ORACLE OPEN WORLD

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Deep Dive into Automating Oracle GoldenGate using the New Microservices

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Oracle GoldenGate Development
October 2, 2017

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Safe Harbor Statement

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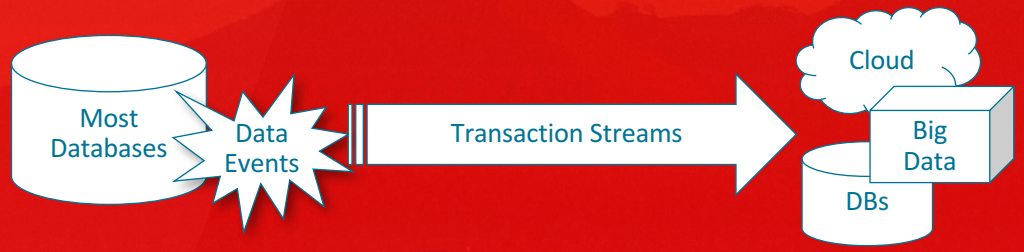
Oracle GoldenGate

Oracle GoldenGate provides low-impact capture, routing, transformation, and delivery of database transactions across homogeneous and heterogeneous environments in real-time with no distance limitations.



**** The most popular enterprise integration tool in history***

Real time Performance

Extensible & Flexible

Proven & Reliable

Supports Databases, Big Data and NoSQL:

ORACLE · MySQL · IBM DB2 · Microsoft SQL Server · TANDEM NonStop (hp) · SAP SYBASE · IBM Informix

hadoop HDFS · Apache Kafka · Apache · HIVE · hadoop · cloudera · Hortonworks · TEZ · Spark · FLUME · APACHE HBASE

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Agenda

1. New GoldenGate Microservices Architecture
2. Automating and Embedding GoldenGate

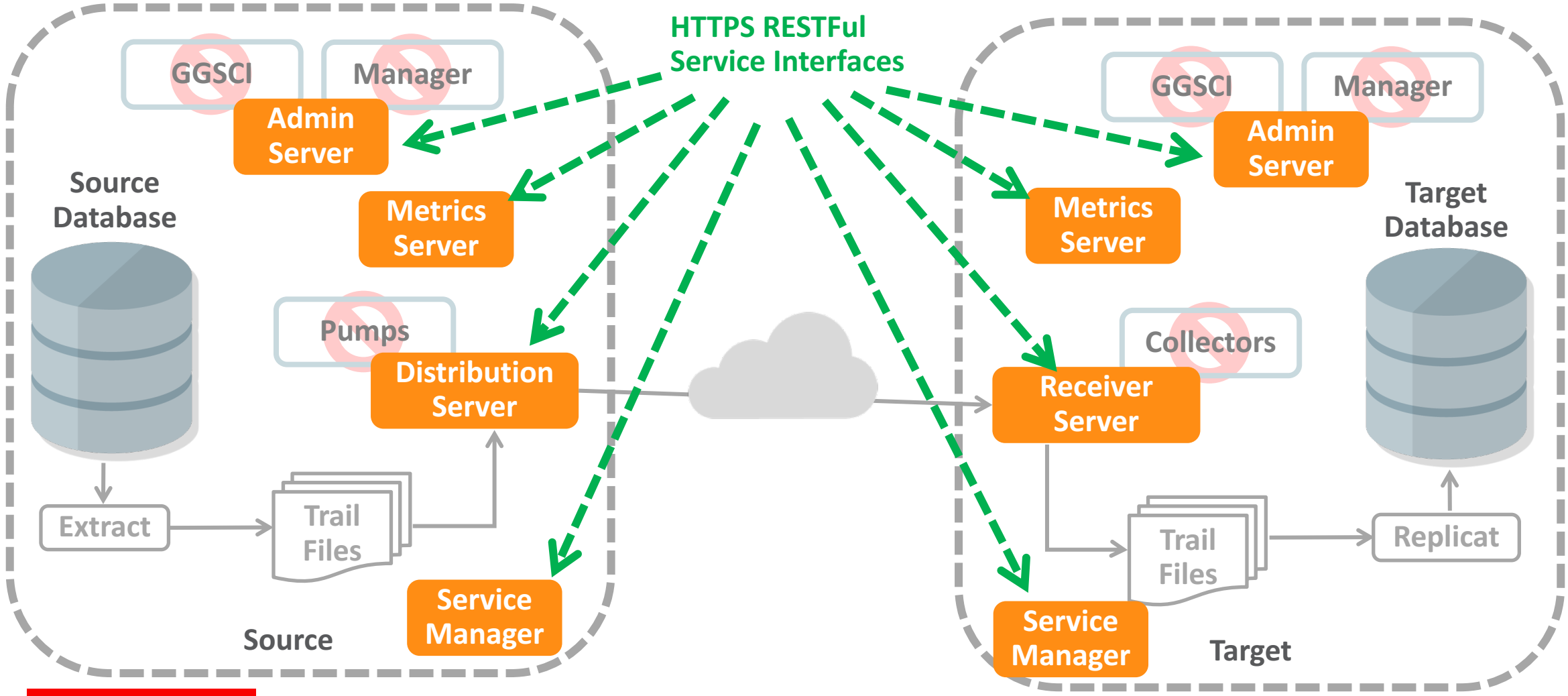
New GoldenGate Microservices Architecture

Simplifies large scale and cloud deployments

- GoldenGate components as micro services with comprehensive RESTful interfaces.
- Enables remote and secure configuration, administration, and monitoring capabilities.
- Enables Applications to embed, automate, and orchestrate GoldenGate.

New Services Architecture for Cloud and Large-scale Deployments

Administration, Distribution, Receiver, Metrics Services with RESTful Service Interfaces

