happiest minds
The Mindful IT Company
Born **Digital** . Born **Agile**

Minimum Zero Downtime Data Migration and Real Time Replication Using Golden Gate

TABLE OF CONTENT

ABSTRACT

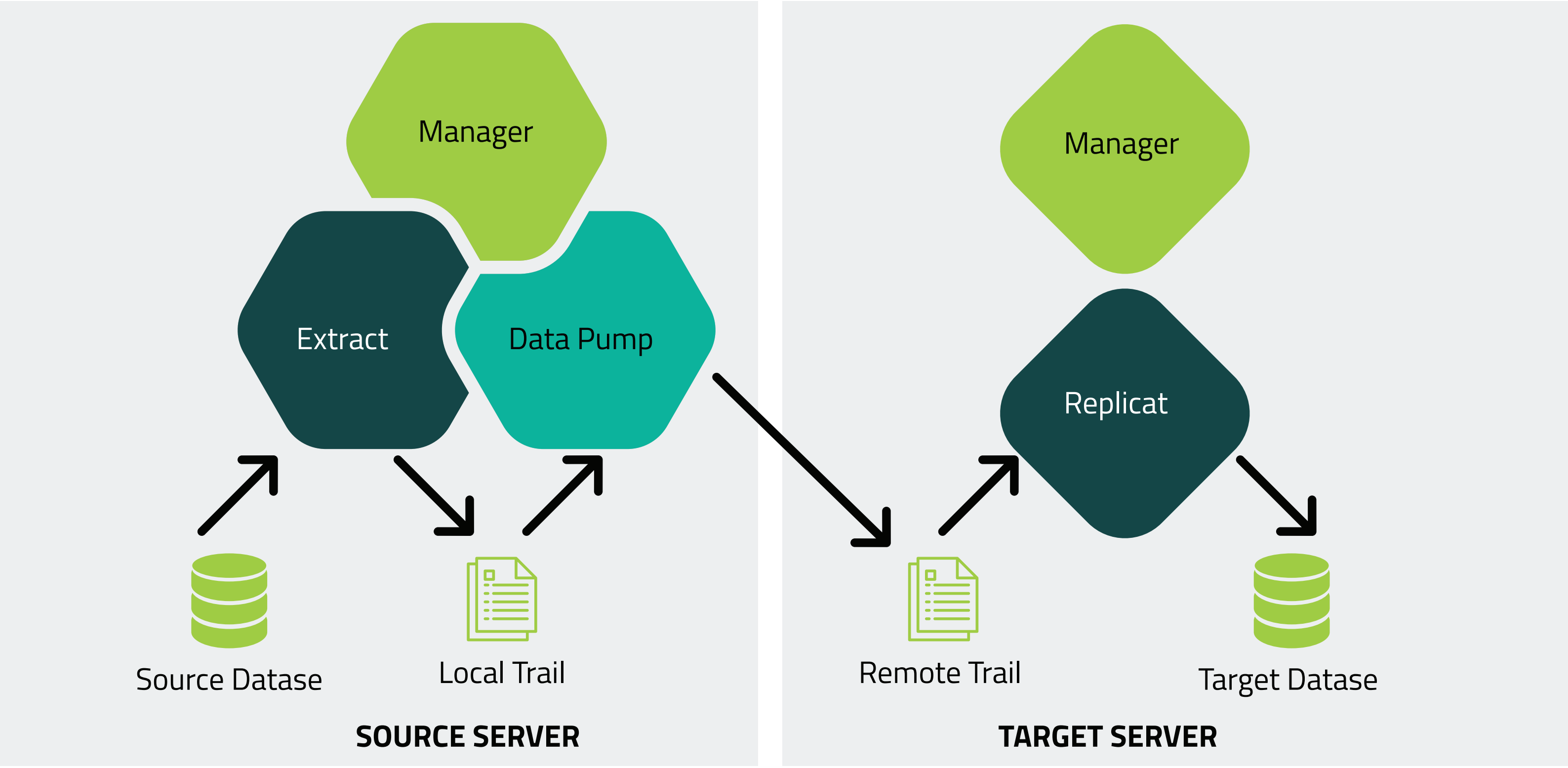
In today's digital world data is the new gold. Making these data available on multiple data lake platforms or transforming into a heterogeneous database to achieve business goals is challenging.

