OPTUM
Government Solutions

and

MDHHS
Michigan Department of Health & Human Services

SQL as a Second Language

John HR Schuster

Version 2.1m, 01/10/2019

Table of Contents

SQL as a Second Language (SASL) was a course that I taught many moons ago. It is being revisited now to help answer some SQL questions brought up by those whose are taking their SQL Skills to the next level.

A PDF version of this web site is available at this Link

1. Introduction

This SQL As a Second Language version will use the Teradata SQL syntax.

Examples

> A teacher, a really good teacher, is never a giver of truth; he is a guide, a pointer to truth
>
> — Bruce Lee

1.1. Chinook Database

The training database will be the Chinook database on music record sales.

Reference: https://github.com/lerocha/chinook-database

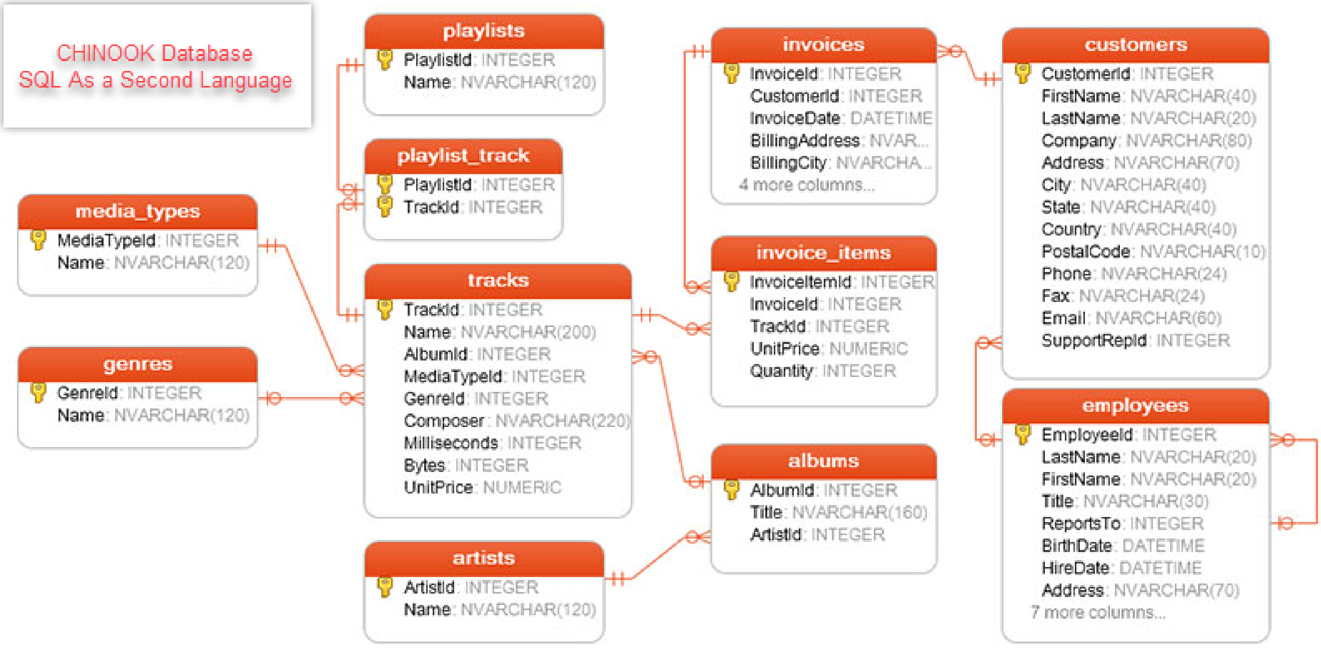


Figure 1. Chinook Database Diagram

1.1.1. Chinook Business Rules

1. Each **Artist** has 1 or more **Albums**
2. Each **Album** has just 1 **Artist**
3. Each **Album** has 1 or more **Tracks**
4. Each **Track** has just 1 **Genre**
5. Each **Track** has just 1 **Media Type**
6. **Tracks** have playtime measured in milliseconds
7. **Tracks** have disk space measured in bytes
8. Each **Employee** has just 1 Manager, who is also an **Employee**
9. Each **Customer** has 1 or more **Invoices**
10. Each **Customer** has just 1 support rep who is an **Employee**
11. Each **Invoice** has 1 or more **Invoice Lines**
12. Each **Invoice Line** is related to just 1 **Track**
13. **Invoices** span 2016 - 2018
14. Each **Playlist** has 1 or more **Tracks**
15. Not all **Genre** have **Tracks**

1.2. Database Objects

In this document the term `Database Object` is used to indicate one of the following Teradata database elements.

- Table (All types)
- View
- Stored Procedure
- Macro

The reason for the term `Database Object` is to eliminate the confusion that can occur when objects change. (IE: A view you created is materialized into a table, a query you wrote is changed into a store procedure)

2. Questions

To ask a **New question** to be added to this list, please email it to john.schuster@PhoenixWorkgroup.com.

How can I get a count of the number of rows in some of the tables of a database?

View this query tableCounts

How can a get a list of the objects (Tables, View, Procedures) for a specific database?

View This query dbObjects

How can I find out the columns and metadata about a specific object (Table, View)?

View this query tableColumns

How can I find where a specific column exist in a database?

View this query findColumn

How do I Join two tables together?

View this query joinQuery Part B

How do I restrict the results by a column that `contains` some string?

View this query joinQuery Part C

How do I sort the results by multiple columns?

View this query joinQuery Part C

How do I use a sub-query to collect information?

View this query derivedTable 1 - Part A

How do I use a sub-query to reduce or filter information?

View this query derivedTable 2 - Part A

When do I use the `having` clause?

View this query derivedTable 2 - Part D

When is it a good idea to use a `view`?

Visit this query Create View

When do I use a `inner` join versus an `outer` join?

Visit this query Join Types

How can I best use "Prompts" in SQL Assistant?

unlinked

3. SQL Overview

4. Queries

4.1. tableCounts

SQL Example

```
/*
=== tableCounts - Count rows in all Chinook tables

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Column Alias, rename a column
* Order by,  also known as sorting
* Union, multiple select queries stacked
*/

Select
    'Album          ' as tableName   ①
    , count(*) as "Rows" from Album  ②

UNION
Select
    'Artist' as tableName
    , count(*) from Artist

UNION
Select
    'Customer' as tableName
    , count(*) from Customer

UNION
Select
    'Employee' as tableName
    , count(*) from Employee

UNION
Select
    'Genre' as tableName
    , count(*) from Genre

UNION
Select
    'Invoice' as tableName
    , count(*) from Invoice

UNION
Select
    'Invoice Line' as tableName
    , count(*) from InvoiceLine

UNION
Select
```

```
    'Media Type' as tableName
    , count(*) from MediaType

UNION
Select
    'Playlist' as tableName
    , count(*) from Playlist

UNION
Select
    'Playlist Track' as tableName
    , count(*) from PlaylistTrack

UNION
Select
    'Track' as tableName
    , count(*) from Track

Order by 2 desc  ③
```

① First query in union determine sizes and names of columns.

② count(*) is an aggregate function

③ Order by can be by the ordinal number of the column (Column 1 is tableName, Column 2 is Rows)

SQL download link click here

Table 1. Results

tableName	Rows
Playlist Track	8715
Track	3503
Invoice Line	2240
Invoice	412
Album	347
Artist	275
Customer	59
Genre	25
Playlist	18
Employee	8
Media Type	5

Your table counts may vary from this example as the Chinook database is updated to help with lesson content.

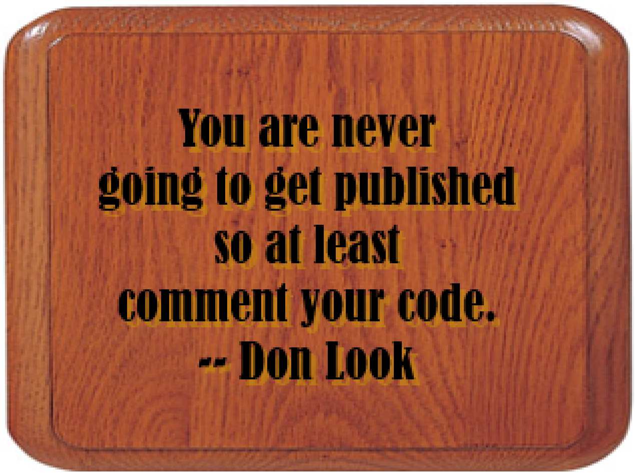


Figure 2. Commenting your SQL

Back to Introduction.

4.2. dbObjects

SQL Example

```
/*
=== dbObjects - Get a list of all the objects in a specific database

==== Topics

* Teradata Specific syntax


==== Special Note

* Change the database name from `chinook` to the database you are interested in
*/

help database chinook
```

SQL download link click here

Table 2. Results

Table/View/Macro name	Kind	Comment	Protection	Creator Name	Commit Option	Transaction Log	Table/View/Macro Dictionary Name	Table/View/Macro SQL Name	Table/View/Macro Name UEscape	Creator Dictionary Name	Creator SQL Name	Creator Name UEscape
Album	T	NULL	N	WINDUSER	N	Y	Album	Album		WINDUSER	WINDUSER	
Artist	T	NULL	N	WINDUSER	N	Y	Artist	Artist		WINDUSER	WINDUSER	
Customer	T	NULL	N	WINDUSER	N	Y	Customer	Customer		WINDUSER	WINDUSER	
Employee	T	NULL	N	WINDUSER	N	Y	Employee	Employee		WINDUSER	WINDUSER	
Genre	T	NULL	N	WINDUSER	N	Y	Genre	Genre		WINDUSER	WINDUSER	
Invoice	T	NULL	N	WINDUSER	N	Y	Invoice	Invoice		WINDUSER	WINDUSER	
InvoiceLine	T	NULL	N	WINDUSER	N	Y	InvoiceLine	InvoiceLine		WINDUSER	WINDUSER	
mComedyList	M	NULL	F	DBC	N	Y	mComedyList	mComedyList		DBC	DBC	

Table/View/Macro name	Kind	Comment	Protection	Creator Name	Commit Option	Transaction Log	Table/View/Macro Dictionary Name	Table/View/Macro SQL Name	Table/View/Macro Name UEscape	Creator Dictionary Name	Creator SQL Name	Creator Name UEscape
MediaType	T	NULL	N	WINDUSER	N	Y	MediaType	MediaType		WINDUSER	WINDUSER	
Playlist	T	NULL	N	WINDUSER	N	Y	Playlist	Playlist		WINDUSER	WINDUSER	
PlaylistTrack	T	NULL	N	WINDUSER	N	Y	PlaylistTrack	PlaylistTrack		WINDUSER	WINDUSER	
Track	T	NULL	N	WINDUSER	N	Y	Track	Track		WINDUSER	WINDUSER	
vComedyTrack	V	NULL	F	DBC	N	Y	vComedyTrack	vComedyTrack		DBC	DBC	

Your database objects may vary from this example as the Chinook database is updated to help with lesson content.

Back to Introduction.

4.3. tableColumns

SQL Example

```
/*
=== tableColumns - Get a list of all the columns for a specific table or object in a
known database

==== Topics

* Teradata Specific syntax

==== Special Note

* Change the database name from `chinook` to the database you are interested in
*/

help table chinook.invoice
```

SQL Download link click here

Table 3. Results

Column Name	Type	Comment	Nullable	Format	Title	Max Length	Decimal Total Digits	Decimal Fractional Digits	Range Low	Range High	UpperCase	Table/View?	Default value	Char Type	IdCol Type	UDT Name	Temporal	Column Dictionary Name	Column SQL Name	Column Name UEscape	Dictionary Title	SQL Title	Title UEscape	UDT Dictionary Name	UDT SQL Name	UDT Name UEscape
InvoiceId	I	NULL	N	-(10)9	NULL	4	NULL	NULL	NULL	NULL	N	T	NULL	NULL	GD	NULL	N	InvoiceId	InvoiceId		NULL	NULL	NULL	NULL	NULL	NULL
CustomerId	I	NULL	N	-(10)9	NULL	4	NULL	NULL	NULL	NULL	N	T	NULL	NULL	NULL	NULL	N	CustomerId	CustomerId		NULL	NULL	NULL	NULL	NULL	NULL

Column Name	Type	Comment	Nullable	Format	Title	Max Length	Decimal Total Digits	Decimal Fractional Digits	Range Low	Range High	UpperCase	Table/View?	Default value	Char Type	IdCol Type	UDT Name	Temporal	Column Dictionary Name	Column SQL Name	Column Name UEscape	Dictionary Title	SQL Title	Title UEscape	UDT Dictionary Name	UDT SQL Name	UDT Name UEscape
InvoiceDate	DA	NULL	N	yyyy-mm-dd	NULL	4	NULL	NULL	NULL	NULL	N	T	NULL	NULL	NULL	NULL	N	InvoiceDate	InvoiceDate		NULL	NULL	NULL	NULL	NULL	NULL
BillingAddress	CV	NULL	Y	X(70)	NULL	70	NULL	NULL	NULL	NULL	N	T	NULL	1	NULL	NULL	N	BillingAddress	BillingAddress		NULL	NULL	NULL	NULL	NULL	NULL
BillingCity	CV	NULL	Y	X(40)	NULL	40	NULL	NULL	NULL	NULL	N	T	NULL	1	NULL	NULL	N	BillingCity	BillingCity		NULL	NULL	NULL	NULL	NULL	NULL
BillingState	CV	NULL	Y	X(40)	NULL	40	NULL	NULL	NULL	NULL	N	T	NULL	1	NULL	NULL	N	BillingState	BillingState		NULL	NULL	NULL	NULL	NULL	NULL
BillingCountry	CV	NULL	Y	X(40)	NULL	40	NULL	NULL	NULL	NULL	N	T	NULL	1	NULL	NULL	N	BillingCountry	BillingCountry		NULL	NULL	NULL	NULL	NULL	NULL
BillingPostalCode	CV	NULL	Y	X(10)	NULL	10	NULL	NULL	NULL	NULL	N	T	NULL	1	NULL	NULL	N	BillingPostalCode	BillingPostalCode		NULL	NULL	NULL	NULL	NULL	NULL

Column Name	Type	Comment	Nullable	Format	Title	MaxLength	DecimalTotalDigits	DecimalFractionalDigits	RangeLow	RangeHigh	UpperCase	Table/View?	Default value	Char Type	IdCol Type	UDT Name	Temporal	Column Dictionary Name	Column SQL Name	Column Name UEscape	Dictionary Title	SQL Title	Title UEscape	UDT Dictionary Name	UDT SQL Name	UDT Name UEscape
Total	D	NULL	N	---------.99	NULL	8	10	2	NULL	NULL	N	T	NULL	NULL	NULL	NULL	N	Total	Total		NULL	NULL	NULL	NULL	NULL	NULL

ColumnType defined the data type of a column. Reference: [ColumnType]

Back to Introduction.

