

Oracle® REST Data Services

Release Notes

Release 21.4

F50513-01

December 2021

Release Notes

These *Release Notes* contain important information not included in the Oracle REST Data Services documentation.

This document contains these topics:

- [Checking for the Most Current Release](#)
- [New Features and Other Changes](#)
- [Bugs Fixed](#)
- [Open Bugs and Known Issues](#)
- [Documentation Accessibility](#)



See Also:

`readme.html` in the folder where you unzipped the Oracle REST Data Services installation kit, for detailed information about new features, changes, and issues fixed.

Checking for the Most Current Release

Oracle REST Data Services is released more frequently than Oracle Database. To view information about or download a more current release (including a possible beta or "early adopter" release), see:

<http://www.oracle.com/technetwork/developer-tools/rest-data-services/overview/index.html>

New Features and Other Changes

This section describes new features and other changes and enhancements for Oracle REST Data Services releases.

- [Release 3.0.0](#)

- [Release 3.0.1](#)
- [Release 3.0.2](#)
- [Release 3.0.3](#)
- [Release 3.0.4](#)
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See Also:

[Bugs Fixed](#)

Release 3.0.0

Oracle REST Data Services release 3.0 includes the following new features and other changes:

- [Changes to the Oracle REST Data Services Installer](#)

- [PL/SQL API for Creating RESTful Services](#)
- [OAuth 2.0 Client Credentials Grant Support](#)
- [RESTful Privileges Can be Mapped to URL Patterns](#)
- [Improved NoSQL Database Support](#)
- [RESTful Services Query Filtering Support](#)
- [Java API for Oracle REST Data Services Plugins](#)
- ["Developer's Guide" Material Now in *Oracle REST Data Services Installation, Configuration, and Development Guide*](#)
- [Apache JServ Protocol \(AJP\) Support Removed](#)
- [SQL Developer 4.1 Graphical Interface for Oracle REST Data Services](#)

Changes to the Oracle REST Data Services Installer

You can now install Oracle REST Data Services with its own schema and define RESTful services.

You have options to run the installation in simple or advanced mode to prompt you for the information. The installation process is simple and fast.

The installer provides the option to migrate RESTful Service definitions stored in Application Express workspaces to Oracle REST Data Services-enabled schemas.

The installer provides an `uninstall` command; enter `java -jar ords.war help uninstall` for more information.

Oracle Application Express is no longer required for an Oracle REST Data Services installation. (It was required in Oracle REST Data Services releases 2.0.n.)

PL/SQL API for Creating RESTful Services

This release previews the PL/SQL API for creating and editing restful services using PL/SQL, enabling the creation and maintenance of RESTful services to be scripted via PL/SQL. The API also exposes all the OAuth 2.0 functionality, enabling OAuth Clients to be registered and managed. Note that this API is subject to change before the final release of 3.0.0.

OAuth 2.0 Client Credentials Grant Support

The OAuth 2.0 Client Credentials Grant type is now supported, enabling server to server authorization via OAuth 2.0, which is an important use case for enterprise applications.

RESTful Privileges Can be Mapped to URL Patterns

RESTful privileges can now be associated with arbitrary URL patterns, enabling RESTful privileges to protect any database resource accessed through Oracle REST Data Services, including JSON Collection store resources and AutoRest resources.

Privilege to URL mappings can be configured using the PL/SQL API or using SQL Developer.

This and the preceding feature mean that JSON Collection store resources and AutoRest resources can now be protected by OAuth 2.0.

Improved NoSQL Database Support

The `/store` prefix on NoSQL Database resources has been eliminated, and support has been added for the new DDL capability introduced in NoSQL Database 3.2.5, enabling DDL statements to be issued through a RESTful endpoint.

RESTful Services Query Filtering Support

RESTful Services (that perform SQL queries) now support the specification of a JSON based filtering clause to further constrain the query. The filter clause can either be specified by including it as a parameter of the service's query string, or by submitting a POST request with the filter clause as the body of the POST request.

Java API for Oracle REST Data Services Plugins

A new Java API enables third parties to contribute extensions to the Oracle REST Data Services runtime. (Note that this API is subject to change before the final release of Oracle REST Data Services 3.0.0.) For more information, see the following under the location where you installed Oracle REST Data Services:

- Documentation: `docs\javadoc\plugin-api`
- Tutorial demonstrating how to compile and add a plugin: `examples\plugins\plugin-demo`

"Developer's Guide" Material Now in *Oracle REST Data Services Installation, Configuration, and Development Guide*

The *Oracle REST Data Services Installation, Configuration, and Development Guide* has been expanded to include material based on the old, unofficial "developer's guide" that was supplied as a file named `restful_services_devguide.html`.

