

# New Features Bulletin

## Replication Agent™ 15.5

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This document describes the new features that are available for Replication Agent™ 15.5 for Linux, Microsoft Windows, and UNIX.

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## Downgrading Replication Agent

You can now downgrade Replication Agent version 15.5 to version 15.2 ESD#2, keeping the accuracy of data intact. Downgrading to the previous version may be necessary in these scenarios:

- When upgrading from a previous to a newer version of Replication Agent fails.
- After upgrading to a newer version, you encounter issues during replication, if:
  - The OQID format has changed in the newer version. To switch back to the old format, Replication Agent must clear old activities from Replication Server® and increase the generation ID of the OQID, to prevent any rejection of new records or duplication of existing records from Replication Server.
  - The contents and structure of the Replication Agent repository has changed, preventing the earlier version from directly reusing the repository of the newer version.
  - Replication fails although some Data Manipulation Language (DML) operations have been replicated successfully and Data Definition Language (DDL) changes have occurred in the primary database.

For downgrading instructions and information on the new APIs that support downgrading, see Appendix A, “Upgrading and Downgrading Replication Agent” in the *Replication Agent 15.5 Primary Database Guide* and the *Replication Agent 15.5 Reference Manual*.

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**Note** Configuration changes made after upgrade are not applied to the downgraded version; you must reapply such changes. Sybase® recommends that you apply the configuration changes only after the newer version has been stabilized in your environment.

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Databases supported

Downgrading is supported for these databases:

- Oracle
- Microsoft SQL Server
- IBM DB2 UDB

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**Note** To download Replication Agent 15.2 ESD#2, go to the Sybase EBF download site at <https://login.sybase.com/login/userLogin.do?referer=http%3A%2F%2Fdownload.s.sybase.com%2Fswd%2Fsummary.do>.

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## Running Replication Agent as a Windows service

You can now run Replication Agent as a Windows service, which allows you to manage it using standard Windows tools. You can use the new command utility `agt_service` to schedule a Replication Agent instance to start automatically whenever the machine is restarted. The instance runs in the background until you shut down.

For information on the new command utility, and how to create, delete, start, and stop a Replication Agent instance as a Windows service, see Chapter 2, “Setting Up and Configuring Replication Agent” in the *Replication Agent 15.5 Administration Guide*.

## New Replication Agent state

Replication Agent 15.5 introduces the following new states:

- **Replication Down** – indicates when a Replication Agent instance unexpectedly exits replication due to an unrecoverable error like a network failure, communication error, or any other fatal replication error. If the replication error is addressed successfully, for example, more disk space is provided in case of an out of disk space error and replication is successfully resumed, the status changes back to replicating once the resume command is issued.
- **Replicating (Resynchronization)** – indicates when a Replication Agent instance has been restarted and is resynchronizing the primary and replicate databases. When Replication Agent has completed resynchronizing the primary and replicate databases, it returns to the Replicating state.

See Chapter 3, “Administering Replication Agent” in the *Replication Agent 15.5 Administration Guide*

To support this feature, some of the existing properties and commands that could be earlier used only in the Admin state have been enhanced and can now also be used in the Replication Down state. See *Replication Agent 15.5 Reference Manual*.

## Autocorrection

Replication Agent now supports the autocorrection feature of Replication Server that prevents failures caused by missing or duplicate rows in a replicated table. In Replication Server, the `set autocorrection` command corrects discrepancies that may occur during materialization by converting each update or insert operations into a delete followed by an insert. A new Replication Agent command, `ra_set_autocorrection`, has been introduced to support the `set autocorrection` command of Replication Server. Use the `ra_set_autocorrection` command to set autocorrection on or off for one or all marked tables, and to return the autocorrection status. See the *Replication Agent 15.5 Reference Manual*.

When you set autocorrection on a marked table using `ra_set_autocorrection`, Replication Agent sends all columns of this table, instead of sending only those columns that have changed in the update statement, to Replication Server.

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**Note** Replication Server 15.5 heterogeneous datatype support (HDS) scripts are required to support this feature.

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Databases supported

The primary databases that support auto correction are:

- Oracle – the auto correction feature cannot work on LOB, LONG, LONG RAW, and user-defined type columns because of Oracle limitations for redo log recording.

