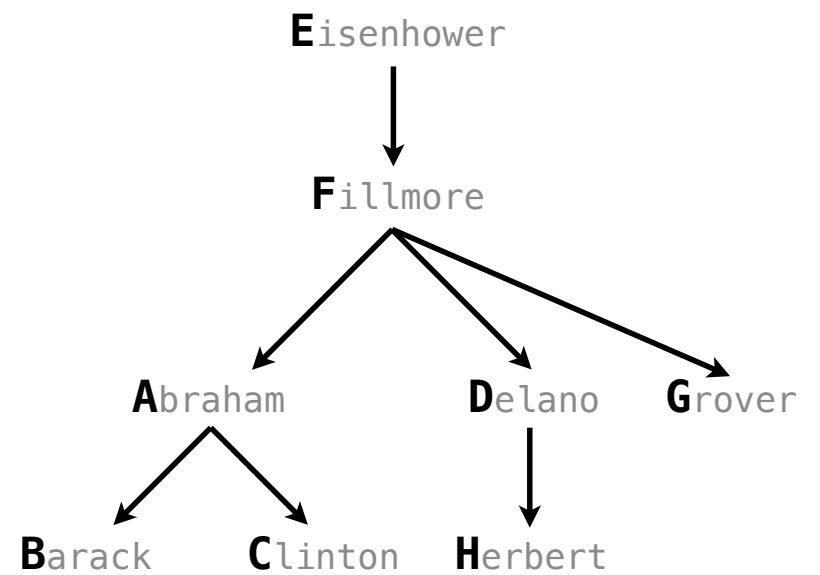


61A Lecture 32

Announcements

Joining Tables

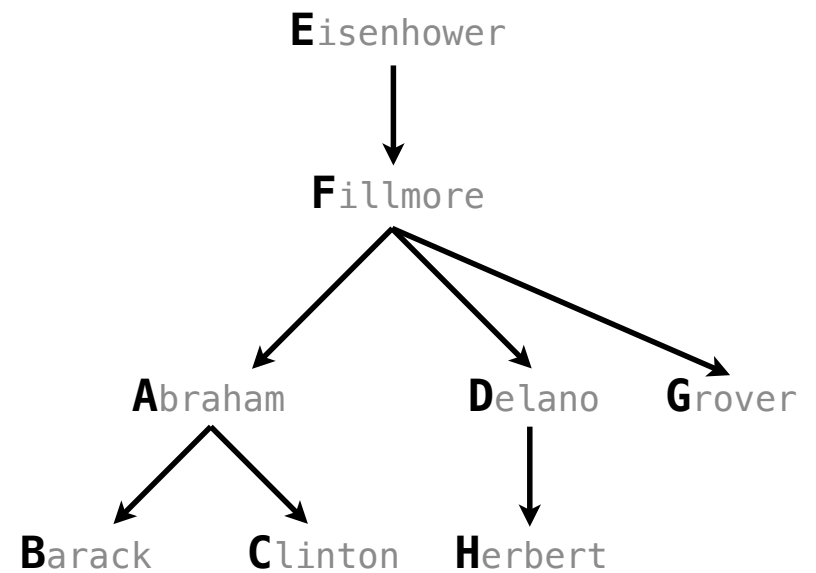
Reminder: John the Patriotic Dog Breeder



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```
select "abraham" as parent, "barack" as child union
select "abraham"          , "clinton"          union
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select "fillmore"         , "abraham"          union
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select "fillmore"         , "grover"          union
select "eisenhower"       , "fillmore";
```

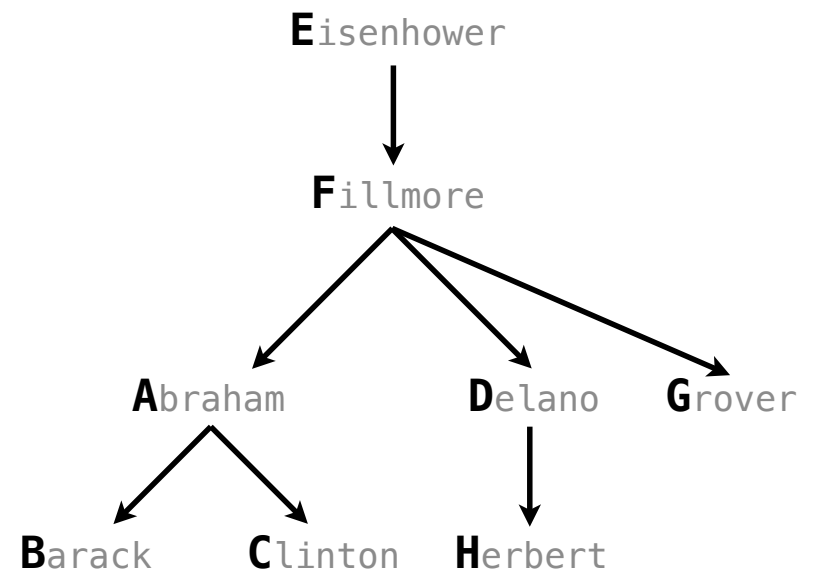


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create table parents as

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Reminder: John the Patriotic Dog Breeder



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  select "fillmore"      , "abraham"      union
  select "fillmore"      , "delano"       union
  select "fillmore"      , "grover"       union
  select "eisenhower"    , "fillmore";
```

Parents :

Parent	Child
abraham	barack
abraham	clinton
delano	herbert
fillmore	abraham
fillmore	delano
fillmore	grover
eisenhower	fillmore

Joining Two Tables

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Two tables **A** & **B** are joined by a comma to yield all combos of a row from **A** & a row from **B**

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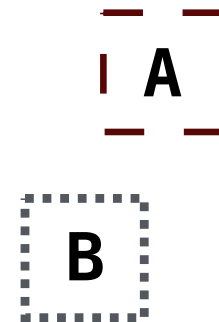
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create table dogs as  
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```

— —
| A |
— —

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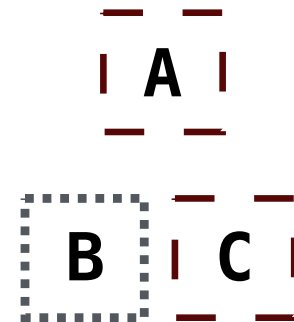
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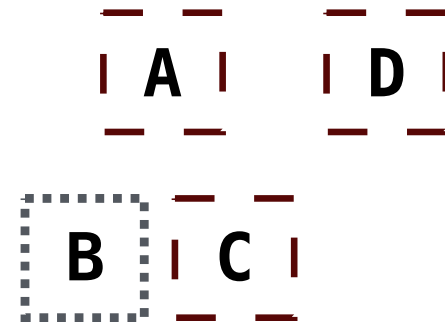
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```