4.4. findColumn

SQL Example

```
/*
=== findColumn - Find out what objects (Table, View) where a specific named column
exist

==== Topics

* Where, results filter or restriction
* Teradata Specific syntax

==== Special Note

* ColumnTypes Reference:
http://developer.teradata.com/doc/connectivity/tdnetdp/14.00/webhelp/DataTypeMappings.
html
* Replace `CustomerID` with the column you are interested in
* The list of columns in the `Select` are the ones that are the most important,
there are many other columns available. Use a single column name `*` to see them all.


*/

select
    ColumnName
    ,DatabaseName
    ,TableName
    ,ColumnFormat
    ,ColumnType
    ,ColumnLength
from dbc.columnsX
where ColumnName = 'CustomerID'
```

SQL Download link click here

Table 4. Results

ColumnName	DatabaseName	TableName	ColumnFormat	ColumnType	ColumnLength
CustomerId	Chinook	Invoice	-(10)9	I	4
CustomerId	Chinook	Customer	-(10)9	I	4

The ColumnType identifies the data type of the column. Reference: Column Type

Back to Introduction.

4.5. joinQuery Part A

Objective: Get a list of tracks from the **Artist** `Aerosmith` where the **Composer** is `Joe Perry`.

Approach: Begin with a simple query to get one element of the objective. In this query we want to get the **ArtistID** for `Aerosmith`

SQL Example

```
/*
=== joinQuery - Multiple Table join with result restriction

==== Topics

* Column Alias, rename a column
* OLAP function
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

Select
   AR.ArtistID
   ,AR.name as artistName  ①
From Artist AR  ②
where artistName = 'Aerosmith'
```

① Column alias, notice name is `artistName`

② Table alias, use alias on every instance of columns from that table

SQL Download link click here

Table 5. Results

ArtistId	artistName
3	Aerosmith

Back to Introduction.

4.6. joinQuery Part B

Objective: Get a list of tracks from the **Artist** `Aerosmith` where the **Composer** is `Joe Perry`.

Approach: Add on to the initial query to get a list of all the **Albums** for the **Artist** `Aerosmith`

SQL Example

```
/*
=== joinQuery - Multiple Table join with result restriction

Part B - Add the second table for the Join

==== Topics

* Column Alias, rename a column
* Derived Table (Sub-Query)
* Join objects (Table, View, Derived Table) together
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

Select
   AR.ArtistID
   ,AL.AlbumID
   ,AR.name as artistName  ①
   ,AL.AlbumTitle
From Artist AR  ②

inner Join Album AL ②
on AR.ArtistID = AL.ArtistID  ③

where artistName = 'Aerosmith'
```

① Column alias, notice name is `artistName`

② Table alias, use alias on every instance of columns from that table

③ The common column used to join the two tables together

SQL Download link click here

Table 6. Results

ArtistId	AlbumId	artistName	AlbumTitle
3	5	Aerosmith	Big Ones

Back to Introduction.

4.7. joinQuery Part C

Objective: Get a list of tracks from the **Artist** `Aerosmith` where the **Composer** is `Joe Perry`.

Approach: Complete the request by joining the `Title` table and a row restriction using the `like` with the wildcard `%` character.

SQL Example

```
/*
=== joinQuery - Multiple Table join with result restriction

Part C - Add the third table and composer restriction

==== Topics

* Column Alias, rename a column
* Join objects (Table, View, Derived Table) together
* Like %Search% similar to `contains`
* Order by,  also known as sorting
* Where, results filter or restriction
*/

Select
   AR.ArtistID
   ,AL.AlbumID
   ,T.TrackID
   ,AR.name as artistName  ①
   ,AL.AlbumTitle
   ,T.Name as trackName    ①
   ,T.Composer
From Artist AR  ②

inner Join Album AL ②
on AR.ArtistID = AL.ArtistID  ③

inner join Track T
on AL.AlbumID = T.AlbumID

where AR.Name = 'Aerosmith'
  and T.Composer like '%Joe Perry%'  ④

order by AL.AlbumTitle
         ,trackName  ⑤
-- order by 5,6 ⑥
```

① Column alias, notice name is `artistName`

② Table alias, use alias on every instance of columns from that table

③ The common column used to join the two tables together

④ The `like` with wildcard character `%` used on `Composer` column

⑤ The order by has both actual column name `AL.AlbumTitle` and an alias column `trackName`

⑥ Shows alternative method of `order by` using ordinal column numbers

SQL Download link click here

Table 7. Results

ArtistId	AlbumId	TrackId	artistName	AlbumTitle	trackName	Composer
3	5	31	Aerosmith	Big Ones	Blind Man	Steven Tyler, Joe Perry, Taylor Rhodes
3	5	34	Aerosmith	Big Ones	Crazy	Steven Tyler, Joe Perry, Desmond Child
3	5	29	Aerosmith	Big Ones	Cryin'	Steven Tyler, Joe Perry, Taylor Rhodes
3	5	27	Aerosmith	Big Ones	Dude (Looks Like A Lady)	Steven Tyler, Joe Perry, Desmond Child
3	5	35	Aerosmith	Big Ones	Eat The Rich	Steven Tyler, Joe Perry, Jim Vallance
3	5	37	Aerosmith	Big Ones	Livin' On The Edge	Steven Tyler, Joe Perry, Mark Hudson
3	5	24	Aerosmith	Big Ones	Love In An Elevator	Steven Tyler, Joe Perry
3	5	25	Aerosmith	Big Ones	Rag Doll	Steven Tyler, Joe Perry, Jim Vallance, Holly Knight
3	5	23	Aerosmith	Big Ones	Walk On Water	Steven Tyler, Joe Perry, Jack Blades, Tommy Shaw
3	5	26	Aerosmith	Big Ones	What It Takes	Steven Tyler, Joe Perry, Desmond Child

Back to Introduction.

4.8. Join Types

The relationships between database objects are defined using `join` statements.

Two database objects are joined using one or more common columns between them.

4.8.1. Inner Join

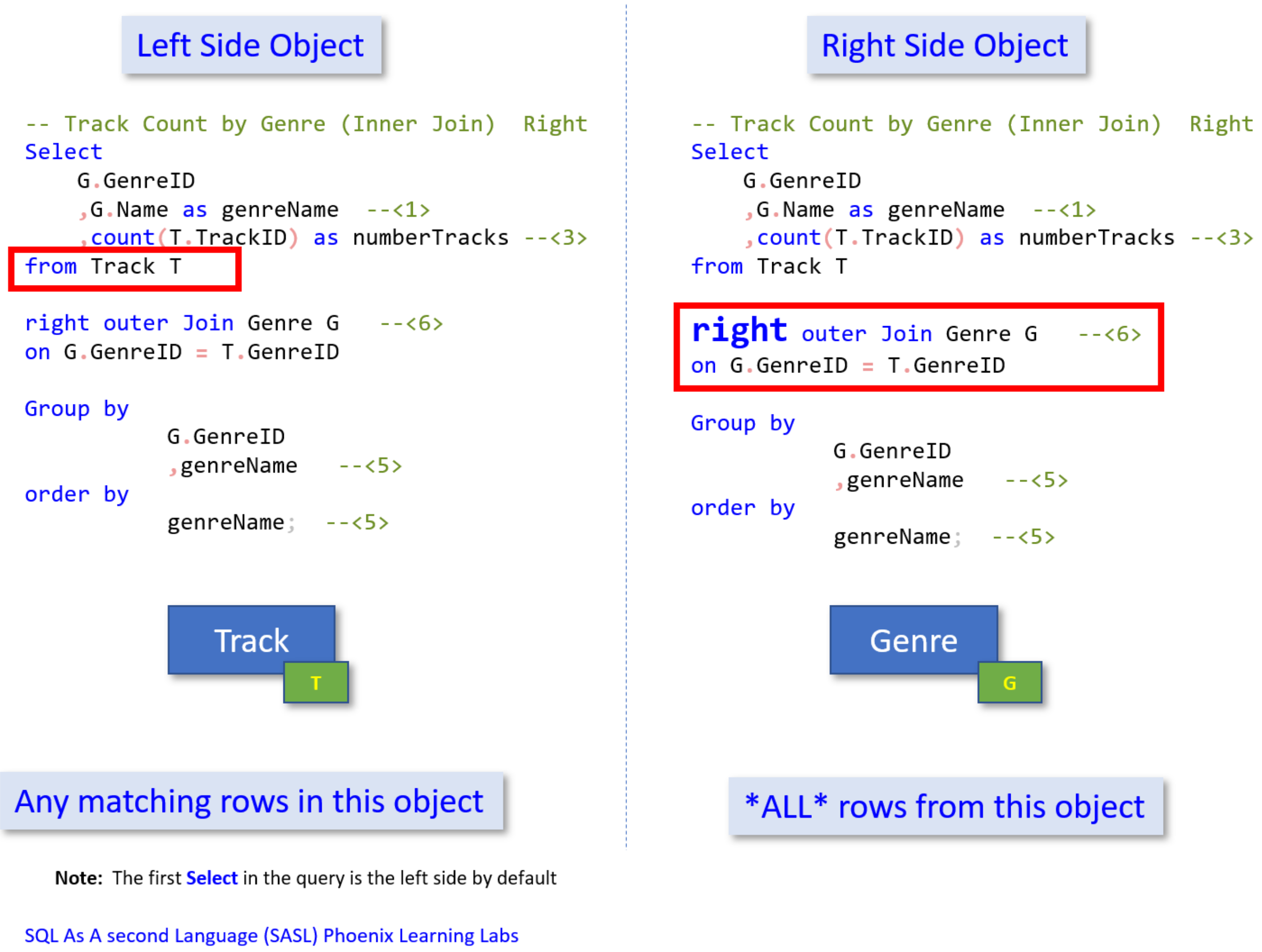
An `Inner Join` can be used when you know there is at least one row in each of the two tables being joined. The business rules or the data model can help define when this relationship occurs.

An `Inner Join` can be used to restrict/filter a large amount of rows from one table by a limited number of rows in the second table.

An `Inner Join` can be used to replace a `where` clause with a list of values or a sub-query. The `Inner Join` can be much more performant than a `where` clause when there are a large number of restriction/filter rows.

4.8.2. Outer Join

- An `Outer Join` can be used when you know that there may no or is not one row in each of the tables being joined.
- An `Outer Join` returns **ALL** of the rows from one table and any matching rows from the second table.
- All `Outer Joins` has a direction, left outer join or right outer join. Think of it as one object on the left and the second object on the right.
- The first `Select` object in the query is the `Left` object by default.
- The outer joined object is the `right` object.
- The direction of the outer join determines which object is the **All** object
- A `Right Outer Join` returns **ALL** the rows from the object on the **RIGHT** and any matching rows from the left object.
- A `Left Outer Join` returns **ALL** the rows from the object on the **LEFT** and any matching rows from the right object.
- The `on` clause of the join does **NOT** indicate the direction of the join. `on G.GenreID = T.GenreID` and `on T.GenreID = G.GenreID`



Left Side Object

```
-- Track Count by Genre (Inner Join)  Right
Select
    G.GenreID
   ,G.Name as genreName  --<1>
   ,count(T.TrackID) as numberTracks --<3>
from Track T

right outer Join Genre G   --<6>
on G.GenreID = T.GenreID

Group by
           G.GenreID
          ,genreName   --<5>
order by
           genreName;  --<5>
```

Any matching rows in this object

Right Side Object

```
-- Track Count by Genre (Inner Join)  Right
Select
    G.GenreID
   ,G.Name as genreName  --<1>
   ,count(T.TrackID) as numberTracks --<3>
from Track T

right outer Join Genre G   --<6>
on G.GenreID = T.GenreID

Group by
           G.GenreID
          ,genreName   --<5>
order by
           genreName;  --<5>
```

