Group Extract Results: All Databases

Scenario: Autonomous Shared v7

This document provides KL Auto Insurance with a set of results and recommendations arising from a joint, collaborative exercise which has the following objectives;

- Explore the Oracle Database Estate within KL Auto Insurance so that a holistic understanding of the assets deployed can feed into strategic decision-making.

- Reveal architectural and development constraints within existing deployments that have the potential to limit Oracle-based applications from being future-proof, portable, scalable and secure.

- Prioritize databases and applications that can quickly benefit from a move to Oracle Autonomous Database Cloud. The benefits of this include cloud-centric operational efficiencies and adherence to Oracle's best practices.

Executive Summary

Subject to further non-functional and operational requirements being met, all databases can migrate to Oracle Autonomous Database - with varying degrees of preparation work being required.

Oracle Estate Explorer ranked each database in the Group according to the effort required to prepare for a move to Oracle Autonomous Database Cloud.
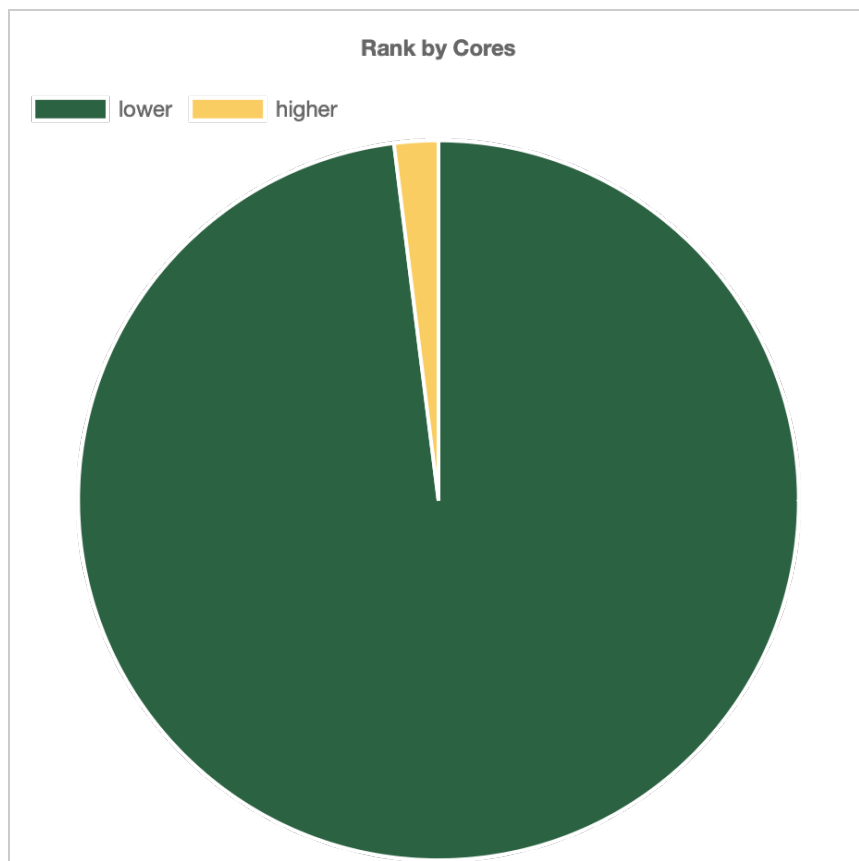
Rank by DBs	# Databases
lower	103
higher	2