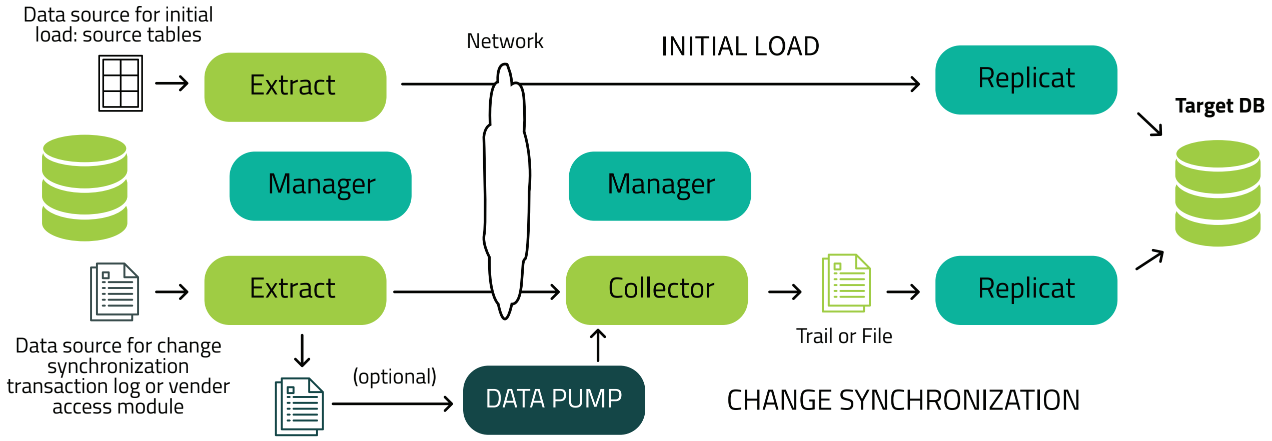
Industries are currently looking for a robust and secure solution that can provide real-time data with minimum downtime regardless of its database engine. It might be of RDMS database, NoSQL Database, Bigdata System or any other.

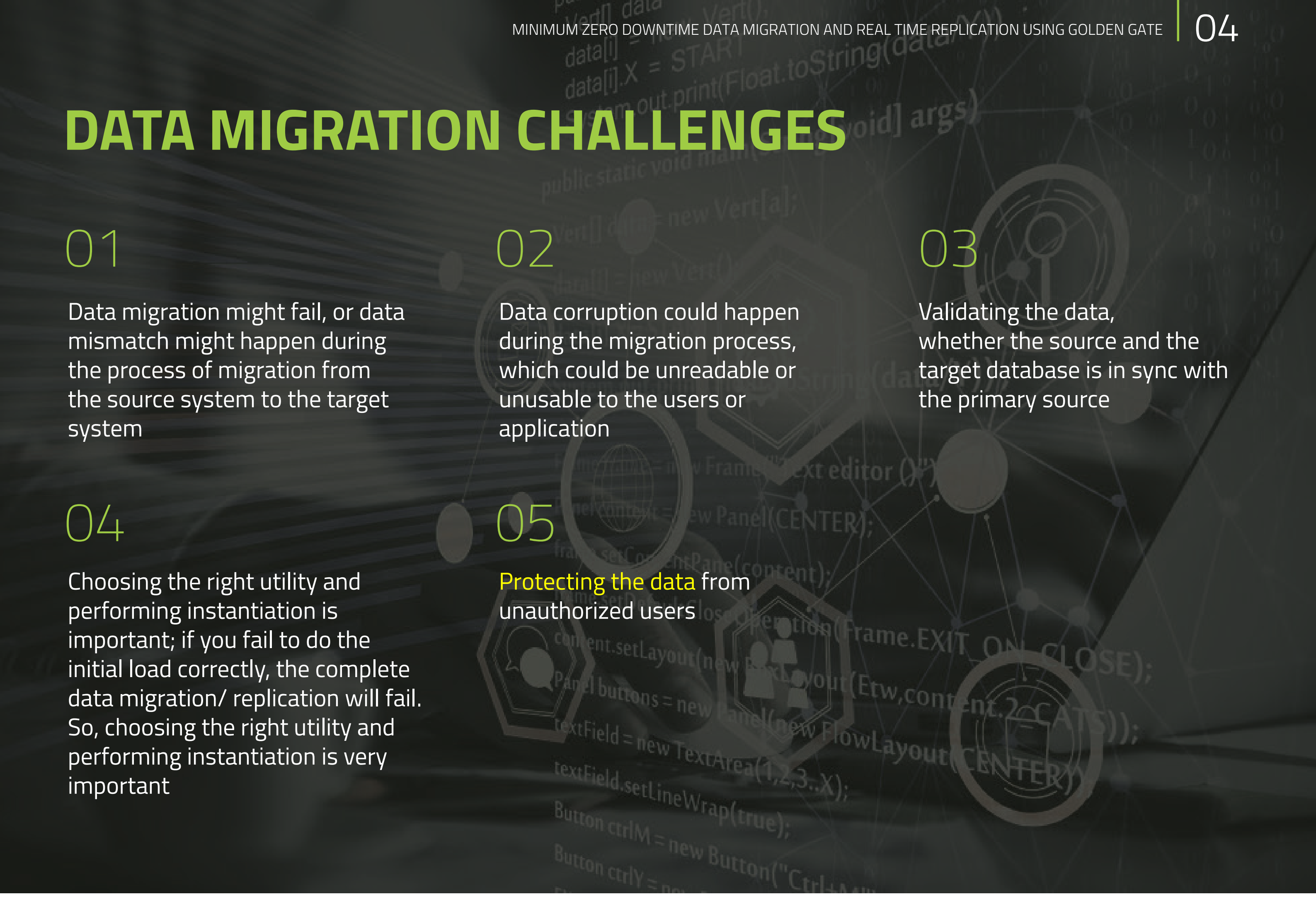
ABOUT ORACLE GOLDENGATE:

Goldengate is an Oracle product that helps you migrate or setup real-time replicating between heterogeneous database engines. We can also use Oracle Goldengate to setup high availability solutions, feed data to different data warehouse environments or to a data lake environment.