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  select "eisenhower"  , "short"      union
  select "fillmore"    , "curly"      union
```

E

F

A **D**

B **C**

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```

E

F

A

D

G

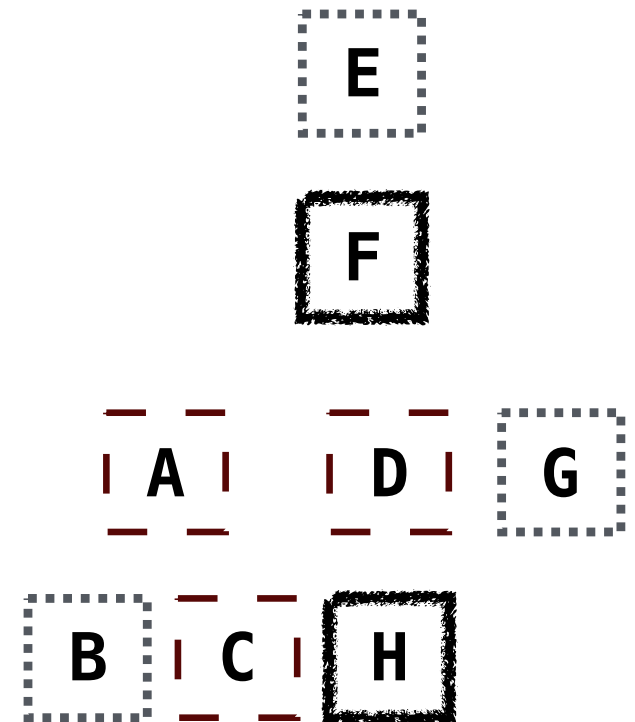
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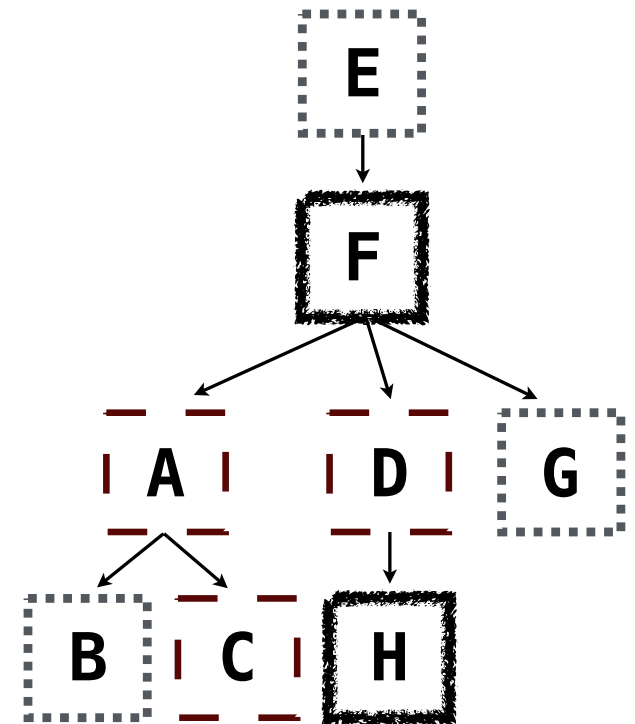


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create table parents as
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  ...;
```



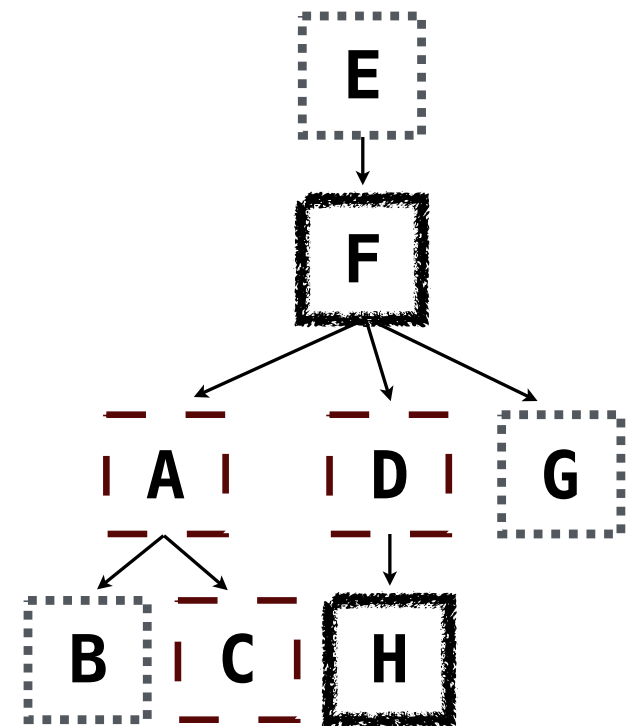
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Select the parents of curly-furred dogs



Joining Two Tables

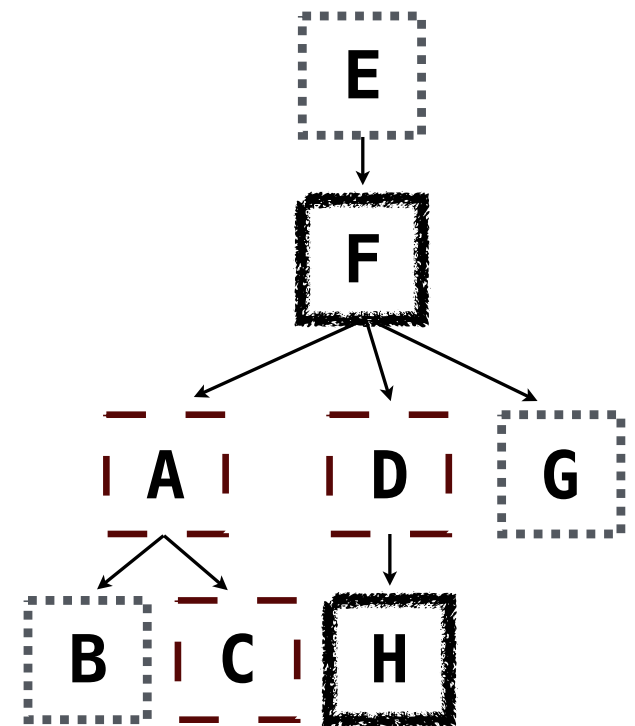
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create table parents as
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```

