Example of GROUP BY

SELECT DEP, JOB, AVG(SAL)
FROM EMPL
WHERE JOB <> 'M'
GROUP BY DEP, JOB
ORDER BY AVG(SAL) DESC

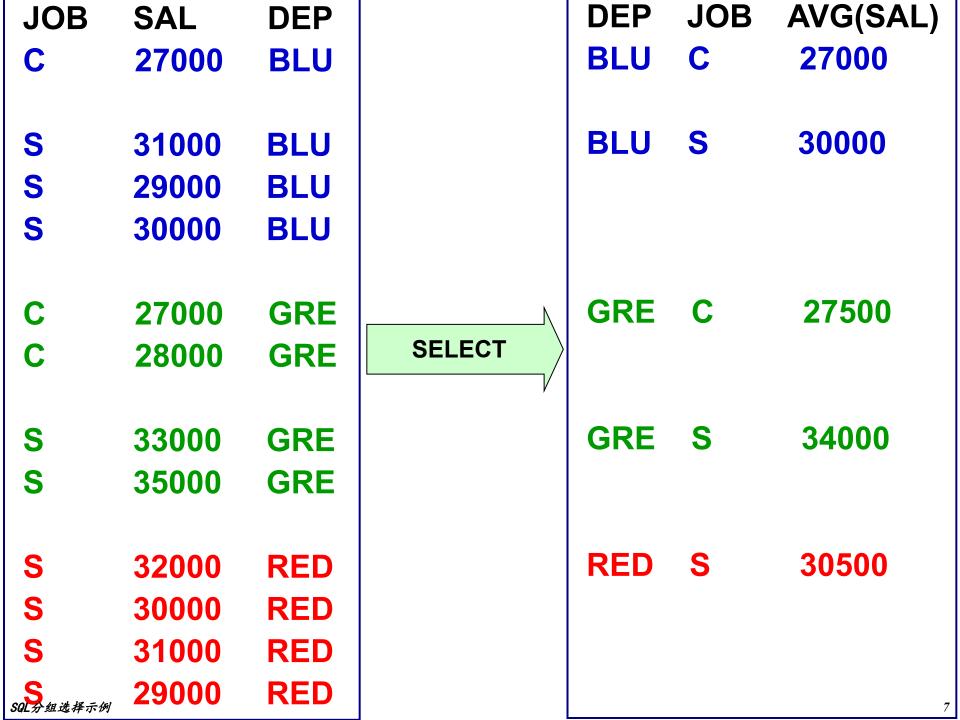
JOB	SAL	DEP	
S	31000	BLU	SELECT DED TOD AVC(SAL)
M	32000	RED	SELECT DEP, JOB, AVG(SAL) FROM EMPL
S	30000	BLU	WHERE JOB <> 'M'
C	27000	GRE	GROUP BY DEP, JOB
S	33000	GRE	ORDER BY AVG(SAL) DESC
M	31000	BLU	
S	32000	RED	
C	28000	GRE	首先执行查询,得到待统计的元组集合
S	30000	RED	
M	33000	GRE	
S	31000	RED	
S	35000	GRE	
C	27000	BLU	
S	29000	RED	
S SQL分组选择示例	29000	BLU	2

JOB	SAL	DEP		JOB	SAL	DEP
S	31000	BLU		S	31000	BLU
M	32000	RED				
S	30000	BLU		S	30000	BLU
C	27000	GRE		С	27000	GRE
S	33000	GRE		S	33000	GRE
M	31000	BLU				
S	32000	RED	WHERE JOB<>'M'	S	32000	RED
C	28000	GRE		С	28000	GRE
S	30000	RED		S	30000	RED
M	33000	GRE				
S	31000	RED		S	31000	RED
S	35000	GRE		S	35000	GRE
C	27000	BLU		C	27000	BLU
S	29000	RED		S	29000	RED
S SQL分组选择示例	29000	BLU		S	29000	BLU 3