The development material is now in the chapter titled "Developing Oracle REST Data Services Applications".

Apache JServ Protocol (AJP) Support Removed

Apache JServ Protocol (AJP) support has been removed because Jetty is now used as the run time for standalone mode, Jetty does not support AJP.

SQL Developer 4.1 Graphical Interface for Oracle REST Data Services

Oracle SQL Developer release 4.1 provides a graphical user interface and enables users to install Oracle REST Data Services and run it in standalone mode within SQL

Developer. Within SQL Developer you can create, edit and validate RESTful services that are stored in Oracle REST Data Services schema.

For more information, see the topic "Oracle REST Data Services Administration and Development" in *Oracle SQL Developer User's Guide* or in the SQL Developer online help.

Release 3.0.1

See the `readme.html` file for detailed information about new features and other changes for this release. These include:

- Oracle 12c multitenant architecture support, which is explained in the new "Using the Multitenant Architecture with Oracle REST Data Services" appendix in *Oracle REST Data Services Installation, Configuration, and Development Guide*.
- A new "Getting Started with RESTful Services" appendix in *Oracle REST Data Services Installation, Configuration, and Development Guide*.
- Standalone mode document root for serving arbitrary static resources
- A new book, *Oracle REST Data Services SODA for REST Developer's Guide*.

Release 3.0.2

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 3.0.3

See the `readme.html` file for detailed information about new features and other changes for this release. These include:

- Support is provided for upgrading Oracle REST Data Services in a container database (CDB) from Release 3.0.1 to 3.0.2.
- Fixes or possible actions are provided regarding 404 errors when configuring Oracle REST Data Services.
- Standalone mode can now serve arbitrary static resources through its new document root feature.

Release 3.0.4

There are no new features for this release.

See the `readme.html` file for additional information.

Release 3.0.5

There are no new features for this release.

See the `readme.html` file for additional information.

Release 3.0.6

There are no new features for this release.

See the `readme.html` file for additional information.

Release 3.0.7

Oracle REST Data Services release 3.0.7 includes the following new features and other changes:

- [APEX_PUBLIC_USER and wwv_flow_epg_include_modules.authorize](#)

APEX_PUBLIC_USER and wwv_flow_epg_include_modules.authorize

In line with security best practices and as recommended by *Oracle Application Express Application Builder User's Guide* when a database pool is configured to use the APEX_PUBLIC_USER, Oracle REST Data Services automatically sets the value of the `security.requestValidationFunction` setting to be:

```
WWV_FLOW_EPG_INCLUDE_MODULES.AUTHORIZE
```

This setting activates the white list of callable procedures that ships with Oracle Application Express and prohibits calls to other procedures. See the *Oracle Application Express Application Builder User's Guide* for more information about this procedure and how to customize its behavior.

See the `readme.html` file for additional information.

Release 3.0.8

There are no new features for this release.

See the `readme.html` file for additional information.

Release 3.0.9

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 3.0.10

Oracle REST Data Services release 3.0.10 includes the following new features:

- [Auto PL/SQL](#)
- [Creating a RESTful Service through the Connections Navigator](#)

Auto PL/SQL

With Auto PL/SQL feature, you can now make PL/SQL available through HTTP(S) for Remote Procedure Call (RPC).

Using this feature, you can enable Oracle Database stored PL/SQL functions and procedures at package level through ORDS, similar to how you enable the views and tables.

 **Note:**

The overloaded package functions or procedures are not supported and will result in a 404 error message.

See the `readme.html` file for additional information.

Creating a RESTful Service through the Connections Navigator

Oracle REST Data Services provides an option through the Connections navigator that enables you to create and edit RESTful service definitions.

See the `readme.html` file for additional information.

Release 3.0.11

There are no new features for this release.

See the `readme.html` file for additional information.

Release 17.4

Oracle REST Data Services release 17.4 includes the following new feature:

- [REST Enabled SQL Service](#)

REST Enabled SQL Service

REST Enabled SQL service provides access to the Oracle Database SQL Engine. You can POST SQL statements to the service. The service then runs the SQL statements against Oracle database and returns the result to the client in a JSON format.

For more information, refer to the Oracle REST Data Services Installation, Configuration, and Development Guide

Also, see the `readme.html` file for additional information.

Release 18.1.1

Oracle REST Data Services release 18.1.1 includes the following new features:

- Oracle REST Data Services Database Authentication
- Installation choices for installing Oracle REST Data Services into the CDB

- Installation Enabling Multiple Releases (Recommended)
- Installation Requiring Same Release
- Migrating Oracle REST Data Services in the CDB to Enable Multiple Releases

 **Note:**

If you are using Oracle Database 12.1.0.1, and want to install or upgrade to Oracle REST Data Services supporting multiple releases in the CDB, then you must upgrade to Oracle Database 12.1.0.2.