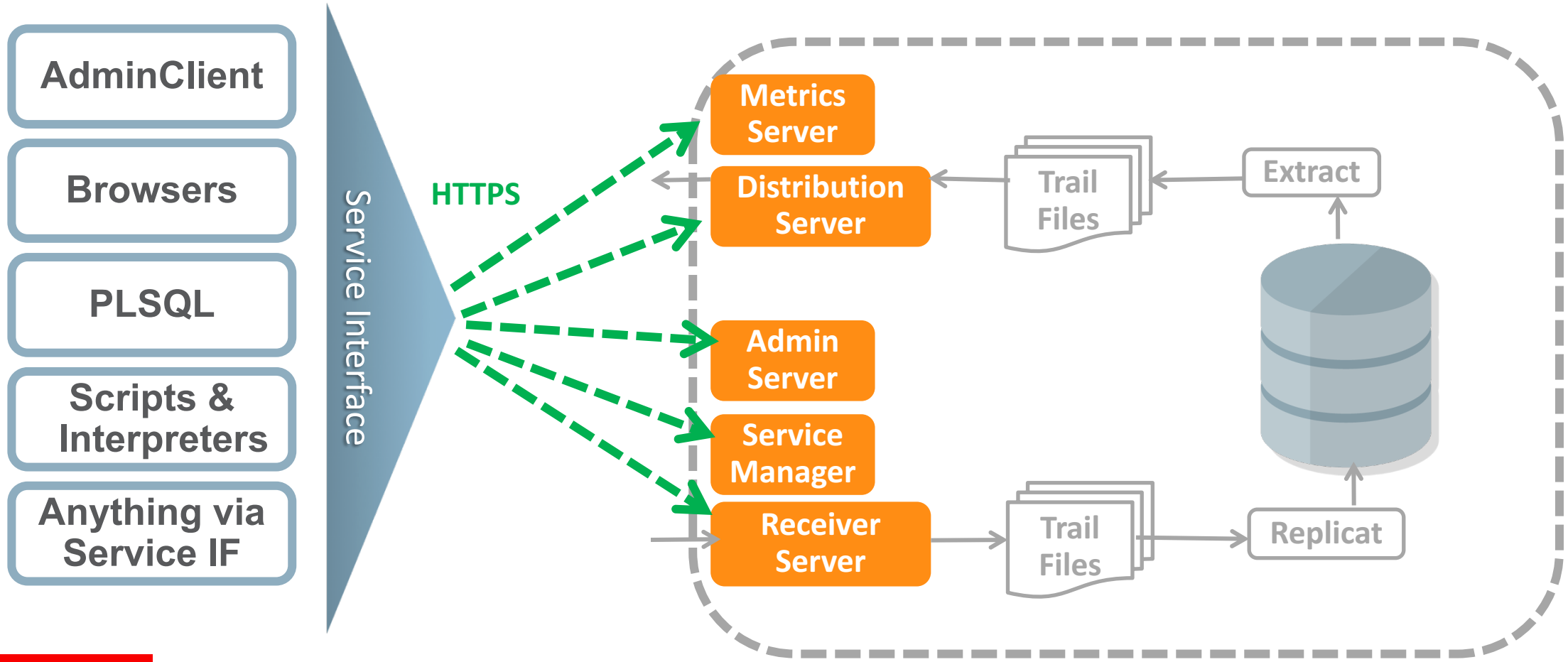


New GoldenGate Microservices

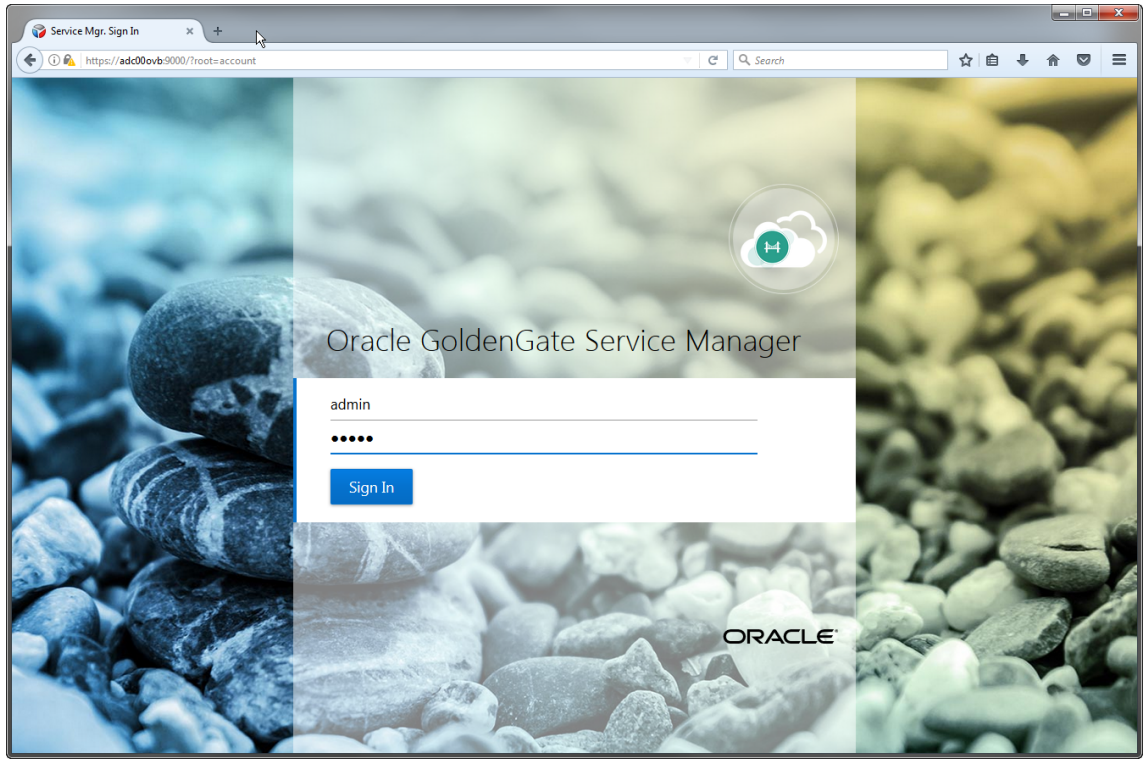
- Administration Service
  - Replaces GGSCI and Manager with a single administration service for managing replication processes
- Multi-threaded Distribution Service
  - Replaces multiple source-side Extract Pumps with a single instance service.
  - Lightweight filtering only (no transformations)
- Multi-threaded Receiver Service
  - Replaces the multiple discrete target-side Server/Collectors with a single instance service
- Performance Metrics Service
  - New service for monitoring metrics related to a particular deployment
  - Also available in the traditional architecture
- Service Manager
  - New service for managing multiple deployments on a local host

Administer GoldenGate with Variety of Clients

Command Line, Browsers, Programmatic RESTful Interfaces



REST based clients for Remote and Secure GoldenGate Administration



- Use browser to administer and monitor GoldenGate
- Each service has an embedded HTML5 app

```
OGG (not connected) > CONNECT https://xyz.us.oracle.com:9000 DEPLOYMENT demo AS admin PASSWORD ***

OGG (https://localhost:9000 demo) > DBLOGIN USERIDALIAS gg_2 DOMAIN OracleGoldenGate
Successfully logged into database.

OGG (https://localhost:9000 demo) > ADD EXTRACT e001 INTEGRATED TRANLOG BEGIN NOW
2016-09-16T01:13:16Z INFO OGG-08100 EXTRACT (Integrated) added.

OGG (https://localhost:9000 demo) > REGISTER EXTRACT e001 DATABASE
2016-09-16T01:13:33Z INFO OGG-02003 Extract e001 successfully registered with database at SCN 1155176.

OGG (https://localhost:9000 demo) > ADD EXTTRAIL ah EXTRACT e001
2016-09-16T01:13:34Z INFO OGG-08100 EXTTRAIL added.

OGG (https://localhost:9000 demo) > START EXTRACT e001
2016-09-16T01:13:34Z INFO OGG-00975 EXTRACT EDBA starting
2016-09-16T01:13:34Z INFO OGG-15426 EXTRACT EDBA started
```

- Thin Command Line client - similar to GGSCI
- Connect and administer local and remote deployments

Example RESTful Service Call to Create Extract

Single Call to create, update parameter file, register, and start integrated Extract

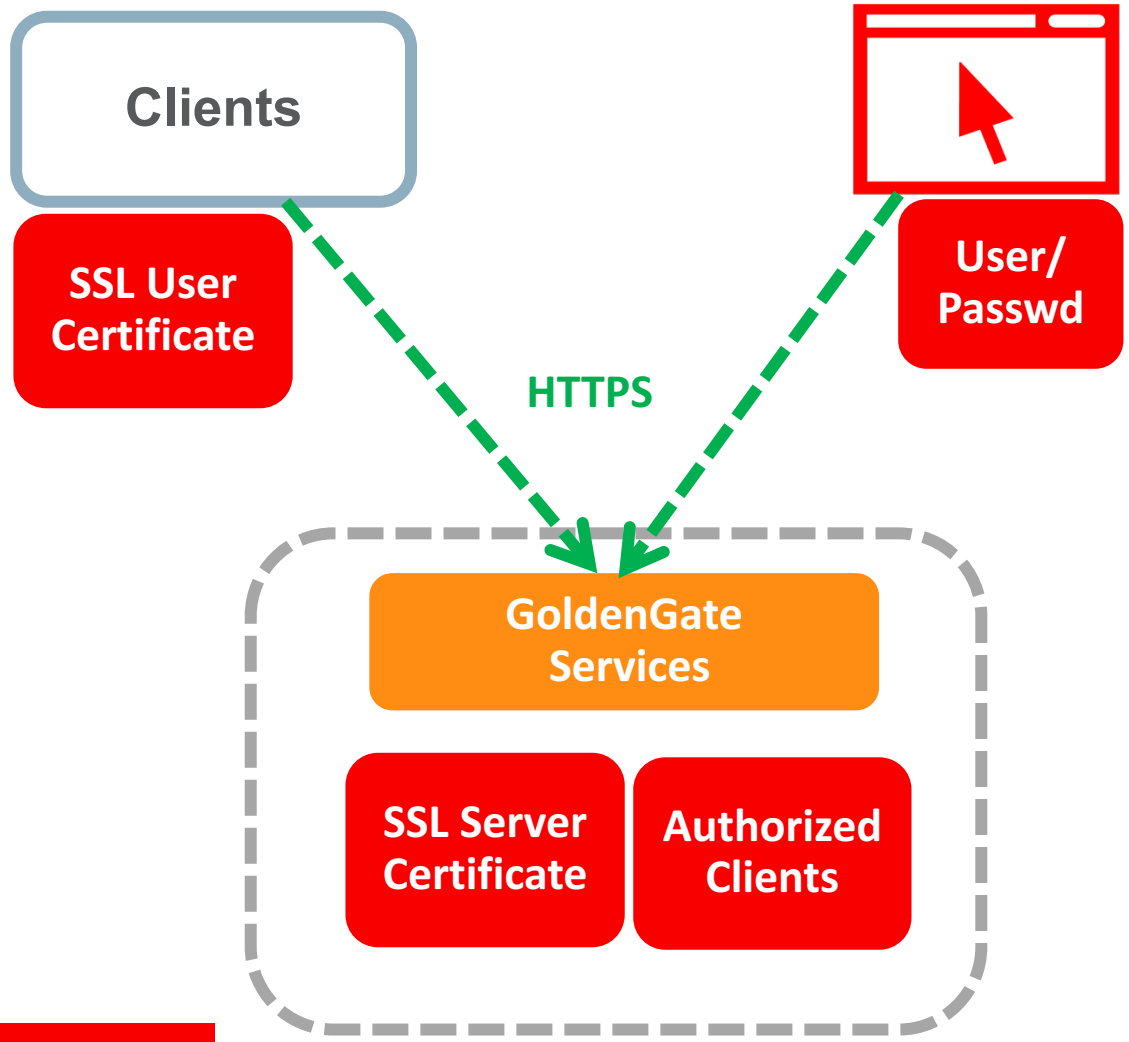
POST https://xyz.us.oracle.com:9101/services/v2/processes/extracts/e001

JSON Payload:

```
{
    "$schema" : "ogg:extract",
    "credentials" :
    {
     "domain" : "OracleGoldenGate",
     "alias" : "gg1"
    },
    "config" :
    [
     "-- Parameter file for primary extract: e001",
     " extract e001",
     " useridalias gg1",
     " exttrail aa, format release 12.3",
     " tranlogoptions excludetag +",
     " eofdelaycsecs 10",
     " table u1.*;",
     " "
    ],
"status" : “running",
    "source" :
    {
     "tranlogs" : "integrated"
    },
    "registration" :
    {
     "csn" : "0.0",
     "share" : true
    },
    "targets" :
    [
     {
    "name" : "aa"
     }
    ]
   }
```

Security Model

Standard TLS/SSL based authentication and Client Authorization

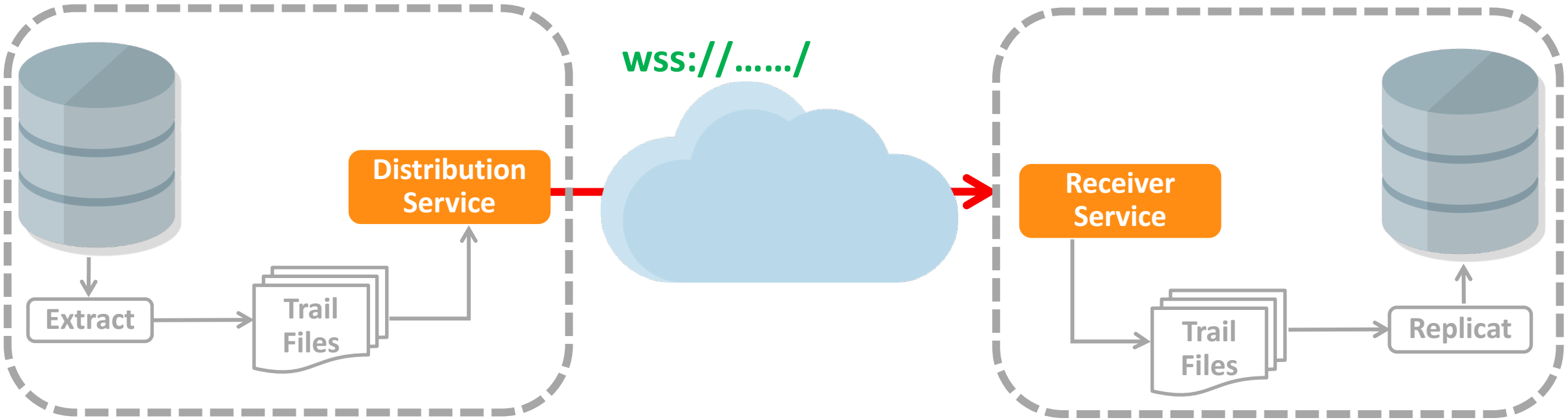


Client Authorization

- Identity via SSL user certificates or via username/password
  - Integrate with SSO configured in proxy/middleware.
- Roles
  - Security User
  - Administrator
  - Operator
  - User