JOB	SAL	DEP	
S	31000	BLU	SELECT DEP, JOB, AVG(SAL)
			FROM EMPL
S	30000	BLU	WHERE JOB <> 'M'
C	27000	GRE	GROUP BY DEP, JOB
S	33000	GRE	ORDER BY AVG(SAL) DESC
	00000	OIL	
S	32000	RED	即即四回日日日上公田仕一场二個住
C	28000	GRE	· 根据GROUP属性上的取值,将元组集 合划分成若干个小组(子集);
S	30000	RED	合利分成石 1 7 小组(7 来);
3	30000	KED	• 在同一个小组中,分组属性上的取值
			都相同;不同小组之间,至少在某一
S	31000	RED	个分组属性上的取值是不同的。
S	35000	GRE	• 组与组之间依据它们的分组属性值进
C	27000	BLU	行了排序。
S	29000	RED	11 1 AIL \ 1, 0
S SQL分组选择示例	29000	BLU	4

JOB	SAL	DEP		JOB	SAL	DEP
S	31000	BLU		С	27000	BLU
				_		
S	30000	BLU		S	31000	BLU
C	27000	GRE		S	29000	BLU
S	33000	GRE		S	30000	BLU
S	32000	RED		С	27000	GRE
C	28000	GRE	GROUP BY DEP,JOB	C	28000	GRE
			V			
S	30000	RED		S	33000	GRE
				S	35000	GRE
S	31000	RED				
S	35000	GRE		S	32000	RED
C	27000	BLU		S	30000	RED
S	29000	RED		S	31000	RED
S SOL分组选择示例	29000	BLU		S	29000	RED

SAL **JOB DEP** C 27000 **BLU** SELECT DEP, JOB, AVG(SAL) FROM EMPL **BLU** S 31000 WHERE JOB <> 'M' S **BLU** 29000 **GROUP BY DEP, JOB** S **BLU** 30000 ORDER BY AVG(SAL) DESC C 27000 GRE 28000 GRE 根据SELECT子句进行如下统计: · 每一个小组(group)都单独进行统计; S 33000 GRE S 35000 GRE • 一个小组产生一条结果元组; S 32000 **RED** S 30000 **RED** S 31000 **RED** 29000 **RED**



DEP	JOB	AVG(SAL)	
BLU	C	27000	SELECT DEP, JOB, AVG(SAL) FROM EMPL
BLU	S	30000	WHERE JOB <> 'M' GROUP BY DEP, JOB ORDER BY AVG(SAL) DESC
GRE	С	27500	

RED S 30500

JOB	AVG(SAL)		DEP	JOB	AVG(SAL)
C	27000		GRE	S	34000
			RED	S	30500
S	30000		BLU	S	30000
			GRE	C	27500
			BLU	C	27000
С	27500	ORDER BY AVG(SAL)			
S	34000	DESC			
S	30500				
	C S	C 27000 S 30000 C 27500 S 34000	C 27000 S 30000 C 27500 ORDER BY AVG(SAL) DESC S 34000	C 27000 S 30000 GRE RED BLU GRE BLU GRE BLU S 34000	C 27000 S 30000 C 27500 C 27500 ORDER BY AVG(SAL) DESC S 34000

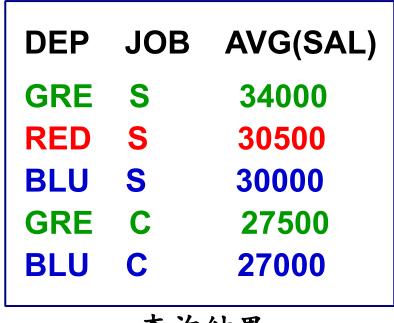
JOB	SAL	DEF
S	31000	BLU
M	32000	RED
S	30000	BLU
C	27000	GRE
S	33000	GRE
M	31000	BLU
S	32000	RED
C	28000	GRE
S	30000	RED
M	33000	GRE
S	31000	RED
S	35000	GRE
C	27000	BLU
S	29000	RED
S SOL分组选择示例	29000	BLU