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**Note** To support autocorrection, the default Oracle logging behavior is changed to enable supplemental logging for all columns. The `pds_username` must have the ALTER ANY TABLE privilege to execute the commands for enabling supplemental logging.

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- Microsoft SQL Server
- IBM DB2 UDB

See “Replication Server set autocorrection command” for each of the database, in the *Replication Agent 15.5 Primary Database Guide*.

Feature limitations

The limitations of this feature are:

- You cannot set autocorrection for unmarked tables.
- Replication Agent cannot alter the autocorrection setting for replication definitions.

## Microsoft SQL Server 2008 supported

Replication Agent 15.5 supports Microsoft SQL Server 2008, at the same level of functionality as supported for Microsoft SQL Server 2005, for both DDL and DML replication. On initialization, Replication Agent can now identify the release version of the Microsoft SQL Server primary database and load the appropriate system schemas into RASD.

See Chapter 2, “Replication Agent for Microsoft SQL Server” in the *Replication Agent 15.5 Primary Database Guide*.

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| Feature limitations | <p>Support for Microsoft SQL Server 2008 is limited to the same features that are supported for Microsoft SQL Server 2005. Replication Agent does not support the new features of Microsoft SQL Server 2008, such as:</p> <ul style="list-style-type: none"><li>• New date types including date, time, datetime2, datetimeoffset, hierarchyid, geometry and geography</li><li>• FILESTREAM data</li><li>• Transparent Data Encryption (TDE)</li><li>• Procedures with table-valued parameters (TVPs)</li><li>• Sparse column and column set</li><li>• Large user-defined types</li><li>• MERGE SQL statement</li></ul> |
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## Extended support for UDB 9.5 features

Replication Agent supports these DB2 UDB 9.5 features:

- Large identifiers – the length limit for most identifiers, for example, authorization ID, column, schema, has increased from 18 and 30 bytes to 128 bytes.

To support UDB 9.5 large identifiers, you must upgrade Replication Agent instances from versions 15.2 to 15.5, to accommodate the modified Replication Agent system tables. You must also upgrade Replication Agent instances when UDB is upgraded from an earlier version to 9.5. See the *Replication Agent 15.5 Primary Database Guide* for upgrade steps.

- Replication of DECFLOAT datatype – this datatype combines the accuracy of DECIMAL with some of the performance advantages of FLOAT. DECFLOAT datatype can have either 16 or 34 digits of precision.

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| Feature limitations | Replication Agent does not support these features of DB2 UDB 9.5: |
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- Replication Agent does not support replication of XML datatype, so restrictions have been imposed on marking a table containing XML columns. Replication Agent generates an error message each time an attempt is made to mark a table with XML columns.

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However, you may override this behavior by using the force keyword when marking a table. If the table containing an XML column is marked, Replication Agent skips the data in the XML columns and the XML data is not replicated.

- When replicating DECFLOAT columns from UDB to other back ends that do not support DECFLOAT or an equivalent datatype, DECFLOAT is mapped to FLOAT, which may cause a loss of precision.

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**Note** Replication Server 15.5 heterogeneous datatype support (HDS) scripts are required to replicate DECFLOAT.

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- Replication Agent does not support replication of DECFLOAT special values such as positive and negative INFINITY, NAN, and SNAN. Replication Agent replicates these values to NULL if the column is nullable, or “0.0” if the column is not nullable.

For more information, see the *Replication Agent 15.5 Primary Database Guide*.

## Oracle support

Replication Agent 15.5 supports:

- Oracle log operation troubleshooting aid
- Replication of Oracle ANYDATA datatype
- Replication of Oracle 10g XML datatype stored as a CLOB
- Replication of stored procedure containing Boolean argument
- Oracle 10g and 11g compressed tables
- Using Oracle Recovery Manager (RMAN) to truncate archive logs
- Coexistence for Oracle Data Guard
- Support for Oracle Flashback
- Oracle index-organized tables
- Oracle 10g running in 9i-compatibility mode and Oracle 11g running in 10g-compatibility mode
- DDL filters to limit replication of DDL commands

- Resynchronization of primary and replicate databases

## Oracle log operation troubleshooting aid

Replication Agent 15.5 lets you analyze Replication Agent failures that occur when processing Oracle log operations, so that you can determine a resolution to resume replication without losing data. You can now obtain detailed information for Oracle transactions and operations that cause Replication Agent failures, and rectify the problem in a timely manner. The new troubleshooting aid displays the original SQL statement that caused the error, and provides a recommendation on how to make the Replication Agent skip the transaction or operation, to keep the Replication Agent running. You can then apply the erroneous SQL statement to the replicate database for keeping it in sync with the primary database after the Replication Agent skips the operation or transaction.