WebSockets -- Default Data Communication Protocol

Industry standard HTTP(S) initiated full-duplex streaming protocol



- SSL based security
- Can seamlessly traverse through HTTP forward/reverse proxy servers

Allows Applications to Embed and Automate GoldenGate

Easily build self-service applications which automates GoldenGate

REST calls to configure, administer, and monitor GoldenGate

GoldenGate Services Deployment

GoldenGate Services Deployment

GoldenGate Services Deployment

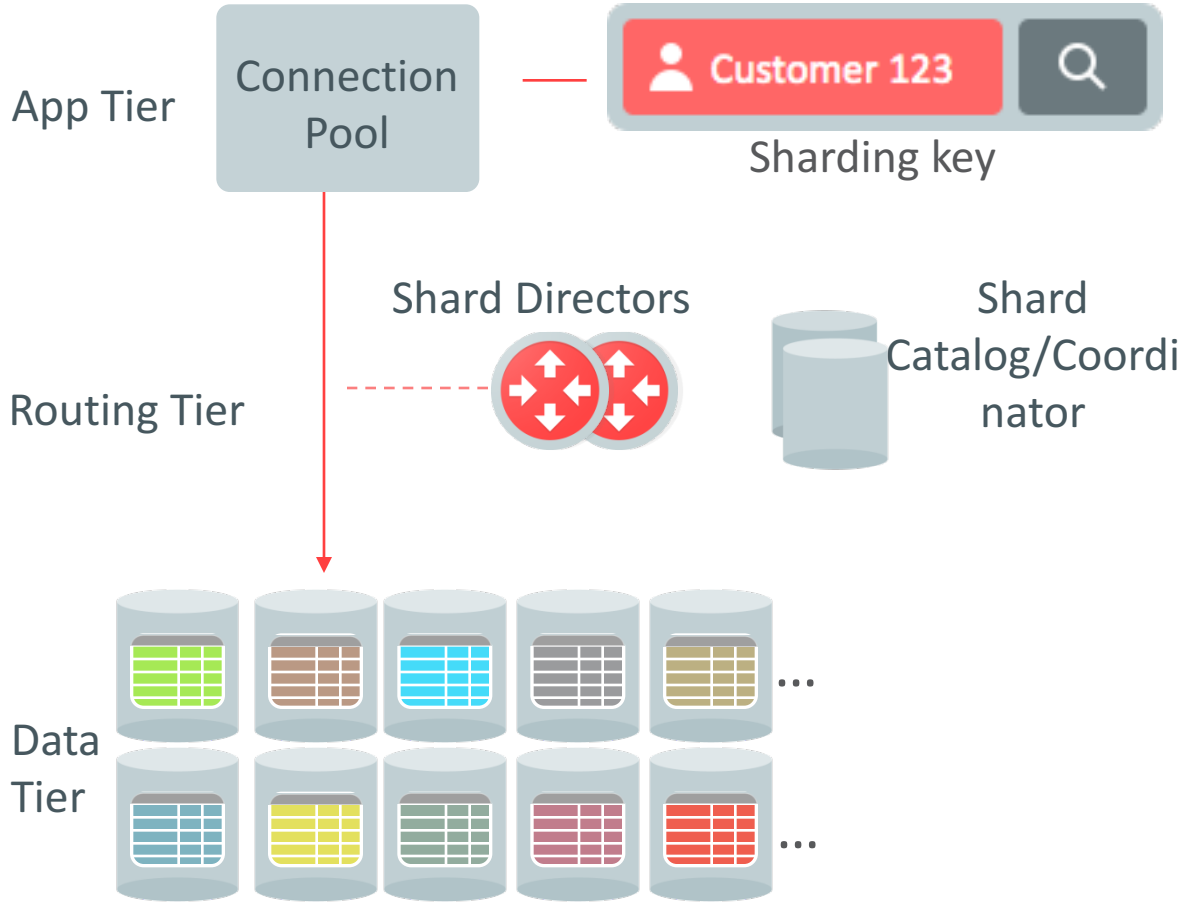
GoldenGate Services Deployment

Catalog of RESTful APIs are available for all services

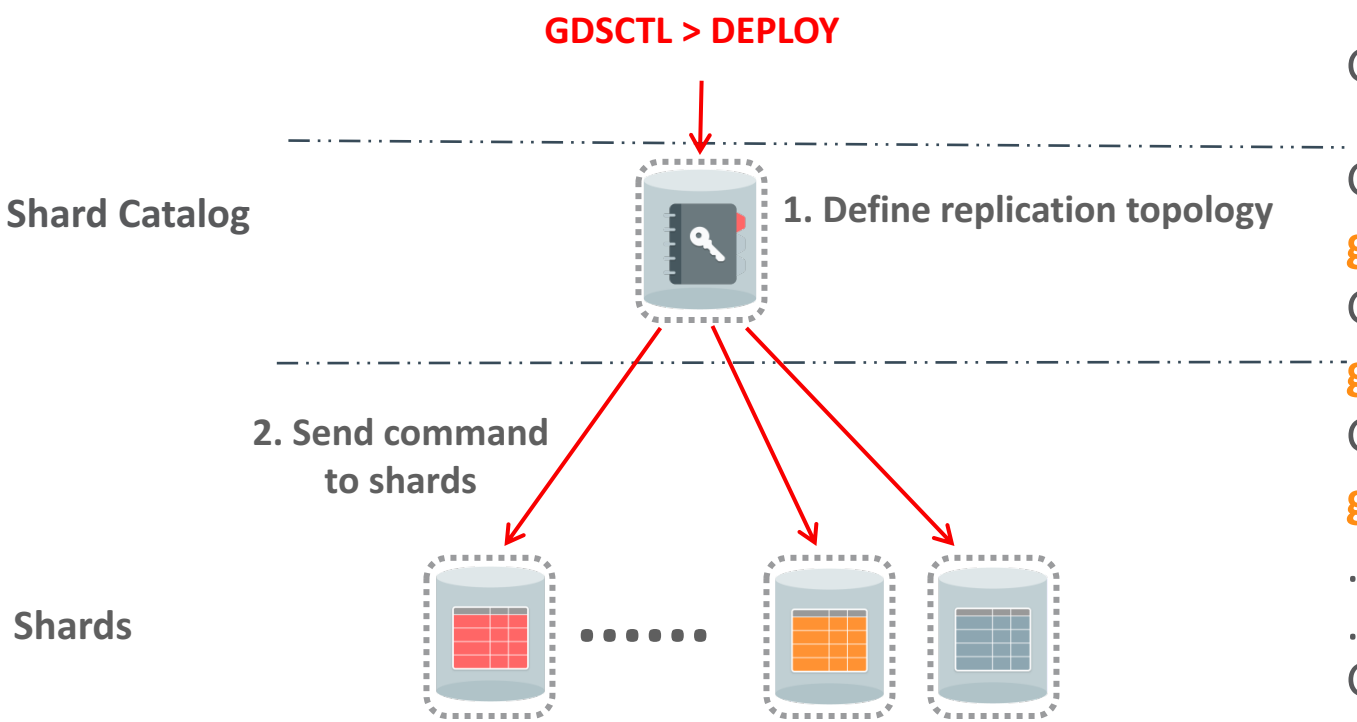
GoldenGate Automated in Oracle Database Sharding

N-way active-active replication automatically set up

- Automatic creation of replication processes
  - Extracts, Replicats, Distribution Paths
  - Automatic CDR for resolving conflicts
- Replication topology is automatically reconfigured upon sharding changes



Sharding - Automatic Oracle GoldenGate Configuration

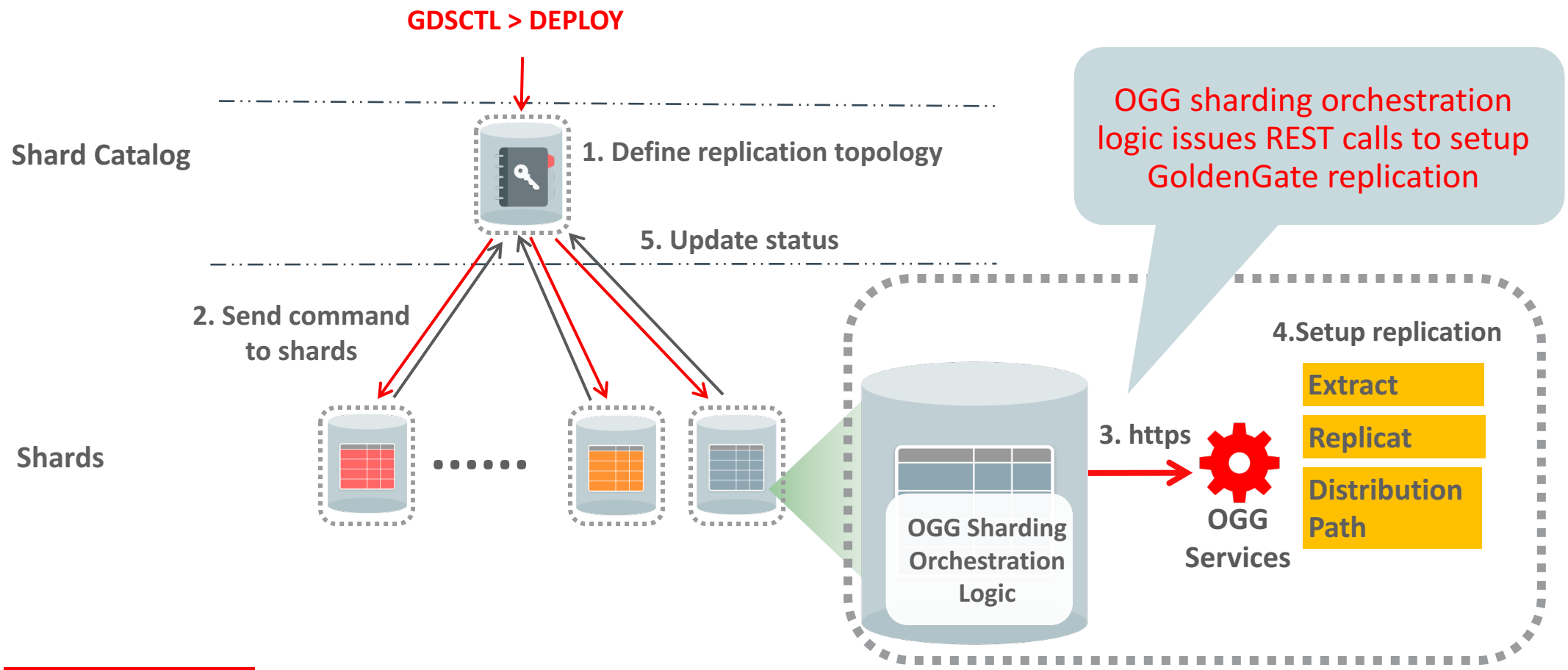


GDSCTL> create shardcatalog …. **-repl OGG** ….