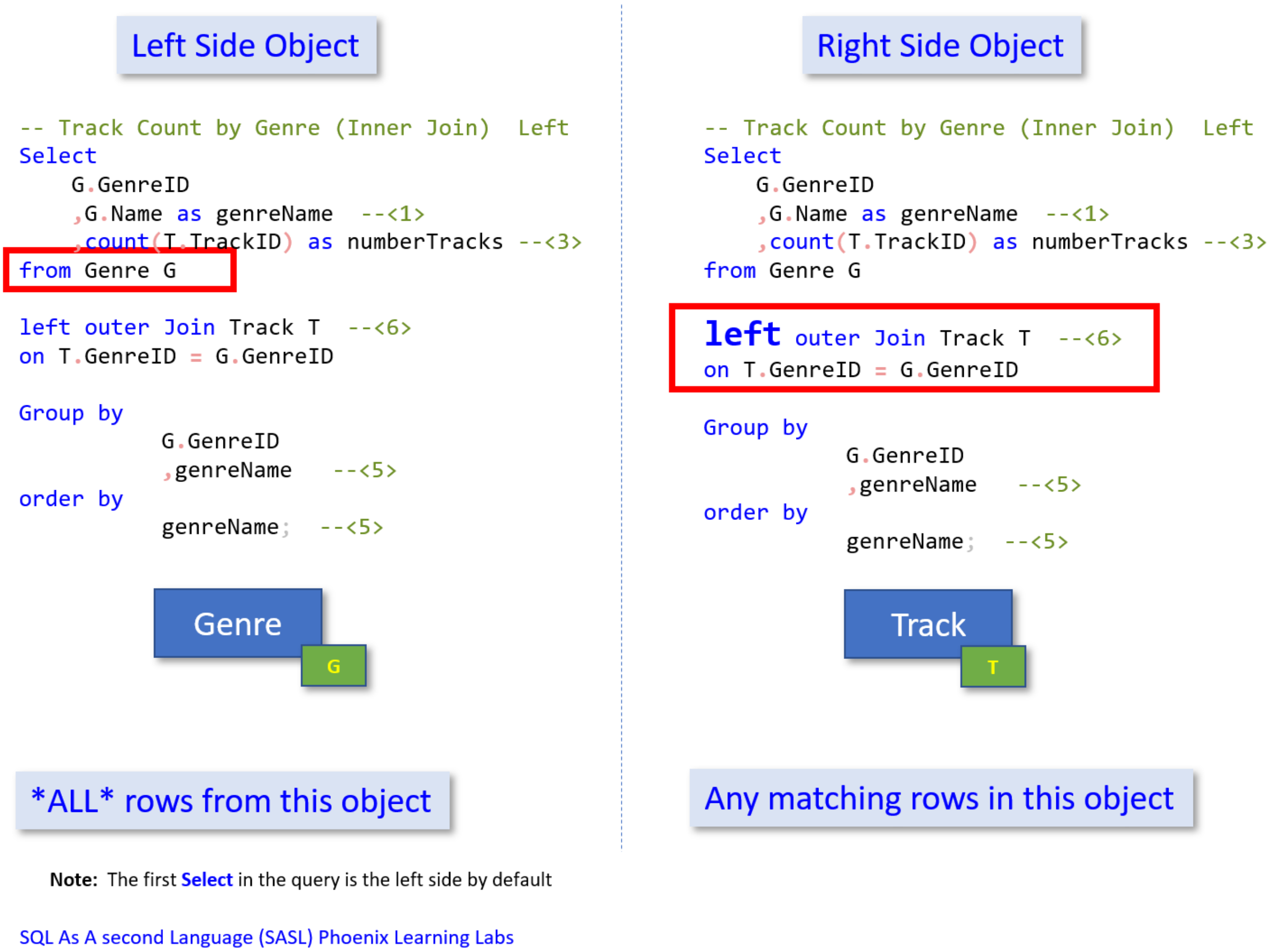
ALL rows from this object

Note: The first **Select** in the query is the left side by default

SQL As A second Language (SASL) Phoenix Learning Labs

Figure 3. Right Outer Join

The same query above could be written reversing the order in which the objects are referenced to show a Left Outer join.



Left Side Object

```
-- Track Count by Genre (Inner Join)  Left
Select
    G.GenreID
   ,G.Name as genreName  --<1>
   ,count(T.TrackID) as numberTracks --<3>
from Genre G

left outer Join Track T  --<6>
on T.GenreID = G.GenreID

Group by
           G.GenreID
          ,genreName    --<5>
order by
           genreName;  --<5>
```

ALL rows from this object

Right Side Object

```
-- Track Count by Genre (Inner Join)  Left
Select
    G.GenreID
   ,G.Name as genreName  --<1>
   ,count(T.TrackID) as numberTracks --<3>
from Genre G

left outer Join Track T  --<6>
on T.GenreID = G.GenreID

Group by
           G.GenreID
          ,genreName    --<5>
order by
           genreName;  --<5>
```

Any matching rows in this object

Note: The first **Select** in the query is the left side by default

SQL As A second Language (SASL) Phoenix Learning Labs

Figure 4. Left Outer Join

The following set of queries show how the results of a query can change due to the direction of the `Outer Join`.

The following query returns a list of all Genres, there should be 28 Genres.

Genre List

```
/*
=== joinTypes - Inner Join and Outer Join

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Between function
* Column Alias, rename a column
* Comments, information or debugging
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

-- List of *all* Genre, there are 28 genres
select
    G.GenreID
    ,G.Name as genreName  ①
from Genre G
order by genreName;
-- Order by 2     ②
```

① Column alias

② Alternative method to order by using `Ordinal` position not recommended

SQL Download link click here

Table 8. Results for Genre List

GenreId	genreName
23	Alternative
4	Alternative & Punk
6	Blues
11	Bossa Nova
24	Classical
32	Club
22	Comedy
21	Drama
30	Dub Step
12	Easy Listening
15	Electronica/Dance
13	Heavy Metal

GenreId	genreName
17	Hip Hop/Rap
2	Jazz
7	Latin
3	Metal
25	Opera
9	Pop
14	R&B/Soul
8	Reggae
1	Rock
5	Rock And Roll
20	Sci Fi & Fantasy
18	Science Fiction
10	Soundtrack
31	Trance
19	TV Shows
16	World

Back to Introduction.

The following query shows the results when a `Inner Join` is used.

There are only 25 Genres in the result as 3 genres have no tracks related to them.

Inner Join Example

```
/*
=== joinTypes - Inner Join and Outer Join

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Between function
* Column Alias, rename a column
* Comments, information or debugging
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/
-- Track Count by Genre (Inner Join), this returns 25 genres
-- because 3 genres have no tracks
Select
    G.GenreID
    ,G.Name as genreName  ①
    ,count(T.TrackID) as numberTracks ②
from Track T

inner Join Genre G   ③
on G.GenreID = T.GenreID

Group by
    G.GenreID
    ,genreName   ④
order by
    genreName;  ④
```

① Column Alias

② Aggregate column with alias

③ Join (Inner)

④ Column alias in group by and order by

SQL Download link click here

Table 9. Results for Inner Join

GenreId	genreName	numberTracks
23	Alternative	40
4	Alternative & Punk	332
6	Blues	81
11	Bossa Nova	15

GenreId	genreName	numberTracks
24	Classical	74
22	Comedy	17
21	Drama	64
12	Easy Listening	24
15	Electronica/Dance	30
13	Heavy Metal	28
17	Hip Hop/Rap	35
2	Jazz	130
7	Latin	579
3	Metal	374
25	Opera	1
9	Pop	48
14	R&B/Soul	61
8	Reggae	58
1	Rock	1297
5	Rock And Roll	12
20	Sci Fi & Fantasy	26
18	Science Fiction	13
10	Soundtrack	43
19	TV Shows	93
16	World	28

The Genres `Club`, `Dub Step`, `Trance` are not in the results because the have no tracks related to them.

Back to Introduction.

The following query shows the results when a `Right Outer Join` is used.

This query is different from the one below, note which table is selected first.

Right Outer Join Example

```
/*
=== joinTypes - Inner Join and Outer Join

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Between function
* Column Alias, rename a column
* Comments, information or debugging
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/
-- Track Count by Genre (Inner Join)  Right
-- This returns *ALL* 28 genres because the table on the right is the Genre table
Select
    G.GenreID
    ,G.Name as genreName  ①
    ,count(T.TrackID) as numberTracks ②
from Track T

right outer Join Genre G   ③
on G.GenreID = T.GenreID  -- NOTE: G is first table, T is second table

Group by
    G.GenreID
    ,genreName   ④
order by
    genreName;  ④
```

① Column Alias

② Aggregate column with alias

③ Join (Right Outer)

④ Column alias in group by and order by

By default the first table in the select is the `Left` table, in this example it is the `Track` table. The `joined` table is the `Right` table and in this example it is the `Genre` table. Since this is a `Right` outer join all the rows from the `Right` table (Genre) are returned with any matching rows from the `Left` table (Tracks).

SQL Download link click here

Table 10. Results for Right Outer Join

GenreId	genreName	numberTracks
23	Alternative	40
4	Alternative & Punk	332
6	Blues	81
11	Bossa Nova	15
24	Classical	74
32	Club	0
22	Comedy	17
21	Drama	64
30	Dub Step	0
12	Easy Listening	24
15	Electronica/Dance	30
13	Heavy Metal	28
17	Hip Hop/Rap	35
2	Jazz	130
7	Latin	579
3	Metal	374
25	Opera	1
9	Pop	48
14	R&B/Soul	61
8	Reggae	58
1	Rock	1297
5	Rock And Roll	12
20	Sci Fi & Fantasy	26
18	Science Fiction	13
10	Soundtrack	43
31	Trance	0
19	TV Shows	93
16	World	28

ℹ All 28 Genres are returned in the results. The Genres `Club`, `Dub Step`, `Trance` are included and have a zero (0) trackCount.

Back to Introduction.

The following query shows the results when a `Left Outer Join` is used.

ℹ This query is different from the one above, note which table is selected first.

Left Outer Join Example

```
/*
=== joinTypes - Inner Join and Outer Join

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Between function
* Column Alias, rename a column
* Comments, information or debugging
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/
-- Track Count by Genre (Inner Join)  Left
-- This returns *ALL* 28 genres because the table on the left is the Genre table
Select
    G.GenreID
    ,G.Name as genreName  ①
    ,count(T.TrackID) as numberTracks ②
from Genre G

left outer Join Track T  ③
on T.GenreID = G.GenreID

Group by
    G.GenreID
    ,genreName   ④
order by
    genreName;  ④
```

① Column Alias

② Aggregate column with alias

③ Join (Left Outer)

④ Column alias in group by and order by

By default the first table in the select is the `Left` table, in this example it is the `Genre` table. The `joined` table is the `Right` table and in this example it is the `Track` table. Since this is a `Right` outer join all the rows from the `Left` table (Genre) are returned with any matching rows from the `Right` table (Tracks).

SQL Download link click here

Table 11. Results for Left Outer Join

GenreId	genreName	numberTracks
23	Alternative	40
4	Alternative & Punk	332
6	Blues	81
11	Bossa Nova	15
24	Classical	74
32	Club	0
22	Comedy	17
21	Drama	64
30	Dub Step	0
12	Easy Listening	24
15	Electronica/Dance	30
13	Heavy Metal	28
17	Hip Hop/Rap	35
2	Jazz	130
7	Latin	579
3	Metal	374
25	Opera	1
9	Pop	48
14	R&B/Soul	61
8	Reggae	58
1	Rock	1297
5	Rock And Roll	12
20	Sci Fi & Fantasy	26
18	Science Fiction	13
10	Soundtrack	43
31	Trance	0
19	TV Shows	93
16	World	28

All 28 Genres are returned in the results. The Genres `Club`, `Dub Step`, `Trance` are included and have a zero (0) trackCount.

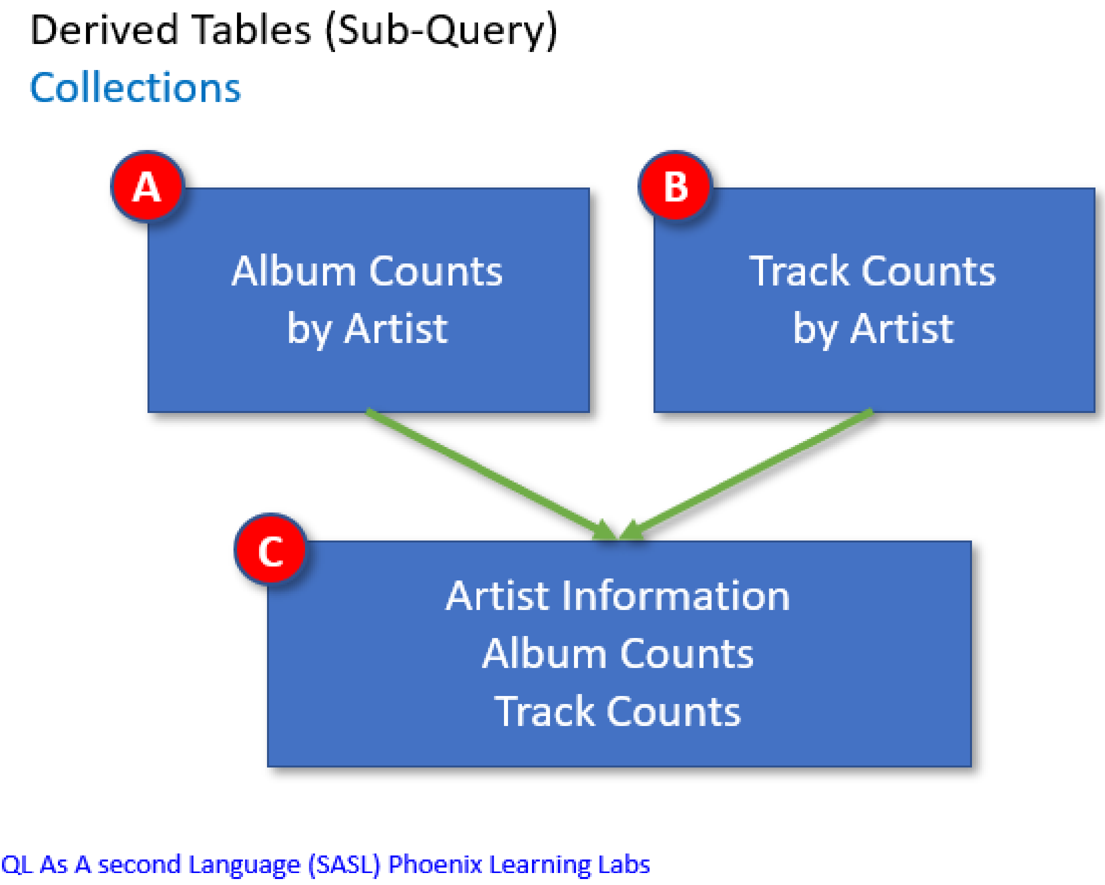
Back to Introduction.

