

HR Database Tutorial

This tutorial needs knowledge of databases or access to someone who does. The first tutorial uses the HR Demo database in Oracle databases. The same approach would be used for any other on premise database HRMS system.

This tutorial will demonstrate some of the features of AMX, specifically:

- Using identityReport to extract a report of identities from Oracle_HR database.
- Using Job_History End_Date table
- Extracting identities with the latest end_date
- Extracting other columns from the latest end_date
- Using end_date for the Active attribute
- Using identitySync

AMX runs on Windows and must be setup as shown in the AMX Tutorial Setup document. In this tutorial identityReport and identitySync are run from the Command Line using AMXRun which sets the environment variables.

Oracle HR as a Source of Identities.

Oracle databases install a HR_demo database with many of the characteristics of HRMS systems, which is tables for employees, locations, jobs etc.

This tutorial will read the identity records with identityReport.exe showing how they can be used for a source of identities.

The tutorial uses [dbVisualizer](#) to investigate the database structure. It is available for Windows, MAC and Linux, install it or use something equivalent.

The Oracle documentation describes the schemas and can be found for the appropriate release by googling for “oracle database sample schemas”. This should find a pdf document, chapter 4 of the 11g version describes the HR schema.

1. Check the Oracle HR_Demo is Installed

Start dbVisualizer or equivalent and connect to the database server, with the help of the Database Administrator that installed the database, find the HR_demo tables. If the Oracle HR_Demo has been removed, re-install it from \$ORACLE_HOME/demo/hr_schema by running hr_main.sql.

2. Examine the Table and View Structure.

Expand the Views and open the EMP_DETAILS_VIEW

The screenshot shows the DbVisualizer interface with the 'EMP_DETAILS_VIEW' table selected. The table data is displayed in a grid format with the following columns: EMPLOYEE_ID, JOB_ID, MANAGER_ID, DEPARTMENT_ID, LOCATION_ID, COUNTRY_ID, FIRST_NAME, and LAST_NAME. The data rows are numbered 1 through 20.

EMPLOYEE_ID	JOB_ID	MANAGER_ID	DEPARTMENT_ID	LOCATION_ID	COUNTRY_ID	FIRST_NAME	LAST_NAME
1	198:SH_CLERK	124	50	1500	US	Donald	OConnell
2	199:SH_CLERK	124	50	1500	US	Douglas	Grant
3	200:AD_ASST	101	10	1700	US	Jennifer	Whalen
4	201:MK_MAN	100	20	1800	CA	Michael	Hartstein
5	202:MK_REP	201	20	1800	CA	Pat	Fay
6	203:HR_REP	101	40	2400	UK	Susan	Mavris
7	204:PR_REP	101	70	2700	DE	Hermann	Baer
8	205:AC_MGR	101	110	1700	US	Shelley	Higgins
9	206:AC_ACCOUNT	206	110	1700	US	William	Gietz
10	100:AD_PRES		90	1700	US	Steven	King
11	101:AD_VP	100	90	1700	US	Neena	Kochhar
12	102:AD_VP	100	90	1700	US	Lex	De Haan
13	103:IT_PROG	102	60	1400	US	Alexander	Hunold
14	104:IT_PROG	103	60	1400	US	Bruce	Ernst
15	105:IT_PROG	103	60	1400	US	David	Austin
16	106:IT_PROG	103	60	1400	US	Valli	Pataballa
17	107:IT_PROG	103	60	1400	US	Diana	Lorentz
18	108:FL_MGR	101	100	1700	US	Nancy	Greenberg
19	109:FL_ACCOUNT	108	100	1700	US	Daniel	Faviet
20	110:FL_ACCOUNT	108	100	1700	US	John	Chen

This view will be used to extract the Identities.

3. Export the Column Names

In dbVisualiser select the Columns tab of the EMP_DETAILS_VIEW, export the columns to a file. This file would normally be used to build the AMX schema. Directory Tutorial1 already contains one called OracleHRSchema1.txt.

4. Configure identityReport Properties file.

In the directory Tutorial1, open the OracleHR.properties file.

1. Update the DatabasesIdentityResource1 with the hostName of the Database Server, the port and the ORACLE_SID of the database.