ORACLE GOLDENGATE ARCHITECTURE:







DATA MIGRATION CHALLENGES

01

Data migration might fail, or data mismatch might happen during the process of migration from the source system to the target system

02

Data corruption could happen during the migration process, which could be unreadable or unusable to the users or application

03

Validating the data, whether the source and the target database is in sync with the primary source

04

Choosing the right utility and performing instantiation is important; if you fail to do the initial load correctly, the complete data migration/ replication will fail. So, choosing the right utility and performing instantiation is very important

05

Protecting the data from unauthorized users

ADDRESSING THE ABOVE CHALLENGES WITH ORACLE GOLDENGATE

Oracle Goldengate is a powerful tool available in the market that can perform heterogeneous and homogeneous data migration and replication. It gives you the advantage of moving the data across the environment regardless of what database engine or the operating system is used, you could also move the data to a cloud-based environment. It supports the widest number of database engine available in the market and could handle data integrity between heterogeneous platforms. Oracle Goldengate supports topologies like unidirectional, bidirectional, peer to peer, one source to many targets, many sources to one target, cascading environment and more.

01 **Data Loss:** Goldengate can make sure that data is migrated with zero data loss and gives you the power to quickly analyze and troubleshoot if a situation arises from data loss and rectify the issue.

02 **Data Corruption and Failure:** Since the data is migrated over the network there are high chances that data could get corrupted and If that happens then we can easily handle the situation by using Oracle Goldengate Automatic recovery feature just by deleting the corrupted trail file. There are chances that data could get corrupted when moving from one database character set to other and even that could be handled easily by using parameters like SOURCECHARSET in the parameter file, and this could be handled at the table level or column level.

03 **Data Validation:** Using Goldengate, you can get the complete report of the number of records processed, and issue record from the report file.

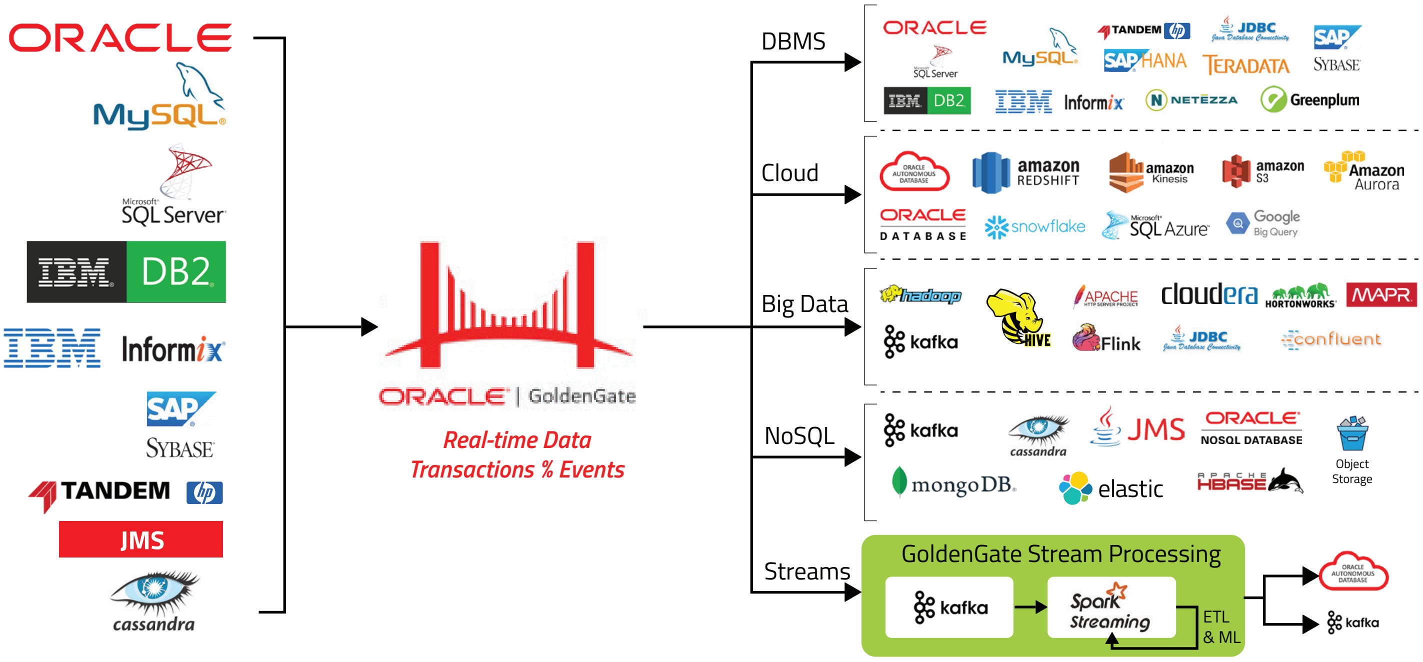
04 **Instantiation:** Using Oracle Goldengate, you can construct initial load extract to perform instantiation to bring the existing data from source to target. You can also use database engine native tools or some utility to perform the initial load. e.g. If you are migrating or setting replication between Oracle database to Oracle Database, then you can make use of Oracle Data Pump or RMAN and similarly if you are setting replication between MySQL to MySQL then you can make use of MySQL Dump.