Rank by DBs
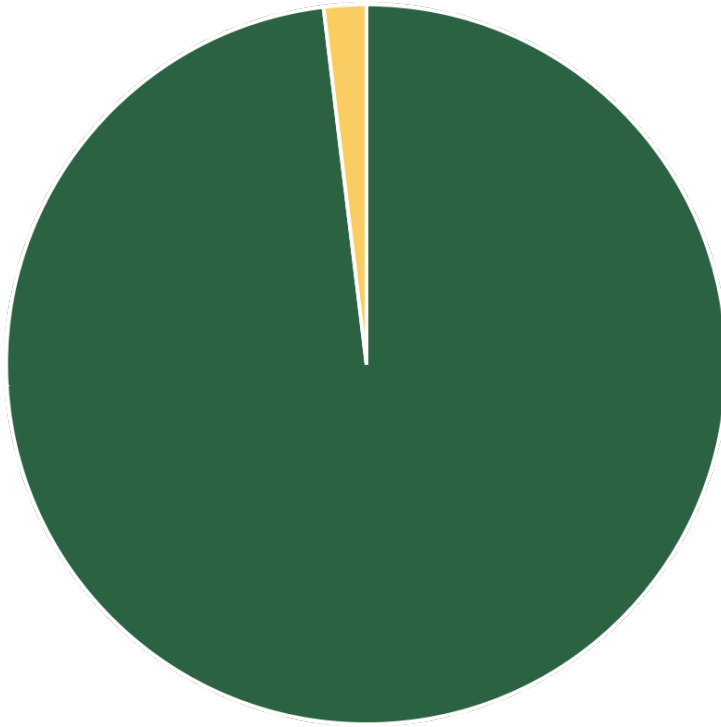
Rank by Cores	
lower	794
higher	16

Rank by Cores

■ lower   ■ higher

Results Overview

Oracle Estate Explorer calculates the effort by applying weighted tests against each database. The calculation considers the resource requirements, scale, technical complexity, and associated risks of preparing each database for migration.

Of the 416 databases within the All Databases Group:

- 103 have a lower modification effort (794 cores)
- 2 have a higher modification effort (16 cores)

It should be noted that the categorization is relative within this group only. A database placed in a higher-effort category may still be a in lower-effort category compared to databases within other groups. Depending on migration targets and objectives, comparisons between Groups may be advantageous.

Database Results

Databases with lower Preparation Effort

Oracle recommends that you prioritize these databases for fast migration to Autonomous Database. They require minimal modifications that do not affect the database architecture or require changes to the application.

The databases in this category:

P146, P119A, P119, P362, P102A, P055R, P177, P178, P228, P580A, P055G, P187, P211, P010OEM, P240, P884, P580, P341A, P685, P450, P705M, P713, P433, P235A, P717, P750, P158, P715, P155, P716, P101A, P298, P470, P341, P601B, P580B, P181, P476, P306, P104, P318, P124, P010DISP, U450E, P118, T439A, T411A, T014, U014C, T014L, U014, U014A, U014R, P292, P342, P342A, P342B, P343, P195, P668, P793, P794, P010, P439, P578E, P296, P422, P112, P578O, P700, P087C, P087A, P381, P087D, P418, P377, P518A, P087B, P795, P055, P411, P126, P146, T450J, P600KAR, P301, P297, P299, P300, P322, P303, P367A, P419, P055C, P205H, P455, P601, P014, P205, P010RMAN, P580C, P119B, P214

Databases with higher Preparation Effort

Databases with a higher preparation effort require a set of modifications that can impact the application or the database's functional operations. These modifications are usually a redeployment or refactoring of existing capabilities that will require regression testing.

The databases in this category:

P463, P182

Databases by ascending effort (easiest First)