GDSCTL> add shardgroup ..shgrp1 **-repfactor 3**

GDSCTL>add shard -shardgroup shgrp1….
gg_service host01:9000/deploy1 ….
GDSCTL>add shard -shardgroup shgrp1…. **-**
gg_service host02:9000/deploy1
GDSCTL>add shard -shardgroup shgrp1…. **-**
gg_service host03:9000/deploy1
…..
…….
GDSCTL>DEPLOY

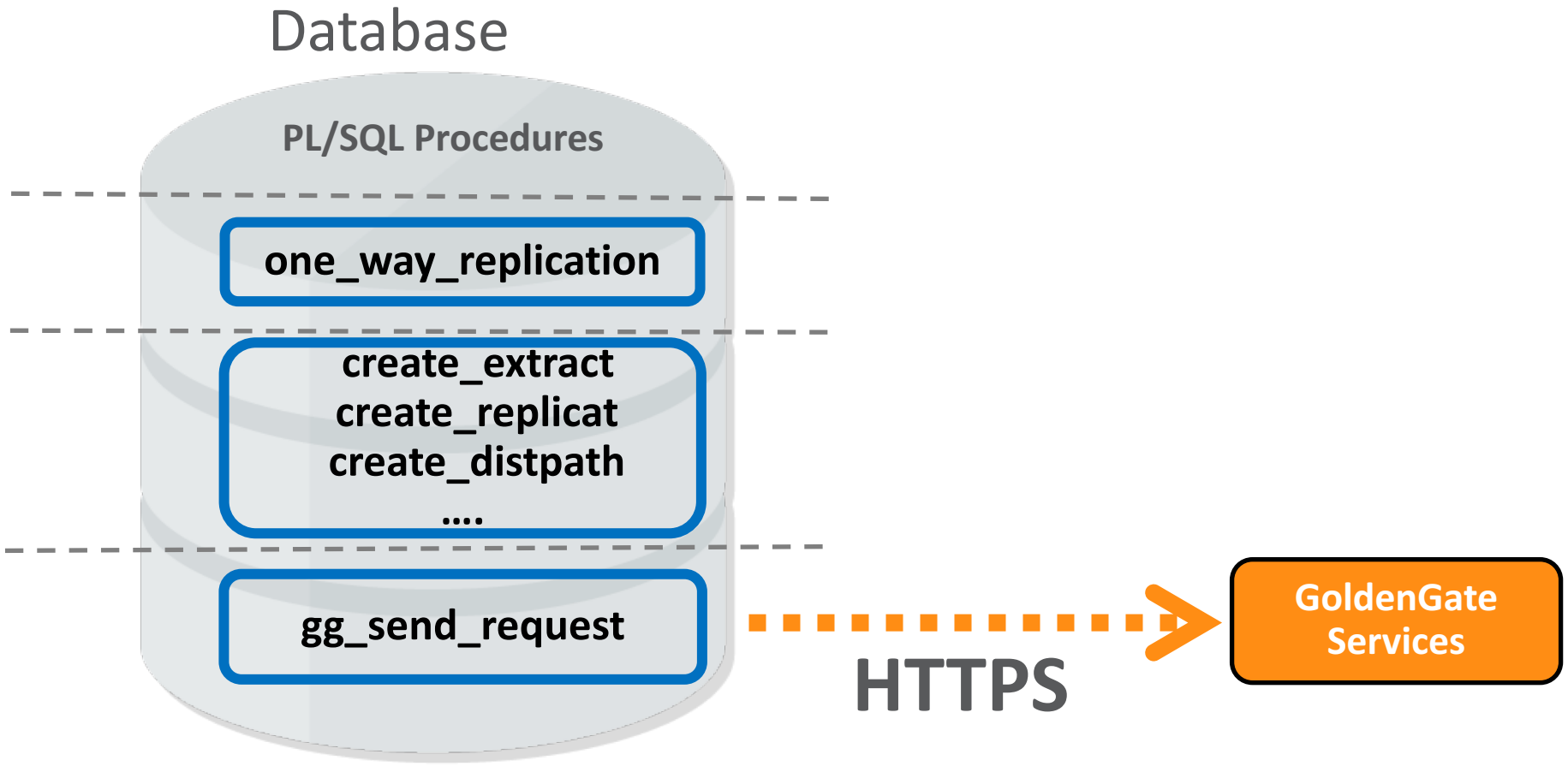
Sharding - Automatic Oracle GoldenGate Configuration



Program Agenda

1. New GoldenGate Microservices Architecture
2. Automating and Embedding GoldenGate

Set up Replication using simple PL/SQL buildings blocks

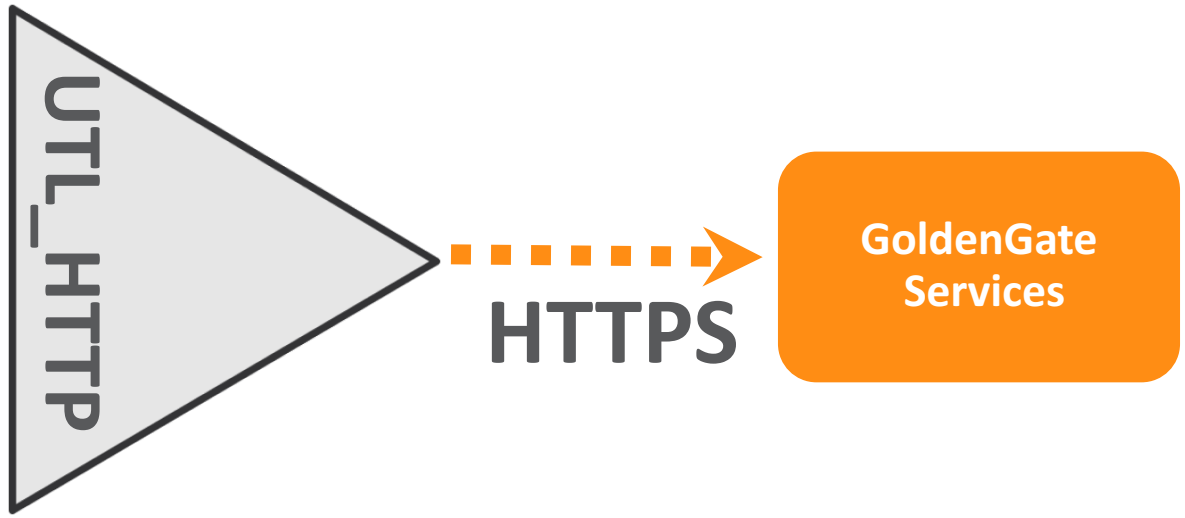


Note: We plan to publish example building blocks on OTN

SEND_GG_REQUEST

Uses UTL_HTTP to make REST calls

```
procedure
 send_gg_request
 ( gg_uri      IN  varchar2
 , verb        IN  varchar2
 , payload     IN  varchar2
 , resp_code   OUT number
 , resp_text   OUT NOCOPY varchar2
 )
```

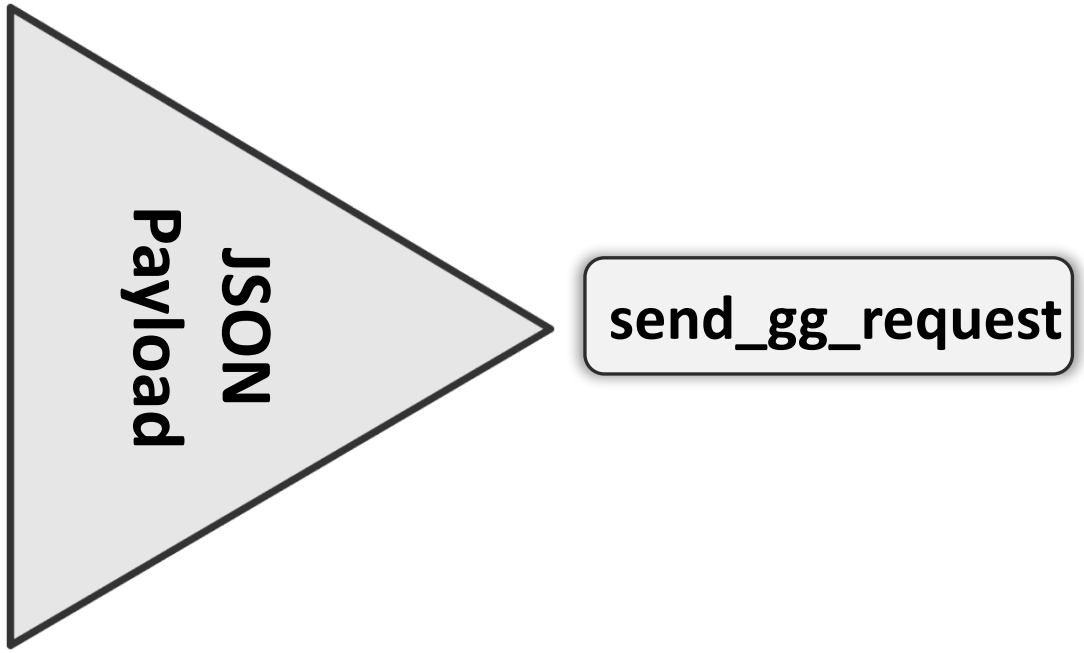


- URI of GoldenGate Service Endpoint : https://<gghost>:9001/services/v2/processes/extracts/e001
- HTML Verb : POST, PATCH, DELETE, GET
- Payload : JSON object specifying the replication process
- Response_Code : 200 (OK), 201 (CREATED), …
- Response_Text : *<detailed Response from Service>*