05 **Security:** Goldengate uses 256-key byte substitution for encryption, and all records going into those files are encrypted across data links and within the trail files. Goldengate also features an alias using Credential store for user ID and password specified in the parameter file to ensure passwords are not disclosed.

06 **Efficient Failback Plan:** With Goldengate, we can have a fallback plan to avoid business impact during migration. It ensures the source and target is always in sync during migration, giving you the leverage to move back to the old system in case of failure or issue.

TRAITS OF ORACLE GOLDENGATE

Database Supported by Oracle Goldengate



Source: https://blogs.oracle.com/dataintegration/oracle-goldengate-for-big-data-191-is-released

* All logos are property and registered trademarks of respective companies

STEP TO PERFORM MINIMUM ZERO DOWNTIME MIGRATION & REAL TIME REPLICATION

Step 1

Complete pre-task on source, target and preparation for database migration

E.g. Pre-Task in Oracle database

```
SQL> SELECT supplemental_log_data_min, force_logging FROM v$database;
SQL> ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
SQL> ALTER DATABASE FORCE LOGGING;
SQL> ALTER SYSTEM SWITCH LOGFILE;

SQL> ALTER SYSTEM SET enable_goldengate_replication=true SCOPE=both;
SQL> ALTER SYSTEM SET streams_pool_size=1G SCOPE=both;
SQL> ALTER SYSTEM SET undo_retention=86400 SCOPE=both;
SQL> CREATE PFILE FROM SPFILE;
SQL> create tablespace ggs_data  datafile 'Datafile Path' size 500m;
SQL> create user ggadmin identified by ********* default tablespace ggs_data temporary tablespace temp;
SQL> ALTER USER ggadmin QUOTA UNLIMITED ON ggs_data;
SQL> GRANT FLASHBACK ANY TABLE TO ggadmin
SQL> GRANT CREATE SESSION TO ggadmin;
SQL> GRANT CONNECT TO ggadmin;
SQL> GRANT RESOURCE TO ggadmin;
SQL> GRANT DBA TO ggadmin;
SQL> GRANT ALTER ANY TABLE TO ggadmin;
SQL> GRANT ALTER SYSTEM to ggadmin;
SQL> exec dbms_goldengate_auth.grant_admin_privilege('ggadmin');
```

Step 2

Build Change sync Extract process to capture the new data changes in source database

Command to add ChangeSync Extract

```
GGSCI> DBLOGIN USERIDALIAS USERALIAS, DOMAIN DOMAINNAME
GGSCI> register extract CSEXTRACT, database
GGSCI> add extract CSEXTRACT, integrated tranlog, begin now
GGSCI> add exttrail /opt/apps/product/gg_home/oracle/dirdat/cs, extract CSEXTRACT
```

Goldengate Parameter File for Change Sync

```
EXTRACT CSEXTRACT
-- Login information
USERIDALIAS USERIDALIAS USERALIAS, DOMAIN DOMAINNAME
-- Below is trailfile information
EXTTRAIL /opt/apps/product/gg_home/oracle/dirdat/cs MEGABYTES 200
TABLE SCHEMANAME.*;
```

Step 3

Select Instantiation process to bring the existing data from source to target by using Initial load extract

This method is Goldengate Feature. It is not mandatory to use initial load extract method for instantiation as you have many tools and utility available based on the database engine. If the source and target is Oracle, we can use Export Dump or Rman or MySQL to MariaDB you can use SQL Dump.

Initial load extract.