Database Name	Group Ranking	Preparation Effort	Action Items	Database Environment	Database Cores	Database Memory (Gb)	Database Size (Gb)
P367A	1	0	0	PRODUCTION	8	4	13
P235A	2	0	0	PRODUCTION	2	2	7
P158	3	0	0	PRODUCTION	6	2	5
P476	4	0	0	PRODUCTION	6	2	10
P362	5	0	1	PRODUCTION	2	3	22
P087B	6	0	2	PRODUCTION	6	1	53
P010DISP	7	0	3	PRODUCTION	4	1	4
P119B	8	0	5	PRODUCTION	6	3	60
P301	9	0	7	PRODUCTION	12	3	58
P303	10	0	7	PRODUCTION	8	3	10
P300	11	0	7	PRODUCTION	8	3	23
P297	12	0	7	PRODUCTION	8	3	9
P296	13	0	7	PRODUCTION	4	1	8
P717	14	0	7	PRODUCTION	2	2	3
P377	15	0	14	PRODUCTION	6	1	79
P155	16	0	18	PRODUCTION	6	1	17
P298	17	0	93	PRODUCTION	12	3	27
P010OEM	18	0	174	PRODUCTION	2	9	283
P518A	19	25	1	PRODUCTION	6	2	9
P087C	20	40	1	PRODUCTION	6	1	229
P685	21	40	4	PRODUCTION	2	3	255
P580C	22	40	4	PRODUCTION	12	3	30
P580B	23	40	4	PRODUCTION	12	3	29
P580	24	40	4	PRODUCTION	2	3	30
P580A	25	40	4	PRODUCTION	2	3	30
T439A	26	40	4	TEST	8	1	955
P439	27	40	4	PRODUCTION	12	8	955
T411A	28	40	5	TEST	8	7	640
P087A	29	40	6	PRODUCTION	6	1	62
P322	30	40	8	PRODUCTION	8	3	243
P187	31	50	7	PRODUCTION	2	3	42
P010RMAN	32	75	2	PRODUCTION	12	5	70
T450J	33	75	149	TEST	8	5	1,540
P578O	34	80	2	PRODUCTION	6	2	6
P411	35	80	6	PRODUCTION	18	6	468
P601B	36	80	38	PRODUCTION	18	4	10
P601	37	80	39	PRODUCTION	18	4	14
P418	38	100	6	PRODUCTION	6	3	27
U450E	39	115	145	DEVELOPMENT	12	5	1,541

P750	40	120	30	PRODUCTION	2	2	9
P342A	41	150	6	PRODUCTION	4	1	2,460
P343	42	150	6	PRODUCTION	4	3	2,400
P342	43	150	6	PRODUCTION	4	2	2,380
P341A	44	155	5	PRODUCTION	2	4	5,674
P087D	45	160	4	PRODUCTION	6	1	104
P705M	46	160	4	PRODUCTION	2	2	4
P381	47	160	4	PRODUCTION	6	1	6
P419	48	160	18	PRODUCTION	6	8	1,518
P126	49	160	49	PRODUCTION	18	4	30
P341	50	175	8	PRODUCTION	88	3	653
P713	51	180	4	PRODUCTION	2	2	15
P119A	52	190	7	PRODUCTION	2	4	672
P211	53	200	5	PRODUCTION	2	3	46
P178	54	200	5	PRODUCTION	2	2	11
P124	55	240	6	PRODUCTION	6	3	21
P177	56	300	7	PRODUCTION	2	1	7
P715	57	320	8	PRODUCTION	6	2	34
P433	58	330	8	PRODUCTION	2	3	5
P318	59	340	8	PRODUCTION	6	3	30
P450	60	355	156	PRODUCTION	2	54	1,541
P118	61	390	15	PRODUCTION	6	5	518
P214	62	440	11	PRODUCTION	6	4	357
P292	63	530	13	PRODUCTION	4	2	7
P342B	64	640	25	PRODUCTION	4	1	210
P306	65	690	21	PRODUCTION	6	5	57
P716	66	700	17	PRODUCTION	6	2	23
P299	67	700	113	PRODUCTION	8	4	59
P181	68	920	60	PRODUCTION	8	2	14
P119	69	990	24	PRODUCTION	2	2	13
P146	70	1,100	27	PRODUCTION	2	3	34
P146	71	1,100	27	PRODUCTION	18	3	34
P195	72	1,180	35	PRODUCTION	8	3	32
P010	73	1,260	46	PRODUCTION	12	2	471
P455	74	1,280	45	PRODUCTION	6	3	294
P055C	75	1,480	681	PRODUCTION	4	2	12
P668	76	1,675	135	PRODUCTION	8	2	629
P055G	77	1,770	658	PRODUCTION	2	3	25
T014L	78	1,780	241	TEST	8	3	963
U014R	79	1,780	241	DEVELOPMENT	8	6	984
U014C	80	1,780	242	DEVELOPMENT	4	8	831
P014	81	1,780	242	PRODUCTION	24	40	970
T014	82	1,780	242	TEST	8	24	959
U014	83	1,820	243	DEVELOPMENT	8	13	917
U014A	84	1,820	243	DEVELOPMENT	8	1	851
P470	85	1,840	42	PRODUCTION	8	11	6
P055R	86	2,320	1,089	PRODUCTION	4	2	21
P600KAR	87	2,750	133	PRODUCTION	18	3	47