SAI

DFP

JOR

SELECT DEP, JOB, AVG(SAL)
FROM EMPL
WHERE JOB <> 'M'
GROUP BY DEP, JOB
ORDER BY AVG(SAL) DESC



查询结果

Example of GROUP BY+HAVING

- □分组选择子句: HAVING group_condition
 - ▶根据GROUP BY子句的分组结果, 定义分组选择条件
 - 在HAVING子句中给出的查询条件是定义在分组后的元组集合上的,通常是根据该集合上的 某种统计计算的结果来定义查询条件
 - 只有满足条件group_condition的元组集合才会被保留下来,用于生成最终的查询结果

Example of GROUP BY+HAVING

□ GROUP BY & HAVING此两子句可以对映像语句所得到的集合元组分组(用GROUP BY子句),并还可利用HAVING子句设置逻辑条件

SELECT DEP, JOB, AVG(SAL)
FROM EMPL
WHERE JOB <> 'M'
GROUP BY DEP, JOB
HAVING AVG(SAL) > 28000
ORDER BY AVG(SAL) DESC

JOB	SAL	DEP
S	31000	BLU
M	32000	RED
S	30000	BLU
C	27000	GRE
S	33000	GRE
M	31000	BLU
S	32000	RED
C	28000	GRE
S	30000	RED
M	33000	GRE
S	31000	RED
S	35000	GRE
C	27000	BLU
S	29000	RED
S SQL分组选择示例	29000	BLU

SELECT DEP, JOB, AVG(SAL)
FROM EMPL
WHERE JOB <> 'M'
GROUP BY DEP, JOB
HAVING AVG(SAL)>28000
ORDER BY AVG(SAL) DESC

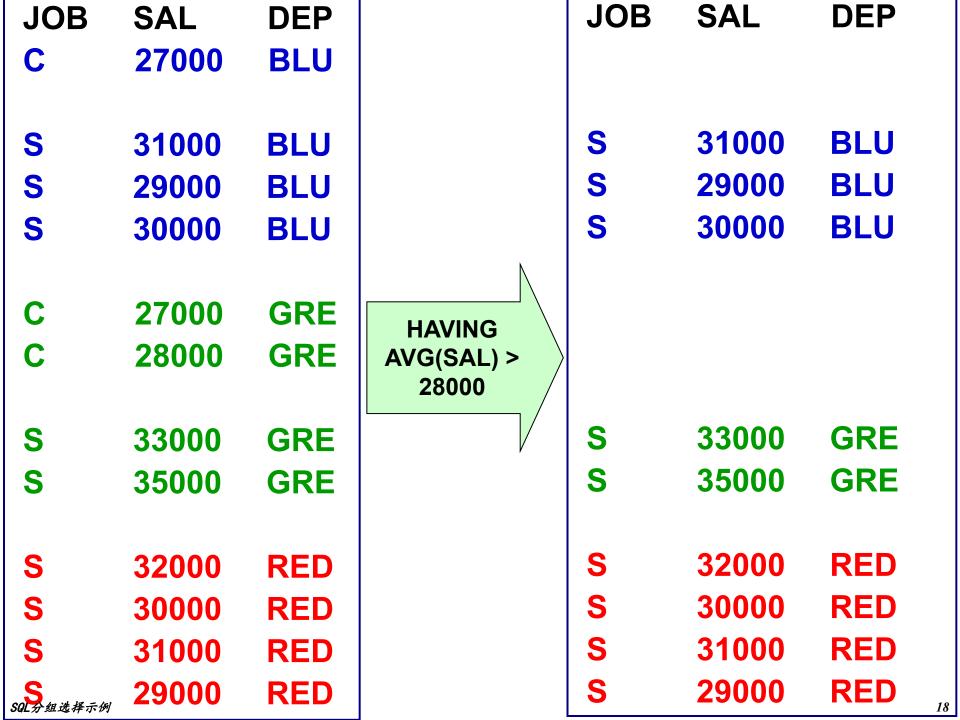
首先根据WHERE子句进行查询,得 到待统计的元组集合

JOB	SAL	DEP		JOB	SAL	DEP
S	31000	BLU		S	31000	BLU
M	32000	RED				
S	30000	BLU		S	30000	BLU
C	27000	GRE		С	27000	GRE
S	33000	GRE		S	33000	GRE
M	31000	BLU				
S	32000	RED	WHERE JOB<>'M'	S	32000	RED
C	28000	GRE		С	28000	GRE
S	30000	RED		S	30000	RED
M	33000	GRE				
S	31000	RED		S	31000	RED
S	35000	GRE		S	35000	GRE
C	27000	BLU		C	27000	BLU
S	29000	RED		S	29000	RED
S SOL分组选择示例	29000	BLU		S	29000	BLU 14