See the `readme.html` file for additional information.

Release 18.2

Oracle REST Data Services release 18.2 includes the following new features and other changes:

- [ORDS_METADATA Schema not Installed into the CDB\\$ROOT Container](#)
- Oracle WebLogic Server supports 12g Release 2 (12.2.1.3) or later for this release.

See the `readme.html` file for detailed information about new features and other changes for this release.

ORDS_METADATA Schema not Installed into the CDB\$ROOT Container

Starting with release 18.2, Oracle REST Data Services no longer installs `ORDS_METADATA` schema into the `CDB$ROOT` container. Only the `ORDS_PUBLIC_USER` (common user) is installed in the `CDB$ROOT` container and its PDBs. The `ORDS_METADATA` schema is now installed in each PDB connected to the CDB. This will minimize the downtime when you are upgrading Oracle REST Data Services as you no longer need to take the CDB and the PDBs offline.

For more information, refer to the Oracle REST Data Services Installation, Configuration, and Development Guide

Also, see the `readme.html` file for additional information.

Release 18.3

The following features are new in this release:

- Support for OAuth 2 Client Credentials authentication.
See REST-Enabled SQL Authentication.
- Parameters for Installing into the CDB.
See Parameters for Installing into the CDB.
- The following new configuration file parameters are included in this release:

- `security.requestAuthenticationFunction`
- `procedure.rest.preHook`
- `jdbc.auth.enabled`
- Updated `security.requestValidationFunction` and `security.maxEntries` parameters.

See Understanding Configurable Parameters.

- The following new chapter is included in this release:

See Oracle REST Data Services Administration PL/SQL Package Reference

The information about consolidated list of implicit parameters used in REST service handlers is provided in this release. See Implicit Parameters.

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 18.4

Oracle REST Data Services release 18.4 includes the following new features:

- **Support for Pre-hook Functions:** PL/SQL based pre-hook functions are invoked prior to any Oracle REST Data Services (ORDS) based REST call. A pre-hook function is typically used to implement application logic that needs to be applied across all REST endpoints of an application.
See Overview of Pre- hook Functions.
- **Migrating from `mod_plsql` to ORDS:** Oracle REST Data Services is a Java EE-based alternative for Oracle HTTP Server `mod_plsql` application. The Oracle HTTP Server `mod_plsql` application can be migrated to ORDS by defining new ORDS configuration files.
See Migrating from `mod_plsql` to ORDS.

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 19.1

Oracle REST Data Services release 19.1 includes the following new features:

- **Generating Hyperlinks:** ORDS provides different mechanisms such as **Primary key hyperlinks** and **Arbitrary hyperlinks** for adding hyperlinks to the REST resources.
See Generating Hyperlinks.
- **Enabling ORDS Database API:** Explains how to enable the Oracle REST Data Services (ORDS) Database API.
See Enabling ORDS Database API.
- **Installing ORDS by a user with DBA privileges:** The user with DBA privileges can install, upgrade, validate or uninstall ORDS in Oracle 11g or a pluggable database. This user must have the DBA role.

See User with DBA Privileges and Privileges Required for Oracle REST Data Services

The following are the additional changes made in this release:

- **DBMS_SCHEDULER job, CLEAN_OLD_ORDS_SESSIONS has been deprecated and replaced by ORDS_HOUSEKEEPING_JOB which will perform the same action of deleting expired sessions that are older than one day.**
During upgrade, the CLEAN_OLD_ORDS_SESSIONS job will be replaced by ORDS_HOUSEKEEPING_JOB if the old job already exists. Otherwise, the new job is created when the first schema is enabled.

See Oracle REST Data Services Administration PL/SQL Package Reference.

Release 19.2

Oracle REST Data Services release 19.2 includes the following new features:

- The installer includes a script file that provides privileges to the user to install, upgrade, validate and uninstall ORDS
See ORDS Installer Privileges Script and Privileges Required for Oracle REST Data Services .
- Starting with ORDS 19.2 release, on a system with ORDS installed, you can perform a set of environment services operations.
See Configuration of Environment Services
- The following two new subprograms are included in ORDS PL/SQL package and ORDS ADMIN PL/SQL package respectively:
 - ORDS.DROP_REST_FOR_OBJECT
 - ORDS_ADMIN.DROP_REST_FOR_OBJECT

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 19.3

Oracle REST Data Services release 19.3 includes the following new features:

- Basic, TNS, and Custom URL connection type prompts are included in this release.
- The following new prompts are included to enable the respective features:
 - SQL Developer Web and
 - REST Enabled SQLSee Advanced Installation Using Command-Line Prompts.
- Updated Enabling ORDS Database API section.
See Enabling ORDS Database API.