Procedures to create GoldenGate Processes

```
procedure
 create_[extract|replicat]
 ( [ext|rep]_name     IN  varchar2
 , adminsrv_uri       IN  varchar2
 , db_credentials     IN  varchar2
 , [ext|rep]_trail    IN  varchar2
 , [ext|rep]_params   IN  varchar2
 )
```

```
procedure
  create_distpath
  ( path_name   IN  varchar2
  , ds_uri      IN  varchar2
  , src_trail   IN  varchar2
  , rs_uri      IN  varchar2
  , tgt_trail   IN  varchar2
  )
```



Orchestration Procedure to setup One-way Replication

Customize as needed

```
procedure one_way_replication
(db_src          varchar2
,gg_src          varchar2
,gg_trg          varchar2
,db_trg          varchar2
,tables          varchar2
,instantiation   varchar2  [YES|NO]
,auto_CDR        varchar2  [YES|NO]
)
```

```
Generate ER process names
Generate Trail file names
…
```

```
create_extract
create_distpath
create_replicat
…
```

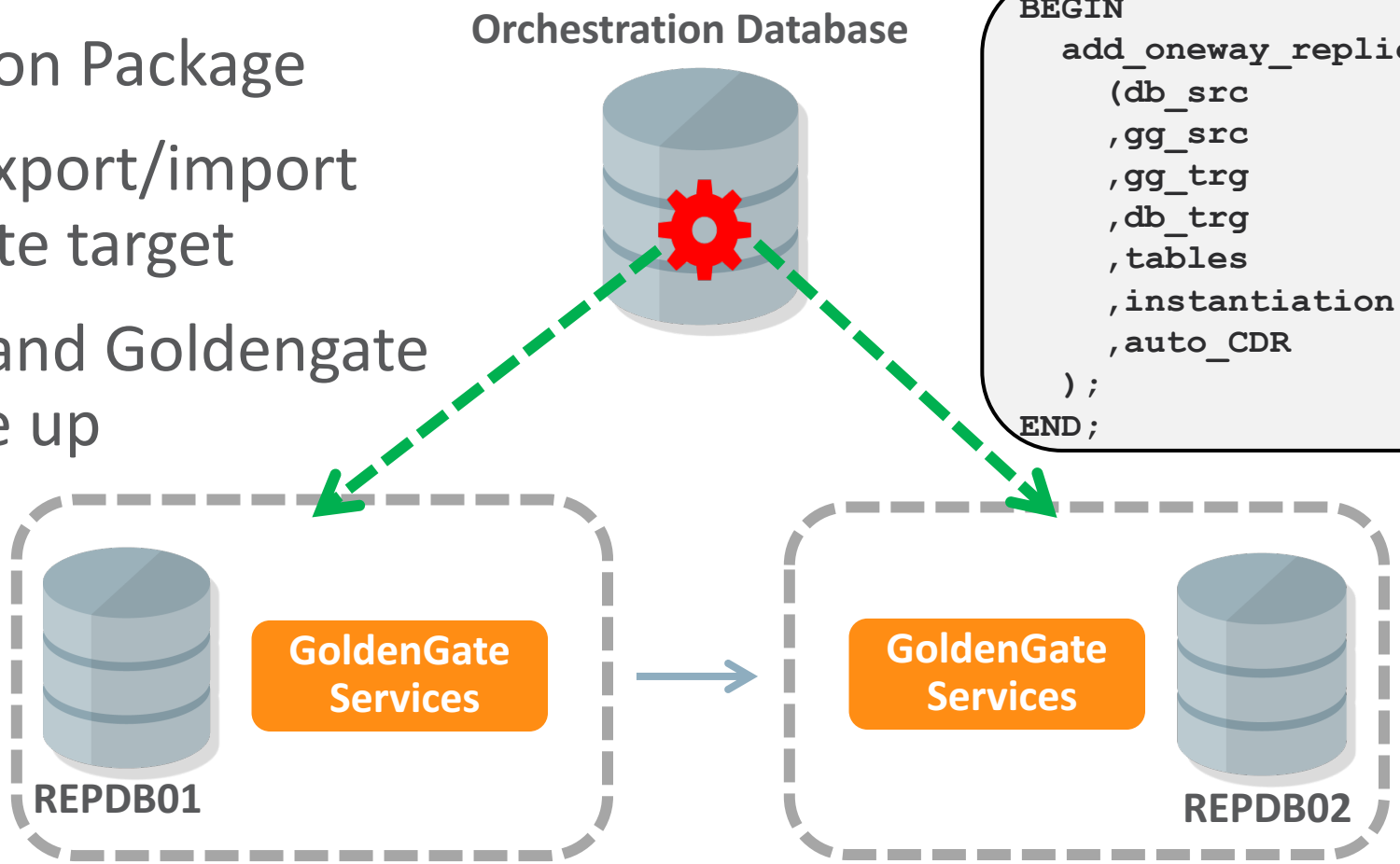
```
Database Utilities
  DBMS_DATAPUMP
  DBMS_FILE_TRANSFER
  DBMS_TTS
  ...
```

```
DBMS_GOLDENGATE_ADM
    ADD_AUTO_CDR(…)
```

Requires DB 12.2+ & OGG 12.3

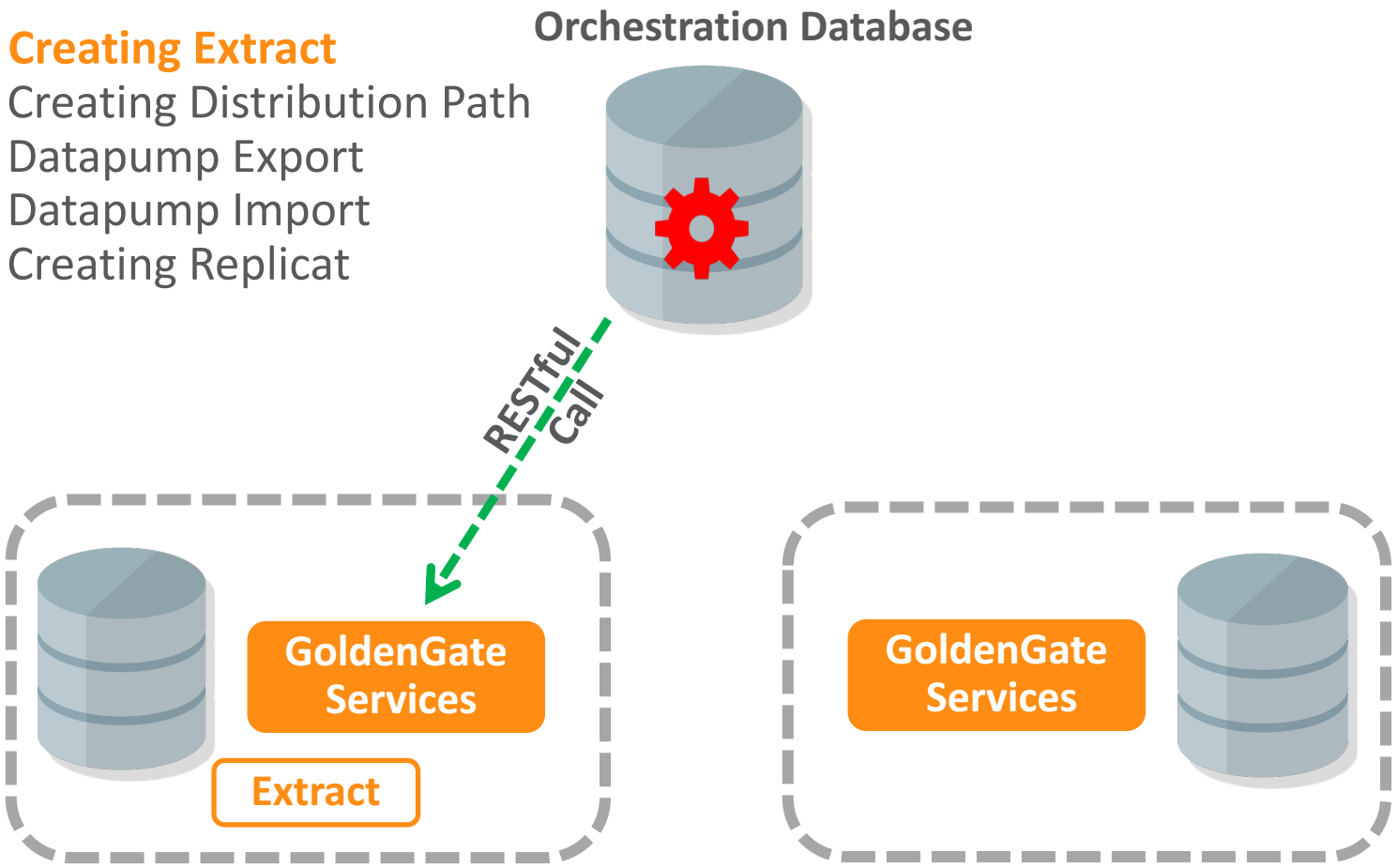
Setup One Way Replication

- Orchestration Package
- Database export/import to instantiate target
- Databases and Goldengate Services are up



