ActiveImage Protector 2016R2SP1

Backup and Recovery of Oracle Database

Third Edition － June 11, 2020

This user guide provides a description about backup and recovery procedures of Oracle database by using ActiveImage Protector 2016R2SP1.
For more detailed operating procedures for a specific topic, please refer to the Help of ActiveImage Protector.

Revision History

Edition	Edited on	Edited Page	Description
First Edition	12/2/2016		First Edition
Second Edition	03/23/2017		Restore a backup image created by online (inconsistent) backup
		P.23	No records in Oracle VSS Writer Event Log - Appendix -
Third Edition	06/11/2020	Cover,P.3, Footer	Revision of notation due to company name change.

CONTENTS

Introduction

This document is intended for the system engineers who are engaged in an effort to design and introduce a new system or the system administrators and maintenance staff who are engaged in maintenance and operational management of the existing system.
The readers of this document are supposed to have specialized expertise about Windows Server 2008, 2012 operating system, Oracle and computer literacy.

This document provides the minimum of the required information for the operation of ActiveImage Protector. For more detailed information about the operating procedures, please refer to the manuals for the respective products.

The screen images included in this document provide only examples of the settings but may differ from the actual appearance.

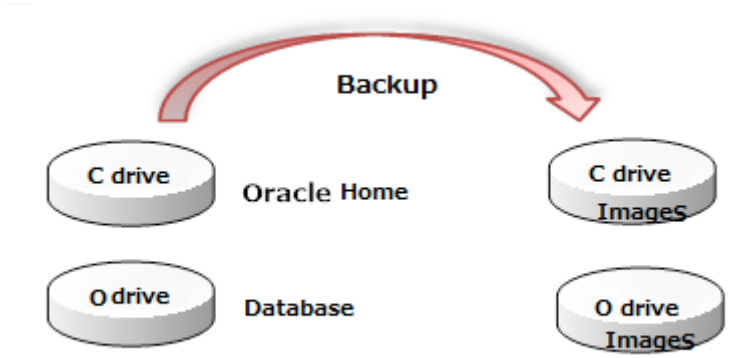
1. Configuration Example

This user guide provides backup and restore procedures based on the following system environment. ActiveImage Protector is hereinafter referred to as “AIP”.

Oracle Configuration Example

SID	ORCL
DB Name	ORCL
Oracle Home	C:\app\Administrator\product\11.2.0\dbhome_1
Oracle Database	O:\app\Administrator\oradata\ORCL
Control File	C:\app\administrator\flash_recobery_area\ORCL\CONTROL02.CTL O:\app\administrator\oradata\ORCL\CONTROL01.CTL
Archive Log	C:\app\administrator\flash_recobery_area\ARCHIVELOG

Backup Flow



This document provides backup and restore procedures based on the above system configuration.
Oracle is installable on a variety of system configuration. Restore procedures should differ depending on the system environment. Even if you take the operating procedures as described in this document, the restored database may not boot up. If you encounter the problem, please check the Oracle error code to identify the cause of the error to address the problem.
You are requested to verify the backup files and restored database in the system environment.

Duplicated Control Files
Depending on the installation procedures of Oracle11gR2 or later, the control files may be duplicated and distributed in multiple locations.
<Ex.>

・C:\app\administrator\flash_recobery_area\<DB Name>\CONTROL02.CTL

・O:\app\administrator\oradata\<DB Name >\CONTROL01.CTL

Since AIP backs up by disk or by volume, you may need to take additional procedures to ensure consistency of the restored control files, depending on the storages of the control files.
Please take note of the paths of the locations where the control files are located in the respective system environment.

2. Back up Oracle database

If you use an old version of Oracle database, the database must be stopped before starting to back it up. If you use Oracle11g or later, the use of Oracle VSS Writer enabled backup of the live database without extra operation required.

2.1 Backup Method optimized for Oracle Database

Two types of backup methods are preplanned for Oracle database. Please select one of the methods depending on the system environment.

A) Online (inconsistent) backup

Advantages
Zero down-time
The use of VSS Writer enables backup of live database by ensuring the data integrity.

Disadvantages
An increase of Archive log files consumes available storage space.

B) Offline (consistent) backup

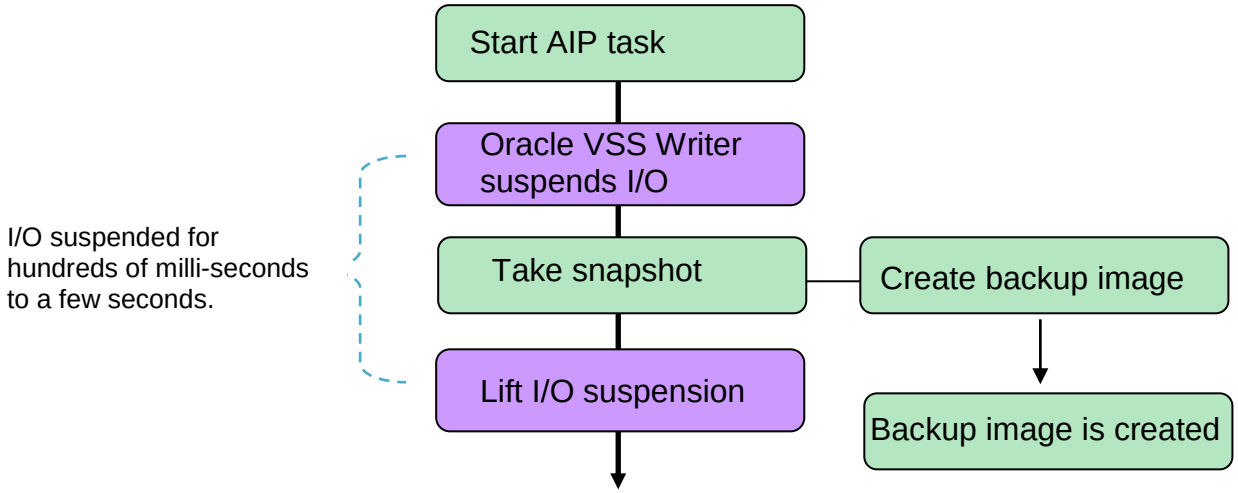
Advantages
Easy restore and recovery
Since the data integrity is ensured, recovery operation is not required after restoring the database.

Disadvantages
Down-time is caused.
As you need to stop the database every time the database is backed up by using AIP, it causes down-time.

3. Backup Procedures

Depending on the backup method you take, the backup operation of Oracle database should differ.

Online (inconsistent) backup
With online backup method, you only need to run AIP backup task, but no additional operation is required to stop the database.