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 19.4

Oracle REST Data Services release 19.4 includes the following new features:

- Basic, TNS, and Custom URL connection type prompts are included in this release.
- The following new prompts are included to enable the respective features:
 - SQL Developer Web and
 - REST Enabled SQLSee [Advanced Installation Using Command-Line Prompts](#).
- Updated Enabling ORDS Database API section.
See [Enabling ORDS Database API](#).
- Included a new section on [Authorizing Oracle REST Data Services to Access Oracle Data Guard Protected Users](#).
See [Authorizing Oracle REST Data Services to Access Oracle Data Guard Protected Users](#).
- Included a new section on [Integrating Oracle REST Data Services and Oracle WebLogic Server](#)
See [Integrating Oracle REST Data Services and Oracle WebLogic Server](#).

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 20.2

Oracle REST Data Services release 20.2 includes the following new features:

- Configure and use ORDS Database API with Open Service Broker API compatible platforms. See [Configuration of the Database API](#) .
- Supported Oracle Application Express (APEX) Versions
- Disabling ORDS Database API services. See [Advanced Setup to Enable the ORDS Database API](#).
- Managing ORDS Administrator Privilege
- Managing ORDS Runtime Privilege
- Oracle REST Data Services PL/SQL package reference functions:
 - `ORDS.SET_SESSION_DEFAULTS`
 - `ORDS.RESET_SESSION_DEFAULTS`
- Oracle REST Data Services (ORDS) ADMIN PL/SQL package functions:
 - `ORDS_ADMIN.SET_SESSION_DEFAULTS`
 - `ORDS_ADMIN.RESET_SESSION_DEFAULTS`
 - `ORDS_ADMIN.PROVISION_ADMIN_ROLE`
 - `ORDS_ADMIN.PROVISION_RUNTIME_ROLE`

- ORDS_ADMIN.UNPROVISION_ROLES
- Other Changes
 - Updated Third-Party License Information section with more details.
 - POST Requests Using application/sql Content-Type.
 - Understanding Configurable Parameters.
 - Bypassing JSON Generation for Relational Data
 - Starting with ORDS release 20.2.1, Oracle REST Data Services can be installed or upgraded into an application container using the ORDS SQL scripts provided in the `ords.version.number.zip` file. See [Setting Up ORDS in an Application Container](#).

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 20.3

Updated the following section for Oracle REST Data Services release 20.3 release with more details:

- See [Configuration of Database API with OpenService Broker API Compatible Platforms](#).

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 20.4

Oracle REST Data Services release 20.4 includes the following new features:

- [Cross-Origin Resource Sharing Feature](#)
- [Monitoring ORDS](#)
- [ORDS can now generate HTTP error responses in JSON or HTML format. See About HTTP Error Responses](#)
- [Updated the section Understanding Configurable Parameters with `error.responseFormat` key details.](#)
- [Updated with Oracle WebLogic Server version supported. See Supported Java EE Application Servers](#)

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 21.1

Oracle REST Data Services release 21.1 includes the following new feature:

- [ORDS can be configured to integrate with ICAP server for virus scan. See Configuring ICAP Server Integration for Virus Scan.](#)

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 21.2

Oracle REST Data Services release 21.2 includes the following new features:

- Configuring ORDS with Kerberos Setup
- Configuring ORDS Metadata Cache
- Updated section, Understanding Configurable Parameters with `cache.metadata.timeout` and `cache.metadata.enabled`.
- Updated section "Oracle REST Data Services Administration PL/SQL Package Reference". See `ORDS_ADMIN.CONFIG_PLSQL_GATEWAY`
- `-Doracle.net.tns_admin` system property is no longer required for TNS connections.
- Updated section Third-Party License Information.

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 21.3

Oracle REST Data Services release 21.3 includes the following new features:

- Updated with section Oracle Cloud Infrastructure under Deploying Oracle REST Data Services section.
- Updated section Third-Party License Information.

See the `readme.html` file for detailed information about new features and other changes for this release.

Release 21.4

See the `readme.html` file for detailed information about new features and other changes for this release.

Features Removed in Oracle REST Data Services in Release 3.0.10

- Excel worksheet to Application Express Collection upload feature

Feature Removed in Oracle REST Data Services in Release 19.1

Starting from this release, Oracle REST Data Services does not support Glassfish Server. Oracle recommends that you use Oracle WebLogic Server, Apache Tomcat Server, or Oracle REST Data Services Standalone Mode instead.