4.9. derivedTable 1 - Part A

Objective: Get a list by Artist that includes number of albums, number of tracks, total artist minutes and average minutes per track.

Approach: Use a set of derived queries (aka sub-queries) to get the parts of the request and assemble the parts together in the main query.

This collection approach is typically used when the parts being collected come from varied databases or putting them in a single query makes it difficult to compose the query.



Derived Tables (Sub-Query)

Collections

SQL As A second Language (SASL) Phoenix Learning Labs

Figure 5. derivedTable Collection

Part A gets the number of albums by artist. It is the (Album Part) we need for the main query.

This request could be done using a single query. The derived tables are being used here, to show how they can be used to build parts of the results, that are assembled in a main query later.

Derived Tables are also know as sub-queries.

SQL Example

```
/*
=== derivedTable - Gets the list of artists and album counts

Part A - Gets the list of artists with album count
this will become one of the derived tables in the final query

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Column Alias, rename a column
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/



select
    AR.ArtistID
    ,count(AL.AlbumID) as albumCount  ① ②
from Album AL ③

INNER JOIN Artist AR  ③
on AR.ArtistID = AL.ArtistID ④

Group by AR.ArtistID  ⑤
```

① Column Alias

② Aggregate `Count` function

③ Table alias

④ Common column to join two tables

⑤ Any non-aggregate column must be included in `group by`

SQL Download link click here

Table 12. Results

ArtistId	albumCount
223	1
265	1
19	2
122	1
80	2
244	1
202	1

ArtistId	albumCount
101	2
59	3
141	1
242	1
263	1
221	1
120	1
78	1
99	2
200	1
17	1
57	1

ℹ Only 20 rows of the result being shown. The result set has 204 rows, one for each artist.

Back to Introduction.

4.10. derived Table 1 -Part B

Objective: Get a list by Artist that includes number of albums, number of tracks, total artist minutes and average minutes per track.

Approach: Use a set of derived queries (aka sub-queries) to get the parts of the request and assemble the parts together in the main query.

This collection approach is typically used when the parts being collected come from varied databases or putting them in a single query makes it difficult to compose the query.

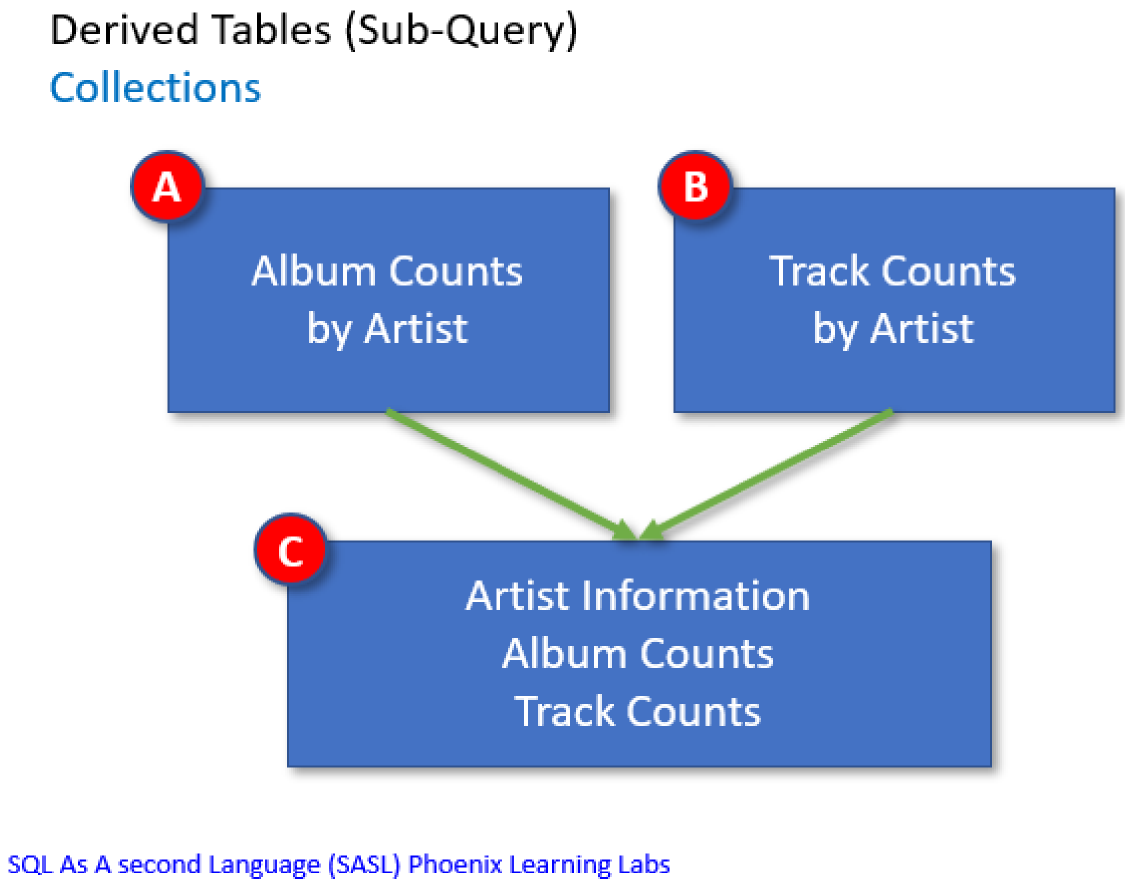


Figure 6. derivedTable Collection

This part gets the number of tracks by artist and calculates the number of minutes total and average minutes per track from the milliseconds. It is the second part (Tracks Part) we need for the main query.

ℹ This request could be done using a single query. The derived tables are being used here, to show how they can be used to build parts of the results, that are assembled in a main query later.

ℹ Derived Tables are also know as sub-queries.

SQL Example

```
/*
=== derivedTable - The derived table collects data on one topic (Tracks)

Part B -Build the query that will become one of the derived tables

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Cast for formatting
* Column Alias, rename a column
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Table alias, standardize and simplify table/view names
*/



Select
    AL.ArtistID
    ,count(T.TrackID) as trackCount
    ,sum(T.Milliseconds) / 60000.00 as totalMinutes  ①
    ,avg(T.Milliseconds) / 60000.00 as avgMinutes    ②
from Album AL

inner Join Track T
on T.AlbumID = AL.AlbumID

group by AL.ArtistID
```

SQL Download link click here

Table 13. Results

ArtistId	trackCount	totalMinutes	avgMinutes
72	15	54.25	3.61635666666667
179	12	57.47	4.78950277777778
96	12	50.27	4.18938194444444
227	1	2.95	2.94851666666667
144	20	76.33	3.81672
88	42	205.93	4.9029876984127
203	1	5.94	5.94043333333333
99	31	136.11	4.39078279569893
275	1	3.43	3.43341666666667
230	1	3.30	3.30106666666667
21	56	233.26	4.16541994047619

ArtistId	trackCount	totalMinutes	avgMinutes
139	30	128.59	4.28646833333333
238	1	6.52	6.51666666666667
246	1	2.22	2.21553333333333
56	14	48.92	3.49458571428571
83	14	47.37	3.38387619047619
91	20	70.19	3.50936833333333
155	19	67.75	3.56591228070175
115	12	60.82	5.06811111111111

① This calculated or derived field is the sum of time (Milliseconds) for all tracks for this artist. Dividing by 60,000.00 translates this into minutes.

② This calculated or derived field is the average of the time (Milliseconds) for all tracks for this artist. Dividing by 60,000.00 translate this into minutes.

ℹ Notice that the division was done using a fractional number 60000.00 which returns the results with two decimal points of precision. If we had used an integer number 60000 we would have gotten an whole number back and lost the two decimal points of precision.

ℹ Only 20 rows of the result being shown. The result set has 204 rows, one for each artist.

Back to Introduction.

4.11. derivedTable 1 - Part C

Objective: Get a list by Artist that includes number of albums, number of tracks, total artist minutes and average minutes per track.

Approach: Use a set of derived queries (aka sub-queries) to get the parts of the request and assemble the parts together in the main query.

This collection approach is typically used when the parts being collected come from varied databases or putting them in a single query makes it difficult to compose the query.

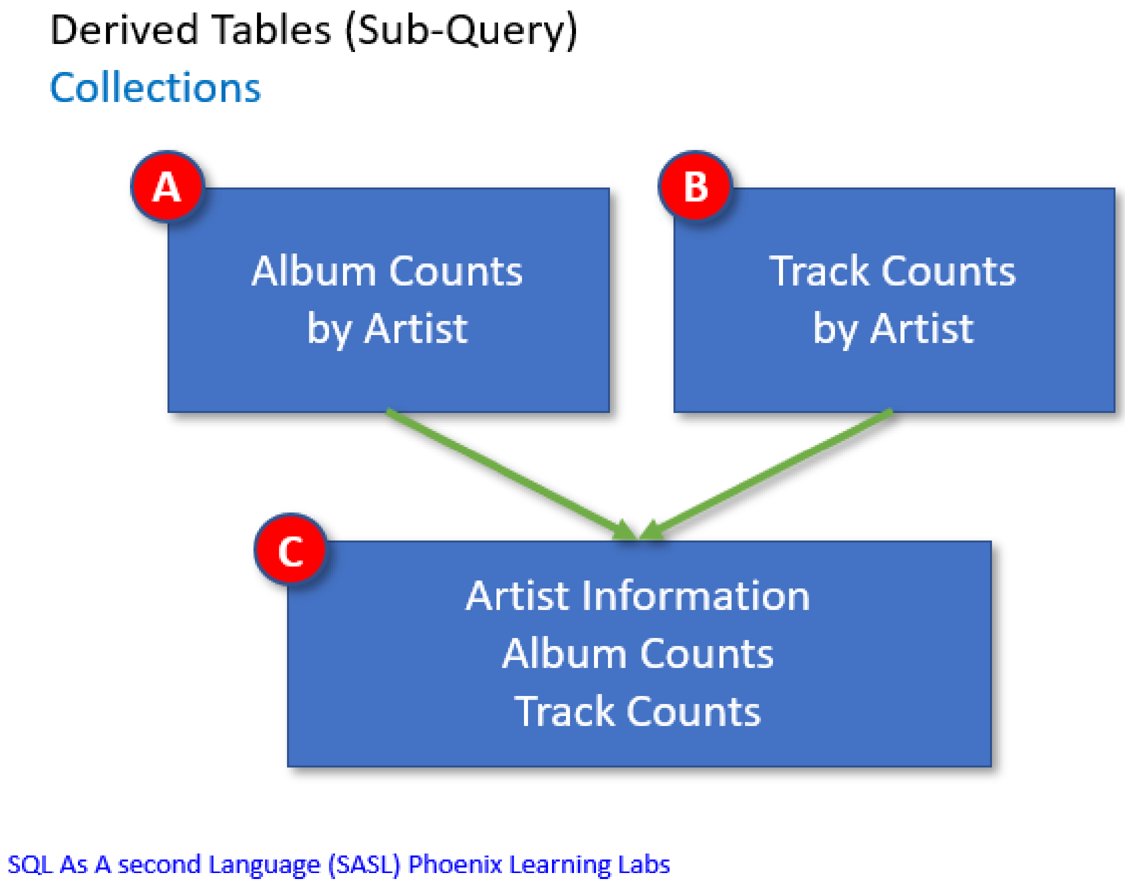


Figure 7. derivedTable Collection

This part assembles the album part (Part A) and tracks part (Part B) with artist information for the main or final query.

ℹ This request could be done using a single query. The derived tables are being used here, to show how they can be used to build parts of the results, that are assembled in a main query later.

ℹ Derived Tables are also know as sub-queries.

SQL Example

```
/*
```

```
=== derivedTable - The derived table collects data on one topic (Albums)

Part C - Build the main query and include the two derived tables

==== Topics

* Aggregates (Count, Sum, Min, Max, Avg, etc)
* Column Alias, rename a column
* Derived Table (Sub-Query)
* Group by, required for non-aggregate columns
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names

=== Assumptions

* Every Artist has at least one album
*/

Select
    AR.ArtistID
    ,AR.Name as artistName
    ,AC.albumCount   ①
    ,TC.totalMinutes
    ,cast(TC.avgMinutes as decimal(5,2))  as averageMinutes  ②
from Artist AR

inner join
    (                   ③
    select
        AR.ArtistID
        ,count(AL.AlbumID) as albumCount  ①
    from Album AL

    INNER JOIN Artist AR
    on AR.ArtistID = AL.ArtistID

    Group by AR.ArtistID
    ) as AC               ④
on AC.ArtistID = AR.ArtistID

inner Join
    (                     ③
    Select
        AL.ArtistID
        ,count(T.TrackID) as trackCount
        ,sum(T.Milliseconds) / 60000.00 as totalMinutes  ⑤
        ,avg(T.Milliseconds) / 60000.00 as avgMinutes    ⑥
    from Album AL
    inner Join Track T
    on T.AlbumID = AL.AlbumID

    group by AL.ArtistID
    ) as TC                ④
on TC.ArtistID = AR.ArtistID

Order by artistName
```

① A column from the derived table (sub-query) being used in the result

② CAST being used to reformat a decimal number to 5,2. Five digits total, two digits precision

③ The beginning of a derived table (sub-query) starts with a (

④ The end of the derived table (sub-query) is marked with a) and a name for the derived table. The derived table name is used to qualify the use of the columns in the main query.

