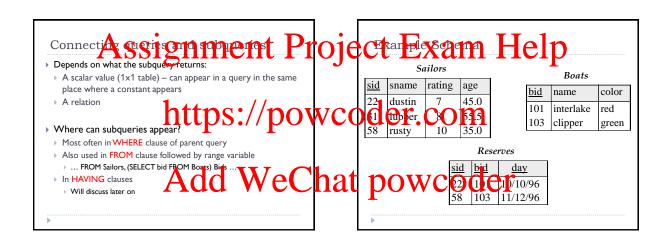


Nested Queries

- An SQL query can be used to help the evaluation of another query
 - E.g., a condition may need to be evaluated on a computed relation, not one readily available
 - Multiple levels of nesting are possible
 - ▶ Semantics similar to those of nested loops
- Nested queries do not appear in relational algebra
 - But it is possible to write relational algebra expressions to obtain same result
- Using nested queries leads to more concise solutions

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Subqueries that return a constant

- Also referred to as subqueries that return a scalar
- Most easy case to understand

SELECT S.sname
FROM Sailors S
WHERE S.sid = (SELECT R.sid
FROM Reserves R
WHERE R.bid=103)

- If subquery returns more than one value or zero values, a runtime error occurs! FRAGILE,AVOID!
- Next, we focus on subqueries that return relations

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Conditions involving relations

- > Test that a relation satisfies some condition
 - \ldots WHERE <code>EXISTS</code> (SELECT \ldots) -TRUE if subquery result is not empty
 - \dots WHERE \mbox{UNIQUE} (SELECT \dots) TRUE if subquery result has no duplicates

SELECT S.sname
FROM Sailors S←
WHERE EXISTS (SELECT *
FROM Reserves R

WHERE R.bid=103 AND S.sid=R.sid)

- Find names of sailors who've reserved boat #103
- ▶ Subquery is **CORRELATED** with parent query

>

Conditions involving relations and tuples

- Typically have some sort of set operations semantics
 - ...WHERE field IN (SELECT ...)
 - ... WHERE field op ANY (SELECT ...)
 - ... WHERE field op ALL (SELECT ...)

SELECT S.sname FROM Sailors S

WHERE S.sid IN (SELECT R.sid

FROM Reserves R WHERE R.bid=103)

Find names of sailors who've reserved boat #103

Conditions involving relations and tuples

- Typically have some sort of set operations semantics
 - ...WHERE field IN (SELECT ...)
 - ... WHERE field op ANY (SELECT ...)
 - ... WHERE field op ALL (SELECT ...)

SELECT S.sname

FROM Sailors S

WHERE S.rating > ANY (SELECT S1.rating

FROM Sailors S1, Reserves R1 WHERE S1.sid=R1.sid AND R1.bid=103)

Find names of sailors whose rating is higher than the minimum rating among sailors who reserved boat 103

Condition Air Sosing dation

- Typically have some sort of set operations semantics
 - ...WHERE field IN (SELECT ...)
 - ... WHERE field op ANY (SELECT ...)
 - ... WHERE field op ALL SELECT

SELECT S.sname FROM Sailors S

WHERE S.age >= ALL (SELECT S1.age FROM Sailors S1)

Find names of sailors with makim

SELECT SQ.sname, SQ.bname

FROM (SELECT S.sname, B.name AS bname FROM Sailors S, Boats B, Reserves R

sid=R.sid and B.bid=R.bid

WHERE SQ.bname='interlake';

WeChat progression coder interlake

Rewriting INTERSECT Queries Using IN

Find sid's of sailors who've reserved both a red and a green boat:

SELECT S.sid

FROM Sailors S, Boats B, Reserves R

WHERE S.sid=R.sid AND R.bid=B.bid AND B.color='red'

AND S.sid IN (SELECT S2.sid

FROM Sailors S2, Boats B2, Reserves R2 WHERE S2.sid=R2.sid AND R2.bid=B2.bid AND B2.color='green')

▶ Similarly, EXCEPT queries re-written using NOT IN.

Nested Queries - Review

- Nested queries returning a constant
- > Typically constant is compared with other value in the WHERE clause
- ... WHERE field = (SELECT bid FROM ...) ...
- Nested queries returning a relation
 - in WHERE clause
 - ... WHERE EXISTS|UNIQUE (SELECT bid FROM ...) ...
 - ... WHERE field IN (SELECT bid FROM ...) ...
 - ... WHERE field op ANY ALL (SELECT bid FROM ...) ...
 - in FROM clause followed by range variable
 - FROM Sailors, (SELECT bid FROM Boats) Bids ...