P700	88		2,800	1,284	PRODUCTION	6	2	38
P240	89		3,450	87	PRODUCTION	8	5	20
P104	90		3,975	121	PRODUCTION	6	2	11
P101A	91		4,030	507	PRODUCTION	6	6	468
P884	92		4,300	223	PRODUCTION	6	3	67
P205	93		6,120	299	PRODUCTION	8	2	21
P205H	94		6,120	299	PRODUCTION	8	2	21
P422	95		11,110	620	PRODUCTION	6	3	523
P102A	96		12,705	633	PRODUCTION	6	3	148
P112	97		15,800	935	PRODUCTION	6	3	335
P055	98		18,620	8,523	PRODUCTION	18	4	61
P795	99		20,930	640	PRODUCTION	6	3	36
P793	100		23,590	723	PRODUCTION	8	2	175
P228	101		27,610	1,075	PRODUCTION	8	4	37
P794	102		29,040	1,696	PRODUCTION	8	2	11
P578E	103		29,465	1,279	PRODUCTION	6	9	351
P463	104		144,730	5,488	PRODUCTION	8	2	121
P182	105		165,780	8,070	PRODUCTION	8	13	2,625
Totals			**572,025**	**38,562**		**810**	**461**	**39,898**

Assessment Method

Oracle Estate Explorer conducts an assessment of a Group based on a series of tests. The tests are applied to data extracted from the target databases. The tests are designed around known features, characteristics, and requirements of the Oracle Autonomous Database. The tests focus on identifying existing target database features that might result in architectural or functional change. The tests are intended to facilitate the decision-making process for migration grouping and prioritisation.

Additional actions may be taken while performing a migration, but these should not be architectural or functional. Oracle Estate Explorer calculates the effort by applying weighted tests against each database. The calculation considers the resource requirements, scale, technical complexity, and associated risks of preparing each database for migration.

You can find details of the tests and weighted modification effort in the appendix of this document. The total preparation effort for a database is a function of the weighted modification effort and the count of exceptions (Action Items) encountered by the test.

A lower total preparation effort represents a closer alignment between the existing database configuration and the capabilities of Oracle Autonomous Database. KL Auto Insurance should prioritise these databases for migration to Oracle Autonomous Database.

Each database is given a ranking within a Group and is subject to placement within a ten-bucket histogram (a lower-numbered bucket is desirable).

Group Histogram	# Databases
0	97
1	6
8	1
9	1
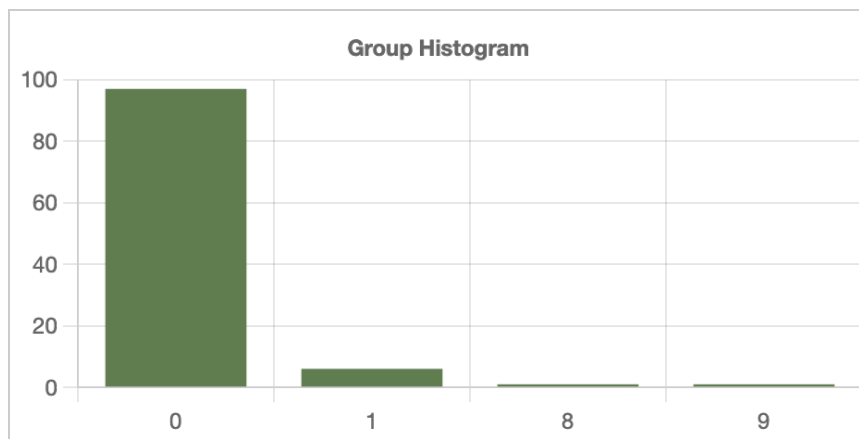
Group Histogram

The histogram illustrates the distribution of results across the Group, helps identify outliers and enables meaningful boundaries to be defined between the Lower, Medium and Higher effort categories.