⑤ This calculated or derived field is the sum of time (Milliseconds) for all tracks for this artist. Dividing by 60,000.00 translates this into minutes.

⑥ This calculated or derived field is the average of the time (Milliseconds) for all tracks for this artist. Dividing by 60,000.00 translate this into minutes.

SQL Download link click here

Table 14. Results

ArtistId	artistName	albumCount	totalMinutes	averageMinutes
230	Aaron Copland & London Symphony Orchestra	1	3.30	3.30
202	Aaron Goldberg	1	4.45	4.45
1	AC/DC	2	80.89	4.49
214	Academy of St. Martin in the Fields & Sir Neville Marriner	1	7.75	3.88
215	Academy of St. Martin in the Fields Chamber Ensemble & Sir Neville Marriner	1	5.82	5.82
222	Academy of St. Martin in the Fields, John Birch, Sir Neville Marriner & Sylvia McNair	1	4.32	4.32

ArtistId	artistName	albumCount	totalMinutes	averageMinutes
257	Academy of St. Martin in the Fields, Sir Neville Marriner & Thurston Dart	1	3.77	3.77
2	Accept	2	20.01	5.00
260	Adrian Leaper & Doreen de Feis	1	9.46	9.46
3	Aerosmith	1	73.53	4.90
197	Aisha Duo	1	9.23	4.62
4	Alanis Morissette	1	57.52	4.42
206	Alberto Turco & Nova Schola Gregoriana	1	4.09	4.09
5	Alice In Chains	1	54.16	4.51
252	Amy Winehouse	2	93.00	4.04
209	Anne-Sophie Mutter, Herbert Von Karajan & Wiener Philharmoniker	1	3.32	3.32
243	Antal Doráti & London Symphony Orchestra	1	6.87	6.87
6	Antônio Carlos Jobim	2	118.81	3.83
7	Apocalyptica	1	44.52	5.57

ℹ Only 20 rows of the result being shown. The result set has 204 rows, one for each artist.

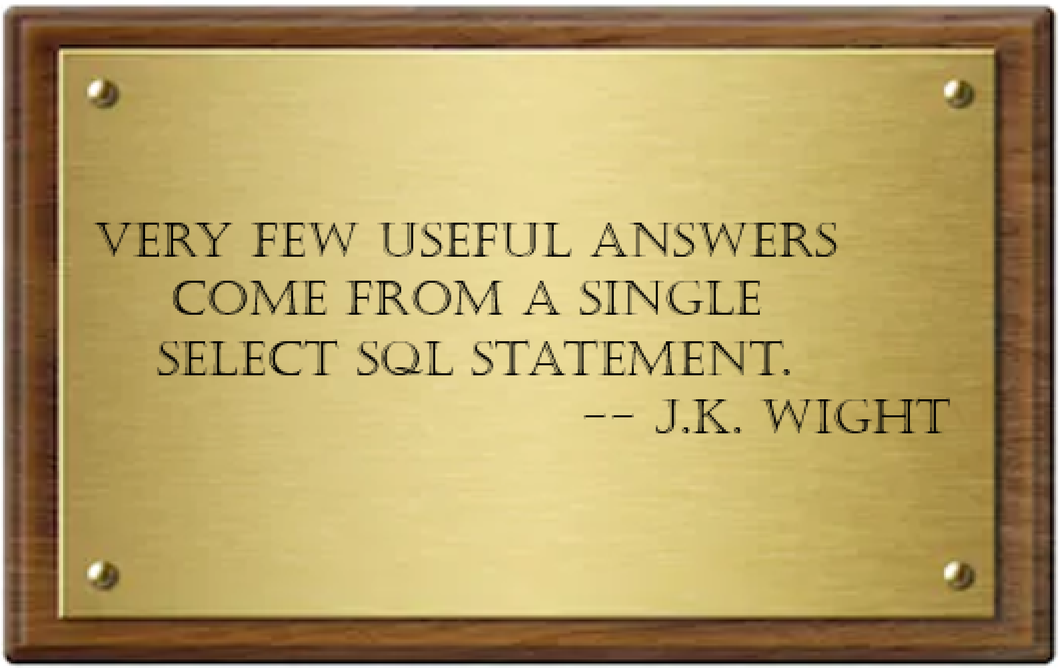


Figure 8. Multiple SQL Selects

Back to Introduction.

4.12. derivedTable 2 - Part A

Objective: The **Top Order Tracks** is a list of tracks from orders in a year that are $5 or more. What other tracks across all orders share a track from the **Top Order Tracks** list?

Approach: Use a set of derived tables (sub-queries) to create progressive filters to get the result

- Part A - List of invoices for one year that are $5 or more
- Part B - Get the list of tracks for the invoices in the Part A, this is the **Top Order Tracks** list
- Part C - Find all invoices that have a track from Part B the **Top order Tacks** list.
- Part D - Find all tracks, across all invoices, with a match in the **Top Order List** and count them

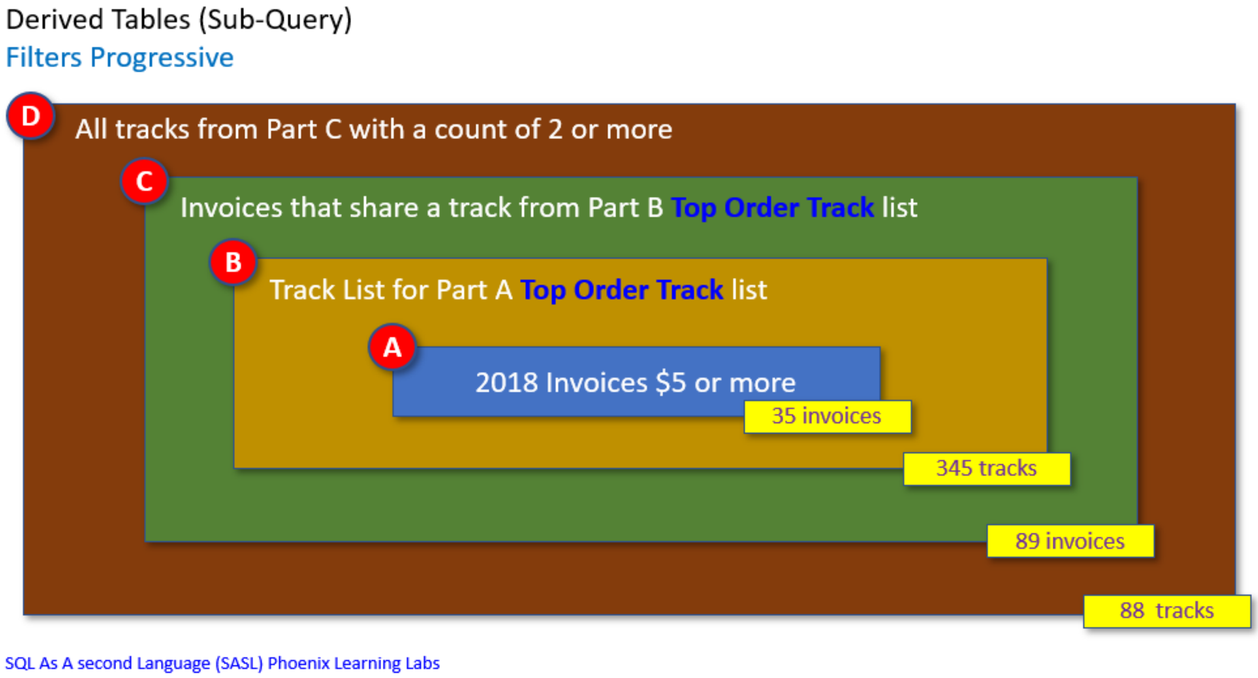

Derived Tables (Sub-Query)
Filters Progressive
D
All tracks from Part C with a count of 2 or more
C
Invoices that share a track from Part B Top Order Track list
B
Track List for Part A Top Order Track list
A
2018 Invoices $5 or more
35 invoices
345 tracks
89 invoices
88 tracks
SQL As A second Language (SASL) Phoenix Learning Labs

Figure 9. derivedTable Filter

This request could be done using a single query. The derived tables are being used here, to show how they can be used as a filter or reduce the number of rows in the result.

Derived Tables are also know as sub-queries.

SQL Example

```
/*
=== derivedTable  List of invoice numbers for orders $5 or more

Part A - Which invoices have a totoal of $5 or more.

==== Topics

* Column Alias, rename a column
* Comments, information or debugging
* Date functions
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

select
--  i.customerid  ①
  I.InvoiceID
--  ,i.InvoiceDate  ①
--  ,i.total  ①
from Invoice I

where I.InvoiceDate between date '2018-01-01' and date '2018-12-31' ② ③
and I.total >= 5.00
```

① Fields used during the testing of the derived table (sub-query) two hypens `--` used to comment out a line

② `between` function requires starting value `and` ending value

③ `date` indicates a date field, Teradata standard format is `yyyy-mm-dd`

SQL Download link click here

Table 15. Results

InvoiceId
383
404
362
339
341
375
402
354
381
333

InvoiceId
360
411
396
390
348
369
367
409
346

Only 20 rows of the result being shown. The result set has 35 rows, one for each invoice of $5 or more.

Back to Introduction.

4.13. derivedTable 2 - Part B

Objective:

Approach:

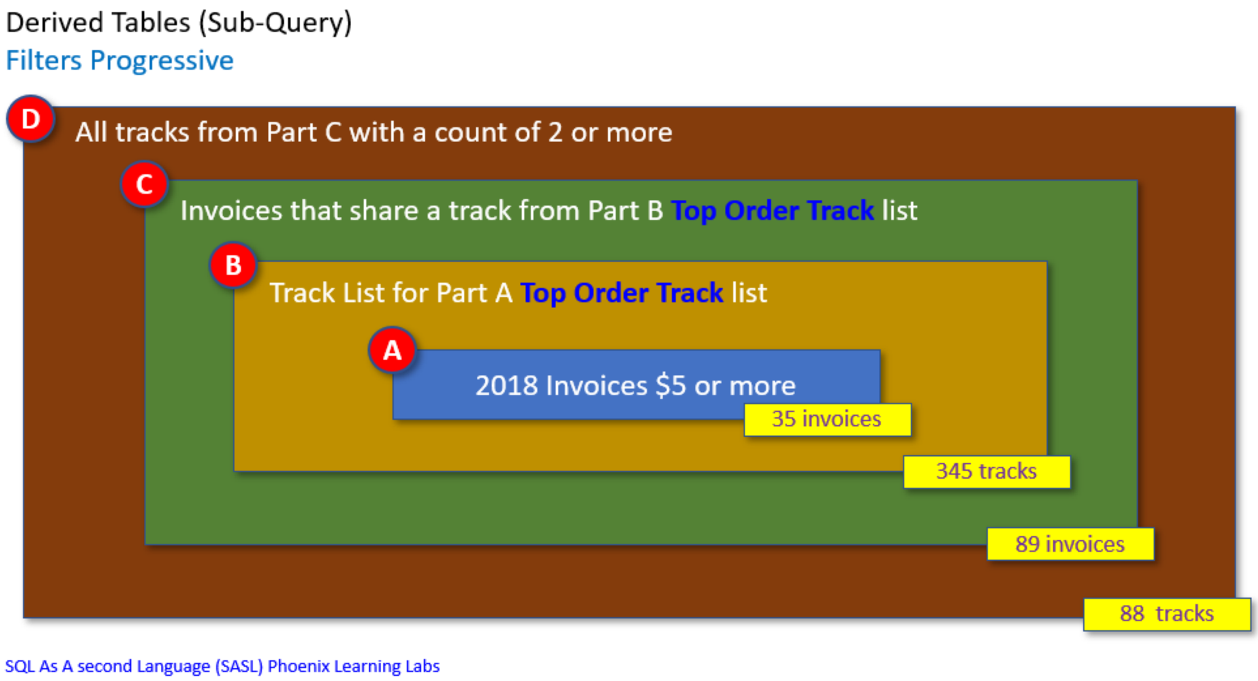

Derived Tables (Sub-Query)
Filters Progressive
D
All tracks from Part C with a count of 2 or more
C
Invoices that share a track from Part B Top Order Track list
B
Track List for Part A Top Order Track list
A
2018 Invoices $5 or more
35 invoices
345 tracks
89 invoices
88 tracks
SQL As A second Language (SASL) Phoenix Learning Labs

Figure 10. derivedTable Filter

This request could be done using a single query. The derived tables are being used here, to show how they can be used as a filter or reduce the number of rows in the result.

Derived Tables are also know as sub-queries.