Select the parents of curly-furred dogs

```
select parent from parents, dogs
      where child = name and fur = "curly";
```



Joining Two Tables

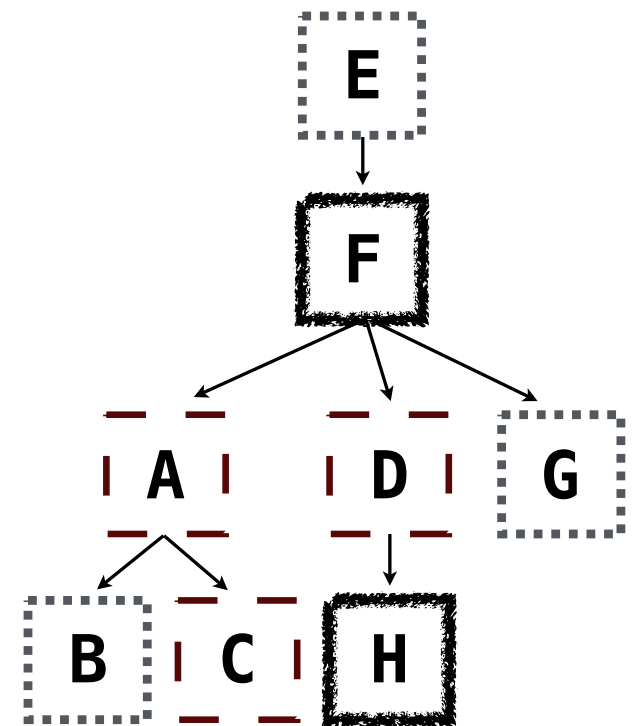
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Joining Two Tables

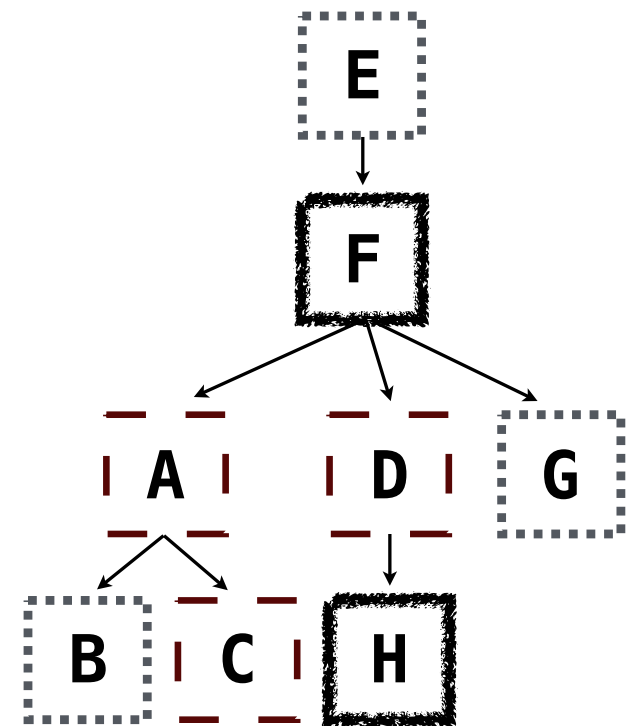
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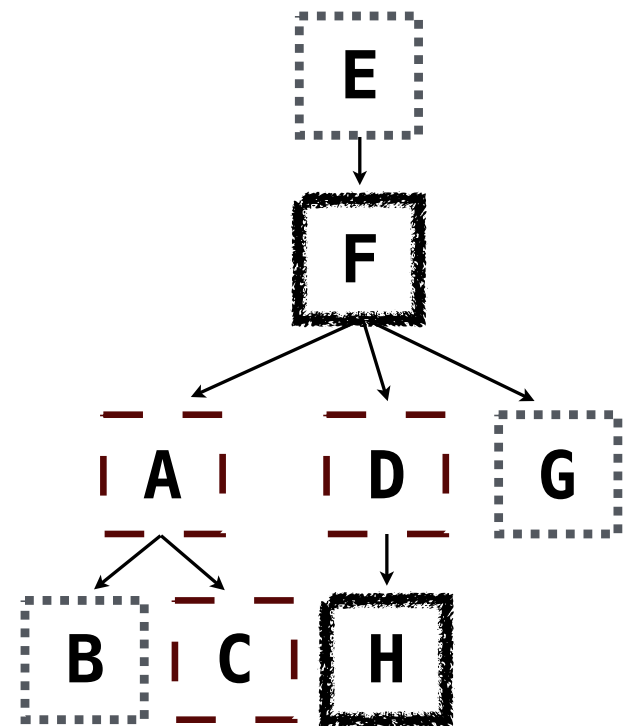
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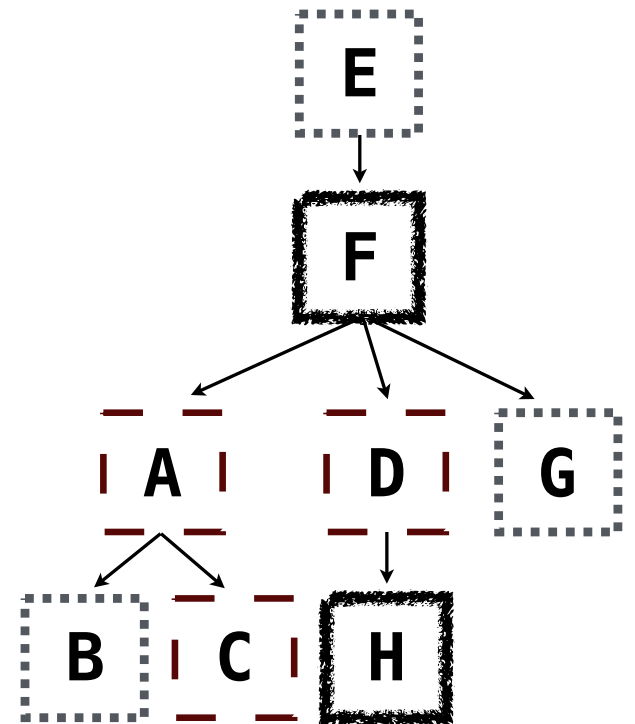
Aliases and Dot Expressions