2. Update the DatabaseIdentityUser1 with the name of the Oracle user account that will be used to read the database. This should be the same account that was used with dbVisualizer.
 3. Create an OraclePasswd1.txt file and add the password in the first line. It will be encrypted when identityReport runs for the first time.
5. [Run identity Report](#)
- Right click on AMX Run in the Start Programs menu or AMXRun.bat in the installation directory bin, and Run as Administrator.



```
C:\WINDOWS\system32\cmd.exe
C:\Dev\AMX\bin>echo off
C:\Dev\AMX\bin>cmd /k @cd /d "C:\Dev\AMX\bin\..\work"
C:\Dev\AMX\work>_
```

1. Change directory to Tutorial1 and run identityReport.exe OracleHR.properties, the database will be extracted into a file IdentityReportOracleHR1.csv as defined in the property Report in the OracleHR.properties file. 106 records will be extracted.

```
C:\AMX\Tutorial1>identityReport.exe OracleHR.properties
Begins Fri, 29 Apr 2016 11:29:26 GMT identityReport
Database System 1 AMX6.corp.example.com:1521/XE
Extracted 106 Identities
Database Finished Sat, 30 Apr 2016 11:30:06 GMT
Ends Fri, 29 Apr 2016 11:30:07 GMT
```

```
C:\AMX\Tutorial1>
```

6. Add Job_History End_Date Table to Query

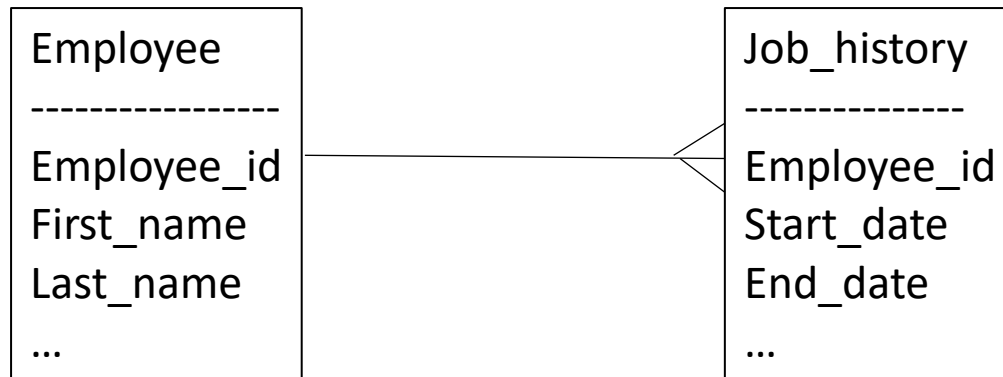
The Oracle HR_demo is similar to most HRMS systems. The job_history table contains a person's assignments. Only one assignment will be current, and to obtain the person's employment status the end_date will have to be established by extracting it from the job_history table.

Open OracleHR.properties and add a join to the DatabaseIdentitySelectFrom property. The property DatabaseIdentitySelectFrom is used to create the SQL select statement. The statement is constructed:

```
Select <Staging Attribute1>,<Staging Attribute1>,.. from <DatabaseIdentitySelectFrom property>
```

To add the last end_date from the job_history table to the extract, use employee_id to join records in the table emp_details_view with matching records in the Job_history table.

The schema diagram shows the join is based on Employee_id, with a "crows foot" on the Job_History. This signifies that a single employee may have one or more Job_history records.



Use a left join to include all the records in the first table emp_details and any matching records in job_history. The tables are given aliases a and b. A DatabaseIdentitySelectFrom property like:

```
HR_DEMO.EMP_DETAILS_VIEW a left join hr_demo.job_history b on a.employee_id = b.employee_id
```

Using a simple join will select a record when an employee_id is found in both tables

7. Add End_Date to the Report

In OracleHR.properties update the property ReportAttributes, adding end_date. Note that this is the Metaverse attribute, and is case sensitive in AMX. Although in Oracle it is not.

8. Update the AMX Schema

The AMX schema file defines the Staging Attribute name and the Meta Attribute name. When there is a join, the Staging Attributes cannot be ambiguous, that is present in both tables.