SQL Example

```
/*
=== derivedTable  List of tracks on the invoice numbers for orders $5 or more for year
2018

Part B - List of tracks on the 2018 orders $5 or larger.  (*Top Order Tracks* list*)

==== Topics

* Between function
* Cast for formatting
* Column Alias, rename a column
* Comments, information or debugging
* Date functions
* Derived Table (Sub-Query)
* Join objects (Table, View, Derived Table) together
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

Select Distinct     ⑤
    IL.TrackID
from invoiceline IL

inner join
    ( -- 2018 Invoices $5 or more    ①
    select
        I.InvoiceID
    from Invoice I
    where I.InvoiceDate between date '2018-01-01' and date '2018-12-31' ② ③
      and I.total >= 5.00
    ) as RI  ④
on RI.InvoiceID = IL.InvoiceID
```

① Derived Table (Sub-query) begins with a `(` then the sub-query SQL

② `between` function requires starting value `and` ending value

③ `date` indicates a date field, Teradata standard format is `yyyy-mm-dd`

④ The end of the derived table (sub-query) is marked with a `)` and a name for the derived table `RI` Reduced Invoices. The derived table name is used to qualify the use of the columns in the main query.

⑤ `DISTINCT` used to elminate duplicates, applied to the entire result set

SQL Download link click here

Table 16. Results

TrackId
1422

TrackId
711
2085
735
2609
807
2681
2109
3109
1235
449
1307
473
1807
521
1823
2299
949
2323

Only 20 rows of the result being shown. The result set has 345 rows, one for each track of a 2018 morder of $5 or more.

Back to Introduction.

4.14. derivedTable 2 - Part C

Objective:

Approach:

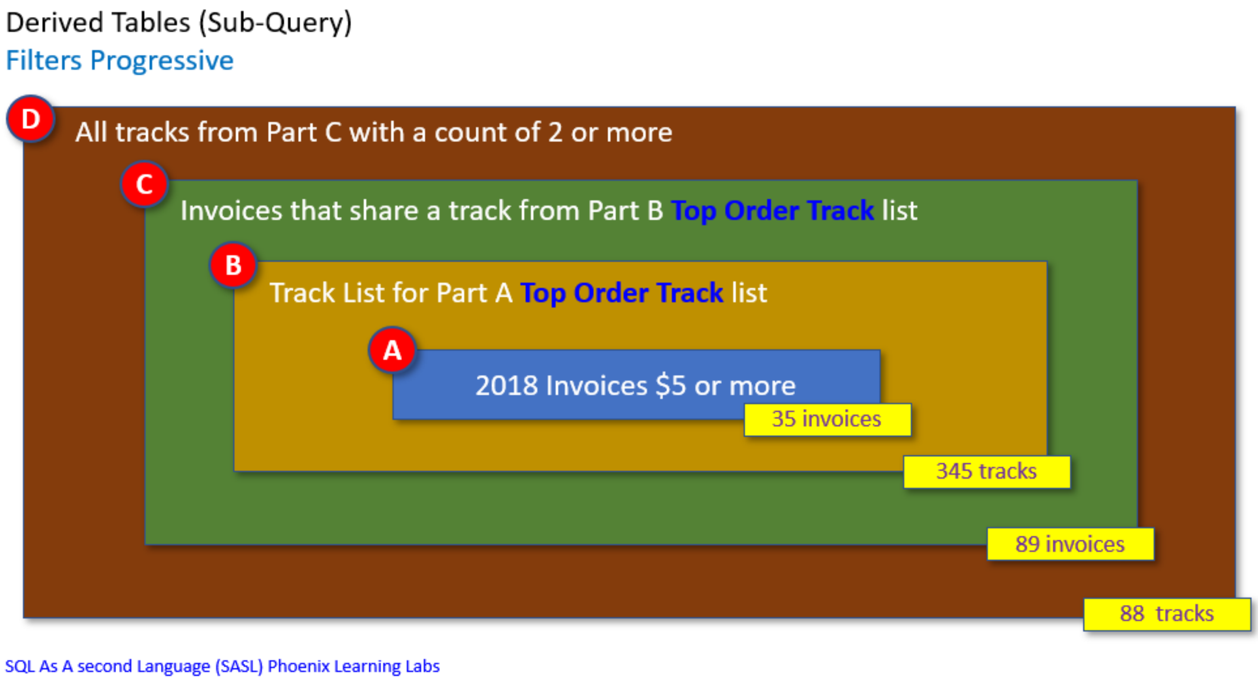

Derived Tables (Sub-Query)
Filters Progressive
D
All tracks from Part C with a count of 2 or more
C
Invoices that share a track from Part B Top Order Track list
B
Track List for Part A Top Order Track list
A
2018 Invoices $5 or more
35 invoices
345 tracks
89 invoices
88 tracks
SQL As A second Language (SASL) Phoenix Learning Labs

Figure 11. derivedTable Filter

This request could be done using a single query. The derived tables are being used here, to show how they can be used as a filter or reduce the number of rows in the result.

Derived Tables are also know as sub-queries.

SQL Example

```
/*
=== derivedTable  List of invoices that share a track with another list

Part C - List of invoices that share a track from the 2018 orders $5 or larger (*Top
Order Tracks* list*)

==== TOPICS

* Distinct to elminate duplicates
* Join multiple tables
* Derived table or sub-query
* Aggregation functions to be used for count
* Table Alias
* Between function
* Date representation

*/

Select distinct  ①
    IL.InvoiceID
from InvoiceLine IL

inner join
    ( -- Track list for 2018 invoice $5 or more  ②
    Select DISTINCT  ①
        IL.TrackID
    from invoiceline IL

    inner join
        ( -- 2018 Invoices $5 or more   ③
        select
            I.InvoiceID
        from Invoice I
        where I.InvoiceDate between date '2018-01-01' and date '2018-12-31'  ⑦ ⑧
          and I.total >= 5.00
        ) as RI  ④
    on RI.InvoiceID = IL.InvoiceID

    ) as TL  ⑤
on TL.TrackID = IL.TrackID  ⑥
```

① DISTINCT used to eliminate duplicates, applied to the entire result set

② Derived Table (Sub-query) begins with a (then the sub-query SQL

③ Derived Table (Sub-query) begins with a (then the sub-query SQL

④ The end of the derived table (sub-query) is marked with a) and a name for the derived table RI Reduced Invoices. The derived table name is used to qualify the use of the columns in the main query.

⑤ The end of the derived table (sub-query) is marked with a `)` and a name for the derived table `TL` Track List. The derived table name is used to qualify the use of the columns in the main query.

⑥ Filter for only tracks that match tracks in the `TL` trackList **Top OrderTrack** list

⑦ `between` function requires starting value `and` ending value

⑧ `date` indicates a date field, Teradata standard format is `yyyy-mm-dd`

SQL Download link click here

Table 17. Results

InvoiceId
163
88
361
334
198
171
150
32
348
369
396
409
134
155
169
353
185
190
383

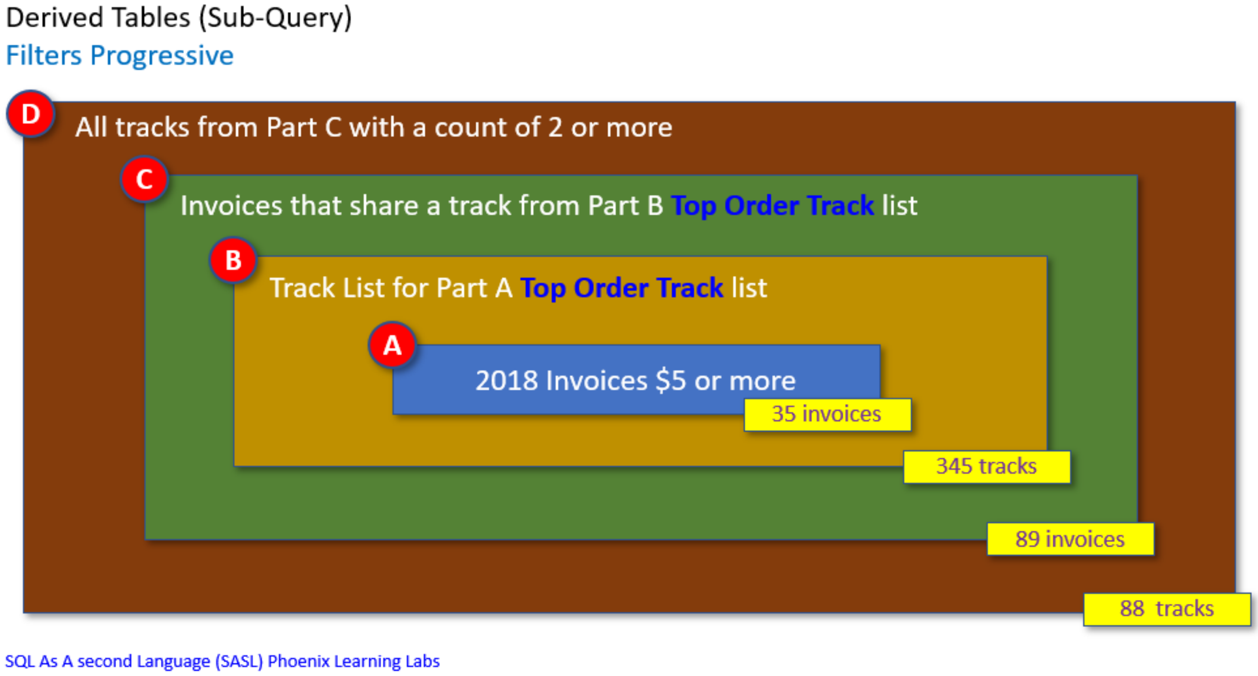
ℹ Only 20 rows of the result being shown. The result set has ??? rows, one for each track of a 2018 morder of $5 or more.

Back to Introduction.

4.15. derivedTable 2 - Part D

Objective:

Approach:



Derived Tables (Sub-Query)

Filters Progressive

D
All tracks from Part C with a count of 2 or more
C
Invoices that share a track from Part B Top Order Track list
B
Track List for Part A Top Order Track list
A
2018 Invoices $5 or more
35 invoices
345 tracks
89 invoices
88 tracks

SQL As A second Language (SASL) Phoenix Learning Labs

Figure 12. derivedTable Filter

This request could be done using a single query. The derived tables are being used here, to show how they can be used as a filter or reduce the number of rows in the result.

Derived Tables are also know as sub-queries.

SQL Example

```
/*

derivedTable  List of album/track info for other tracks that match 2018 order $5 or
more track list

Part D - Add Album and Track information

==== Topics

* Between function
* Column Alias, rename a column
* Comments, information or debugging
* Date functions
* Derived Table (Sub-Query)
* Group by, required for non-aggregate columns
* Having, filter for aggregate column
* Join objects (Table, View, Derived Table) together
* Order by,  also known as sorting
* Where, results filter or restriction
* Table alias, standardize and simplify table/view names
*/

Select
    IL.TrackID
    ,T.Name as trackName   ①
    ,A.AlbumID
    ,A.AlbumTitle
    ,count(T.TrackID) as trackCount  ②
from InvoiceLine IL

inner Join Track T
on T.TrackID = IL.TrackID

inner join Album A
on A.AlbumID = T.AlbumID

inner join
    ( -- Any invoice with tracks from the 2018 invoice $5 or more track list  ③
    Select distinct   ④
        IL.InvoiceID
    from InvoiceLine IL

    inner join
        ( -- Track list for 2018 invoice $5 or more  ⑤
        Select
            IL.TrackID
        from invoiceline IL

        inner join
            ( -- 2018 Invoices $5 or more  ⑥
            select DISTINCT  ④
                I.InvoiceID
            from Invoice I
            where I.InvoiceDate between date '2018-01-01' and date '2018-12-31' ⑦ ⑧
              and I.total >= 5.00
            ) as RI  ⑨
        on RI.InvoiceID = IL.InvoiceID

        ) TL ⑩
    on TL.TrackID = IL.TrackID

    ) as SI ⑪
on SI.InvoiceID = IL.InvoiceID

-- Syntax below is related to the top most query
```

```
group by ⑫
    IL.TrackID
    ,T.Name
    ,A.AlbumID
    ,A.AlbumTitle

Order by
    trackCount Desc  ⑬
    ,trackname       ⑭

Having trackCount >= 2  ⑮
```

① column alias

② derived column with column alias

③ The beginning of a derived table (sub-query) starts with a `(`

④ `DISTINCT` used to eliminate duplicates, applied to the entire result set

⑤ The beginning of a derived table (sub-query) starts with a `(`

⑥ The beginning of a derived table (sub-query) starts with a `(`

⑦ `between` function requires starting value `and` ending value

⑧ `date` indicates a date field, Teradata standard format is `yyyy-mm-dd`

⑨ The end of the derived table (sub-query) is marked with a `)` and a name for the derived table `RI` Reduced Invoices. The derived table name is used to qualify the use of the columns in the main query.

⑩ The end of the derived table (sub-query) is marked with a `)` and a name for the derived table `TL` Track List. The derived table name is used to qualify the use of the columns in the main query.

⑪ The end of the derived table (sub-query) is marked with a `)` and a name for the derived table `SI` Special Invoices. The derived table name is used to qualify the use of the columns in the main query.