JOB	SAL	DEP	
S	31000	BLU	SELECT DEP, JOB, AVG(SAL)
			FROM EMPL
S	30000	BLU	WHERE JOB <> 'M'
C	27000	GRE	GROUP BY DEP, JOB
			HAVING AVG(SAL)>28000
S	33000	GRE	ORDER BY AVG(SAL) DESC
S	32000	RED	• 根据GROUP属性上的取值,将元组集
C	28000	GRE	合划分成若干个小组(子集);
S	30000	RED	+
			• 在同一个小组中,分组属性上的取值
S	24000	DED	都相同;不同小组之间,至少在某一
	31000	RED	个分组属性上的取值是不同的。
S	35000	GRE	• 组与组之间依据它们的分组属性值进
C	27000	BLU	行了排序。
S	29000	RED	11 1 41L\1.0
S SOL分组选择示例	29000	BLU	15
CULN SERVENT IN P.	1		I I I

JOB	SAL	DEP		JOB	SAL	DEP
S	31000	BLU		С	27000	BLU
S	30000	BLU		S	31000	BLU
C	27000	GRE		S	29000	BLU
S	33000	GRE		S	30000	BLU
S	32000	RED		С	27000	GRE
			GROUP BY DEP,JOB	C	28000	GRE
C	28000	GRE	/			
S	30000	RED		S	33000	GRE
				S	35000	GRE
S	31000	RED				
S	35000	GRE		S	32000	RED
C	27000	BLU		S	30000	RED
S	29000	RED		S	31000	RED
S SOL分组选择示例	29000	BLU		S	29000	RED

SAL **JOB** DEP 27000 **BLU** C SELECT DEP, JOB, AVG(SAL) FROM EMPL S **BLU** 31000 WHERE JOB <> 'M' S 29000 **BLU GROUP BY DEP, JOB** S 30000 **BLU** HAVING AVG(SAL)>28000 ORDER BY AVG(SAL) DESC C 27000 **GRE** 28000 GRE 根据HAVING子句进行如下GROUP选择: · 对每一个小组(group),都按照 S GRE 33000 HAVING子句的要求进行统计计算: S 35000 GRE • 如果一个group的统计结果满足 HAVING子句的要求,那么该group S 32000 **RED** 将被保留下来, 否则整个group将被 S 30000 **RED** 舍弃: S 31000 **RED** 29000 **RED** 17