Create and Start Integrated Extract

1. Creating Extract
2. Creating Distribution Path
3. Datapump Export
4. Datapump Import
5. Creating Replicat

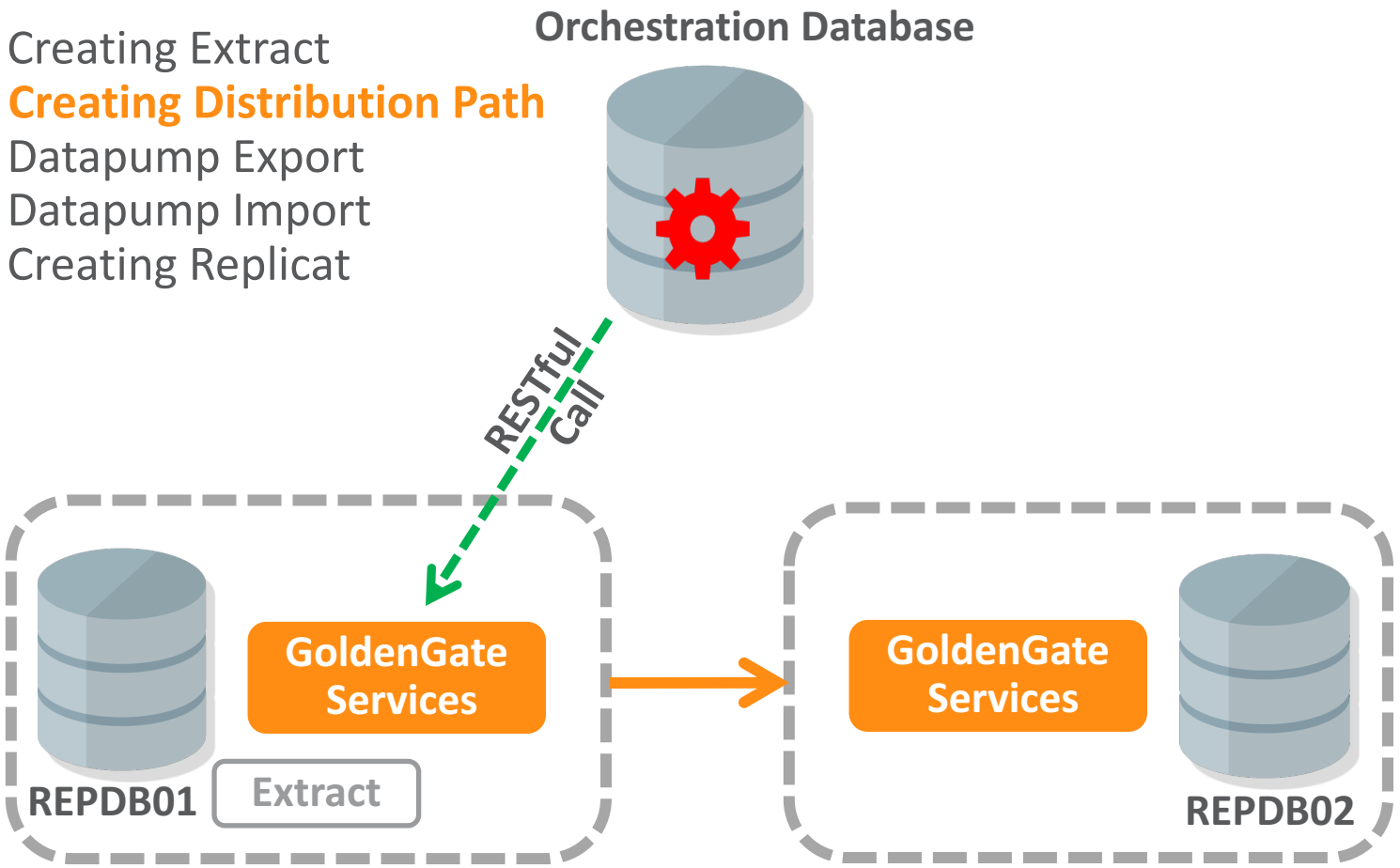


POST HTTPS://gg_src:8001/....

```
{
 "config":[
   "Extract     E01AA",
   "ExtTrail    et",
   "UseridAlias gg_src",
   "Table       HR.EMP;"
   ],
   "source":{
     "tranlogs":"integrated"
   },
   "credentials":{
     "alias":"gg_src"
   },
   "registration":"default",
   "begin":"now",
   "targets":[
   {
     "name": "et"
   }
 ]
}
```

Create and Start Distribution Path

1. Creating Extract
2. **Creating Distribution Path**
3. Datapump Export
4. Datapump Import
5. Creating Replicat

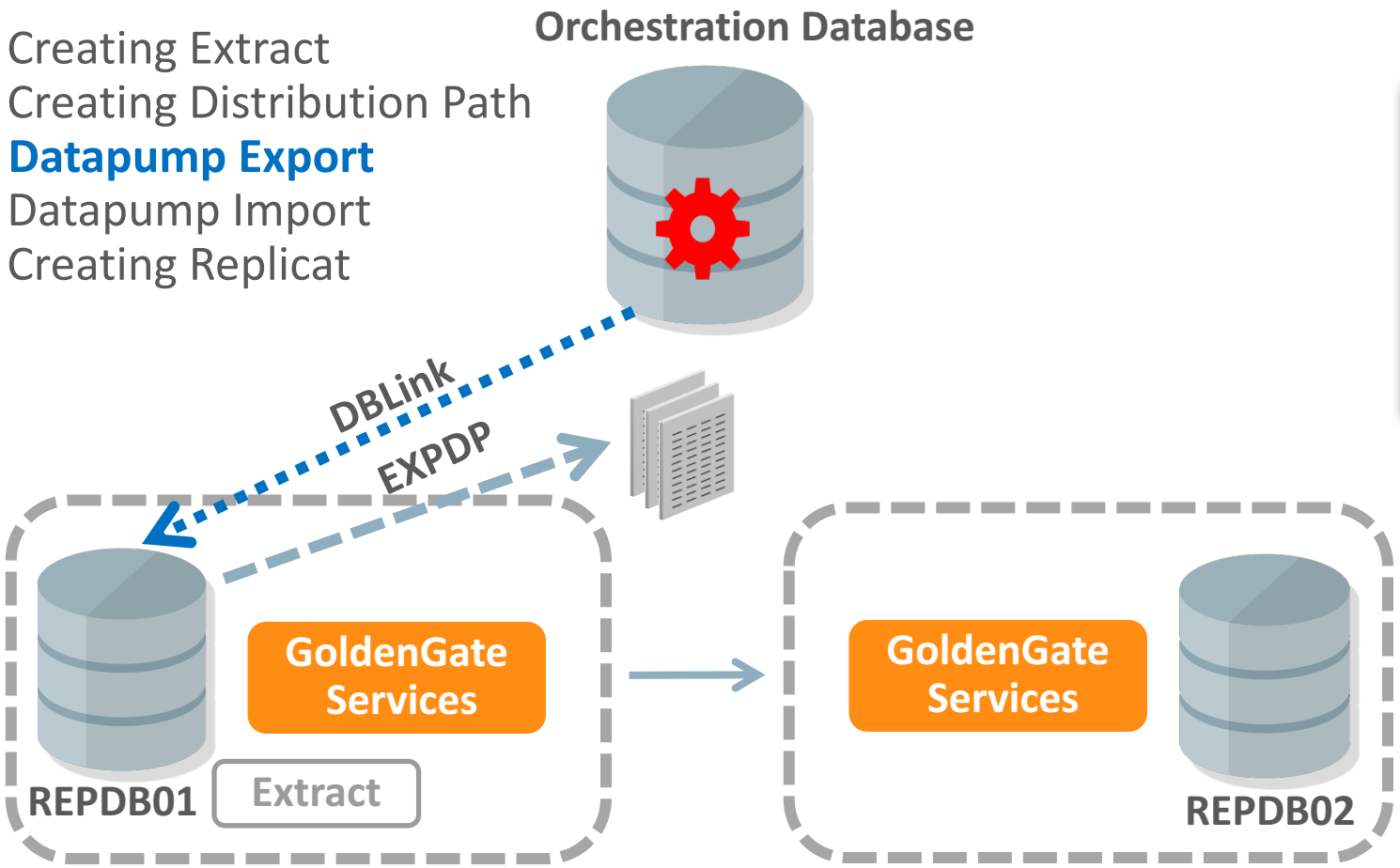


POST HTTPS://gg_src:8002/....

```
{
 "$schema":"ogg:distPath",
 "name":"AAtoAB",
 "description":"distPath1",
 "source":{
  "uri":"trail://ggsource:8002/
                 dirdat/et"
},
 "target":{
  "uri":"ogg://ggtarget:9003/
                 dirdat/rt"
 },
  "begin":{
  "sequence":0,
  "offset":0
  },
 "status":"running"
}
```

Datapump Export

1. Creating Extract
2. Creating Distribution Path
3. **Datapump Export**
4. Datapump Import
5. Creating Replicat

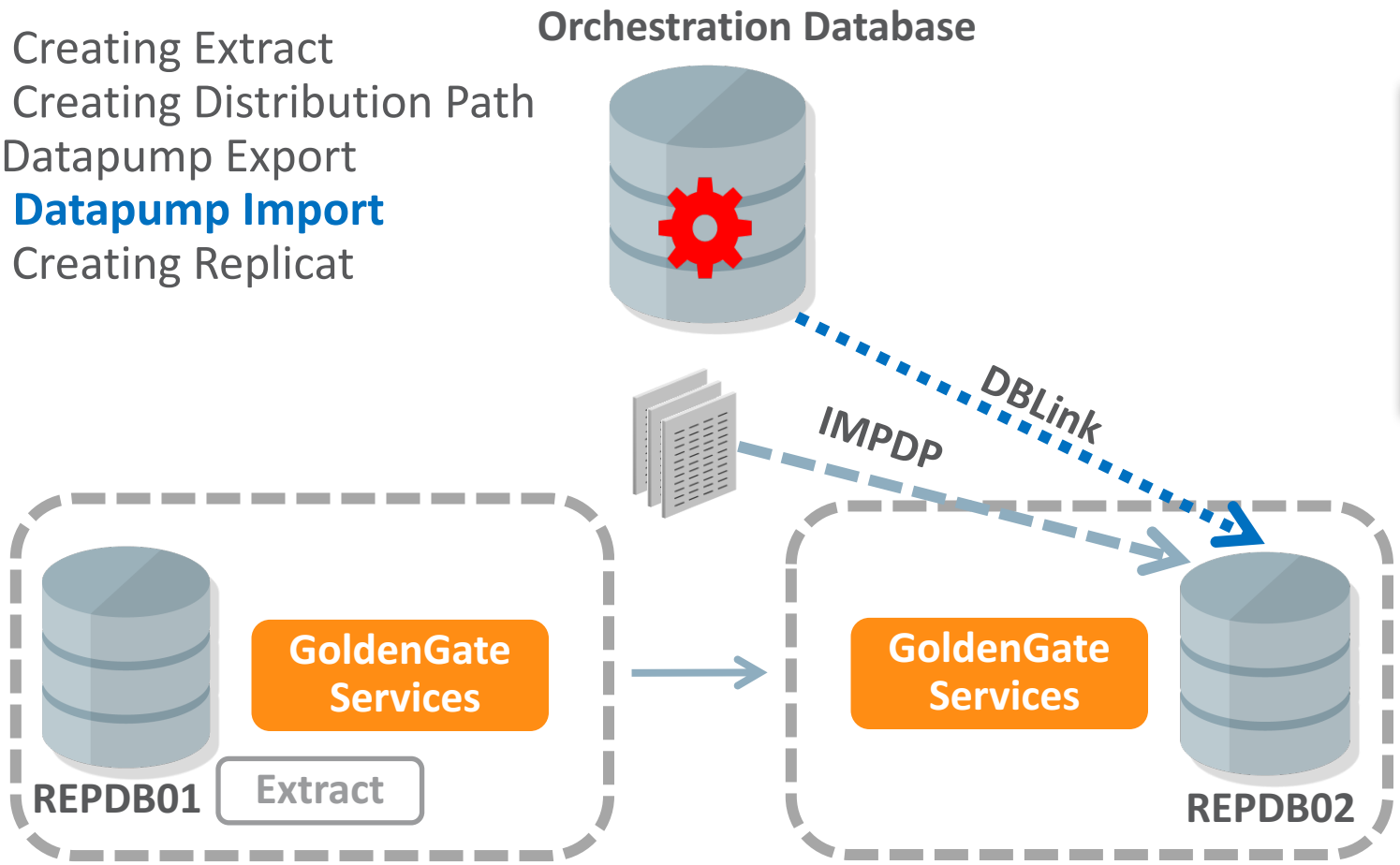


Datapump Export (EXPDP)

```
v_dp_handle:=dbms_datapump.open
dbms_datapump.add_file
…
dbms_datapump.set_parameter
dbms_datapump.metadata_filter
dbms_datapump.start_job
dbms_datapump.detach
```