⑫ `Group by` required for any column that is not an aggregate column

⑬ `trackCount` is a column alias of a derived column (Count) used here for sorting

⑭ `trackName` is a column alias

⑮ `having` is a filter for a aggregate column

SQL Download link click here

Table 18. Results

TrackId	**trackName**	**AlbumId**	**AlbumTitle**	**trackCount**
2108	Children Of The Grave	174	Tribute	5
698	Good Golly Miss Molly	55	Chronicle, Vol. 2	3

TrackId	trackName	AlbumId	AlbumTitle	trackCount
2250	Nega Do Cabelo Duro	184	Os Cães Ladram Mas A Caravana Não Pára	3
530	Ando Meio Desligado	42	Minha História	2
1853	Battery	152	Master Of Puppets	2
1865	Better Than You	153	ReLoad	2
2172	Big Wave	179	Pearl Jam	2
2305	Binky The Doormat	189	New Adventures In Hi-Fi	2
2793	Cabeça Dinossauro	224	Acústico	2
449	Calling Dr. Love	37	Greatest Kiss	2
1226	Can I Play With Madness	96	A Real Live One	2
2781	Comida	224	Acústico	2
681	Commotion	54	Chronicle, Vol. 1	2
2763	Compadre	222	Serie Sem Limite (Disc 1)	2
512	Comportamento Geral	41	Meus Momentos	2
2317	Country Feedback	187	Out Of Time	2
1621	Dazed and Confused	132	Led Zeppelin I	2
2531	End Of Romanticism	204	Morning Dance	2
3064	Eruption	243	The Best Of Van Halen, Vol. I	2

Only 20 rows of the result being shown. The result set has 88 rows, one for each track of an order with a matching track in the **Top Order Track** list.

Back to Introduction.

4.16. Create View

A view is a database object is built from other database objects like tables and views.

Views can help give you a simpler viewable version of a complex query.

Views can help you reuse a standard copy of a database object across queries.

Unlike a table which takes up permanent space for its data, a view does not take up permanent space.

4.16.1. Example

In the Chinook database many of the queries require comprehensive Album information.

To get the comprehensive information we need data from five different tables.

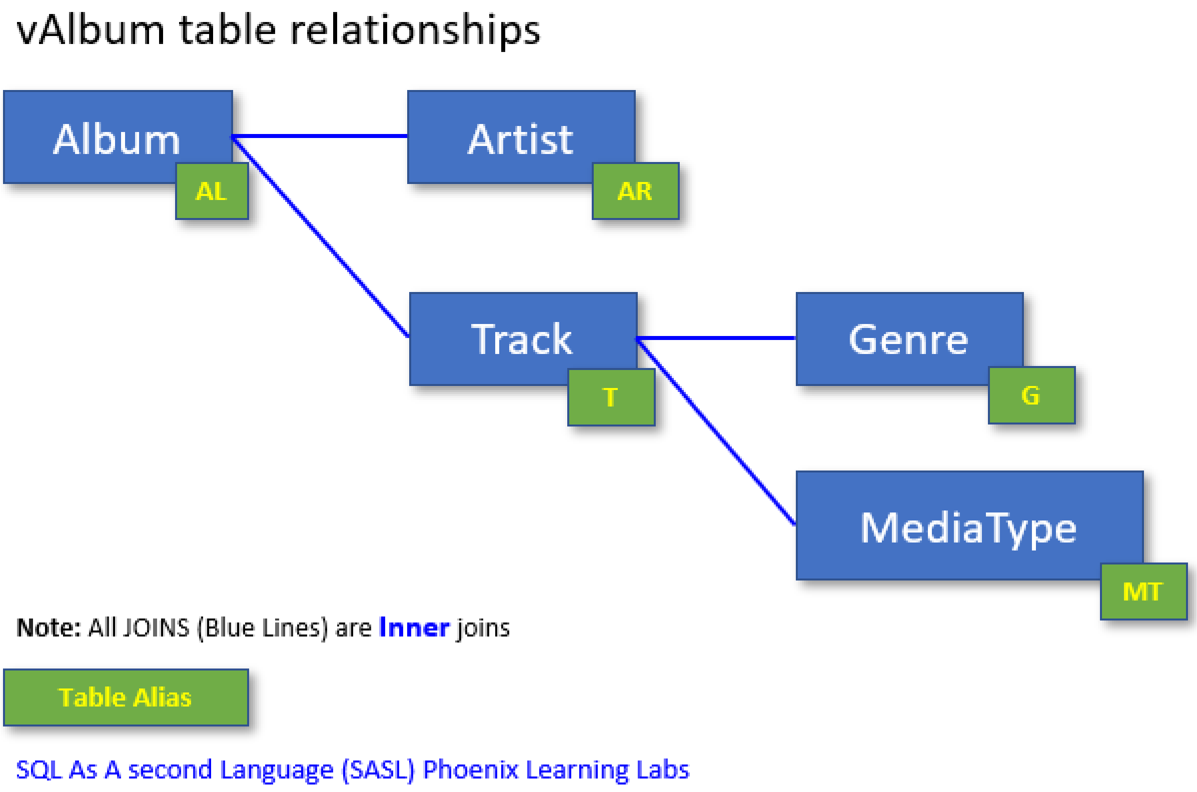

vAlbum table relationships
Album
AL
Artist
AR
Track
T
Genre
G
MediaType
MT
Note: All JOINS (Blue Lines) are Inner joins
Table Alias
SQL As A second Language (SASL) Phoenix Learning Labs

Figure 13. vAlbum Relationships

SQL Example

```
/*   Create vAlbums with all required parts

=== Create View - Create a view for comprehensive album information

NOTE: Your account must have `perm space` assigned to it to create a view

* Need to join the following tables
** Album - Artist
** Album - Track
** Track - Genre
** Track - Media Type

==== TOPICS

* Table alias
* Column Alias
* Join Table together


==== TIPS

.Table Alias
* Table alias shorten the typing needed to complete the query,
1-3 character alias recommended.
* Good practice is to have table alias used everywhere in the query.

.Column Alias
* Column alias help to give meaningful, non conflicting names.
* Good practice, alias column names use lowerUpper naming
to identify them as alias (albumCount)
* Good practic, Use the same alias across all queries.

.Naming practice
* Good practice, System Generated Primary Index column name be
include with `ID` suffix.
* Good practice, Primary Key and Foreign Key join columns
should use the same name.

.Join requirements
* Coulmns for join must match in data type and size.
* Good practice, bring keys from join tables into the view when possible
Helps to reduce debugging efforts later.

*/


Create view vAlbum  ①
-- Update View vAlbum   ②

as

Select
    AL.AlbumId
    ,AL.AlbumTitle
    ,AR.ArtistID
    ,AR.Name as artistName  ③
    ,T.TrackId
    ,T.Name as titleName
    ,T.Composer
    ,T.Milliseconds
    ,T.Milliseconds / 60000.00 as minutes -- Divide milliseconds by 60,000 for minutes ④
    ,T.SizeBytes
    ,T.SizeBytes / 1048576.00 as mbSize  -- Megabyte 2^20 1024 x 1024 or 1,048,567 ⑤
    ,G.GenreId
    ,G.Name as genreName
    ,MT.MediaTypeID
    ,MT.Name as mediaTypeName
from Album AL    ⑥

INNER JOIN Artist AR  -- Artist name ⑥
on AR.ArtistID = AL.ArtistID

INNER JOIN Track T -- All tacks info  ⑥
on T.AlbumID = AL.AlbumId

INNER JOIN Genre G -- Genre for each track
on G.GenreId = T.GenreId  ⑥

INNER JOIN MediaType MT -- MediaType for each track
on MT.MediaTypeId = T.MediaTypeId ⑥
```

① The first time a view is built use the `Create` statement

② To change the view use the `update` statement

③ Column Alias in order avoid confusion with the field `name`

④ Derived Column (aka Calculated Column) notice the 60000.00 has two zeros of precision in order to return a decimal number

⑤ Derived Column (aka Calculated Column) notice the 1048576.00 has two zeros of precision in order to return a decimal number

⑥ Table alias, each joined table has it own unique table alias. NOTE: This example the `Album` table was chosen as the main table of the view.

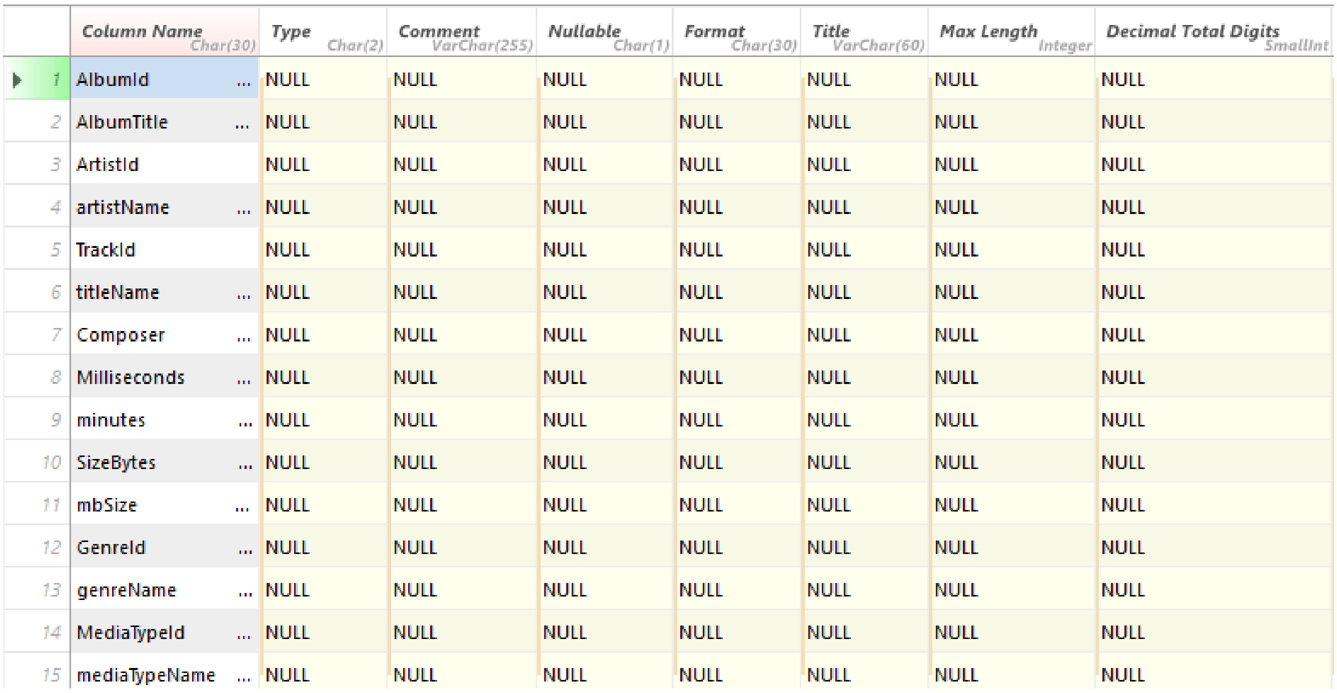
SQL Download link click here

If you didn't create the view then you may not know the column names of the view.

To display a list of the `vAlbum` view columns use

```
help view vAlbum
```

The column list of the view will be returned.



	Column Name Char(30)	Type Char(2)	Comment VarChar(255)	Nullable Char(1)	Format Char(30)	Title VarChar(60)	Max Length Integer	Decimal Total Digits SmallInt
1	AlbumId	NULL	NULL	NULL	NULL	NULL	NULL	NULL
2	AlbumTitle	NULL	NULL	NULL	NULL	NULL	NULL	NULL
3	ArtistId	NULL	NULL	NULL	NULL	NULL	NULL	NULL
4	artistName	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5	TrackId	NULL	NULL	NULL	NULL	NULL	NULL	NULL
6	titleName	NULL	NULL	NULL	NULL	NULL	NULL	NULL
7	Composer	NULL	NULL	NULL	NULL	NULL	NULL	NULL
8	Milliseconds	NULL	NULL	NULL	NULL	NULL	NULL	NULL
9	minutes	NULL	NULL	NULL	NULL	NULL	NULL	NULL
10	SizeBytes	NULL	NULL	NULL	NULL	NULL	NULL	NULL
11	mbSize	NULL	NULL	NULL	NULL	NULL	NULL	NULL
12	GenreId	NULL	NULL	NULL	NULL	NULL	NULL	NULL
13	genreName	NULL	NULL	NULL	NULL	NULL	NULL	NULL
14	MediaTypeId	NULL	NULL	NULL	NULL	NULL	NULL	NULL
15	mediaTypeName	NULL	NULL	NULL	NULL	NULL	NULL	NULL