Parameter File.

```
EXTRACT ILEXT
-- Login information
USERIDALIAS USERIDALIAS USERALIAS, DOMAIN DOMAINNAME
-- Below is trailfile information
EXTFILE /opt/apps/product/gg_home/oracle/dirdat/il MEGABYTES 200
TABLE SCHEMANAME.*;
```

Command to Add Initial Load Extract

```
GGSCI> add extract ILEXT, sourceistable
```

Step 4

Load the initial load in the Target database by building initial load replicat

Initial Load Replicat Parameter file

```
replicat repil
SETENV (NLS_LANG = AMERICAN_AMERICA.AL32UTF8)
SETENV (ORACLE_HOME="/opt/apps/product/ORAHOME/12c1")
END RUNTIME
ABORTONFATALERROR
TARGETDB DatabaseName@Instance:<Port_Number>, USERIDALIAS USERIDALIAS USERALIAS, DOMAIN
DOMAINNAME
reportcount every 1800 seconds, rate
DISCARDFILE /opt/apps/GG_HOME/mysql/dirrpt/repil.dsc, APPEND, megabytes 4096
SQLEXEC ("set foreign_key_checks=0");
MAP SCHEMANAME.*, TARGET SCHEMANAME.*;
```

Command to Add initial Load replicat

```
add replicat repil , exttrail /opt/apps/product/gg_home/oracle/dirdat/il, NODBCHECKPOINT
```

Step 5

Once the existing data is loaded, we need to build change sync replicat to apply the new changes in target captured by change sync extract

ChangeSync Replicat parameter File:

```
replicat REPCS
SETENV (NLS_LANG = AMERICAN_AMERICA.AL32UTF8)
SETENV (ORACLE_HOME="/opt/apps/product/ORAHOME/12c1")
TARGETDB DatabaseName@Instance:<Port_Number>, USERIDALIAS USERIDALIAS USERALIAS, DOMAIN
DOMAINNAME
reportcount every 1800 seconds, rate
DISCARDFILE /opt/apps/GG_HOME/mysql/dirrpt /repsc.dsc, APPEND, megabytes 4096
SQLEXEC ("set foreign_key_checks=0");
MAP SCHEMANAME. *, TARGET SCHEMANAME.*;
```

Command to Add ChangeSync Replicat

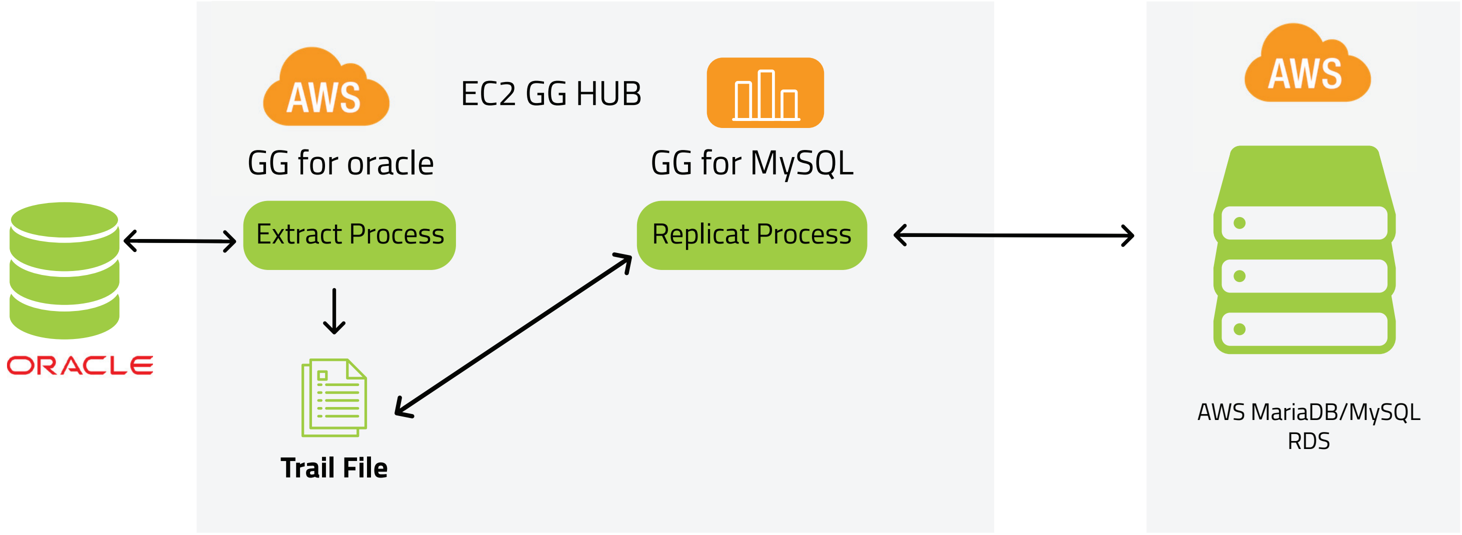
```
add replicat recsc , exttrail /opt/apps/product/gg_home/oracle/dirdat/cs, NODBCHECKPOINT
```

HAPPIEST MINDS USED CASE IMPLEMENTED AT CUSTOMER ENVIRONMENT

We have successfully implemented Zero Downtime migration and Real-time replication. Below are some of the use case studies of our customers.