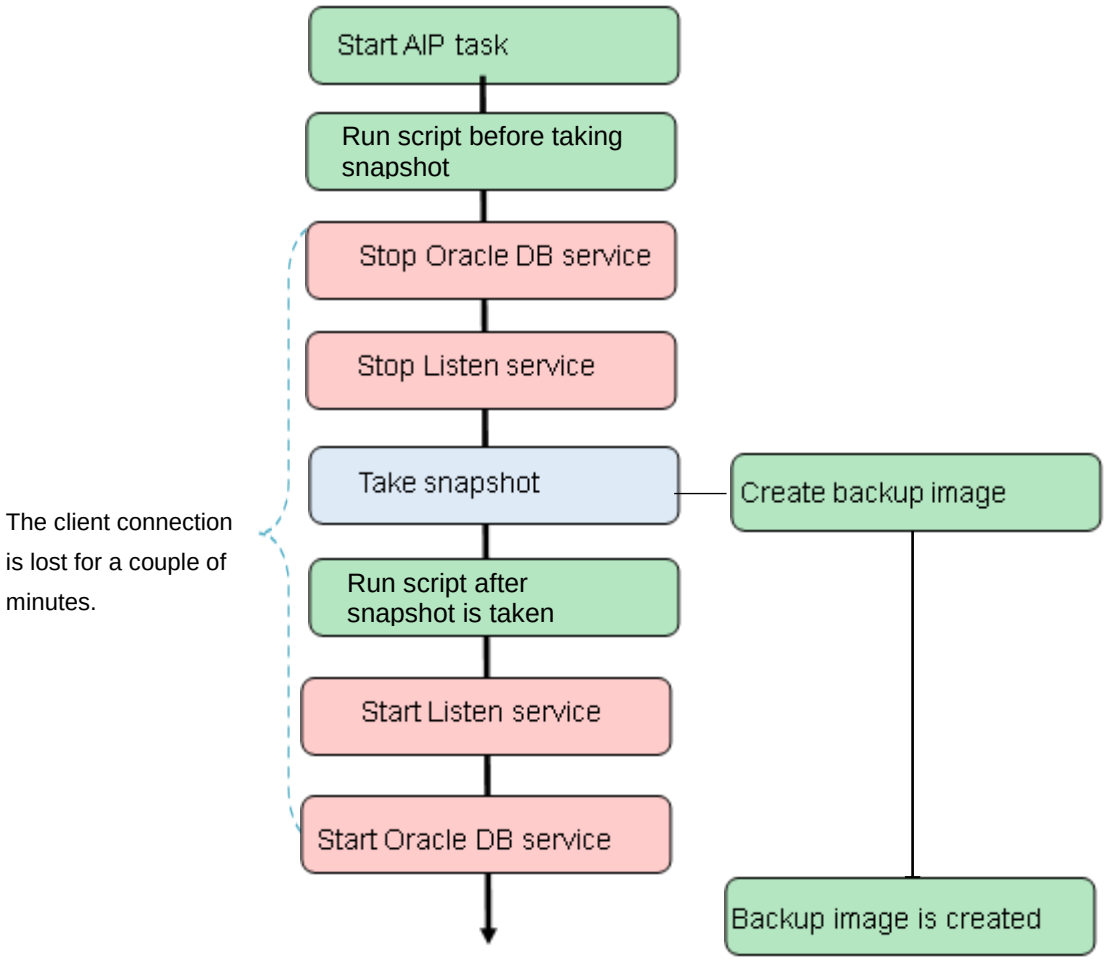


During online (inconsistent) backup process, I/O suspends for a brief second. However, the session is maintained without losing the client connection.

Offline (consistent) backup

With Offline backup method, you need to create and run a batch file to automatically execute the processes from stopping the database to starting the database. You may run the created script before and/or after execution of AIP backup task.

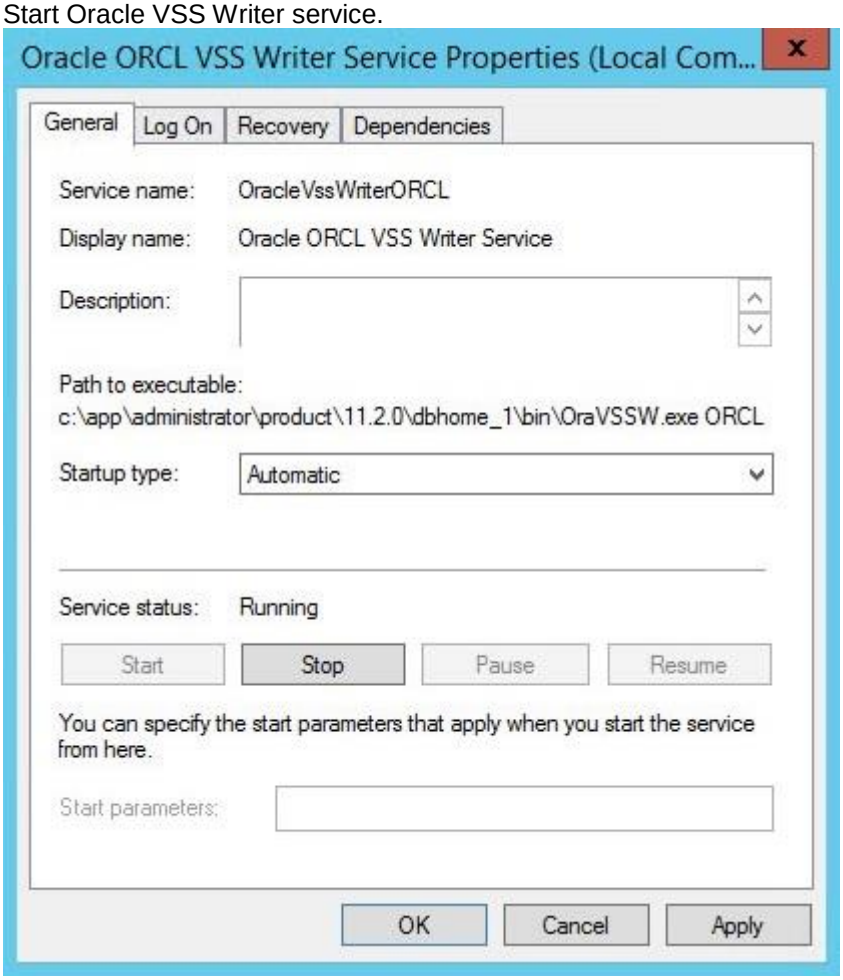
Backup process flows as illustrated below:



Since offline (consistent) backup is executed only after the database stopped, the client connection is lost. Therefore you may have to reestablish the client connection or log in again depending on client application.

3.1 Online (inconsistent) backup operating procedures

1. Start Oracle VSS Writer service.



Please make sure that [Automatic] is selected for [Startup type] for OracleVssWriter in Windows service console.

2. Alter to ARCHIVELOG mode

```
sqlplus / as sysdba

SQL> shutdown immediate;
SQL> startup mount;
SQL> alter database archivelog;
SQL> alter database open;

Identify Mode
SQL> archive log list;
```

3. Create AIP backup task.
   For more detailed information of operating procedures to create a backup task, please refer to AIP Help.