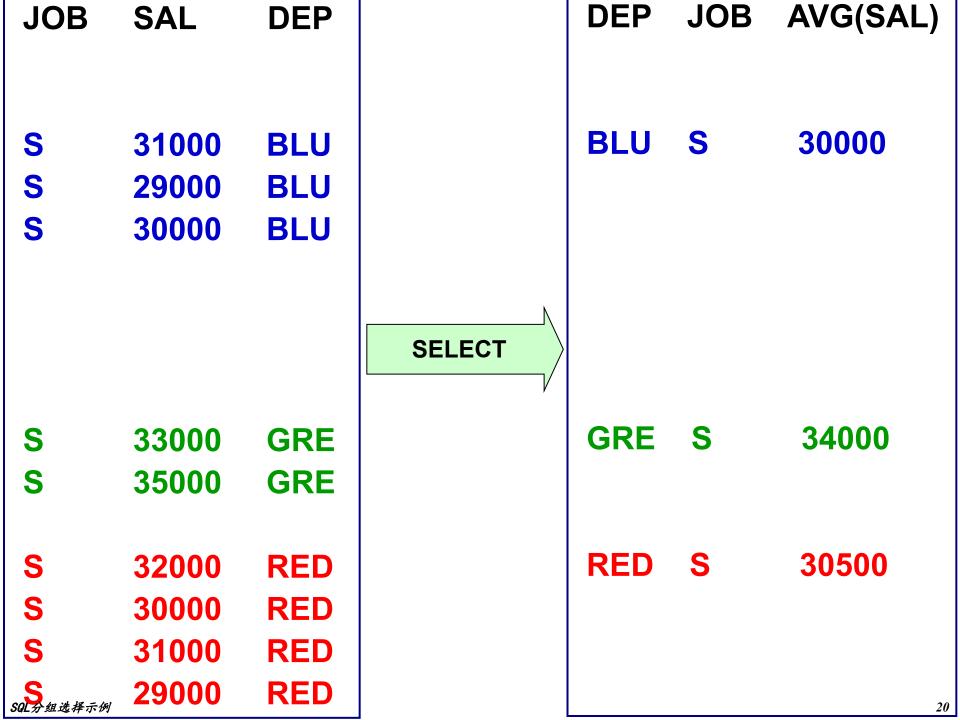
JOB	SAL	DEP	
S S S	31000 29000 30000	BLU BLU BLU	SELECT DEP, JOB, AVG(SAL) FROM EMPL WHERE JOB <> 'M' GROUP BY DEP, JOB HAVING AVG(SAL)>28000 ORDER BY AVG(SAL) DESC
S	33000 35000	GRE GRE	根据SELECT子句进行如下统计: • 每一个小组(group)都单独进行统计;
S	32000	RED	• 一个小组产生一条结果元组;

S 31000 RED S 29000 RED

S

30000

RED



BLU	S	30000	WHERE JOB <> 'M' GROUP BY DEP, JOB HAVING AVG(SAL)>28000 ORDER BY AVG(SAL) DESC	
GRE	S	34000	根据ORDER BY子句的要求,对结果元组进行排序输出。	
RED	S	30500		
SQL分组选择示例	V			21

FROM EMPL

SELECT DEP, JOB, AVG(SAL)

DEP JOB AVG(SAL)

DEP JOB AVG(SAL) DEP JOB AVG(SAL) GRE S 34000 RED S 30500 30000 S 30000 **BLU BLU** S **ORDER BY** AVG(SAL) **DESC** GRE S 34000

SQL分组选择示例 22

30500

RED

S

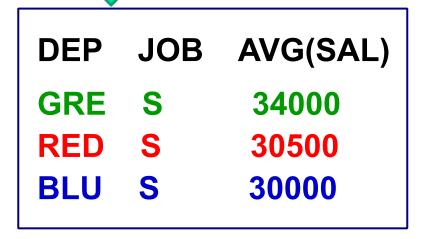
S	31000	BLU
M	32000	RED
S	30000	BLU
C	27000	GRE
S	33000	GRE
M	31000	BLU
S	32000	RED
C	28000	GRE
S	30000	RED
M	33000	GRE
S	31000	RED
S	35000	GRE
C	27000	BLU
S	29000	RED
S SQL分组选择示例	29000	BLU

SAL

DEP

JOB

SELECT DEP, JOB, AVG(SAL)
FROM EMPL
WHERE JOB <> 'M'
GROUP BY DEP, JOB
HAVING AVG(SAL)>28000
ORDER BY AVG(SAL) DESC



查询结果

SELECT语句执行的一般规则

- 1. 合并FROM子句中的表(笛卡儿乘积);
- 2. 利用WHERE子句中的条件进行元组选择,抛弃 不满足WHERE条件的那些元组;
- 3. 根据GROUP BY子句对保留下来的元组进行分组;
- 4. 利用HAVING子句中的条件对分组后的元组集合 (group)进行选择,抛弃不满足HAVING条件的那些元组集合;
- 5. 根据SELECT子句进行统计计算,生成结果关系中的元组: a group → a result row
- 6. 根据ORDER BY子句对查询结果进行排序。