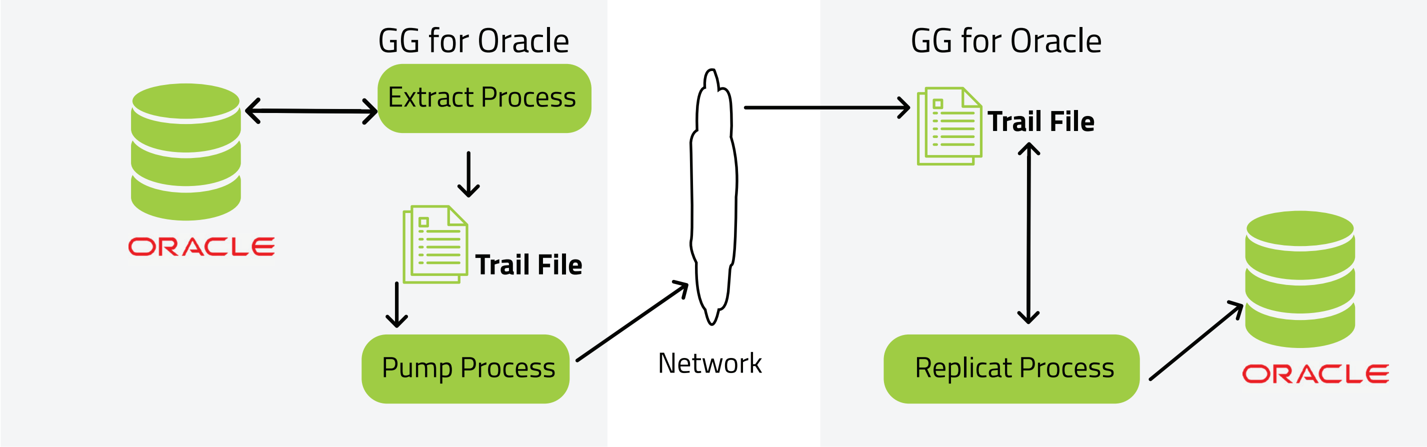
User Case 1: Migration between Oracle Database to MariaDB/MySQL

In this use case, the source is on-prem Oracle and target is AWS MariaDB RDS instance. The requirement was to migrate data with zero minimum downtime between source and target.



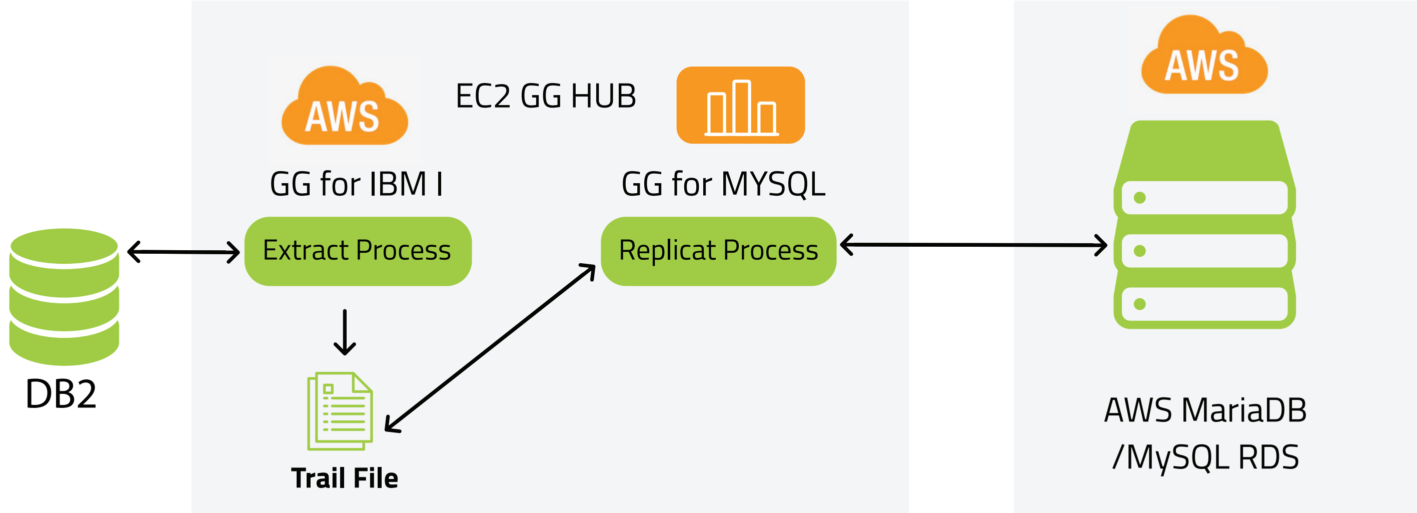
User Case 2: Migration between Oracle to Oracle

In this use case, the requirement was to perform homogeneous replication between the source on-prem database to target Aws EC2 Instance.



