Height of Btree index	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Incompatibility of Import Features with Fixed Height of Btree index	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.9.1 Change in Execution Plan due to Fixed Height of Btree index

Incompatibility

Fixing statistics with the following features may change the execution plan because the height of the Btree index is now fixed as well:

- dbms_stats.lock_*
- dbms_stats.restore_*
- dbms_stats.import_*

Action method

If you want to run compatibility with Fujitsu Enterprise Postgres 15 and earlier, configure the following:

- pg_dbms_stats.use_tree_height
- pg_dbms_stats.lock_tree_height

2.9.2 Incompatibility of Import Features with Fixed Height of Btree index

Incompatibility

Statistics exported by the export function in pg_dbms_stats prior to Fujitsu Enterprise Postgres 15 cannot be imported using the legacy import function.

Action method

When importing statistics exported by the export function in pg_dbms_stats prior to Fujitsu Enterprise Postgres 15, use a function with the suffix "_no_tree_height" appended to its name.

2.10 orafce Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Interface changes due to enhancements to the DBMS_SQL package	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y: Incompatibility exists

N: Incompatibility does not exist

2.10.1 Interface changes due to enhancements to the DBMS_SQL package

Incompatibility

In Fujitsu Enterprise Postgres 17, includes enhancements to the DBMS_SQL package. The I/O interfaces of some functions have changed accordingly.

Refer to "Compatibility with Oracle Databases" in Application Development Guide.

Action method

If you are using the DBMS_SQL package, you will need to switch to the same procedures as Fujitsu Enterprise Postgres 16 SP1 or earlier for Oracle database compatibility enhancements, or modify your application.

Refer to "Compatibility with Oracle Databases" in Application Development Guide.

2.11 WebAdmin Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changing the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options'	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N
Cannot specify prefer-read for target_session_attrs	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.11.1 Changing the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options'

Incompatibility

In Fujitsu Enterprise Postgres 16, the default value of the item 'Number of digits for floating values' which is set in the section 'SQL options' in the view 'PostgreSQL configuration' is changed in order to match the default value of PostgreSQL.

Fujitsu Enterprise Postgres 15 or earlier

0

Fujitsu Enterprise Postgres 16 or later

1

Action method

Change the value of the item 'Number of digits for floating values', if necessary.

2.11.2 Cannot specify prefer-read for target_session_attrs

Incompatibility

FUJITSU Enterprise Postgres 14 will no longer allow prefer-read to target_session_attrs as a connection method to an upstream server that is specified when creating an instance of a standby server.

Action method

Specify prefer-standby.

2.12 Confidentiality Management Incompatibility

Item	Pre-migration version											
	9.5	9.6	10	11	12	13	12 SP1	13 SP1	14	15	16	16 SP1
Changes due to Changes in the pg_dump Specification	N	N	N	N	N	N	N	N	N	Y	N	N
Changing Permission Settings by Changing the CREATEROLE Permission	N	N	N	N	N	N	N	N	N	Y	N	N
Change due to Restriction of CREATEROLE Privilege	N	N	N	N	N	N	N	N	N	Y	N	N

Y: Incompatibility exists

N: Incompatibility does not exist

2.12.1 Changes due to Changes in the pg_dump Specification

Incompatibility

If you are using multiple non-superuser sensitivity confidentiality management role to manage the sensitivity matrix, run the product-provided policy configuration script to define a row-level security feature policy on the table provided by the sensitivity support feature to make the sensitivity management roles independent of each other.

In Fujitsu Enterprise Postgres 15 or earlier, the effects of this script could be retained and backed up by pg_dump, but as of Fujitsu Enterprise Postgres 16, policy settings can no longer be backed up.

Action method

In Fujitsu Enterprise Postgres 16 or later, if you are managing a sensitivity matrix using more than one confidentiality management role other than superuser, then immediately after restoring a clear-text dump file using pg_dump, run the following command as superuser to reapply the confidentiality management feature policy:

```
psql -f ${install_dir}/share/extension/pgx_confidential_management_support_policy.sql
```

2.12.2 Changing Permission Settings by Changing the CREATEROLE Permission

Incompatibility

In Fujitsu Enterprise Postgres 16, if you want to use a non-superuser role as a confidentiality management role, you may need to set additional permissions for the confidentiality management role.

Action method

The confidentiality management role must already have the privileges it expects to operate on, other than the CREATEROLE privilege.

[Example]

If the confidentiality management role "manager_role" is also going to work with CREATEDB privileges, it will also set CREATEDB privileges when the role is created, like this:

```
CREATE ROLE manager_role LOGIN CREATEROLE CREATEDB;
```

If the required permissions are not set, the sensitivity management API terminates abnormally with a message similar to the following:

```
ERROR:  permission denied to create role
DETAIL:  Only roles with the CREATEDB attribute may create roles with the CREATEDB attribute.
```

2.12.3 Change due to Restriction of CREATEROLE Privilege

Incompatibility

In Fujitsu Enterprise Postgres 16, if you want to use a non-superuser role as a secret management role, the permissions on the roles that can be set in the secret group are different, and the roles that you set in the secret group must be granted ADMIN OPTION permission on the secret confidentiality management role before they can be used.

Action method

Take one of the following actions:

- A role created with the privileges of the confidentiality management role is to be managed in the confidential group. This creates a role that grants only the ADMIN OPTIN privilege to the sensitive confidentiality management role.
- Grant ADMIN OPTION permission on the role to the sensitive management role before setting the managed role to the sensitive group.

[Example]

You want to grant only the ADMIN OPTION privilege for role "user _role1" to the confidentiality management role "manager_role".

```
GRANT user_role1 TO manager_role WITH ADMIN TRUE, INHERIT FALSE, SET FALSE;
```

If the required permissions are not set, the sensitivity management API terminates abnormally with a message similar to the following:

```
ERROR:  permission denied to alter role
DETAIL:  Only roles with the CREATEROLE attribute and the ADMIN option on role "user_role1" may
alter this role.
```

Chapter 3 Program Updates

This version incorporates the following fixes:

- PostgreSQL 17

See

Refer to the PostgreSQL Global Development Group website for information on the updates implemented in the following releases:

[PostgreSQL 17]

```
https://www.postgresql.org/docs/17/release-17.html
```

In addition, issues that occurred in previous versions are also fixed.

Refer to the following for details of the program fixes included in this version and level.

Table 3.1 Fujitsu Enterprise Postgres 17 Program Updates

P number	Update summary	AE	SE
PH24153	When Mirroring Controller uses an arbitration server, the mc_ctl status command might terminate abnormally.	Y	-
PH24182	When TCP communication such as connection connection is performed, communication may fail.	Y	Y
PH24183	The pgx_stat_lwlock system view shows incorrect contents in the lwlock_name column.	Y	Y
PH24217	A security flaw (CVE-2024-43485) when using Npgsql makes it vulnerable to algorithmic complexity attacks, which can lead to denial of service.	Y	Y
PH24224	Update security bug fixes absorbed by PostgreSQL17.1 to Fujitsu Enterprise Postgres. - CVE-2024-10976 - CVE-2024-10977 - CVE-2024-10978 - CVE-2024-10979	Y	Y
PH24249	Update security bug fixes absorbed by PostgreSQL 17.2 to Fujitsu Enterprise Postgres. - When CVE-2024-10978, which was absorbed in PostgreSQL 17.1, is applied, the role specified in SET ROLE does not take effect in the SQL command ALTER ROLE.	Y	Y

Y : Fixed
- : Not relevant to this product

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