Two new commands for Oracle, `ra_helpop` and `ra_dumptran`, enable you to obtain troubleshooting information pertaining to an operation or database transaction. See “Troubleshooting Oracle transactions and operations” in Chapter 1, “Replication Agent for Oracle,” of the *Replication Agent 15.5 Primary Database Guide*.

## Replication of Oracle ANYDATA datatype

Replication Agent 15.5 introduces support for replication of the ANYDATA datatype in an Oracle-to-Oracle replication system. ANYDATA, which can be used as a table column datatype, lets you store heterogeneous values in a single column. The values can be of SQL built-in types as well as user-defined types.

The ANYDATA datatype is supported only when the primary database and the replicate database are both Oracle, and when the primary table and replicate table have the same column, which is ANYDATA.



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A new configuration parameter, `pdb_ignore_unsupported_anydata` has been introduced to support the ANYDATA datatype. This parameter determines whether Replication Agent should ignore data for unsupported datatypes stored in ANYDATA columns or should send illegal data. If set to true, the unsupported data in the ANYDATA is not replicated to the replicate side. If set to false, illegal data is replicated, causing Replication Server to fail, thus allowing intervention or correction to take place in Replication Server or the replicate database, for each row containing unsupported data. See the *Replication Agent 15.5 Reference Manual*.

**Feature limitations**

Replication Agent does not extend support for ANYDATA when:

- Replication is from an ANYDATA column to a non-ANYDATA column.
- ANYDATA size exceeds 16KB, which is the size constraint of the Replication Server OPAQUE datatype.
- BFile, UROWID, REF, NESTED TABLE, and VARRAY datatypes are stored in the ANYDATA column.

See Chapter 1, “Replication Agent for Oracle,” in the *Replication Agent 15.5 Primary Database Guide*.

## Replication of Oracle 10g XML datatype stored as a CLOB

Replication Agent supports replication of the Oracle XMLType datatype, stored as character large object (CLOB), from Oracle to Oracle and Oracle to ASE. The XMLType datatype is a specialized datatype used to both store and process XML documents in an Oracle database. Setting up your table or columns to store XMLType datatype as CLOBs enables you to store XML documents without schema, in the database. You may want to use this feature when you are interested in storing and retrieving the whole document, or when you do not require replication to perform piece-wise updates on XML documents.

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**Note** You can use this feature with Replication Server 15.5 only. When replicating to Oracle, use ExpressConnect for Oracle.

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**Feature limitations**

Replication Agent 15.5 does not support:

- Oracle 10g XML Types not stored as CLOB.
- All Oracle 11g XML Types.

- Replication of data stored in Oracle XML DB repository using standard protocols such as FTP and HTTP(S) or WebDAV, and other Oracle XML DB API.

See Chapter 1, “Replication Agent for Oracle,” in the *Replication Agent 15.5 Primary Database Guide*.

## Replication of stored procedure containing Boolean argument

Replication Agent 15.5 supports replication of stored procedures that include Boolean arguments, from Oracle to other databases.

Replication Agent sends the Boolean argument as an integer value to Replication Server, then Replication Server uses a function string to convert the integer value to Boolean. To execute the corresponding procedure at the replicate site, you need to manually create the function string to convert the integer value to Boolean in Replication Server, for each procedure that includes Boolean arguments. See the *Replication Server 15.5 Reference Manual* for information on how to create the function string.

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**Note** Microsoft SQL Server does not support boolean as a stored procedure argument. For this database, map the Boolean argument at the primary site to an integer value at the replicate site. You need not create a function string when replicating to these databases.