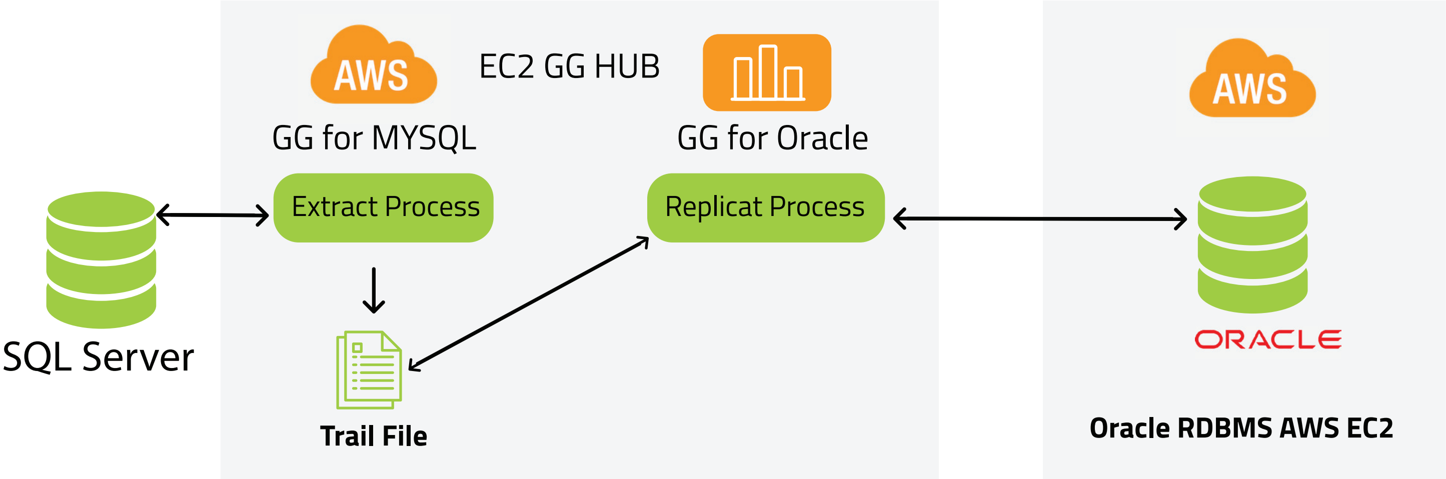
User Case 3: Migration/Replication between source IBM I series and Target Aws MariaDB RDS instance

In this use case, the customer requirement was to migrate a few tables from DB2 database to AWS MariaDB RDS instance and to have ongoing replication set between source and target to keep the table sync for reporting purpose.

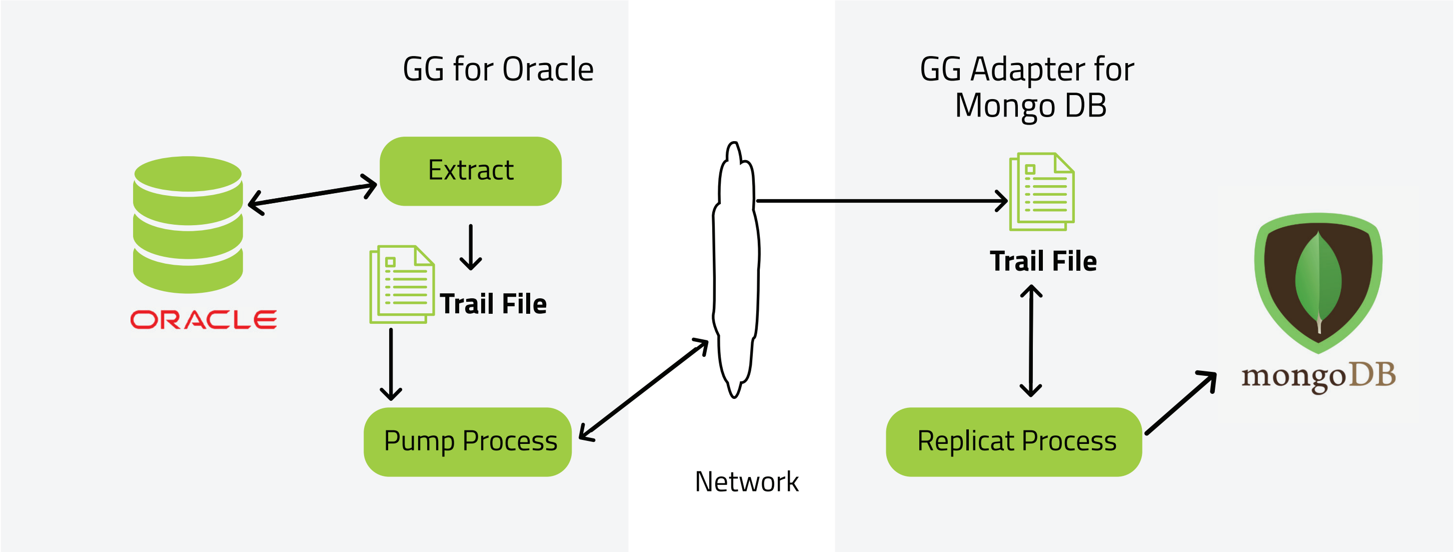


User Case 4: Migration between source MSSQL database to target AWS Ec2 Oracle database

In this use case, customer requirement was to migrate data from on-prem MSSQL database to target AWS EC2 Oracle database.