Histogram Interpretation

- Databases in the lower effort buckets (Buckets 0-2) should be considered for immediate migration
- Databases in the medium effort buckets (Buckets 3-6) require further examination.
- Databases in the higher effort buckets (Buckets 7-9)need modifications that may affect the architecture of the database or result in functional redeployments that may result in significant regression testing.

Test Result Summary

The following charts and tables illustrate the effort and counts of Action Items arising out of each test applied to the All Databases Group.

ORACLE   Estate Explorer - Test Result Summary

Action Items by Databases

Action Items by Databases	# Databases
ROWID COLUMNS	36
IOTS	31
JAVA OBJECTS	8
DBLINKS	65
RESTRICTED PACKAGES	47
XMLTYPES	3
LIBRARIES	17

Action Items by Databases

- ROWID COLUMNS
- IOTS
- JAVA OBJECTS
- DBLINKS
- RESTRICTED PACKAGES
- XMLTYPES
- LIBRARIES

ORACLE	Estate Explorer - Test Result Summary
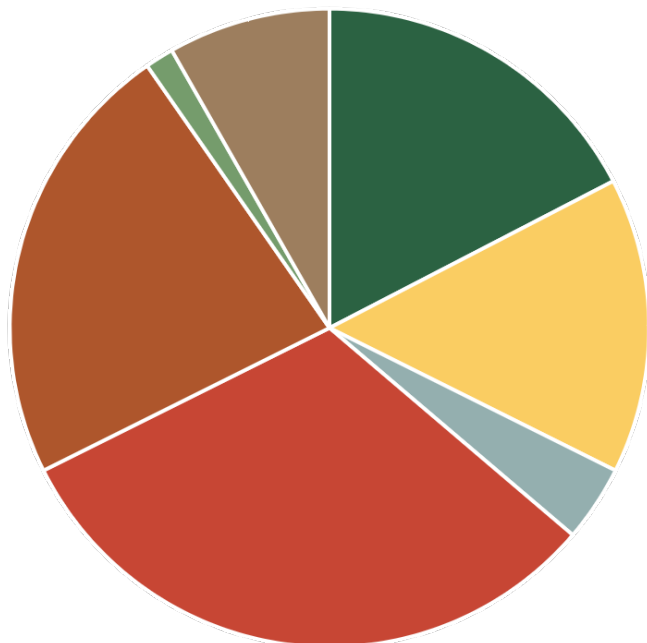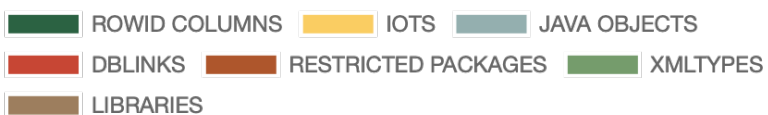
Action Items by Effort

Action Items by Effort	Effort
ROWID COLUMNS	325200
IOTS	182375
JAVA OBJECTS	25850
DBLINKS	23080
RESTRICTED PACKAGES	15200
XMLTYPES	150
LIBRARIES	170