Ambiguous Attributes in the Oracle HR_Demo are:

- EMPLOYEE_ID
- JOB_ID
- DEPARTMENT_ID

The Staging Attributes must specify which table the value will be extracted from. In the DatabaseIdentitySelectFrom property the tables have been given aliases a and b. Update the Staging attributes with the prefix of the table that will be used to define the attribute. When the Metaverse Attribute is not defined in an AMX schema, it defaults to the Staging Attribute name, this would require changes to the ReportAttributes property to reflect the changed name. To avoid this define the Metaverse Attribute names with the table prefix removed. For example:

```
a.EMPLOYEE_ID,EMPLOYEE_ID;DisplayName
a.JOB_ID,JOB_ID
MANAGER_ID,
a.DEPARTMENT_ID,DEPARTMENT_ID
LOCATION_ID,
COUNTRY_ID,
FIRST_NAME,
LAST_NAME,
DEPARTMENT_NAME,
JOB_TITLE,
CITY,
STATE_PROVINCE,
COUNTRY_NAME,
REGION_NAME,
```

Add the end_date to the schema. For example:

```
b.end_date,
```

Add end_date to the ReportAttributes property in OracleHR.properties.

9. Run identityReport

Run identityReport, 109 records will be Extracted rather than the 106 before.

The reason for the increase is the table Job_History contains multiple job entries for an individual. For example employee_id 101 had 2 jobs the last one ended in 1997-03-15.

*	EMPLOYEE_ID	START_DATE	END_DATE	JOB_ID	DEPARTMENT_ID
1	101	1989-09-21 00:00:00.0	1993-10-27 00:00:00.0	AC_ACCOUNT	110
2	101	1993-10-28 00:00:00.0	1997-03-15 00:00:00.0	AC_MGR	110
3	102	1993-01-13 00:00:00.0	1998-07-24 00:00:00.0	IT_PROG	60
4	114	1998-03-24 00:00:00.0	1999-12-31 00:00:00.0	ST_CLERK	50
5	122	1999-01-01 00:00:00.0	1999-12-31 00:00:00.0	ST_CLERK	50
6	176	1998-03-24 00:00:00.0	1998-12-31 00:00:00.0	SA_REP	80
7	176	1999-01-01 00:00:00.0	1999-12-31 00:00:00.0	SA_MAN	80
8	200	1987-09-17 00:00:00.0	1993-06-17 00:00:00.0	AD_ASST	90
9	200	1994-07-01 00:00:00.0	1998-12-31 00:00:00.0	AC_ACCOUNT	90
10	201	1996-02-17 00:00:00.0	1999-12-19 00:00:00.0	MK_REP	20

The identityReport report as defined in the Report property will show two issues.

- a. The end_date has the time and is converted to the Native Language date format. For the UK this is:
15/03/1997 00:00:00
- b. There are multiple lines for persons with multiple entries in the job_history table. For example:
101,AD_VP,15/03/1997 00:00:00,100,90,1700,US,Neena,Kochhar,..
101,AD_VP,27/10/1993 00:00:00,100,90,1700,US,Neena,Kochhar,..

10. Update the Date Format

The dates include the time, and in the Oracle HR_demo all times are 00:00:00. The .Net libraries that are used by AMX convert datetimes to the native language settings of the computer running AMX. Use an AMX Attribute modifier, see the AMX Reference Guide for more details. For example to convert 15/03/1997 00:00:00 to 15/03/1997 use left to Transform the value to the first leftmost field (field 0) delimited by a space.

```
end_date,;left0 ;
```

Run identityReport and check the end_date in IdentityReportOracleHR1.csv is Transformed as expected.

11. Extract Records with the Latest end_date

To extract a single record for an identity a more complex select statement is required. This is not intended to be a SQL tutorial, and help from a Database Administrator may be required, particularly when using databases other than Oracle. SQL syntax is not consistent between db2 , MySQL, MS SQL and Oracle.