3.2 Offline (consistent) backup operating procedures

1. Scripting

Example of stop Oracle database command

```
@echo off

rem --- Stop the database and Listener ---

set oracle_sid=orcl
SQLPLUS /nolog @c:¥stop.sql

echo %date% %time% >>c:¥orclstop.log
net stop OracleServiceORCL>>c:¥orclstop.log

echo %date% %time% >>c:¥orclstop.log
net stop OracleOraDb11g_home1TNSListener>>c:¥orclstop.log
echo ****************************************  >>c:¥orclstop.log
```

Example of stop.sql

```
connect / as sysdba;
shutdown immediate;
exit
```

Example of start Oracle database command

```
@echo off

rem --- Start the database and Listener ---

echo %date% %time% >>c:¥orclstart.log
net start OracleOraDb11g_home1TNSListener>>c:¥orclstart.log

echo %date% %time% >>c:¥orclstart.log
net start OracleServiceORCL>>c:¥orclstart.log

echo %date% %time% >>c:¥orclstart.log
echo **************************************** >>c:¥orclstart.log
```

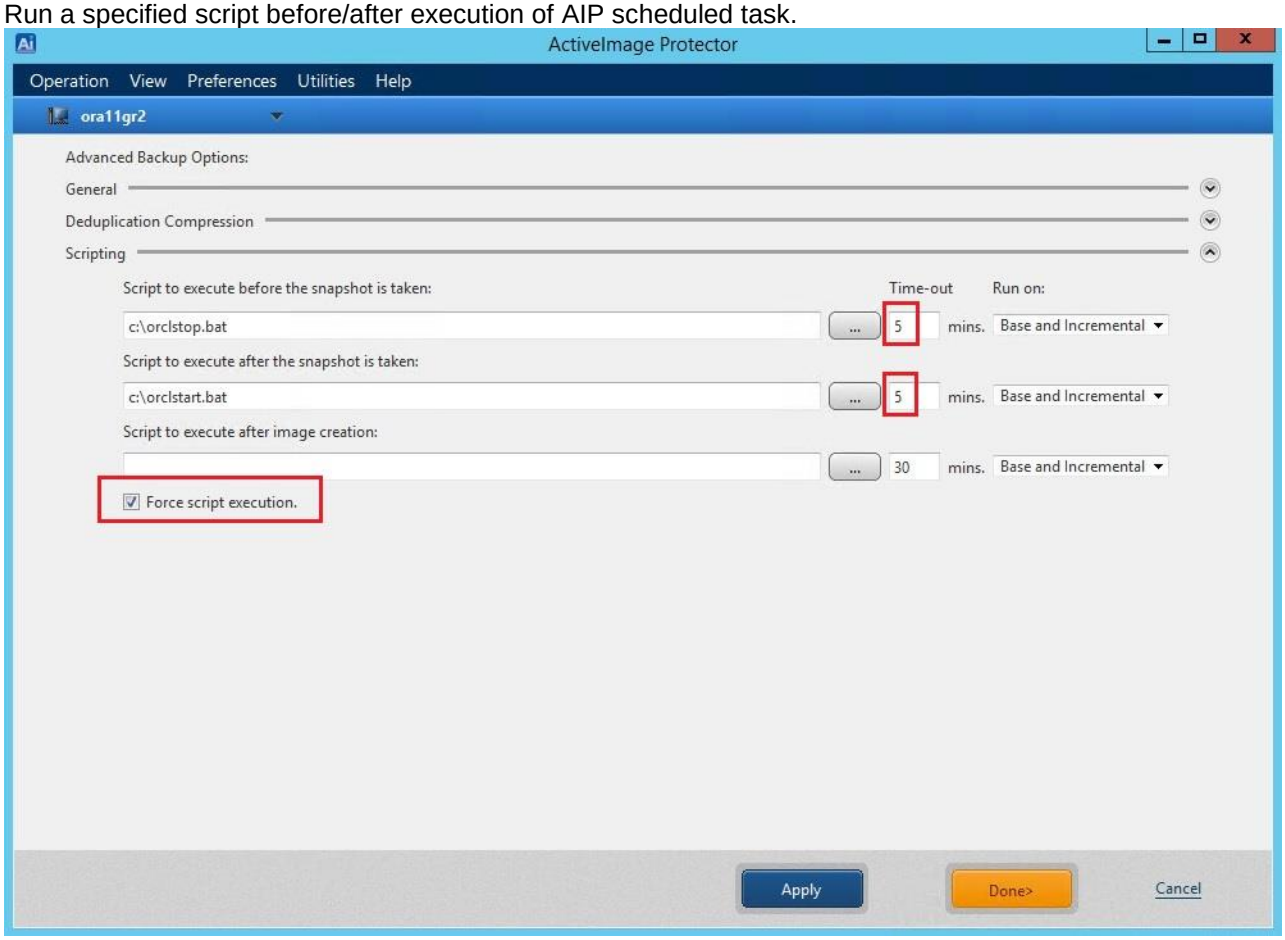
The batch file and shutdown command have to be saved in C: drive.

The red texts in the above sample batch should be replaced with other depending on the system environment.

In the event of any trouble, you need the log information output by this batch, therefore, please make sure that the required settings are configured for logging.

2. Create AIP backup task
   Please take the following steps to create AIP backup tasks. For more detailed operating procedures on how to create backup tasks, please refer to AIP Help.

3. Run a specified script before/after execution of AIP scheduled task.



Check the checkbox to enable [Force script execution] option.
Please assign [5] minutes for the script [Time-out].

4. Summary of Restore Procedures

Restore procedures for Oracle database should differ depending on the backup method used to create the backup file.

Oracle database restore procedures

Backup method	Restore process
Online (inconsistent) backup	Restore a backup image using AIP, thereafter depending on the situation, command execution may be required.
Offline (consistent) backup	Restore a backup image using AIP.

Restore procedures should differ depending on backup method.

Backup method	Restore procedures
Online (inconsistent) backup	1. Stop Oracle database. 2. Restore a backup image by using AIP. 3. Start Oracle database service. 4. Depending on the situation, execution of a command may be required. 5. Start Oracle database.

Backup method	Restore procedures
Offline (consistent) backup	1. Stop Oracle database. 2. Restore a backup image by using AIP. 3. Start Oracle database service.

There is no much difference of restore procedures whether you use a backup image created by online (inconsistent) or offline (consistent) backup method. In case of online (inconsistent) backup method, the system administrator has to run Oracle command. Otherwise, you cannot start Oracle database.

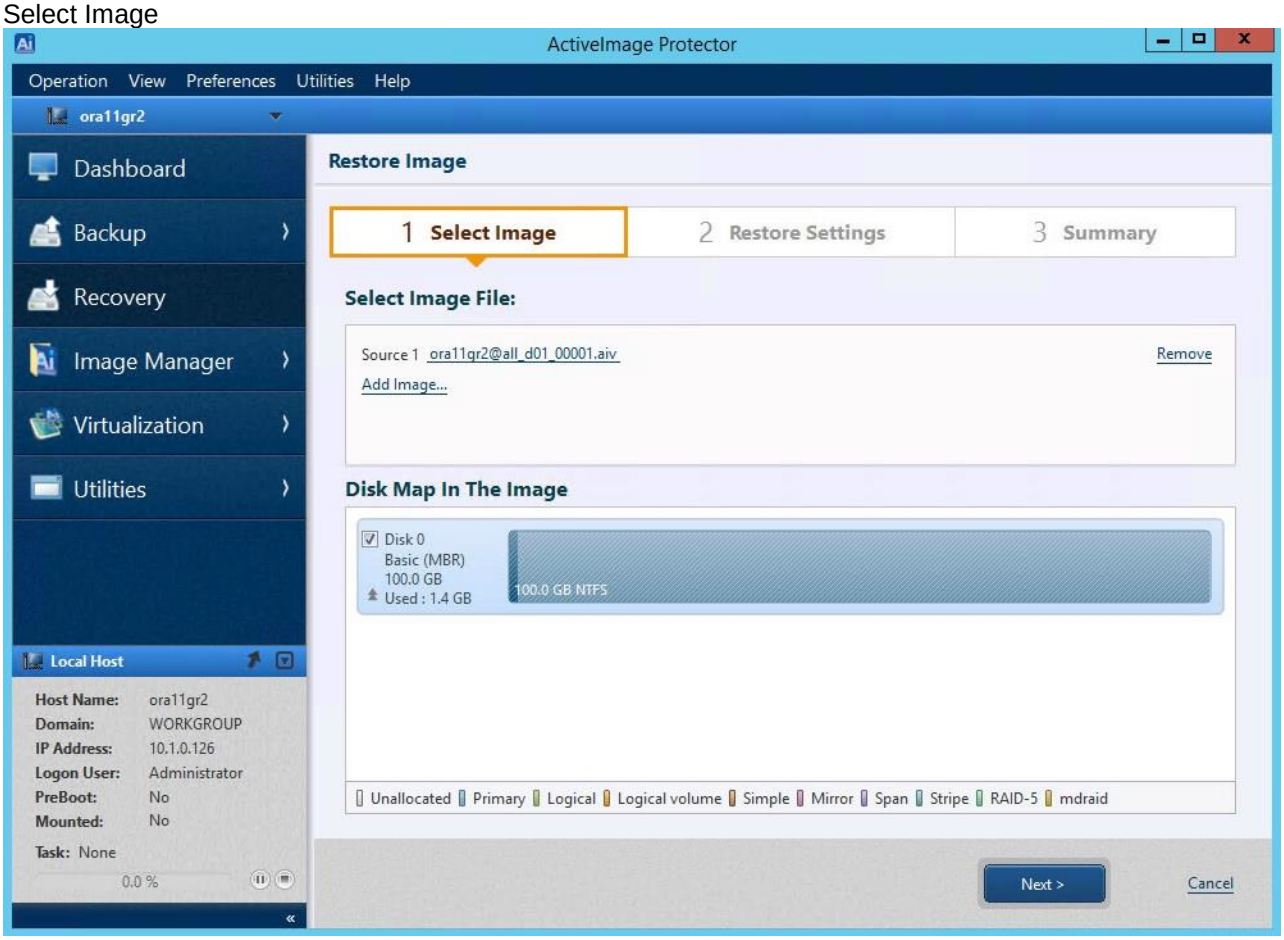
The following operating procedures are provided assuming that hot recovery of O drive which includes Oracle database is performed.