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Products that support this feature include:

- Oracle 10g or later
- Replication Server 15.5
- Replication Agent 15.5

See Chapter 1, “Replication Agent for Oracle,” in the *Replication Agent 15.5 Primary Database Guide* for details on how to replicate stored procedures with Boolean arguments from Oracle to other databases.

## Oracle 10g and 11g compressed tables

Replication Agent 15.5 supports replicating data change operations from compressed tables in Oracle 10g and 11g. Data is replicated in the same manner as data from non-compressed tables.

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## Using Oracle Recovery Manager (RMAN) to truncate archive logs

Replication Agent 15.5 supports the Recovery Manager (RMAN) utility for manipulating the Oracle archive log. In earlier versions, if Replication Agent removed the old archive redo log files directly by file system operation, the Oracle system table and RMAN were not updated for file deletion. Replication Agent can now call the RMAN utility to perform archive log truncation, which helps to keep the information in the RMAN utility and the Oracle system table accurate. To prevent Replication Agent from using the old technique of archiving transaction logs and using the RMAN utility instead, you must enable this feature.

Three new configuration parameters have been introduced for this feature, `rman_enabled`, `rman_username`, and `rman_password`. See Chapter 2, “Configuration Parameters” in the *Replication Agent 15.5 Reference Manual*.

### Feature limitations

Replication Agent supports only the archive log truncation feature of the RMAN utility.

## Coexistence for Oracle Data Guard

Replication Agent 15.5 provides coexistence support for Oracle Data Guard. Oracle Data Guard provides the management, monitoring, and automation software infrastructure to create and maintain one or more synchronized standby databases to protect data from failures, disasters, errors, and corruption.

You can now set up Replication Agent on an Oracle database using Data Guards, without affecting your legacy Data Guard system. You can set up Replication Agent either on the primary database, which can be a single Oracle instance or Oracle RAC, or the logical standby database within a Data Guard configuration. Sybase recommends installing Replication Agent for Oracle on the logical standby database to minimize the changes made to the primary database and to provide a smooth failover from the primary database to the logical standby database.

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**Note** To configure Replication Agent to read from a Data Guard standby database transaction log, `pds_username` must have the alter database permission.

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See Chapter 1, “Replication Agent for Oracle,” in the *Replication Agent 15.5 Primary Database Guide*.

## Support for Oracle Flashback

Replication Agent 15.5 supports replication of Oracle Flashback at the table and transaction levels. Oracle Flashback provides the capability to query historical data, perform change analysis, and perform self-service repair to recover from logical corruptions while the database is online. Oracle customers can use Flashback to undo previous data changes, thereby minimizing application outages caused by operator or user errors, such as accidental deletion of valuable data, deletion of the wrong data, and dropping the wrong table.

Flashback operations supported by Replication Agent are:

- DML Flashback – replication of DML change from a command flashback table to a system change number (SCN), timestamp, or restore point. The only requirement is that `undo_retention` should be large enough so that the flashback command can be executed successfully. The DML changes results from executing the `undo_sql` from flashback query are naturally supported if the table is marked.
- DDL Flashback – captures the full DDL command from the Oracle redo log when the following commands are executed; `drop table to recyclebin`, `flashback table in recycle bin`, `purge table`, `purge index`, `purge tablespace`, `purge recyclebin`, `purge dba_recyclebin`. When the replicate database recycle bin is enabled, Replication Agent guarantees the replication of these DDL commands executed in the primary database to the replicate database. Since the recycle bin of the replicate database can be different from the primary database, these DDL commands may not successfully execute at the replicate database. In addition, the results of these DDL commands at the replicate database may be a little different from that in the primary database.
- Flashback Data Archive – replicating `alter`, `create`, or `drop` flashback data archive DDL commands. The Flashback Data Archive replication feature is only available for Oracle 11g primary and replicate databases.
- Flash Recover Area – reading archive logs from Oracle Flash Recover Area by configuring `pdb_archive_path` to the location of the `flash_recovery_area`.

To use this feature:

- `pds_username` must have Select permission on `SYS.RECYCLEBIN$`.
- `ddl_user` must have `sysdba` privilege and `ddl_username` should be suffixed with “as sysdba” if `purge dba_recyclebin` is replicated.