Joining a Table with Itself



Joining a Table with Itself

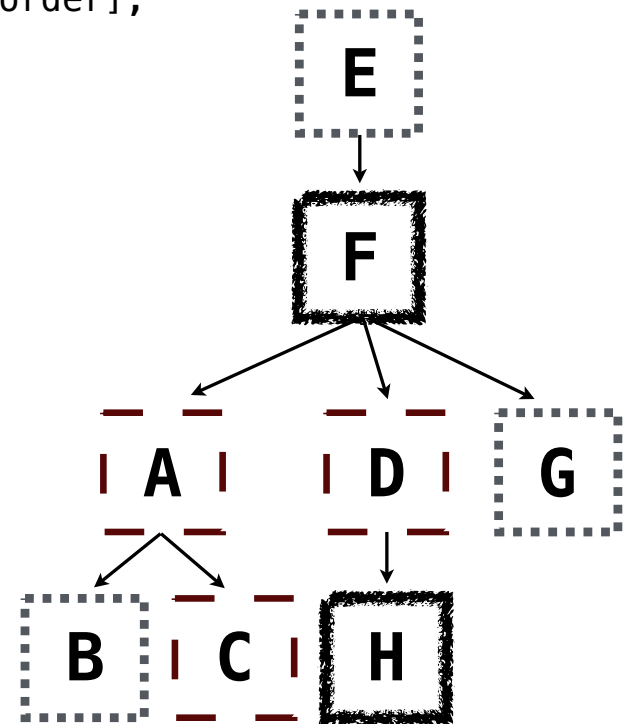
Two tables may share a column name; dot expressions and aliases disambiguate column values



Joining a Table with Itself

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select [columns] from [table] where [condition] order by [order];
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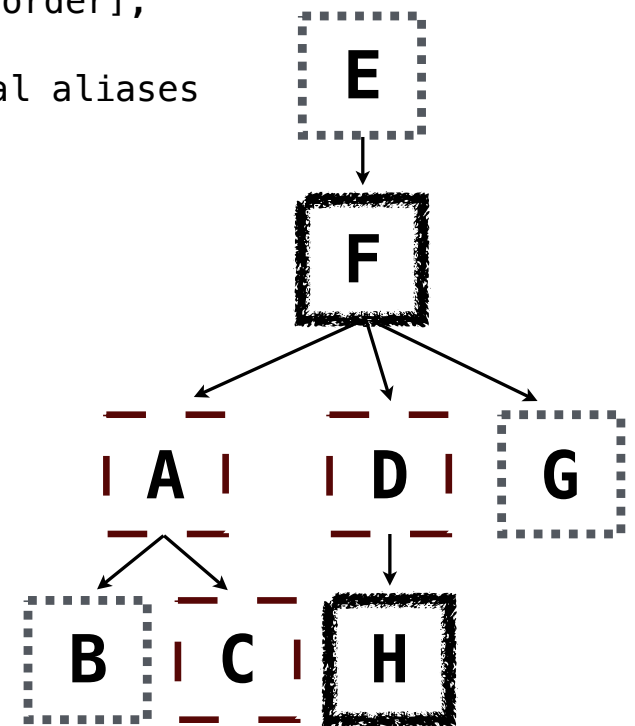


Joining a Table with Itself

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[table] is a comma-separated list of table names with optional aliases



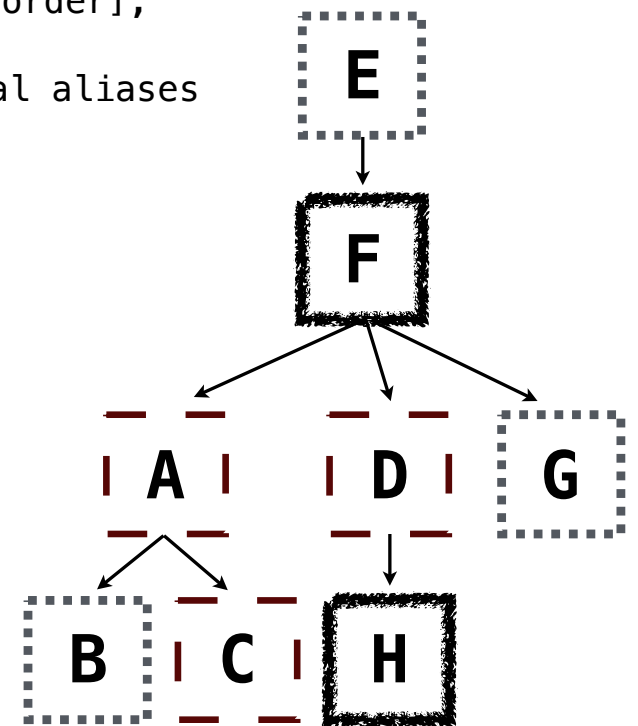
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Select all pairs of siblings



Joining a Table with Itself

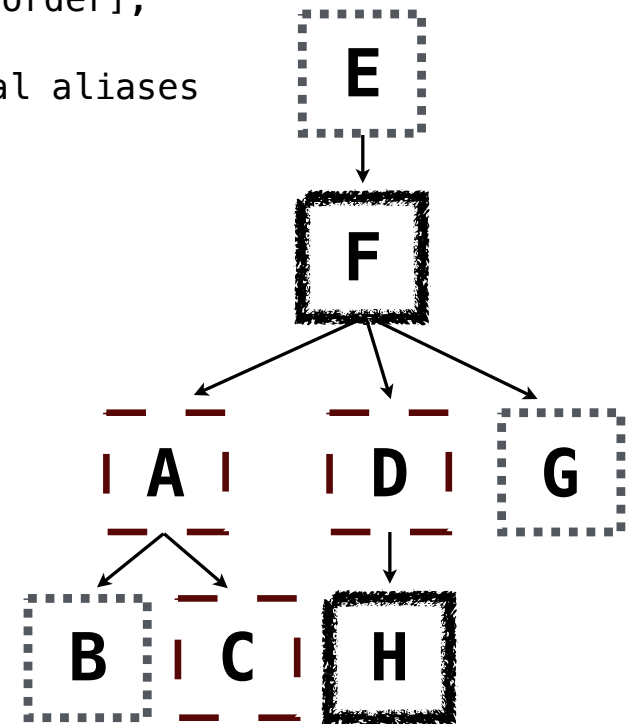
Two tables may share a column name; dot expressions and aliases disambiguate column values

```
select [columns] from [table] where [condition] order by [order];
```

[table] is a comma-separated list of table names with optional aliases

Select all pairs of siblings

```
select a.child as first, b.child as second  
from parents as a, parents as b  
where a.parent = b.parent and a.child < b.child;
```