Action Items by Effort

- ROWID COLUMNS
- IOTS
- JAVA OBJECTS
- DBLINKS
- RESTRICTED PACKAGES
- XMLTYPES
- LIBRARIES

ORACLE   Estate Explorer - Test Result Summary
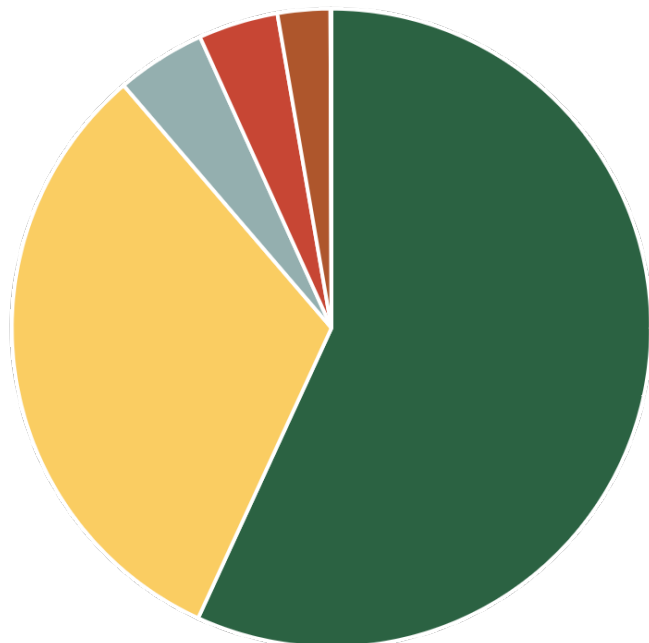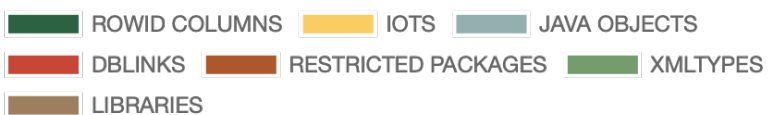
Action Items by Percentage

Action Items by Percentage	Percent
ROWID COLUMNS	57
IOTS	32
JAVA OBJECTS	5
DBLINKS	4
RESTRICTED PACKAGES	3
XMLTYPES	0
LIBRARIES	0

Action Items by Percentage

- ROWID COLUMNS
- IOTS
- JAVA OBJECTS
- DBLINKS
- RESTRICTED PACKAGES
- XMLTYPES
- LIBRARIES

Action Items by Percentage

ORACLE   Estate Explorer - Test Action Items
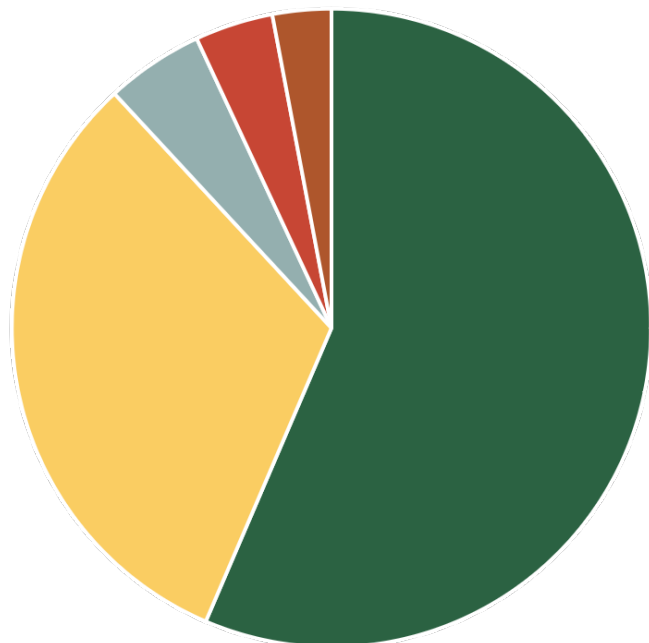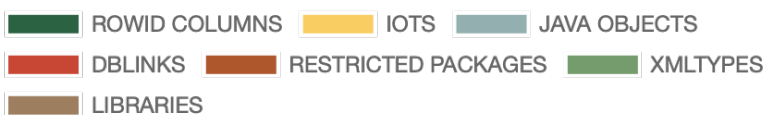
Test Results by Action Item

ROWID COLUMNS - 57% (325,200)

Group Finding

ROWID COLUMNS represent 57% of the overall effort for the group with 36 databases affected, and a calculated remediation effort of 325200.

ROWID COLUMNS Advice

A ROWID Column has a datatype that represents the address of a row within the database. Apart from Index-Organized Tables (IOTs), ROWID Columns store the physical address of the row (down to the specific database block).

Physical rowids provide the fastest possible access to a given table row. They allow you to retrieve the row in a single block access. Oracle guarantees that, for as long as the row exists, its rowid will not change. These performance and stability qualities make rowids useful for applications that select a set of rows, perform some operations on them, and then access some of the selected rows again, perhaps to update them.

In dedicated deployments of Oracle Autonomous Database, the ROWID data type is not enabled by default. ROWID s can be enabled; however, they are incompatible with rolling upgrade operations and other internal operations that physically move a row. At a minimum, database activities involving ROWID should be suspended during upgrades. Applications using ROWID columns should introduce correctness validation to mitigate against logical errors in the application if a row relocates.