4.1 Restore backup images created by online (inconsistent) backup method

In the event of database failure, for example, the database does not start for some reason, data corruption, data loss, hot recovery allows you to restore by disk, volume or file.

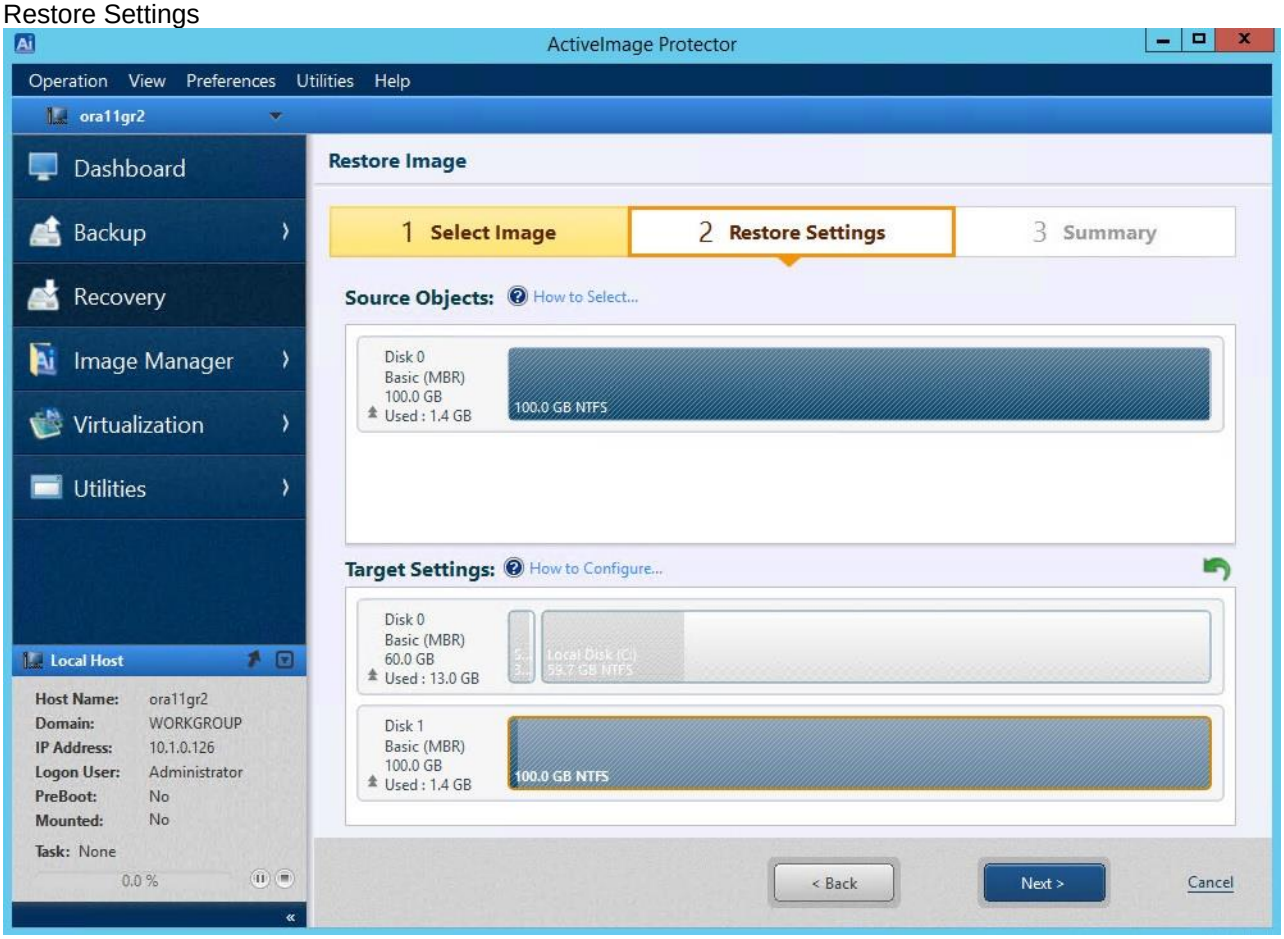
1. Stop Oracle database
   Please stop Oracle database service to stop the database completely.