Joining a Table with Itself

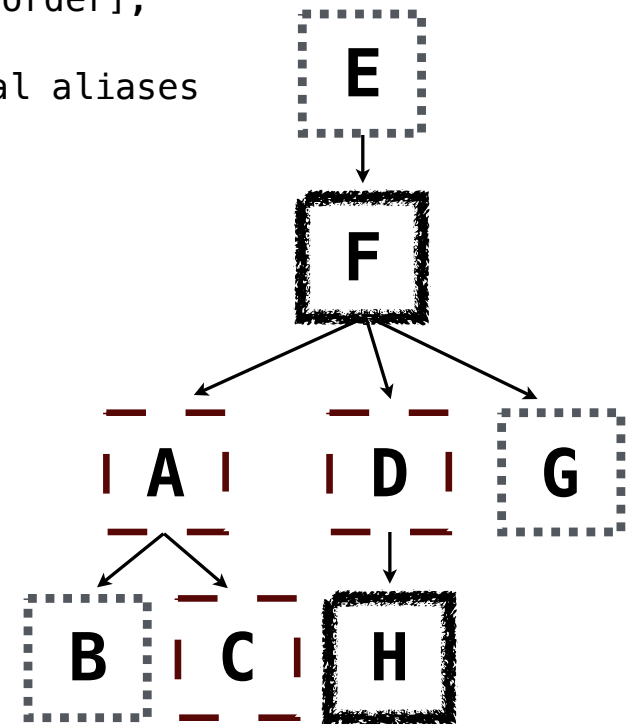
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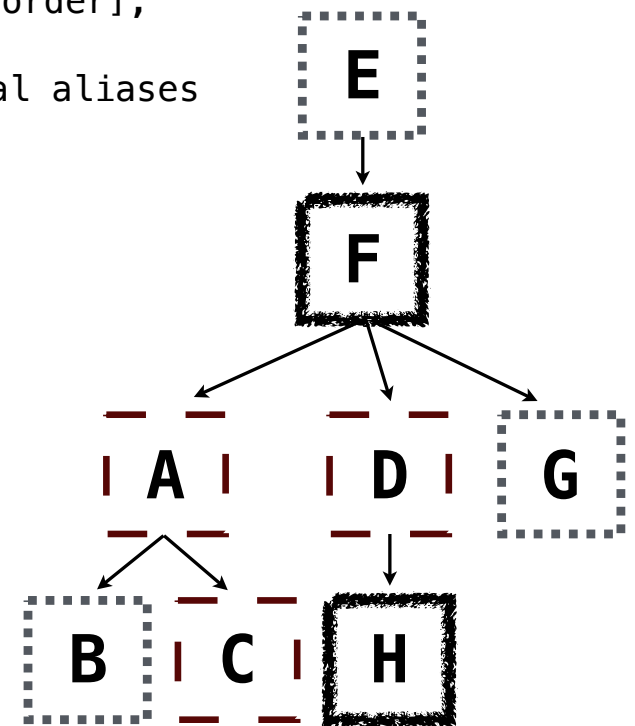
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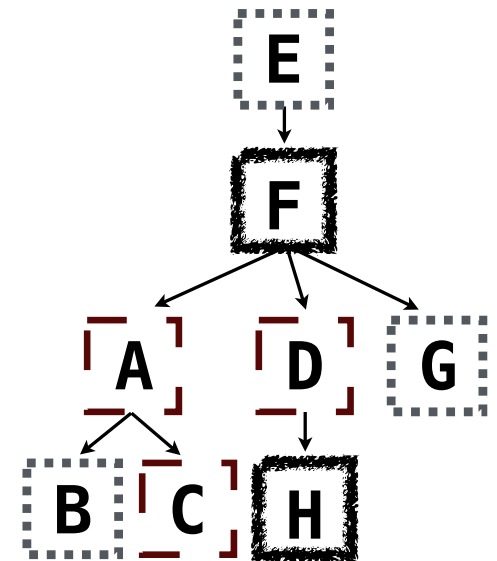
First	Second
barack	clinton
abraham	delano
abraham	grover
delano	grover



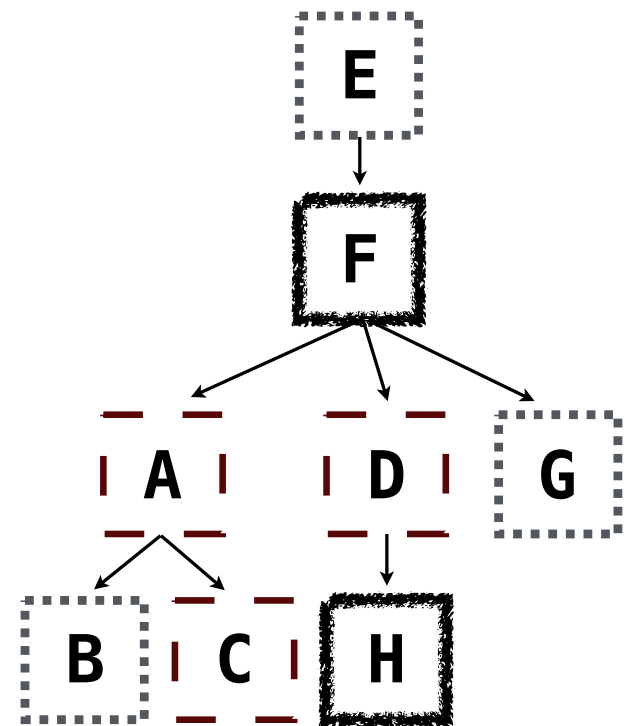
Example: Grandparents

Which select statement evaluates to all grandparent, grandchild pairs?

- 1 `select a.grandparent, b.child from parents as a, parents as b
where b.parent = a.child;`
- 2 `select a.parent, b.child from parents as a, parents as b
where a.parent = b.child;`
- 3 `select a.parent, b.child from parents as a, parents as b
where b.parent = a.child;`
- 4 `select a.grandparent, b.child from parents as a, parents as b
where a.parent = b.child;`
- 5 None of the above