- Feature limitations
- When the replicate database recycle bin is disabled, the replication of flashback and purge commands executed in the primary database fails, in spite of successful replication of the drop table command since the table is dropped permanently at the replicate database.
  - For Oracle to non-Oracle replication, Replication Agent requires DDL replication to be turned off, since DDL translation is not supported. This prevents sending the flashback DDL command to Replication Server.
  - When multiple versions of a dropped table exist in the recycle bin of the replicate database, and the flashback table or purge table is replicated, the most recent version of dropped table is flashbacked or purged.
  - If a dropped table is flashbacked with the rename clause, replication definition is not automatically changed to match the new object name. You must manually adjust the replication definition.

See Chapter 1, “Replication Agent for Oracle,” in the *Replication Agent 15.5 Primary Database Guide*.

## Oracle index-organized tables

Replication Agent 15.5 supports DML replication on Oracle index-organized tables (IOTs), which is a unique storage organization feature that provides added value in performance, scalability, and availability over conventional tables. Unlike an ordinary (heap-organized) table in which data is stored as an unordered collection (heap), data for an index-organized table is stored in a B-tree index structure in a primary key sorted manner. In Replication Agent, DML is supported on:

- Simple IOTs
- IOTs with including and overflow clause
- IOTs with composite partition
- IOTs with mapping table
- Index-compressed IOTs
- IOTs with row dependency
- IOTs with LOB
- IOTs with secondary index

Feature limitations IOTs with nested tables and varray columns cannot be replicated.

## Oracle 10g running in 9i-compatibility mode and Oracle 11g running in 10g-compatibility mode

Replication Agent 15.5 supports Oracle 10g and 11g. However, it continues to provide support for Oracle 9i when Oracle 10g or 11g is running in compatibility mode.

### Feature limitations

These new features of Replication Agent 15.5 are not supported by Oracle 9i:

- Oracle index-organized tables and ANYDATA datatypes – supported only by Oracle 10g and 11g.
- Autocorrection – supported only by Oracle 10g and 11g.
- Replication of XML datatype – supported only by Oracle 10g.
- Oracle Flashback – supported only by Oracle 10g and 11g.
- Real Application Clusters (RAC) and Automated Storage Management (ASM) – supported only by Oracle 10g and 11g.

## DDL filters to limit replication of DDL commands

Replication Agent 15.5 allows you to replicate only those DDL commands that affect replicated tables, instead of all DDL commands, using Oracle DDL filters.

In versions earlier than Replication Agent 15.5, if you enabled `pdb_setrepdll`, all DDL commands executed in the primary database were replicated. Limiting the replication of DDL commands lets you:

- Enable DDL replication and override any prior version of enable or disable.
- Exclude:
  - Table, procedures, and sequences
  - Owners
  - DDL commands or set of commands from replication
  - DDL commands executed by a certain database user from replication
- Keep items in the DDL filter lists persisted with the Replication Agent instance.

To support this feature:

- The `pdb_setrepdll` command has been updated with new usage and keywords.
- A new command, `ra_truncateddflfilters`, has been introduced to truncate older versions of DDL filter lists in the RASD.

See the *Replication Agent 15.5 Reference Manual* and the *Replication Agent 15.5 Administration Guide*.

## Resynchronization of primary and replicate databases

Replication Agent 15.5 introduces database resynchronization for Oracle to rematerialize your replicate database and resume replication without the risk of data loss or data inaccuracy, and without forcing a quiesce of your primary database. Database resynchronization is based on obtaining a data dump from a trusted source and applying the dump to the target database you want to resynchronize. See the *Replication Agent 15.5 Primary Database Guide* and the *Replication Server 15.5 Heterogeneous Replication Guide*.

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**Note** This feature only works with Replication Server 15.5.