2. Select Image



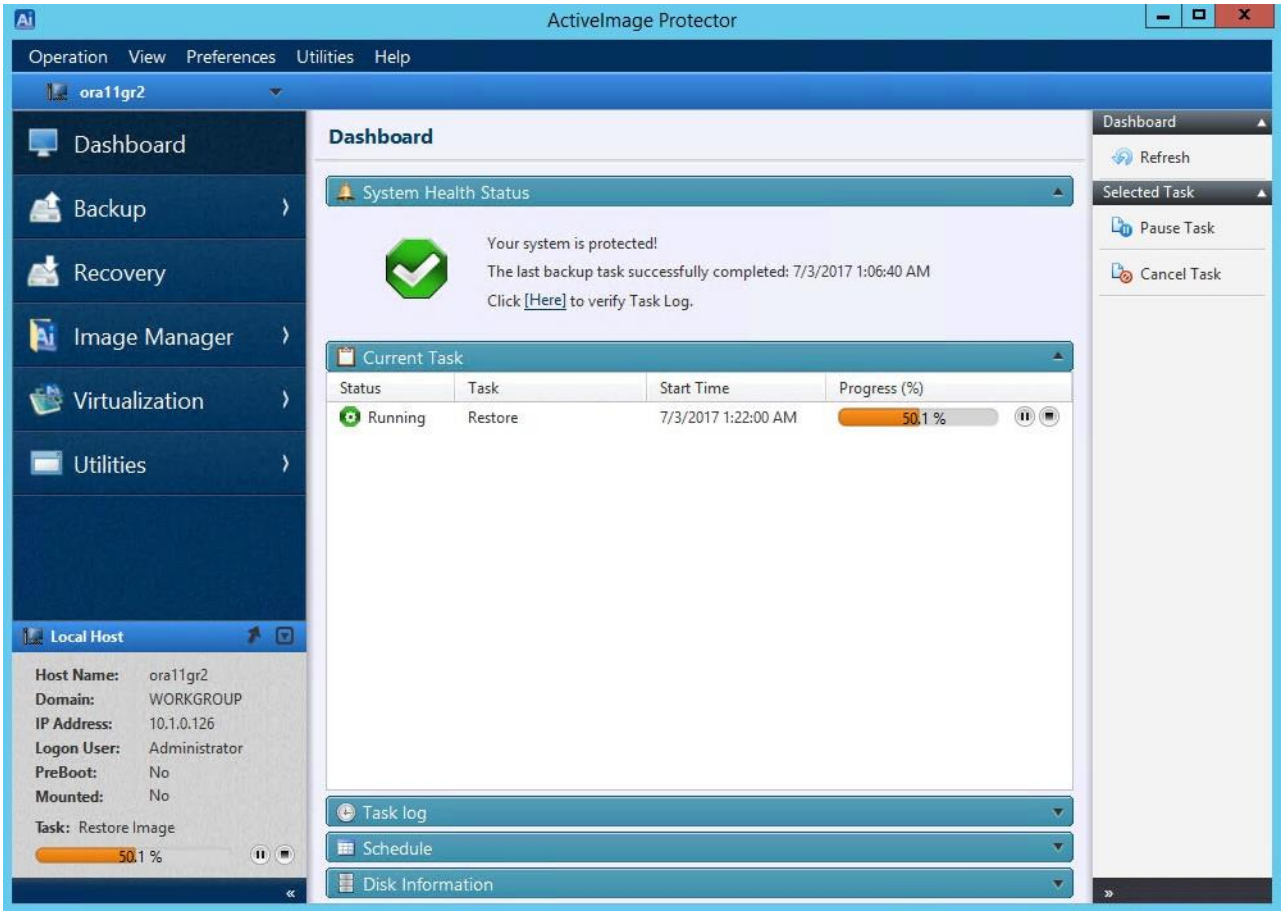
Please select a backup image to restore.

3. Restore Settings



Drag and drop the restore source item from [Source Object] to restore destination in [Target Settings].

4. Restore Volume task



Please wait until execution of the task completes.

5. Copy control files
When the instance stops, in order to ensure consistency of the control files, please restore CONTROL02.CTL from the backup image created by executing the same backup task.
Or, delete CONTROL02.CTL and copy CONTROL01.CTL located on O drive to the directory at the same layer as CONTROL02.CTL. Then, rename the copied CONTROL01.CTL to CONTROL02.CTL.

＊In the event that the entire system is recovered, this step is not required.

For more details, please refer to "Appendix 1 Recovery Problems associated with duplicated control files".

6. Start Oracle database service
Please start Oracle database service. If Oracle database service can be started only to mount status, you need to reset backup status.

7. Identify the status of the instance.

```
C:¥Users¥Administrator>sqlplus / as sysdba

SQL> select status from v$instance;
STATUS
------------
MOUNTED
```

If the status is “Mounted”, please check if the following error record is included in alert_<SID>.log.

Errors in file C:\APP\ADMINISTRATOR\diag\rdbms\orcl\orcl\trace\orcl_ora_XXXX.trc:
ORA-10873: file 1 needs to be either taken out of backup mode or media recovered
ORA-01110: data file 1: 'O:\APP\ADMINISTRATOR\ORADATA\ORCL\SYSTEM01.DBF'
ORA-10873 signalled during: alter database open...

8. Reset backup status

```
SQL> select * from v$backup;

    FILE# STATUS            CHANGE# TIME        CON_ID
---------- ------------------ ---------- -------- ----------
         1 ACTIVE             2981562 17-02-28         0
         3 ACTIVE             2981568 17-02-28         0
         5 ACTIVE             2981575 17-02-28         0
         6 ACTIVE             2981582 17-02-28         0
         7 ACTIVE             2981588 17-02-28         0

SQL> alter database end backup;

Changed database status.
```

9. Open database.

```
SQL> alter database open;

Changed database status.
```

10. Ensure the database started
Please check Oracle alert_<SID>.log to ensure that the database normally started.
Please identify the following one sentence at the end of log to ensure that the database normally started.