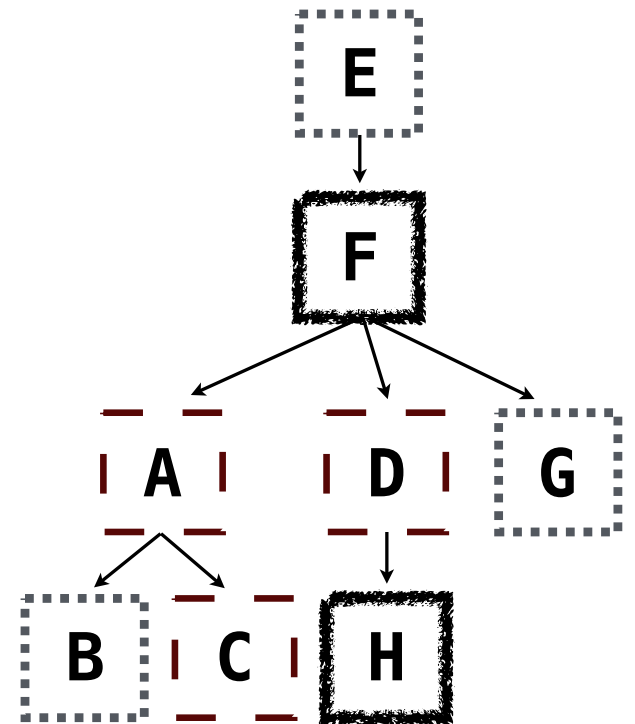


Joining Multiple Tables



Joining Multiple Tables

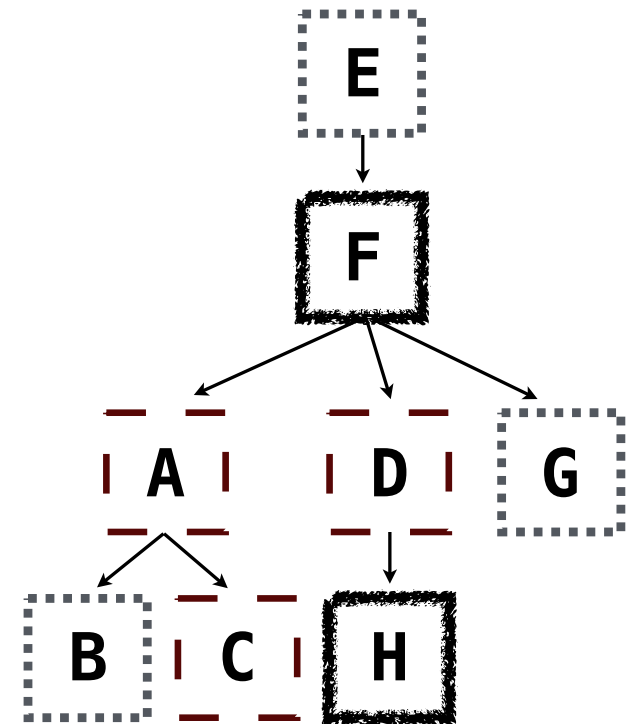
Multiple tables can be joined to yield all combinations of rows from each



Joining Multiple Tables

Multiple tables can be joined to yield all combinations of rows from each

```
create table grandparents as
select a.parent as grandog, b.child as granpup
from parents as a, parents as b
where b.parent = a.child;
```

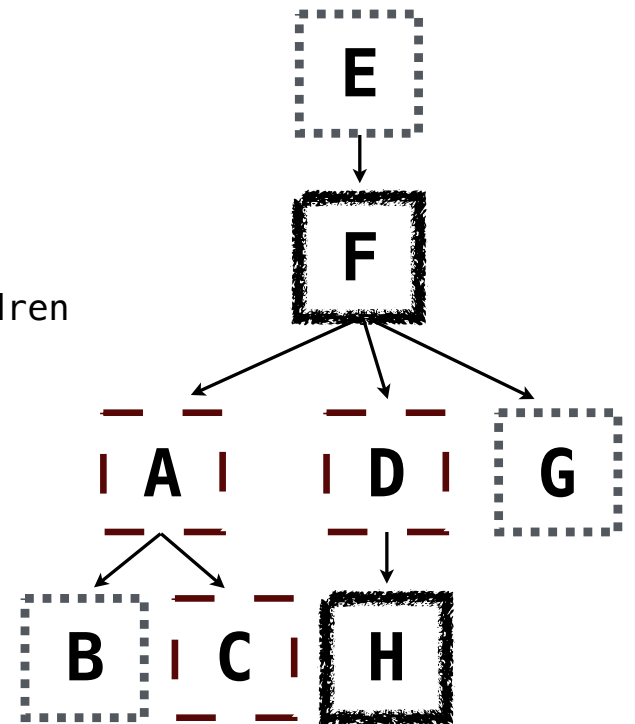


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Select all grandparents with the same fur as their grandchildren



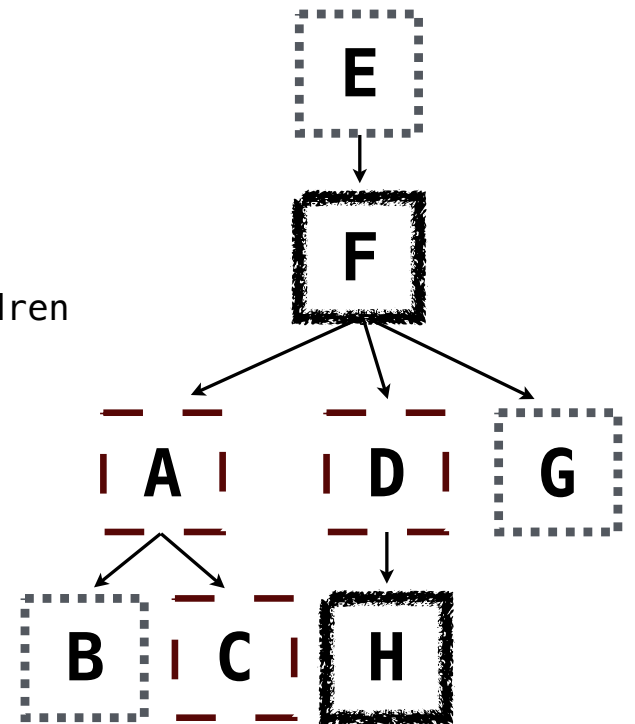
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Which tables need to be joined together?