The AMX property DatabaseIdentitySelectFrom in OracleHR.properties is used to create the SQL select statement during the Extract phase. The select statement is constructed:

```
Select <Staging Attribute1>,<Staging Attribute2>,.. from <DatabaseIdentitySelectFrom property>
```

The DatabaseIdentitySelectFrom property allows a suitable select statement to be constructed. The select statement can be developed and tested in dbVisualizer and everything after “from” pasted into the DatabaseIdentitySelectFrom property. To extract the latest end_date from job_history use this select statement:

```
select LOCATION_ID, COUNTRY_NAME, a.EMPLOYEE_ID, FIRST_NAME, DEPARTMENT_ID, REGION_NAME, JOB_TITLE,  
MANAGER_ID, DEPARTMENT_NAME, LAST_NAME, b.end_Date, a.JOB_ID, CITY, COUNTRY_ID, STATE_PROVINCE  
  
from HR_DEMO.EMP_DETAILS_VIEW a  
  
left join  
  
(select employee_id, max(end_date) as end_date from hr_demo.job_history group by employee_id) b  
  
on a.employee_id = b.employee_id
```

- Select is constructed by AMX from the Staging Attributes in the Schema file, and is unchanged.
- from is unchanged
- The left join is now with a temporary table created by selecting the value of max(end_date), the latest date which is given the alias “end_date”, grouped by employee_id. The temporary table will contain one record per employee_id. This select statement can be tested in dbVisualizer.
- The left join will select a record even when the employee_id is not present in the temporary table (that is the employee has no job!). Replace it with a straight join in dbVisualizer and you will get the 8 employees that have jobs defined in job_history.
- On is unchanged

Run identityReport and review the results. 106 records are Extracted.

12. Extract Records with Other Columns from the Latest end_date Only

To extract another column from the job_history table for instance start_date a more complex SQL select is required.

Open the OracleHRSchema1.txt file. Update the schema file and add start_date:

```
start_date,;left0 ;
```

Open the OracleHR.properties file and update the property ReportAttributes to add start_date to the report.

Update the property DatabaseldentitySelectFrom1. The existing SQL statement cannot extract more columns from job_history, for example start_date, because each column must be either in “group by” or selected by max, min or similar functions.

To extract the latest end_date from job_history use this select statement in the properties file:

```
Select LOCATION_ID, COUNTRY_NAME, a.EMPLOYEE_ID, FIRST_NAME, REGION_NAME, a.DEPARTMENT_ID, JOB_TITLE,
MANAGER_ID, DEPARTMENT_NAME, LAST_NAME, end_date, start_date, a.JOB_ID, CITY, COUNTRY_ID, STATE_PROVINCE
from hr_demo.emp_details_view a left join
(select s1.employee_id, s1.start_date, s1.end_date from hr_demo.job_history s1 inner join
    (select employee_id, max(end_date) end_date from hr_demo.job_history group by employee_id) s2
    on s1.employee_id = s2.employee_id and s1.end_date = s2.end_date) b
on a.employee_id = b.employee_id
```

- select is constructed by AMX from the Staging Attributes in the Schema file, and has start_date added from the AMX schema.
- from is unchanged
- left join is unchanged, but instead of joining to the job_history table it is left joining to a temporary table created by the first set of brackets and aliased to b. This temporary table b will have columns s1.employee_id, s1.start_date and s1.end_date.
- Temporary table b is itself the result of a join with a second temporary table aliased to s2.
- Temporary table s2 will have columns employee_id and max(end_date) which is aliased (simplified) to be end_date. This is the end_date of the latest job.
- Temporary table b uses an inner join with temporary table s2 to get the single record where the employee_ids match and the record in job_history has a matching end_date with the record in s2 – the end_date of the latest job.

- The outer select is still a “left join” of temporary table b, which selects columns from the job_history table where the employee_id in emp_details_view matches the employee_id in temporary table b.

The simplest way to understand this is to work from the inside out with a tool such as dbVisualizer.

- Create temporary table s2

```
select employee_id, max(end_date) end_date from hr_demo.job_history group by employee_id
```
- This will create a table of unique employee_ids and the latest end_date. 8 records in total.

- Create temporary table b

```
select s1.employee_id, s1.start_date, s1.end_date from hr_demo.job_history s1 inner join
(select employee_id, max(end_date) end_date from hr_demo.job_history group by employee_id) s2
on s1.employee_id = s2.employee_id and s1.end_date = s2.end_date
```

- This will create a table of unique employee_ids with the latest start_date and end_date. 8 records in total.

Run identityReport and review the results. 106 records will be reported, only 8 of them having start and end dates. The table job_history does not have many records.