Bugs Fixed

The following section lists bugs fixed in Oracle REST Data Services. Numbers in parentheses following the problem description refer to bug numbers in the Oracle Bug Database.

See Also:

This section is current as of the writing of this document. To view the most current information, see [Checking for the Most Current Release](#).

This section contains the following topics:

- [Bugs Fixed in Oracle REST Data Services in Release 3.0.0](#)
- [Bugs Fixed in Oracle REST Data Services in Release 3.0.1](#)
- [Bugs Fixed in Oracle REST Data Services in Release 3.0.2](#)
- [Bugs Fixed in Oracle REST Data Services in Release 3.0.3](#)
- [Bugs Fixed in Oracle REST Data Services in Release 3.0.4](#)
- [Bugs Fixed in Oracle REST Data Services in Release 3.0.5](#)
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- [Bugs Fixed in Oracle REST Data Services in Release 21.4](#)

Bugs Fixed in Oracle REST Data Services in Release 3.0.0

See [readme.html](#) in the folder where you unzipped the Oracle REST Data Services installation kit for detailed information about problems, fixes, and issues. In addition to the fixes listed in that file, the bugs fixed since the final 2.0.*n* release include the following:

- Fixed a problem where the Oracle REST Data Services uninstall script sometimes did not work, often with no explanation or an unhelpful one. (20140082)
- Ensured that a transaction for original resource handler is committed before forwarding the request to the GET handler. (20197577)
- Correctly handle escaped slash characters in JSON values. (20221841)
- Addressed regression in 3.0.0 EA1 that prevented tabular forms in Application Express from working correctly. (20536145)
- Ensured that @ApplicationScoped services are not started when the command line is active. (20568202)
- Enabled PL/SQL Gateway support for the HEAD operation. (20601219)

Bugs Fixed in Oracle REST Data Services in Release 3.0.1

See [readme.html](#) for information about bugs fixed since Release 3.0.0 and since the previous beta (Early Adopter 1) of Release 3.0.1.

Bugs Fixed in Oracle REST Data Services in Release 3.0.2

See [readme.html](#) for information about bugs fixed since Releases 3.0.0 and 3.0.1.

Bugs Fixed in Oracle REST Data Services in Release 3.0.3

See [readme.html](#) for information about bugs fixed since Releases 3.0.0, 3.0.1, and 3.0.2

Bugs Fixed in Oracle REST Data Services in Release 3.0.4

This release includes fixes for the following bugs:

- BUG:21890324 - Fix problem with conditional DELETE of NoSQL table resources

- BUG:22342053 - Fix issue with the dispatching of Resource Modules with empty base path
- BUG:22525939 - Fix issues causing APEX static resources to give 404 Not Found errors
- BUG:22550686 - Fix problem preventing install into PDB in Oracle Database 12.1.0.1
- BUG:22605437 - Fix issues causing ORA-01000 Maximum Open Cursors Exceeded error message

See also [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.5

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.6

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.7

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.8

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.9

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 3.0.10

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

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See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 20.2

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 20.3

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Bugs Fixed in Oracle REST Data Services in Release 20.4

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Bugs Fixed in Oracle REST Data Services in Release 21.1

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See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 21.3

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Bugs Fixed in Oracle REST Data Services in Release 21.4

See [readme.html](#) for information about bugs fixed since Release 3.0.0.

Open Bugs and Known Issues

This section describes bugs and known issues for Oracle REST Data Services.

See also [readme.html](#) in the folder where you unzipped the Oracle REST Data Services installation kit for possible additional information about problems, fixes, and issues.

SODA

- Indexing of `TIMESTAMP` type does not work.
- `HEAD` responses incorrectly report 0 (zero) as the content length, and some also incorrectly report 204 (no content) as the status.

Application Express RESTful Service Migrations

- Migrating Application Express-based RESTful Services is not handling the case where a database does not contain any Application Express schema. It also does not handle the case where the installed version of Application Express is 5.0.0 or later. (Bug 21302877)

Autogenerated REST Endpoints

- AutoREST resources support the OAuth 2.0 Client Credentials flow only.

RESTful Services

- Application Express workspaces do not support first party authentication, and therefore do not support the `/sign-in/` interactive sign-in form. Accessing `/sign-in/` in Application Express workspaces will produce a 404 status.

NoSQL

- It is currently not possible to access secured NoSQL REST Endpoints with OAuth 2.0. Only first-party cookie authentication is supported.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Oracle REST Data Services Release Notes, Release 21.4

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