Joining Multiple Tables

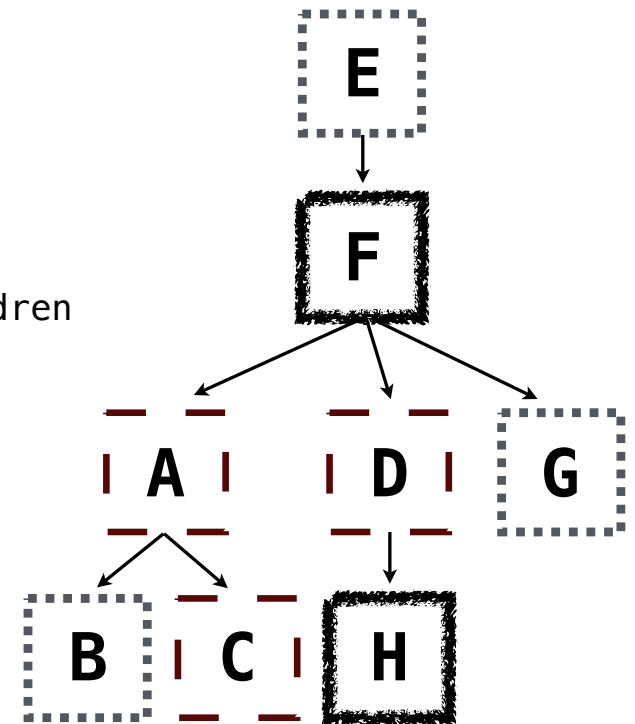
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Which tables need to be joined together?

```
select granddog from grandparents, dogs as c, dogs as d
where granddog = c.name and
granpup = d.name and
c.fur = d.fur;
```



Example: Dog Triples

Fall 2014 Quiz Question (Slightly Modified)

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Write a SQL query that selects all possible combinations of three different dogs with the same fur and lists each triple in *inverse* alphabetical order

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Write a SQL query that selects all possible combinations of three different dogs with the same fur and lists each triple in *inverse* alphabetical order

```
create table dogs as
  select "abraham" as name, "long" as fur union
  select "barack"      , "short"      union
  ...;
```

Fall 2014 Quiz Question (Slightly Modified)

Write a SQL query that selects all possible combinations of three different dogs with the same fur and lists each triple in *inverse* alphabetical order

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create table dogs as
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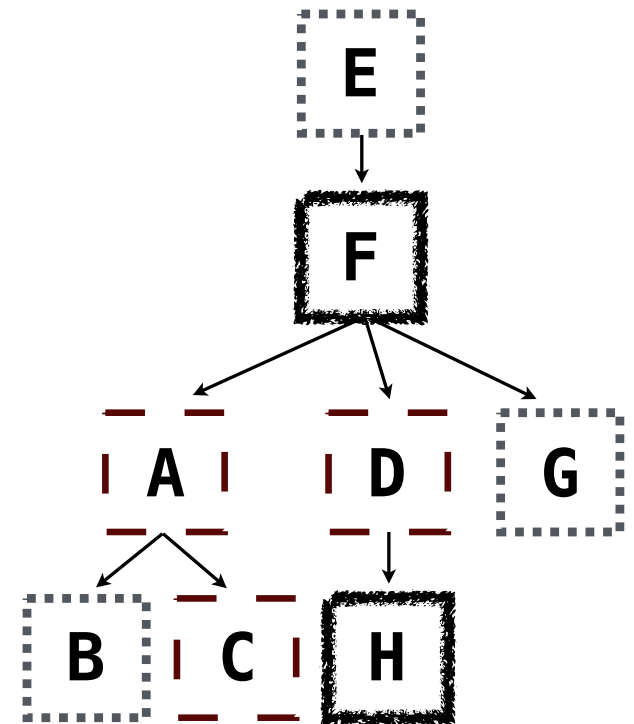
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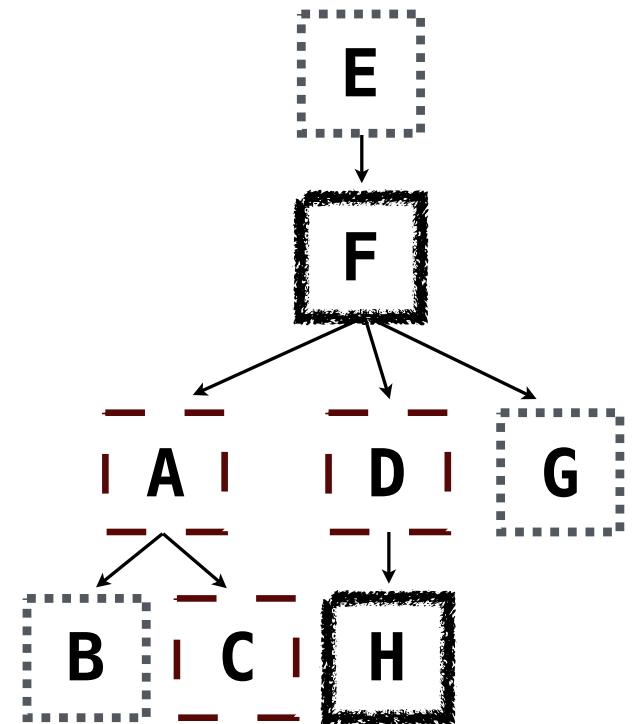
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  select "abraham"      , "clinton"      union
  ...;
```

Expected output:

```
delano|clinton|abraham
grover|eisenhower|barack
```



Fall 2014 Quiz Question (Slightly Modified)

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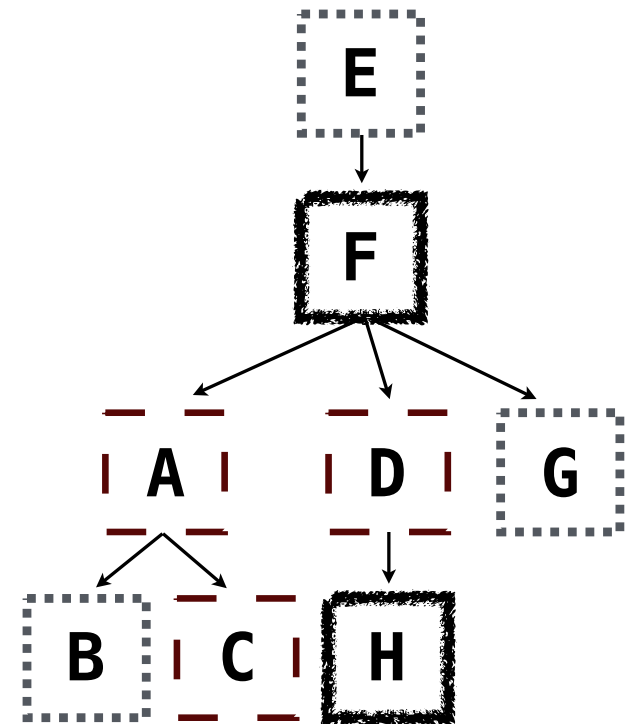
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(Demo)



Numerical Expressions

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Expressions can contain function calls and arithmetic operators

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```
select [columns] from [table] where [expression] order by [expression];
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```
[expression] as [name], [expression] as [name], ...
```

```
select [columns] from [table] where [expression] order by [expression];
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Combine values: +, -, *, /, %, and, or

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Transform values: abs, round, not, -

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(Demo)

String Expressions

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String values can be combined to form longer strings

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sqlite> select "hello," || " world";  
hello, world
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sqlite> create table phrase as select "hello, world" as s;
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sqlite> create table phrase as select "hello, world" as s;  
sqlite> select substr(s, 4, 2) || substr(s, instr(s, " ")+1, 1) from phrase;
```