13. Using the End_Date for the Active Attribute

When the end_date is extracted into the Metaverse as the Active attribute, if the end date is in the future Active is set to Y. This value is used by identitySync to disable any accounts used by this person. The end_date includes the time which is 00:00:00, in most cases the end_date or last day of work needs to allow the leaver access to email etc on their last day. Use replace to change the time to something more suitable such as 17:30.

Update the Schema file adding:

```
end_date, active;date;replace/(\S{10})/$1 17:30:00/;enddate;replace/^\$/Y/
```

The attribute modifier “enddate” marks this as a DateTime and it will be checked to see if the end date is in the future, in which case Active is set to Y otherwise it is blank. The final replace will change a blank value to Y. identitySync uses the active attribute to disable accounts of people who have left the organisation.

Add Active to the ReportAttributes in the OracleHR Properties file.

Run identityReport.exe OracleHR.properties, and check IdentityReportOracleHR1.csv, notice that any individual that does not have a job_history is marked as Active=Y. Since all the dates in the HR_demo database are earlier than today, any individual with a job history is marked Active=N.

Add a job history that is current. Run this SQL statement in dbVisualiser or sqlplus:

```
insert into hr_demo.job_history ("EMPLOYEE_ID", "START_DATE", "END_DATE", "JOB_ID", "DEPARTMENT_ID")
values ('198',TO_DATE('01-MAR-2007', 'dd-MON-yyyy'),TO_DATE('01-MAR-2020', 'dd-MON-
yyyy'),'SH_CLERK','50');
```

Run identityReport.exe OracleHR.properties, and notice that employee_id 198 Donald OConnell is now marked active.

14. Using identitySync

identitySync uses the same Schema file and properties as identityReport. A source of Identities such as an HRMS system can be combined with other sources, for instance Contractor databases and used to synchronise Account Resources.

Error Messages

Error: AMXlib ColumnCheck properties file contains <Metaverse Attribute name> and Schema <Schemafilename> does not

The identityAttributes in the properties file must match the Metaverse Attributes in the Schema file, schema including the case.

If the Logging Level property is >=2 the Metaverse Attributes found in the first Schema file are written to the debug file.

Error: Database Extract ORA-00903: invalid table name

DatabaseldentitySelectFrom property syntax error, found a reserved keyword where a table or view was expected. Reserved word such as from, join, select, etc. The property is appended to Select * from, so a property beginning with from would cause this error. Check the debug file for Database Extract from Container: to see the SQL select statement that was used.

Error: Database Extract ORA-00904: <attribute>: invalid identifier

The Staging Attribute defined in the AMX Schema file does not exist in the Database Table referenced in the DatabaseldentitySelectFrom property.

Error: Database Extract ORA-00905: missing keyword

Expected a keyword such as from, join. Check typos such as joim.

Error: Database Extract ORA-00942: table or view does not exist

The user's default session does not include the tables defined in the DatabaseldentitySelectFrom property. Use dbVisualizer or similar to investigate, login as the user defined in the property DatabaseldentityUser and try to open the table. If not grant the user access or use another account.

or

The Database Table or View defined in the DatabaseldentitySelectFrom property does not exist.

Error: Database Extract ORA-01045: user <user> lacks CREATE SESSION privilege; logon denied
Users need at least Grant Create Session to <user> to logon.

Error: Database Extract ORA-01950: No privileges on tablespace <tablespace>
Either user has not been granted enough quota on the tablespace.

Error: Database Extract ORA-12170: TNS:Connect timeout occurred
Cannot connect to host, check hostname.

Error: Database Extract ORA-12514: TNS:listener does not currently know of service requested in connect descriptor
Can be caused by an incorrect or undefined SID in DatabaseResource or DatabaseldentityResource

Error: Database Extract ORA-12541: TNS:no listener
Can be caused by an incorrect port.

Error: Database Extract ORA-12545: Connect failed because target host or object does not exist
Can be caused by a port number with a non-numeric character

Error: Database Extract ORA-12546: TNS: permission denied
Admin account defined in property DatabaseldentityUser has not been granted permission to access the table or view. Grant access to the table or view.

Error: Database Extract ORA-12569: TNS:packet checksum failure
Can be caused when the port is active but not an Oracle listener. Usually port 1521.