Datapump Import

1. Creating Extract
2. Creating Distribution Path
3.Datapump Export
4. Datapump Import
5. Creating Replicat



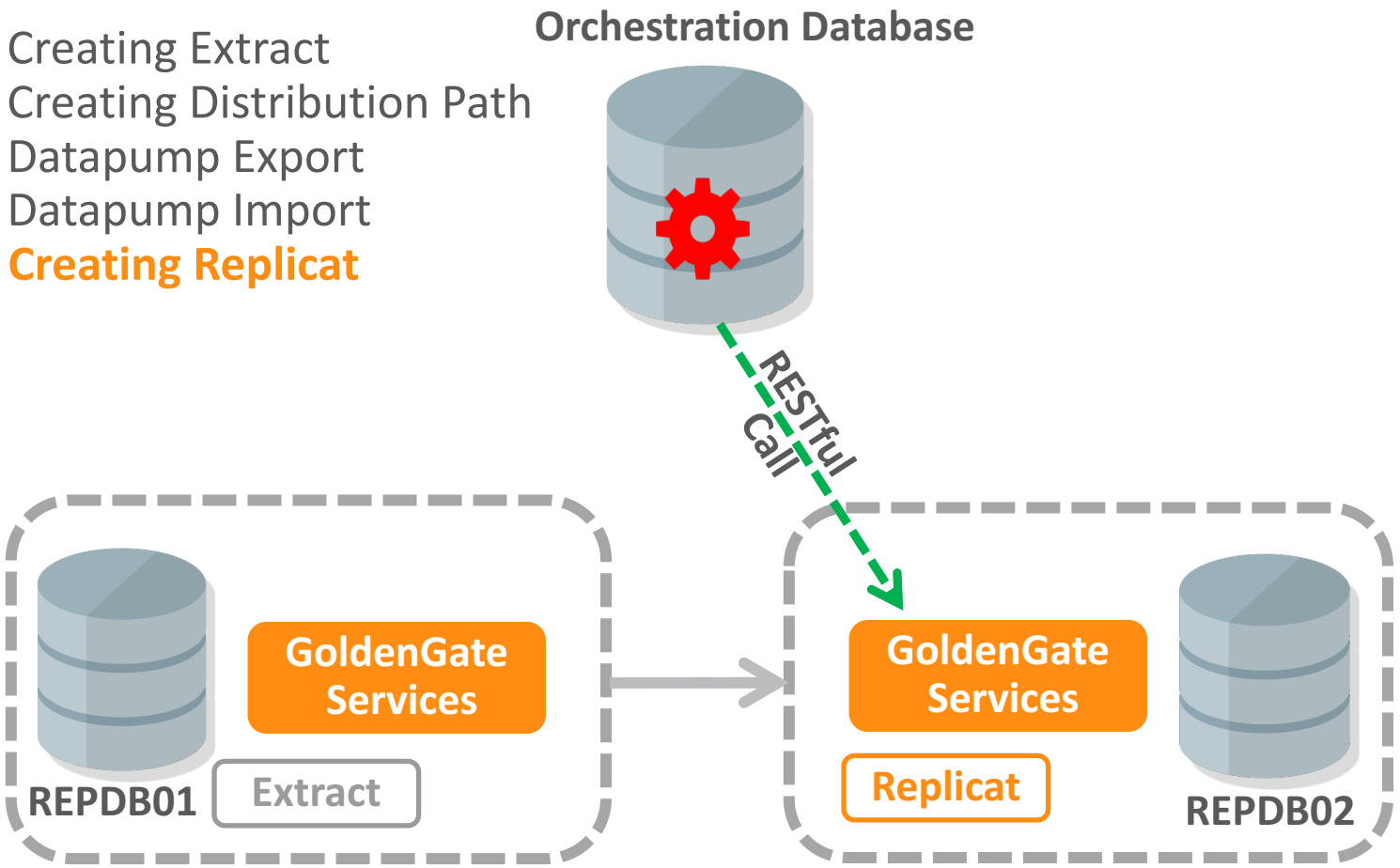
Datapump Import (IMPDP)

```
v_dp_handle:=dbms_datapump.open
dbms_datapump.add_file
…
dbms_datapump.set_parameter
dbms_datapump.metadata_filter
dbms_datapump.start_job
dbms_datapump.detach
```

Create and Start Replicat to complete setup

GoldenGate instantiation SCN features automatically filters pre-instantiation changes

1. Creating Extract
2. Creating Distribution Path
3. Datapump Export
4. Datapump Import
5. **Creating Replicat**



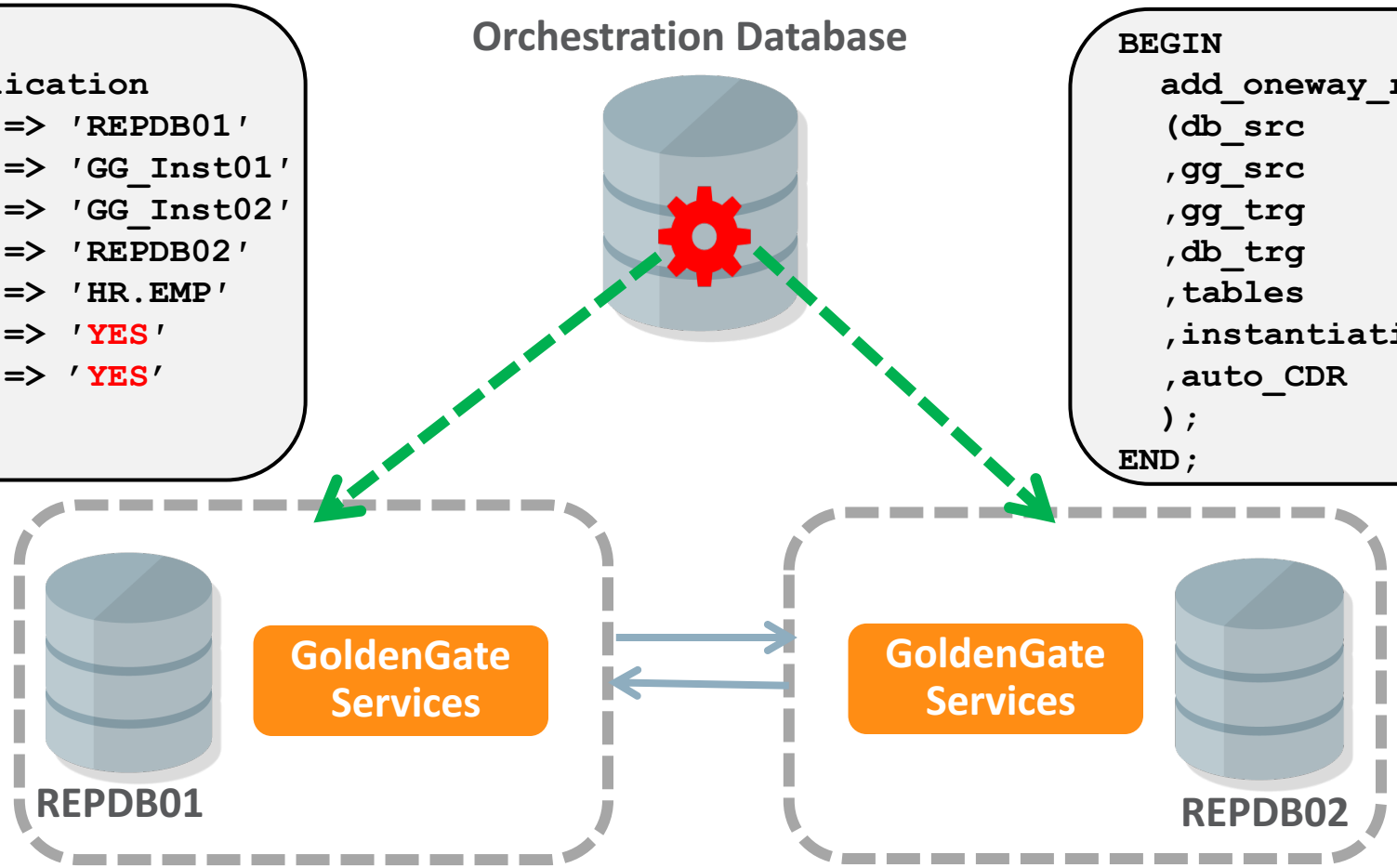
POST HTTPS://gg_trg:9001/....

```
{
  "config":[
    "Replicat    R01BA",
    "UseridAlias ggadmin",
    "Map         HR.EMP,",
    "Target      HR.EMP;"
    ],
    "source":{
      "name":"rt"
    },
    "credentials":{
      "alias":"gg_trg"
    },
    "checkpoint":{
      "table":"ggadmin.ckpt"
    }
}
```