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```

String Expressions

String values can be combined to form longer strings



```
sqlite> select "hello," || " world";  
hello, world
```

Basic string manipulation is built into SQL, but differs from Python



```
sqlite> create table phrase as select "hello, world" as s;  
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sqlite> create table lists as select "one" as car, "two,three,four" as cdr;
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sqlite> select substr(cdr, 1, instr(cdr, ",")-1) as cadr from lists;  
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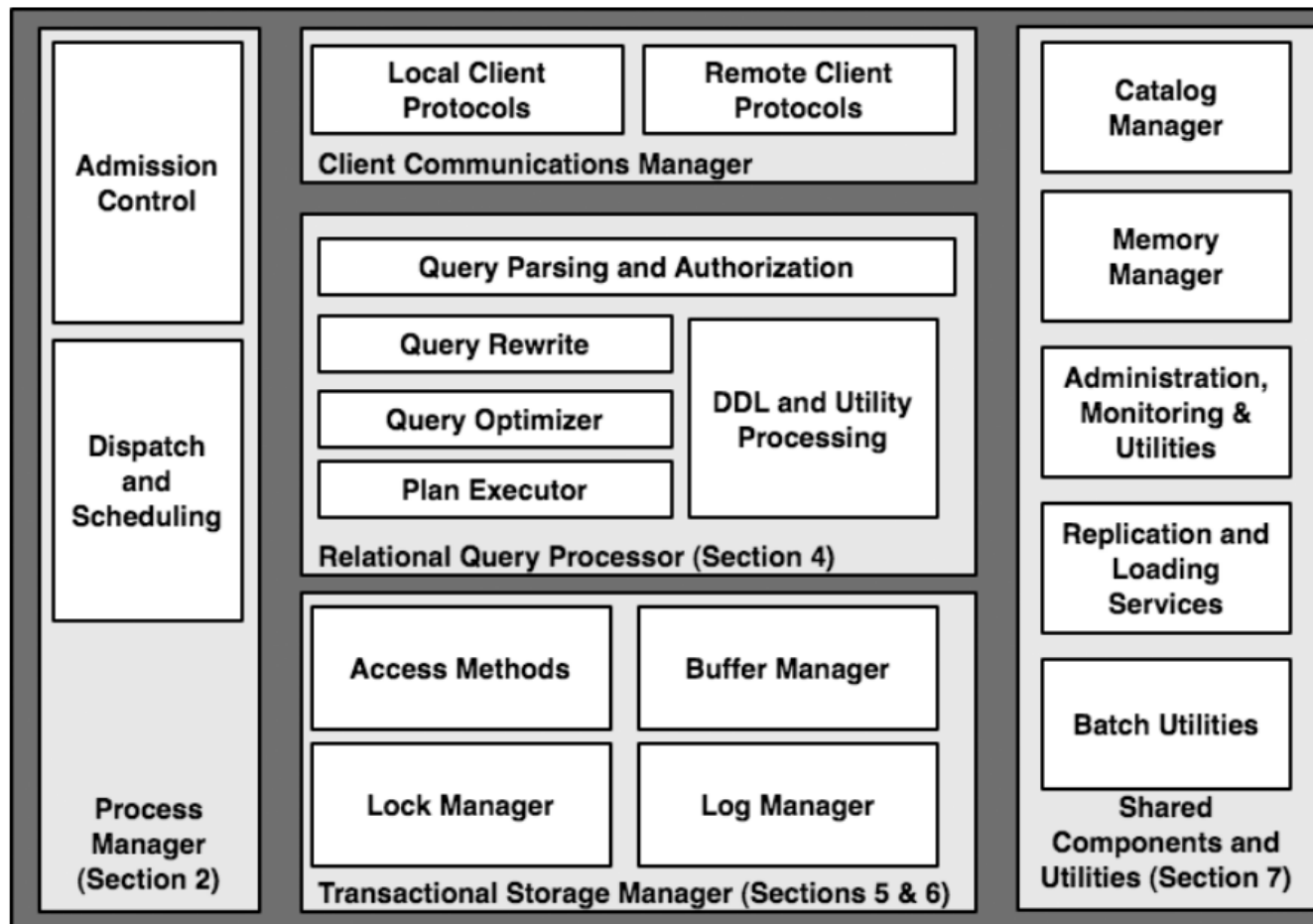


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(Demo)

Database Management Systems

Database Management System Architecture



Query Planning

The manner in which tables are filtered, sorted, and joined affects execution time

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Select the parents of curly-furred dogs:

```
select parent from parents, dogs
      where child = name and fur = "curly";
```


Query Planning

The manner in which tables are filtered, sorted, and joined affects execution time

Select the parents of curly-furred dogs:

```
select parent from {parents, dogs}  
               where child = name and fur = "curly";
```

Query Planning

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select parent from {parents, dogs}  
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Join all rows of parents to all rows of dogs, filter by `child = name` and `fur = "curly"`

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The manner in which tables are filtered, sorted, and joined affects execution time

Select the parents of curly-furred dogs:

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select parent from {parents, dogs}  
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```

Join all rows of parents to all rows of dogs, filter by `child = name` and `fur = "curly"`

Join only rows of parents and dogs where `child = name`, filter by `fur = "curly"`

Query Planning

The manner in which tables are filtered, sorted, and joined affects execution time

Select the parents of curly-furred dogs:

```
select parent from [parents, dogs]
where [child = name] and [fur = "curly"];
```

Join all rows of parents to all rows of dogs, filter by `child = name` and `fur = "curly"`

Join only rows of parents and dogs where `child = name`, filter by `fur = "curly"`

Filter dogs by `fur = "curly"`, join result with all rows of parents, filter by `child = name`

Query Planning

The manner in which tables are filtered, sorted, and joined affects execution time

Select the parents of curly-furred dogs:

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Join all rows of parents to all rows of dogs, filter by `child = name` and `fur = "curly"`

Join only rows of parents and dogs where `child = name`, filter by `fur = "curly"`

Filter dogs by `fur = "curly"`, join result with all rows of parents, filter by `child = name`

Filter dogs by `fur = "curly"`, join only rows of result and parents where `child = name`