In shared deployments, scale-down operations in Auto-Scaling for Storage may result in values stored in ROWID Columns pointing to different rows than originally intended. Auto-Scaling for Storage is disabled by default in Autonmous Shared.

If the requirements of ROWID s on Autonomous Database represent a challenge, then this will necessitate effort to redesign the affected tables, which, in turn, may result in application changes. An option to consider is the use of existing or new primary key values in place of ROWIDs.

IOTS - 32% (182,375)

Group Finding

IOTS represent 32% of the overall effort for the group with 31 databases affected, and a calculated remediation effort of 182375.

IOTS Advice

Index-organized tables are not supported, but attempting to create one does not generate an error.

Instead, a heap-organized table with a primary key index is created.

Therefore, if you use index-organized tables, you should test the applications that use index-organized tables to confirm that they work using heap-organized tables with a primary key indexes.

JAVA OBJECTS - 5% (25,850)

Group Finding

JAVA OBJECTS represent 5% of the overall effort for the group with 8 databases affected, and a calculated remediation effort of 25850.

JAVA OBJECTS Advice

Oracle Database provides support for developing, storing, and deploying Java applications. Java support in Oracle Database includes the Java Virtual Machine (JVM).

The Oracle JVM is a standard, Java-compatible environment that runs any pure Java application. It is compatible with the standard JLS and the JVM specifications. It supports the standard Java binary format and the standard Java APIs. In addition, Oracle Database adheres to standard Java language semantics, including dynamic class loading at run time.

Oracle Autonomous Database fully supports Oracle JVM. There are some characteristics of running Java in Oracle Autonomous Database that should be considered before migrating;

- You cannot disable Oracle Java after it is enabled on the Autonomous Database instance.
- Autonomous Database performs Oracle Java patching, as required, during the regular Autonomous Database maintenance window.
- During Oracle Java patching, Java is not available and users could get an error similar to the following:
- During the maintenance window, during the Java patching phase, there would be no response for Java session calls or you would see an ORA-29548 error. After the maintenance window completes, Java usage is restored.

DBLINKS - 4% (23,080)

Group Finding

DBLINKS represent 4% of the overall effort for the group with 65 databases affected, and a calculated remediation effort of 23080.

DBLINKS Advice

Database links are often used as a means of integration between databases. They are implemented as database objects and use the SQL*Net interface to directly connect databases to other databases to exchange data.

Oracle Autonomous Database fully supports database links. When compared with on-premises, the principle difference in Autonomous is how they are created and implemented. All on-premises database links will need to be recreated on Autonomous. They will not be automatically re-created during an export/import migration. The on-premises creation of database links is achieved through the DDL statement, CREATE DATABASE LINK . In contrast, the Autonomous implementation is a two-step operation using a new Oracle package called DBMS_CLOUD_ADMIN.

The greatest effort in redeploying database links is ensuring that the network connectivity prerequisites have been met and that sufficient regression testing takes place for each integration. Redeploying the database links themselves is a low-resource requirement that could be scripted if needed.

Successful implementation of database links relies upon the databases being accessible to each other. In the case of the databases being in different networks (either OCI or On-Premises), the appropriate routing and firewall settings need to be in place.

Consideration should be given to the volume and frequency of traffic passing between two databases. It is important that bandwidth and latency requirements can be met.

When a database contains many database links, it can take on the appearance and function of a hub . In this case, extra attention should be given to the security and accessibility requirements and the concurrent bandwidth and latency requirements of all participating databases. It may be beneficial to migrate dependent databases collectively within the same Group.

RESTRICTED PACKAGES - 3% (15,200)

Group Finding

RESTRICTED PACKAGES represent 3% of the overall effort for the group with 47 databases affected, and a calculated remediation effort of 15200.

RESTRICTED PACKAGES Advice

Oracle supplies many PL/SQL packages with the Oracle Database to extend database functionality and provide PL/SQL access to SQL features. Customers can use the supplied packages when creating applications.