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Replication Agent introduces new commands and enhances some existing commands to support database resynchronization:

- `pdb_skip_missing_user` – configures Replication Agent behavior for missing session information. The default behavior is to skip processing of any command for which no session or user information is available.
- `lr_dump_marker` – applicable for Oracle only, this parameter configures the Replication Agent to send a dump database marker to Replication Server when the first log recorded with System Change Number (SCN) is larger than or equal to the configured value. This works only when Replication Agent is running in resync mode.
- `resume` – supports a new `resynch` parameter, which allows you to start Replication Agent in resync mode.
- `ra_status` – enhanced to verify whether Replication Agent is running in resync mode. When Replication Agent is resumed in resync mode, `ra_status` returns “Replicating - Resynchronization” as the status.

See the *Replication Agent 15.5 Reference Manual*.

## Replication Server support

Replication Agent 15.5 has added support for:

- Enhanced alter replication definition command
- Warm standby for Oracle

### Enhanced *alter replication definition* command

Replication Agent 15.5 supports the enhancements made to the alter replication definition command in Replication Server 15.5, which simplify altering replication definitions by automatically coordinating the propagation of the new replication definition and data replication. To issue an alter replication definition request, you no longer need to wait for all the data associated with a primary table or stored procedure to be processed through the entire replication system.

This makes coordinating database schema changes and replication definition changes more convenient, as there is no downtime for the primary database, and minimal or no downtime for the replicate database.

To support the Replication Server 15.5 changes, Replication Agent has been enhanced to:

- Handle error codes returned from Replication Server when an invalid replication definition is issued.
- Handle RSSD schema changes. Replication Agent supports RSSD of Replication Server version 15.5 or earlier.
- Support the increased parameter size of rs\_marker. The parameter size for the Replication Agent command ra\_marker has also been increased to 16K for Oracle and 8000 for Microsoft SQL Server. See the *Replication Agent 15.5 Reference Manual*.
- Provide SQL scripts for the new rs\_send\_repserver\_cmd stored procedure, which allows you to execute replication definition change requests directly at the primary database.
- Support Replication Server versions earlier than 15.5. When the length of parameter of stored procedure rs\_marker is larger than 255 and if the Replication Server version is earlier than 15.5, Replication Agent records a warning message in the Replication Agent log file.



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| Databases supported | <p>The new enhanced alter replication definition command is supported by these primary databases:</p> <ul style="list-style-type: none"><li>• Oracle</li><li>• Microsoft SQL Server</li></ul>  |
| Feature limitations | <p>Limitations of this feature are:</p> <ul style="list-style-type: none"><li>• This feature is not supported for IBM DB2 UDB, as this database does not support replication of SQL store procedures.</li><li>• The altered table cannot include columns that have datatypes without direct ASE datatype mapping, and thus require some transformation by Replication Server. These datatypes include:<ul style="list-style-type: none"><li>• For Oracle – DATE, RAW, BINARY ROWID, MLSLABEL, REF, TIMESTAMP, TIMESTAMP WITH TZ, INTERVAL YEAR TO MONTH, INTERVAL DAY TO SECOND, BINARY UROWID, and TIMESTAMP WITH LOCAL TZ.</li><li>• For Microsoft SQL Server – VACHAR (MAX), VARBINARY (MAX), and NVARCHAR (MAX).</li></ul></li></ul> |

See the *Replication Agent 15.5 Primary Database Guide* and the *Replication Server 15.5 Heterogeneous Replication Guide*.

## Warm standby for Oracle

Sybase Replication Server 15.5 allows you to create and maintain a warm standby environment for the Oracle database. To support warm standby:

- Replication Agent must be installed and initialized on both the primary and standby side. Replication Agent on the standby side should run in standby mode.
- Replication Agent should be configured to use the Replication Server physical connection instead of the logical connection.

A new configuration parameter, `ra_standby`, has been added to support this feature. This parameter identifies whether Replication Agent works in a standby mode. See Chapter 2, “Configuration Parameters” in the *Replication Agent 15.5 Reference Manual*.

See the *Replication Server 15.5 Heterogeneous Replication Guide* for detailed steps about creating and managing warm standby for Oracle.