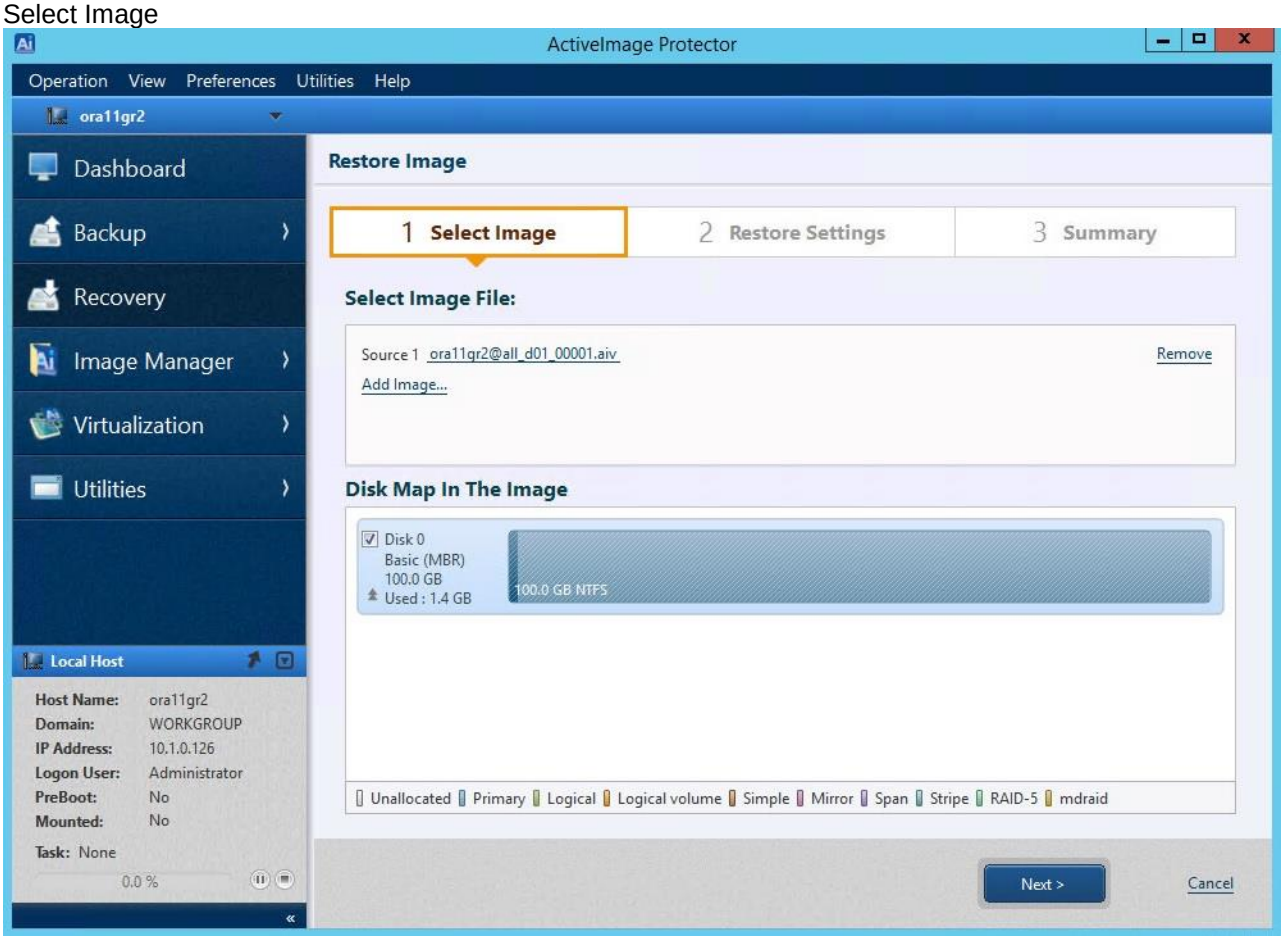
Completed: alter database open

4.2 Restore backup image created by offline (consistent) backup method

In the event of database failure, for example, the database does not start for some reason, data corruption, data loss, hot recovery allows you to restore by disk, volume or file.

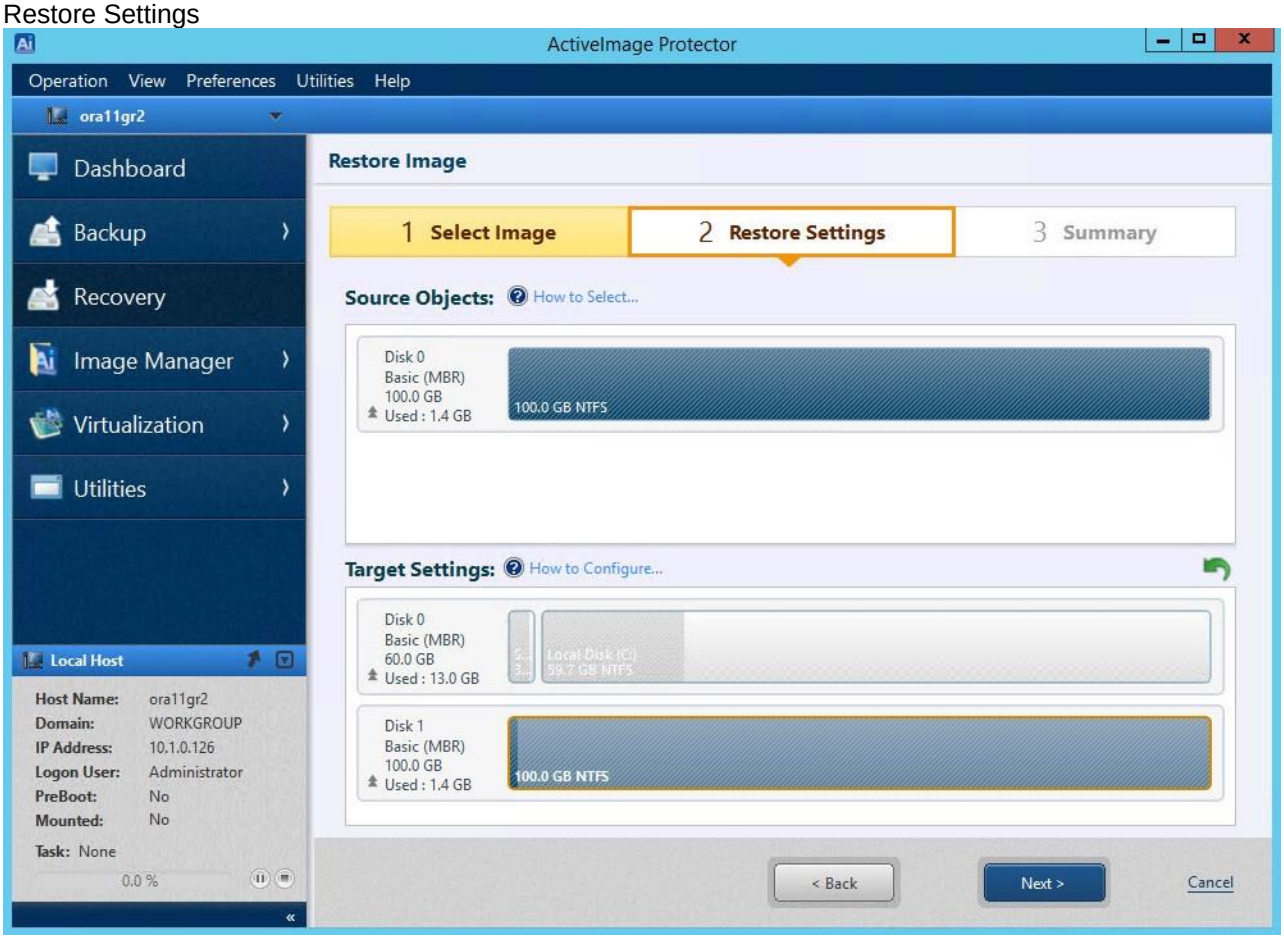
1. Stop Oracle database
   Please stop Oracle database service to stop the database completely.

2. Select Image



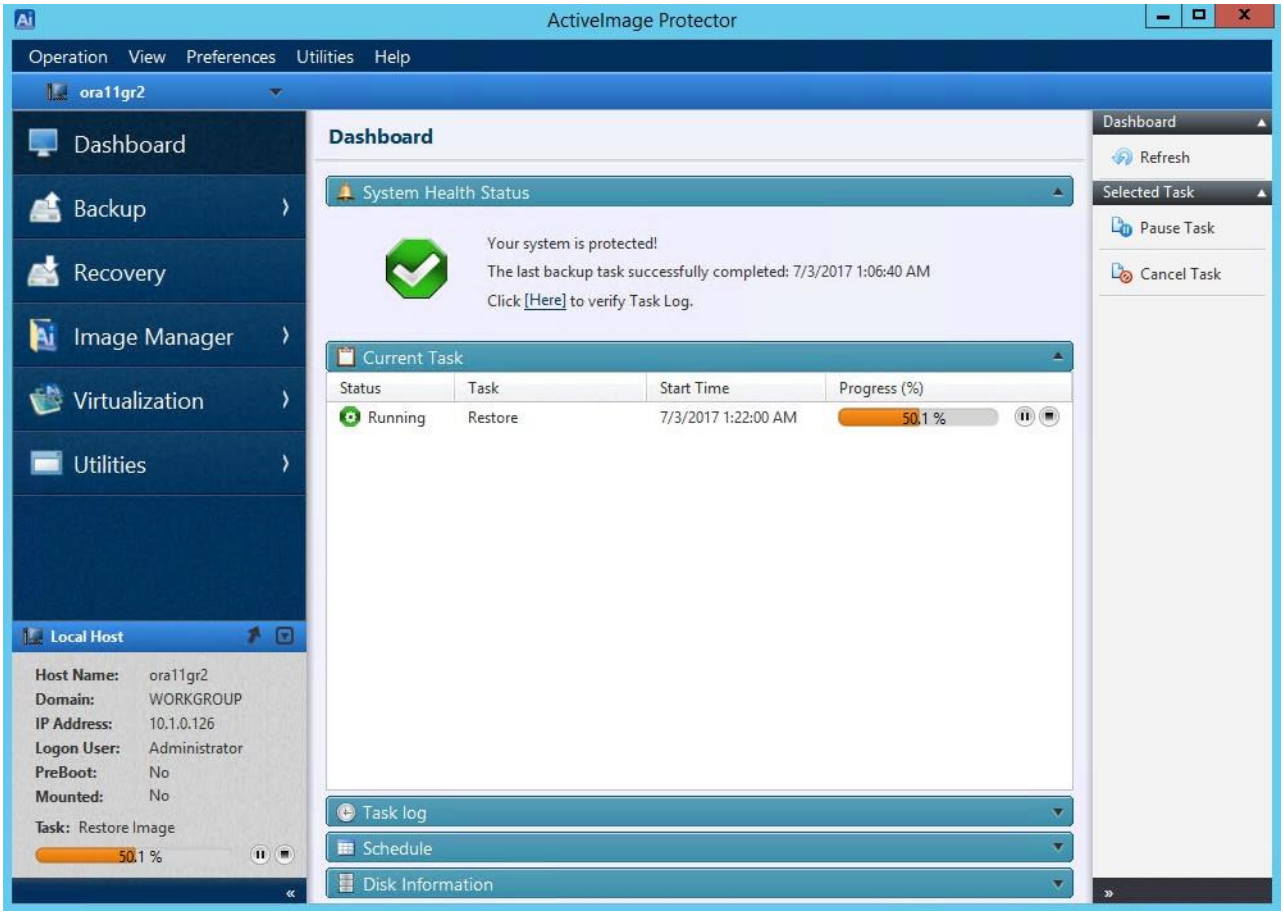
Please select a backup image to restore.