The vast majority of previously supplied PL/SQL packages are unchanged with Oracle Autonomous Database. A small

number of packages have been amended to reflect the fact that they are now operating within a cloud environment. This is mainly the case when the provided packages interface with network-based features and capabilities.

It is prudent to evaluate the references to these packages and establish that any enhanced security requirements are manageable before committing to a specific migration to Autonomous Database.

UTL_TCP

- The IP address is not allowed in the host name.
- The only allowed ports are: 443 (HTTP) 25 and 587 (SMTP).
- For port 443, only HTTPS URLs are allowed.
- The WALLET_PATH and WALLET_PASSWORD arguments for the OPEN_CONNECTION procedure are ignored. The default value for the WALLET_PATH and WALLET_PASSWORD property are set to the wallet that is used by UTL_HTTP and DBMS_CLOUD for making outbound web requests on Autonomous Database
- UTL_TCP usage is audited by default. You cannot disable auditing for UTL_TCP.
- SSL/TLS is enforced for all communication happening over TCP/IP connections.
- When your Autonomous Database instance is configured with a private endpoint, set the ROUTE_OUTBOUND_CONNECTIONS database parameter to 'PRIVATE_ENDPOINT' to specify that all outgoing UTL_TCP connections are subject to the Autonomous Database instance private endpoint VCN's egress rules.

UTL_SMTP

- The only supported email provider is Oracle Cloud Infrastructure Email Delivery service. See Overview of the Email Delivery Service for more information
- Mail with an IP address in the host name is not allowed.
- The only allowed ports are 25 and 587.
- UTL_SMTP usage is audited by default. You cannot disable auditing for UTL_SMTP.
- When your Autonomous Database instance is configured with a private endpoint, set the ROUTE_OUTBOUND_CONNECTIONS database parameter to 'PRIVATE_ENDPOINT' to specify that all outgoing UTL_SMTP connections are subject to the Autonomous Database instance private endpoint VCN's egress rules..

UTL_HTTP

- Connections through IP addresses are not allowed.
- Only HTTPS connections are allowed (HTTP and HTTP_PROXY are disallowed).
- All web services must be secured. The only allowed port is 443.
- Your instance is preconfigured with an Oracle Wallet that contains more than 90 of the most commonly trusted root and intermediate SSL certificates. This Oracle Wallet is centrally managed and therefore you cannot consume 3rd party web services that are protected using self-signed SSL certificates.
- The SET_PROXY and SET_AUTHENTICATION_FROM_WALLET procedures are disallowed.
- The WALLET_PATH and WALLET_PASSWORD arguments for the CREATE_REQUEST_CONTEXT, REQUEST, and REQUEST_PIECES procedures are ignored.
- Oracle Wallet configuration cannot be altered. All arguments for SET_WALLET procedure are ignored.
- UTL_HTTP usage is audited by default. You cannot disable auditing for UTL_HTTP.
- When your Autonomous Database instance is configured with a private endpoint, set the ROUTE_OUTBOUND_CONNECTIONS database parameter to 'PRIVATE_ENDPOINT' to specify that all outgoing UTL_HTTP connections are subject to the Autonomous Database instance private endpoint VCN's egress rules..

XMLTYPES - 0% (150)

Group Finding

XMLTYPES represent 0% of the overall effort for the group with 3 databases affected, and a calculated remediation effort of 150.

XMLTYPES Advice

Tables with XMLType column will not migrate unless the STORAGE_TYPE is BINARY.

Tables with XMLType columns defined with CLOB or Object-Relational storage are not supported in Autonomous Database. For non-schema types use the BINARY storage option. Use of XML Schema Objects requires modification of your application.

See Oracle Support Document ID 1581065.1 for more information.

LIBRARIES - 0% (170)

Group Finding

LIBRARIES represent 0% of the overall effort for the group with 17 databases affected, and a calculated remediation effort of 170.

LIBRARIES Advice

The CREATE LIBRARY statement is not allowed on ADB. Applications that depend on these libraries will fail because the libraries will not be created on the target instance. Applications must be updated to remove their dependencies on any listed libraries.