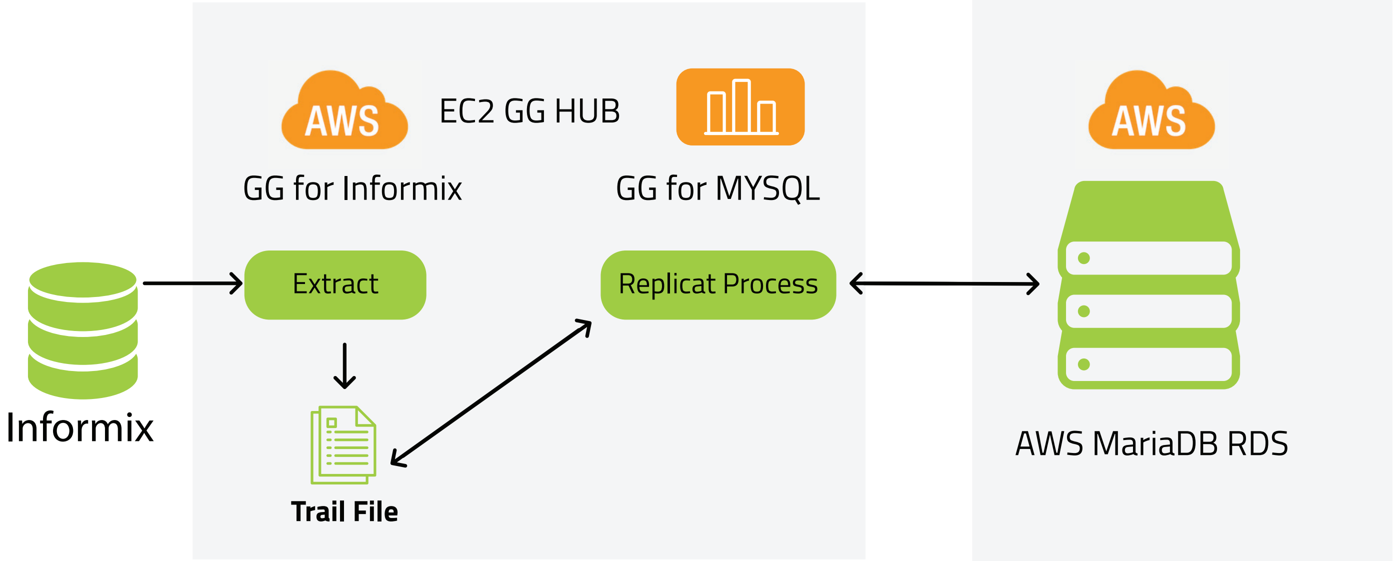


User Case 5: Migration between Source On-prem Oracle database to Target On-Prem MongoDB



User Case 6: Migration between source IBM Informix to Target AWS MariaDB RDS instance

In this use case, customer demand was to migrate data from legacy IBM Informix on-prem database to AWS MariaDB RDS instance.



CONCLUSION

To win the race in the market businesses needs the transactional data readily available in different platforms or Database without interruption or delay in business. Ensuring that data is available, accessible, and delivered accurately to the target system is not an easy task. Oracle Goldengate gives you that power to make the data available, accessible, and accurate regardless of having different database engines, OS, Cloud infrastructure or others. It helps and makes things easy to handle mission-critical environments that demand continuous data availability, and getting downtime is not an option.

ABOUT THE AUTHOR

Vikas Seelan is an Oracle Certified Professional (OCP), he has over 10+ years of IT experience as Database Administrator. He has spent many years with planning, designing, consulting data migration for different platform and database. He has worked with multiple database engines and successfully performed data migration using Oracle Goldengate, Oracle Veridata, AWS Data migration services, Microsoft SSMA and more. Vikas Seelan currently working as a technical lead at Happiestminds Technologies, he is responsible for planning and implementing heterogeneous database migration on Cloud/On-Prem Infrastructure.

Business Contact business@happiestminds.com

About Happiest Minds Technologies

happiest minds
The Mindful IT Company
Born **Digital** . Born **Agile**

www.happiestminds.com

Happiest Minds Technologies Limited (NSE: HAPPSTMNDS), a Mindful IT Company, enables digital transformation for enterprises and technology providers by delivering seamless customer experiences, business efficiency and actionable insights. We do this by leveraging a spectrum of disruptive technologies such as: artificial intelligence, blockchain, cloud, digital process automation, internet of things, robotics/drones, security, virtual/augmented reality, etc. Positioned as 'Born Digital . Born Agile', our capabilities span digital solutions, infrastructure, product engineering and security. We deliver these services across industry sectors such as automotive, BFSI, consumer packaged goods, e-commerce, edutech, engineering R&D, hi-tech, manufacturing, retail and travel/transportation/hospitality.

A Great Place to Work-Certified™ company, Happiest Minds is headquartered in Bangalore, India with operations in the U.S., UK, Canada, Australia and Middle East.