3. Restore Settings



Drag and drop the restore source item from [Source Object] to restore destination in [Target Settings].

4. Restore Volume task



Please wait until execution of the task completes.

5. Copy control files
When the instance stops, in order to ensure consistency of the control files, please restore CONTROL02.CTL from the backup image created by executing the same backup task.
Or, delete CONTROL02.CTL and copy CONTROL01.CTL located on O drive to the directory in the same layer as CONTROL02.CTL. Then, rename the copied CONTROL01.CTL to CONTROL02.CTL.

＊In the event that the entire system is recovered, this step is not required.

For more details, please refer to "Appendix 1 Recovery Problems associated with duplicated control files".

6. Start Oracle database service
Start Oracle database service and open the database.

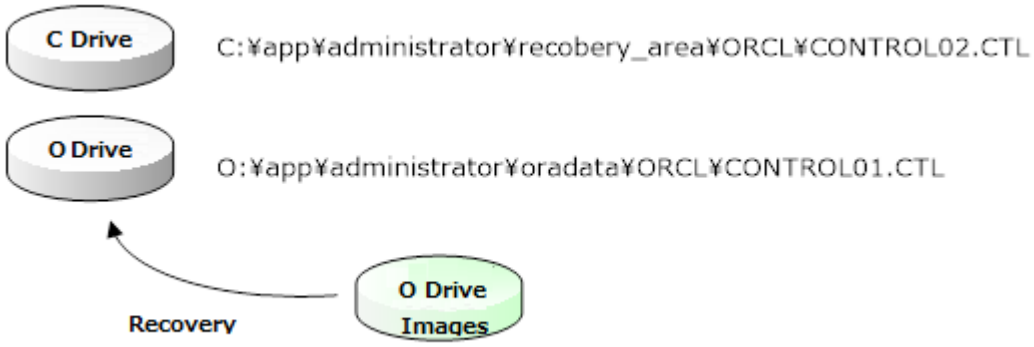
7. Ensure the database is started.
Please check Oracle alert.log to ensure that the database normally started.
Please identify the following one sentence at the end of log to ensure that the database normally started.

```
----------------------------------------

Completed: alter database open

----------------------------------------
```

Appendix 1 Recovery problems associated with duplicated control files

If the control files are duplicated and distributed in multiple volumes, you may encounter the problem that the database restored from a backup image fails to start.

For example, the following illustrates the system environment where the duplicated control files are distributed. If only O drive is restored, the versions of control files CONTROL01.CTL and CONTROL02.CTL are inconsistent so that you get ORA-00214 error and as a result the database fails to start.



Oracle Database error message
ORA-00214: control file 'string' version string inconsistent with file 'string' version string
Cause: Version inconsistent in the set of control files, datafiles/logfiles and REDO files used.
Action: Use a version consistent set of control files, datafiles/logfiles, and REDO log files. That is, all the files must be for the same database and for the same point in time.

Actual error message when tried to start database by SQLPlus.

```
ORA-00214: controlfile 'C:¥app¥administrator¥recobery_area¥ORCL¥CONTROL02.CTL'
version 1925 is inconsistent with file
'O:¥app¥administrator¥oradata¥ORCL¥CONTROL01.CTL' version 1921.
```

Solution
Stop the instance and restore CONTROL02.CTL from the backup image created by the same backup task ensuring the consistency of the control files.
Or, delete CONTROL02.CTL, copy CONTROL01.CTL located on O drive to the directory at the same layer as CONTROL02.CTL and rename the copied CONTROL01.CTL to CONTROL02.CTL.

Appendix 2 Oracle VSS Writer backup event log

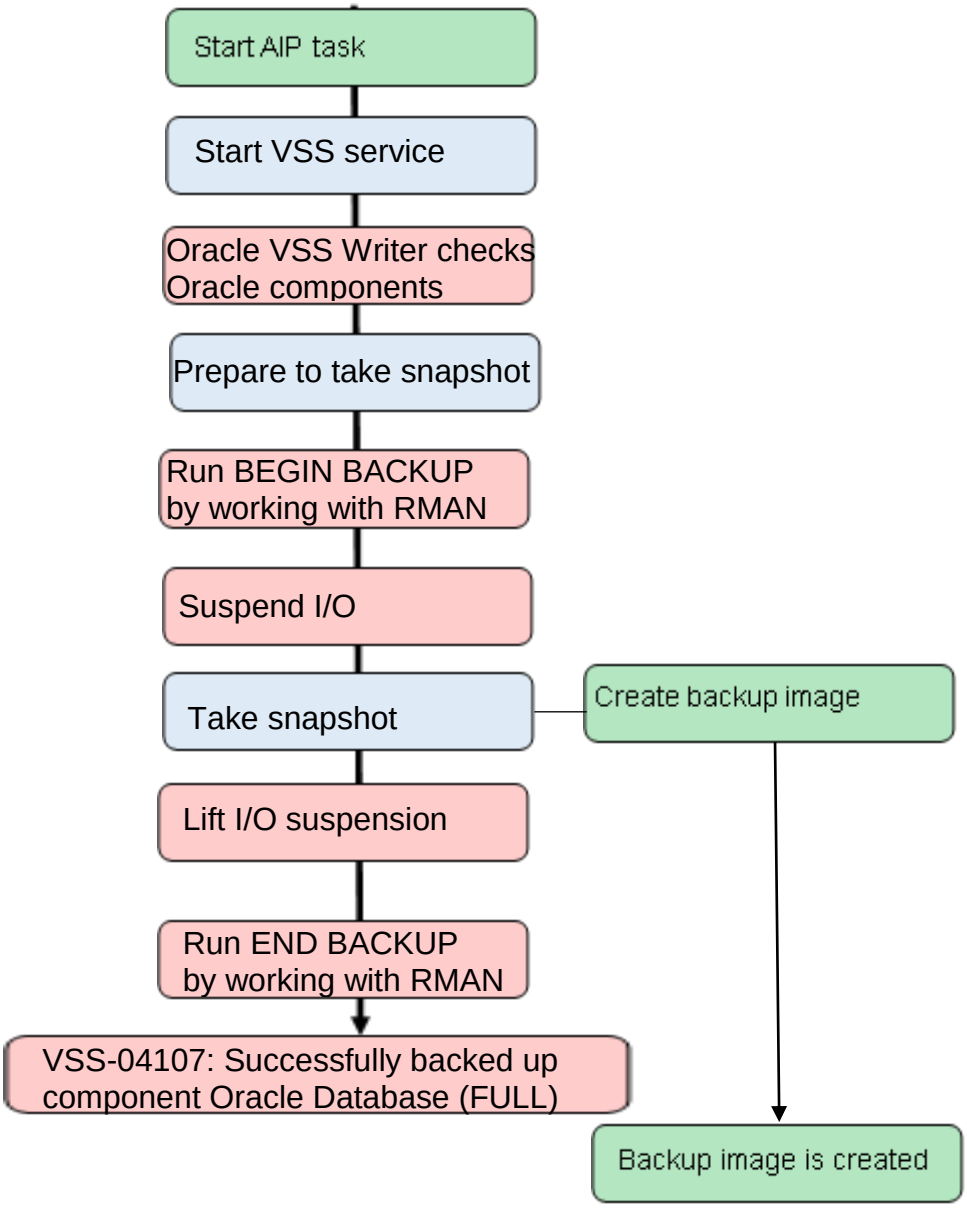
Depending on the backup source volume, Oracle VSS Writer events recorded in Windows event log may differ.