Setup Bidirectional Active-Active Replication from PL/SQL

Using the same high level building block

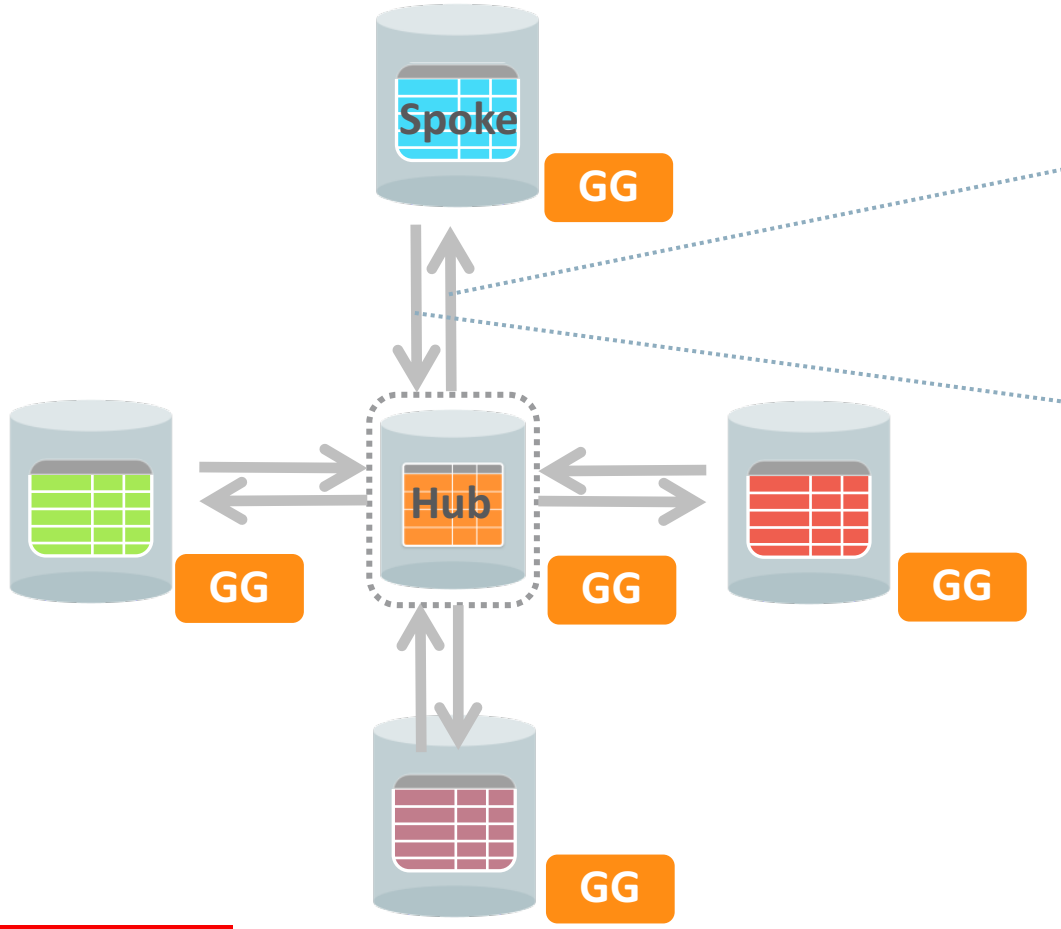
```
BEGIN
  add_oneway_replication
  (db_src          => 'REPDB01'
  ,gg_src          => 'GG_Inst01'
  ,gg_trg          => 'GG_Inst02'
  ,db_trg          => 'REPDB02'
  ,tables          => 'HR.EMP'
  ,instantiation   => 'YES'
  ,auto_CDR        => 'YES'
  );
END;
```




```
BEGIN
  add_oneway_replication
  (db_src          => 'REPDB02'
  ,gg_src          => 'GG_Inst02'
  ,gg_trg          => 'GG_Inst01'
  ,db_trg          => 'REPDB01'
  ,tables          => 'HR.EMP'
  ,instantiation   => 'NO'
  ,auto_CDR        => 'YES'
  );
END;
```

Hub & Spoke Configuration

Two calls for every Hub/Spoke pair




```
BEGIN
  add_oneway_replication
  (db_src          => 'HUB'
  ,gg_src          => 'GG_Inst_HUB'
  ,gg_trg          => 'GG_Inst_01'
  ,db_trg          => 'Spoke01'
  ,tables          => 'HR.EMP'
  ,instantiation   => 'YES'
  ,auto_CDR        => 'YES'
  );
END;
```

```
BEGIN
  add_oneway_replication
  (db_src          => 'Spoke01'
  ,gg_src          => 'GG_Inst_01'
  ,gg_trg          => 'GG_Inst_HUB'
  ,db_trg          => 'HUB'
  ,tables          => 'HR.EMP'
  ,instantiation   => 'NO'
  ,auto_CDR        => 'YES'
  );
END;
```

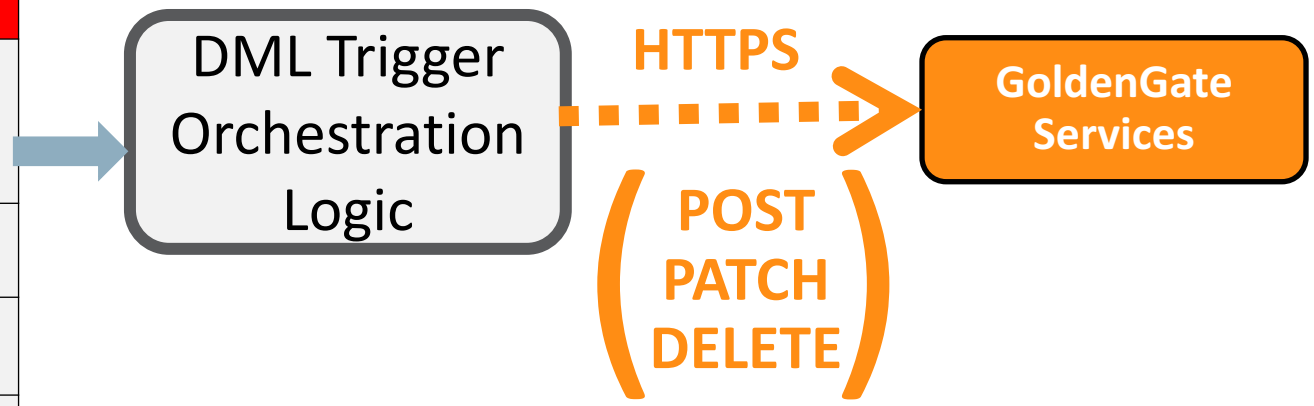
Global Replication Catalog

Keep Track of Replication Deployments

- Control Replication Environments in replication catalog
- Create, modify or remove Replication Topologies from this catalog table
- Can manage replication with DML to table
  - Have a DML trigger execute the PL/SQL replication orchestration logic

Replication Catalog

Source Database	Extract	Dist Path	Replicat	Target Database	...
REPDB01	E01AB	A_to_B	R01BA	REPDB02	...
REPDB01	E02AC	A_to_C	R01CA	REPDB03	...
.....	...	...	...	...	...



Monitor Replication from the Database

Retrieve information about Replication environments

- Use GET RESTful calls
- Check status, warnings/errors (if any), throughput, lag, …

Replication Catalog									
Source Database	Extract	Dist Path	Replicat	Target Database	...	...	Status	LAG [s]	Throughput [Changes/s]
REPDB01	E01AB	A_to_B	R01BA	REPDB02	...	...	OK	1.8	54,673
REPDB01	E02AC	A_to_C	R01CA	REPDB03	...	...	OK	1.8	78,924
…..	...	...	...	...	...	...	...	...	...

Easy Orchestration with New GoldenGate Microservices

Classic Architecture

✖Combination of scripts

- Shell Scripts, SQL scripts, …
- Obey Files, Parameter Files,…

✖Requires OS access to DB hosts

- Not secure

GoldenGate Microservices

✔Simple and secure REST calls for all GoldenGate operations

New GoldenGate Microservices Architecture

Simplifies large scale and cloud deployments

- GoldenGate components as micro services with comprehensive RESTful interfaces.
- Enables remote and secure configuration, administration, and monitoring capabilities.
- Enables Applications to embed, automate, and orchestrate GoldenGate.

Additional sessions and Demos

Sunday, October 1

- Lift and Shift Workloads to Cloud with Oracle Data Integration Platform Cloud [SUN6653]
- Data Movement between On-Prem, Fusion ERP Cloud, Fusion HCM Cloud and Salesforce [SUN7286]
- Accelerate Migration to Cloud Infrastructure with Data Integration Platform [SUN6896]

Monday, October 2

- Oracle Data Integration Platform Strategy and Roadmap [CON6646]
- Filling Your Data Lake with Potable Data, Using Data Integration [CON5465]
- **GoldenGate : Deep Dive into Automating OGG using the new Microservices [CON6569]**
- Oracle Data Integration Platform: Foundation for Cloud Integration [CON6650]
- Oracle Data Integration Platform Empowers Enterprise Grade Big Data Solutions [CON6893]
- Oracle Data Integration Platform Cloud Deep Dive [CON6651]
- Oracle GoldenGate Cloud Service: Real-Time Data Replication in the Cloud [HOL7715]

Tuesday, October 3

- Oracle Data Integrator Product Update and Strategy [CON6654]
- Oracle Enterprise Data Quality: Product Overview and Roadmap [CON6656]
- Accelerate Cloud On-Boarding Using Oracle GoldenGate Cloud Service [CON6894]
- Oracle Enterprise Data Quality for All Types of Data [HOL7653]
- Oracle Data Integration Platform: a Cornerstone for Big Data [CON6655]
- **GoldenGate: MAA and Best Practices for Oracle GoldenGate Microservices [CON6570]**
- Oracle GoldenGate Product Update and Strategy [CON6897]

Wednesday, October 4

- A Practical Path to Enterprise Data Governance with Enterprise Data Quality [CON6657]
- Oracle Data Integrator and Oracle GoldenGate for Big Data [HOL7708]
- Introduction to Oracle Data Integration Platform Cloud [HOL7673]
- An Enterprise Databus: GoldenGate in the Cloud Working with Kafka and Spark (CON6895]
- **GoldenGate: Best Practices & Deep Dive on OGG 12.3 Microservices at Cloud [CON6568]**
- Oracle GoldenGate for Big Data [CON6898]
- Oracle Data Integration Platform Cloud Service Governance Edition [CON6652]
- Oracle Sharding: Linear Scalability, Extreme Availability, and Geo-Distribution [CON6673]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