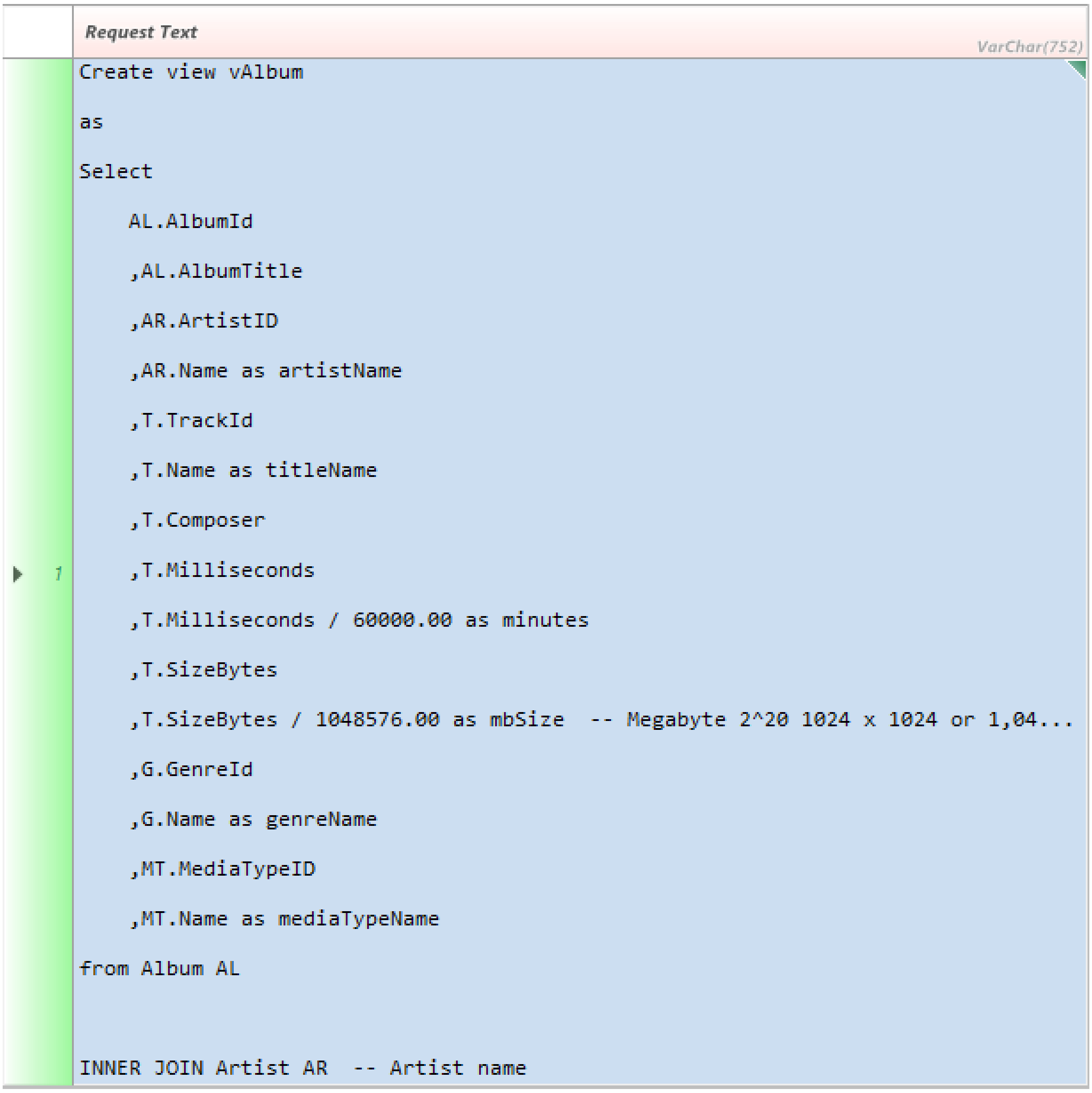
Figure 14. Display View Columns

This column list may be sufficient enough for you to use the view in your work.

If you need more knowledge about how the vAlbum view was built use

```
show view vAlbum
```

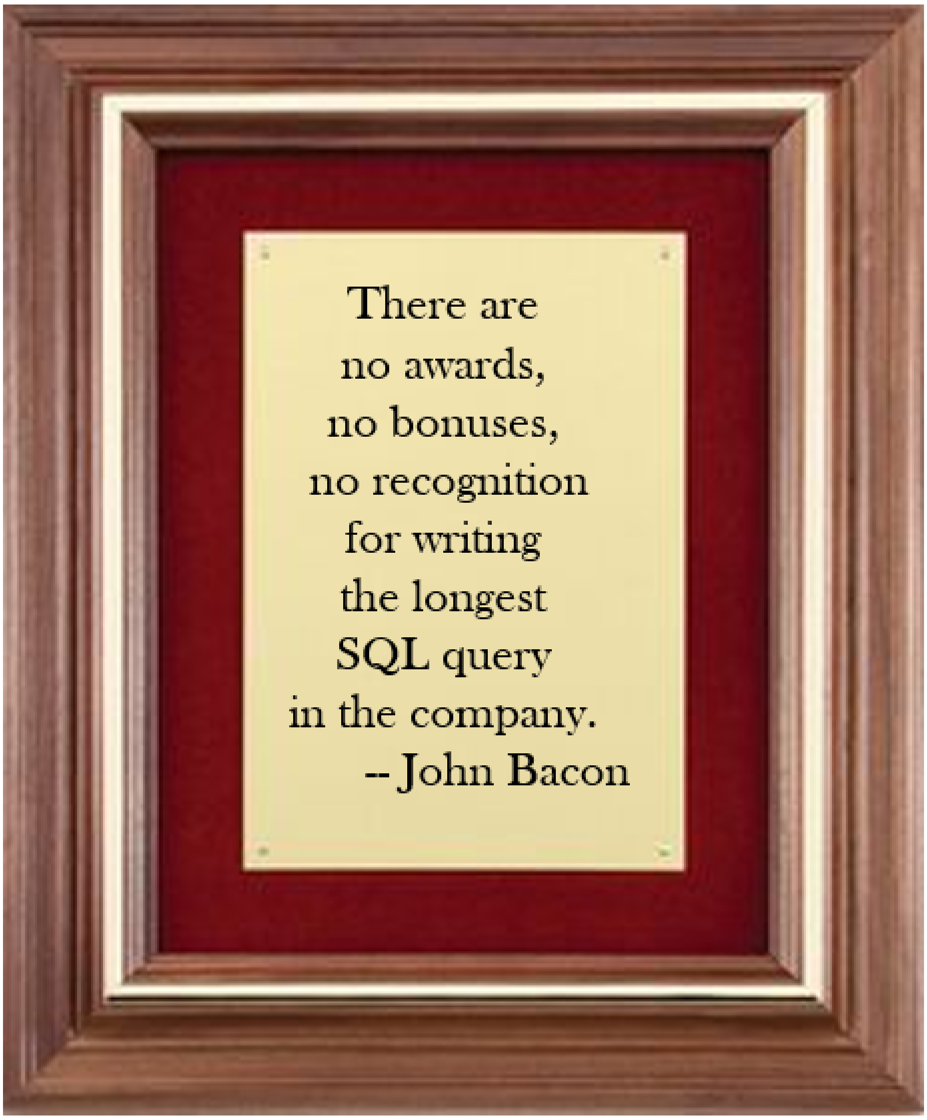
The SQL statement used to create the vAlbum view will be returned.



```
Create view vAlbum

as

Select

    AL.AlbumId

    ,AL.AlbumTitle

    ,AR.ArtistID

    ,AR.Name as artistName

    ,T.TrackId

    ,T.Name as titleName

    ,T.Composer

    ,T.Milliseconds

    ,T.Milliseconds / 60000.00 as minutes

    ,T.SizeBytes

    ,T.SizeBytes / 1048576.00 as mbSize  -- Megabyte 2^20 1024 x 1024 or 1,04...

    ,G.GenreId

    ,G.Name as genreName

    ,MT.MediaTypeID

    ,MT.Name as mediaTypeName

from Album AL


INNER JOIN Artist AR  -- Artist name
```

Figure 15. Display View SQL

Any bulk comments `/* comments \*/` will have been stripped out by Teradata when the view is created or updated.



There are
no awards,
no bonuses,
no recognition
for writing
the longest
SQL query
in the company.
-- John Bacon

Figure 16. Longest Query Rewards

Back to Introduction.

5. Tips

This tips can be considered suggestions to make developing SQL a little bit easier.

5.1. Aggregate Functions

These functions are used to compress or limit the number of rows into a single row.

- `Count(?)` Counts the number of rows, duplicates included in the count.
- `Count Distinct(?)` Count the number of rows, duplicates only counted once.
- `Sum(?)` Sums the values in the column, the column must be a numeric column.

5.2. Column Alias

- Column alias help to give meaningful, non conflicting names.
- Good practice, alias column names use lowerUpper naming to identify them as alias (ie: albumCount, salesDollars, genreAverage)
- Good practice, try to use the same column alias across all queries.

5.3. Dates

- Default Teradata date format is `yyyy-mm-dd`
- Convert a string into a date with `DATE` function (DATE '2018-01-01')
- Extract parts of a date with the `EXTRACT` function (EXTRACT MONTH I.InvoiceDate)

5.4. Derived Tables (Sub-Queries)

- Start with a regular query until you get the results you need.
- Enclose the regular query in `(…)` and assign a table alias name.
- Good practice is to start a derived table with a `(` on a line by itself.
- Good practice is to end a derived table with a `( as XX` on a line by itself
- Good practice is to indent the derived table within the `(` and `) as XX`

5.5. Formatting / Conversion

- `Cast(x,y)` can be used to reduce number of digits of precision.

X=Number of digits on both sides of the decimal point totaled (ie: 999.99 X=5)

Y=Number of digits of precision, number og digits to the right of the decimal point. (ie: 999.99 Y=2)

5.6. Naming practice

- Good practice, System Generated Primary Index column name include a `ID` suffix (AlbumID, TrackID).
- Good practice, Primary Key and Foreign Key join columns should use the same name.
- Short descriptive column names are better than abbreviations.

5.7. Join

- The `Left` table is defined by the first `Select` in the query.
- The `Right` table is defined by the object in the `Join` clause.
- The `Inner Join` returns results where there is a matching column in both Left and Right tables.
- The `Outer Join` returns **ALL** results from one table and any matching results from the other table.
- The **ALL** table is determined by the direction of the `Outer join` (Left Outer Join, Right Outer Join).

5.8. Order By

- Can use actual column name (T.Milliseconds, I.InvoiceDate), column alias name (trackCount, genreName), or ordinal position (1,2,3,4).
- Good practice is to avoid using ordinal position because as queries change the number and order of select columns, the results can become invalid.

5.9. Select columns

- Use single quote `'` to denote text.
- Use double-quotes `"` for renaming objects.
- Indent columns selected.
- Limit one column per row.
- Put commas at the beginning of the column name, not at the end, starting on the 2nd column.

Not recommended

```
Select
    T.Name as trackName,
    I.InvoiceDate,
    AL.Name as albumName,
    count(T.TackID) as trackCount,
```

Recommended

```
Select
    T.Name as trackName
    ,I.InvoiceDate
    ,AL.Name as albumName
    ,count(T.TackID) as trackCount
```

5.10. Table Alias

- Table alias shorten the typing needed to complete the query, 1-3 character alias recommended.
- Use the same table alias across all queries.
- Good practice is to have table alias used everywhere in the query, including Select, From, Join, Where, Group By and Order By.
- Good Practice is to have table alias be uppercase (IE: I, IL, T, G)

5.11. Teradata Specific

- Teradata will look for any `Primary Index` specified in the DDL.
- If a `Primary Index` is not specified, it will then look for `Primary Key` constraint in DDL for making it `Primary Index`.

5.12. Union

- UNION allows joining of multiple queries
- Each queries must have same number and data type of columns.
- First query in union determine sizes and names of columns.
- Start small and build on to the Union query.

5.13. Where

- Good practice, put `and` where clauses on separate lines
- Good practice, put `or` where clause on single line
- Use `(..)` to help clarify logical groupings

6. Contact Information

Author contact Information

Email: schusterj@Michigan.gov

Email: john.schuster@PhoenixWorkgroup.com

Phone: 517-927-7400

> Please provide any feedback, corrections or suggestions to the author. The folks providing the most anount of feedback will win prizes.

7. Reference

7.1. Teradata links

Documentation: https://docs.teradata.com/landing-page/

Forum: https://community.teradata.com/

SQL Assistant: https://bit.ly/2LYpXxB

SQL Introduction: https://bit.ly/2Fhxp5C

Stack Overflow (Teradata Forum): https://stackoverflow.com/questions/tagged/teradata

7.2. Column Type

ColumnType reference table. Reference: http://developer.teradata.com/doc/connectivity/tdnetdp/14.00/webhelp/DataTypeMappings.html

Table 19. ColumnType

ColumnType Abbrev	ColumnType Description
A1	ARRAY
AN	MULTI-DIMENSIONAL ARRAY
AT	TIME
BF	BYTE
BO	BLOB
BV	VARBYTE
CF	CHARACTER
CO	CLOB
CV	VARCHAR
D	DECIMAL
DA	DATE
DH	INTERVAL DAY TO HOUR
DM	INTERVAL DAY TO MINUTE
DS	INTERVAL DAY TO SECOND
DY	INTERVAL DAY
F	FLOAT
HM	INTERVAL HOUR TO MINUTE
HS	INTERVAL HOUR TO SECOND
HR	INTERVAL HOUR
I	INTEGER

ColumnType Abbrev	ColumnType Description
I1	BYTEINT
I2	SMALLINT
I8	BIGINT
JN	JSON
MI	INTERVAL MINUTE
MO	INTERVAL MONTH
MS	INTERVAL MINUTE TO SECOND
N	NUMBER
PD	PERIOD(DATE)
PM	PERIOD(TIMESTAMP WITH TIME ZONE)
PS	PERIOD(TIMESTAMP)
PT	PERIOD(TIME)
PZ	PERIOD(TIME WITH TIME ZONE)
SC	INTERVAL SECOND
SZ	TIMESTAMP WITH TIME ZONE
TS	TIMESTAMP
TZ	TIME WITH TIME ZONE
UT	UDT Type
XM	XML
YM	INTERVAL YEAR TO MONTH
YR	INTERVAL YEAR
++	TD_ANYTYP

8. Document History

Table 20. Document History

Date	Version	Author	Description
01/10/2019	V2.1M	JHRS	Moved Tips from SQL queries to make them smaller and avoid sync issues, fixed join definitions updated derived query B
01/09/2019	v2.1k	JHRS	Added View and join types, plaques
01/08/2018	V2.1j	JHRS	Updated Chinook introduction
01/03/2019	V2.1h	JHRS	Added derived Table for Filters Added diagrams for derived tables
01/02/2019	V2.1g	JHRS	Updated derived query for collections
12/28/2018	V2.1f	JHRS	Added derivedQuery from archived
12/27/2018	V2.1e	JHRS	Added joinQuery set from archive
12/21/2018	V2.1d	JHRS	Added vsCode snippet for quick query insert added Reference section
12/20/2018	V2.1c	JHRS	Attempting standard document template
12/17/2018	V2.1b	JHRS	Initial version