Oracle VSS Writer event log recorded upon successful completion of a backup task

・VSS-04107: successfully backed up component Oracle Database (FULL)

This event log is recorded when the entire volume on which both Oracle home and Oracle database are located.

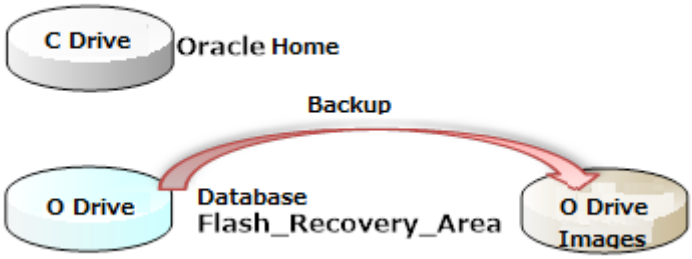
When the drives of both Oracle home and Oracle database are backed up by executing one backup task, Oracle VSS Writer works with RMAN in the backup process as illustrated below.



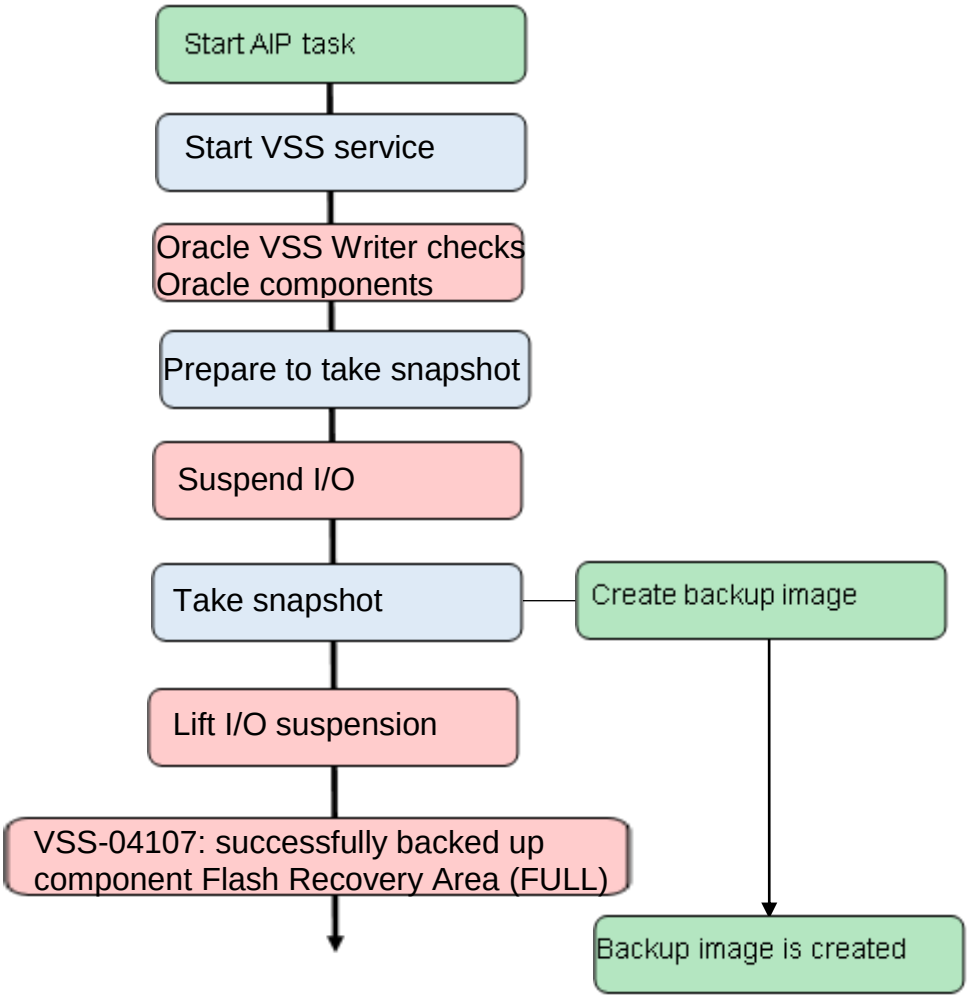
When you restore the backup image created by a backup task that returned this event, you need to reset the backup status of the database. For more detailed procedures, please refer to “8. Reset backup status”.

・VSS-04107: successfully backed up component Flash Recovery Area (FULL)

The above event log is recorded when only the volume on which Flash_Recovery_Area folder exists is backed up.



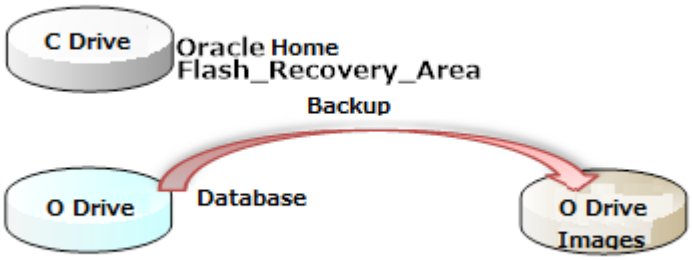
When the volume on which Flash_Recovery_Area folder exists is backed up by executing a single backup task, the backup process flows as illustrated below.



When you restore the backup image created by a backup task that returned this event, crash recovery is automatically performed and the database is opened.
Therefore, recovery operation may not be required.

・Oracle VSS Writer event log is not recorded

When the only drive on which the database files exist is backed up, Oracle VSS Writer event may not be recorded in the log.



In such case, after restoring a backup image, starting the database service automatically performs crash recovery and the database can be opened.
Behaving in the same manner as shutdown abort, instance recovery is performed from the current REDO log so that the database can be restored to the point in time the database transactions were committed and the snapshot was taken.