## Performance enhancements

Replication Agent 15.5 performance enhancements include:

- Improving Oracle RAC replication
- Addition of new configuration properties
- Modification of existing configuration parameters

### Improving Oracle RAC replication

To improve performance of Replication Agent in an Oracle RAC environment, you can now:

- Configure the Replication Agent for Oracle to use a multithreaded cluster log scanner for Oracle RAC replication. This decreases the amount of time between when a log record is written to the primary database log, and when it is first read by the Replication Agent. The `lr_parallel_scan` configuration property has been added to support this enhancement. `lr_parallel_scan`, is applicable to Oracle RAC only and determines whether the redo log threads for all nodes in a clustered database are scanned in parallel, or whether a single serial scan is used. The benefit of enabling parallel scan threads is improved performance and reduced read and process latency, because all redo log threads are scanned simultaneously. By default, this property is set to false. If set to true, additional system resources may be required and you may need to tune Replication Agent configuration properties.
- Configure the Replication Agent for Oracle to generate commit log records in the primary database at a configured interval. If the primary database is a clustered database, the Replication Agent generates commit log records in each primary database node on the configured interval. This decreases process latency—the amount of time between when a log record is first read by the Replication Agent, and when it is then processed by the Replication Agent. These configuration properties and commands have been added to support this enhancement:
  - `pdb_commit_generation` – configuration property that determines whether committed transactions are generated in the primary database while the Replication Agent is in the replicating state. By default, this property is set to false.

- `pdb_commit_interval` – configuration property that determines the interval, in seconds, at which committed transactions are executed in the primary database. The default value is 1 second.
- `pdb_commit_generation_status` – a command that returns information and status for all primary database commit generation threads.

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**Note** For the commit generation feature to work, `pds_username` must be granted `execute` on `dbms_lock` privilege.

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- `pdb_commit_generation_filter` – a command that is used to modify the commit generation filter list. The filter list contains the list of Oracle instance names that should be filtered for commit generation. If an instance name is in the filter list, then commit generation does not occur against that instance when enabled.

To monitor the effectiveness of the commit generation feature, a new Log Reader (LR) statistic has also been added to the results of the `ra_statistics` command. The new statistic shows the average number of seconds between log record checkpoints. For Oracle RAC database replication, the statistic shows an average for each node in the cluster.

See the *Replication Agent 15.5 Reference Manual*.

## Addition of new configuration properties

These configuration properties have been added in Replication Agent 15.5 to enhance performance:

- `lr_max_scan_queue_size` – configures the maximum number of log records allowed in the log readers log scan queue during replication. This configuration property is available for Microsoft SQL Server and Oracle.
- `lr_max_op_queue_size` – configures the maximum number of operations allowed in the log readers operation queue during replication. This configuration property is available for Microsoft SQL Server and Oracle.
- `lr_read_buffer_size` – configures the size, in bytes, of the log read buffer. This configuration property is available only for IBM DB2 UDB.

See the *Replication Agent 15.5 Reference Manual*.

The `max_ops_per_scan` configuration property has been deprecated. Changing the value of this configuration property has no effect.

## Modification of existing configuration parameters

These default values of these configuration properties have been increased in Replication Agent 15.5:

- `log_read_block_count` (Oracle and Microsoft SQL Server only) – determines the number of blocks or pages that are read at a time from the primary database transaction log. The default value has been changed to 64 from 1.
- `archive_read_block_count` (Oracle only) – determines the number of blocks or pages that are read at a time from the primary database archive log. The default value has been changed to 64 from 1.
- `lti_update_trunc_point` – determines the number of Log Transfer Language (LTL) commands sent before requesting a new LTM locator from the Replication Server. The default value has been changed to 10000 from 1000.

See *Replication Agent 15.5 Reference Manual*.

## Documentation enhancements

This section describes Replication Agent documentation enhancements.

### Oracle materialized views

A materialized view is a database object that contains the results of a query. They are local copies of data located remotely, or are used to create summary tables based on aggregations of a table data. Oracle materialized views, which store data based on remote tables, are also known as snapshots.

See Chapter 1 in the *Replication Agent 15.5 Primary Database Guide*, which now includes detailed information about Oracle materialized views.

## Tuning Replication Server and Replication Agent for heterogeneous replication

“Configuring and tuning the Replication Agent” section in Chapter 3, “Administering Replication Agent” of the *Replication Agent 15.5 Administration Guide*, now includes information on how to tune Replication Server and Replication Agent, and manage resources effectively to optimize the performance when replicating data in a heterogeneous environment.

