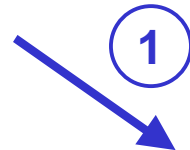


department listing	
department	name
αρχουντσ	φανε βαλικτ
δδσφιασδδη	σδηφγ ασκφηλκ
τεχνηνιχαλ	αλαν φουν διξ
τεχνηνιχαλ	φοην μαριανι

Jenny starts with the departmental listing.  
This has employees listed within department

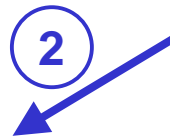


She drills down through the employee name.  
The inferred ER sttructure relates this to the payroll redcords in the databasee and the project members in the spreadsheet.

department listing	
department	name
αρχουντσ	φαν
δδσφιασδδη	σδη
τεχνηνιχαλ	αλα
τεχνηνιχαλ	φοην

payroll.empname  
projects.member

She selects the payroll option.



department listing	
department	name
αρχουντσ	φαν
δδσφιασδδη	σδη
τεχνηνιχαλ	αλα
τεχνηνιχαλ	φοην

payroll.empname  
projects.member



The additional fields from the payroll record are added as columns. Note the name field from the payroll does not appear at this point as she has 'come from' the name already. Note also that the 'payroll' title and 'salary' column name are slightly lower to show they are drilled down from the department level.

department listing		payroll
department	name	salary
αρχουντσ	φανε βαλικτ	34628
δδσφιασδδη	σδηφγ ασκφηλκ	16389
τεχνηνιχαλ	αλαν φουν διξ	17284
τεχνηνιχαλ	φοην μαριανι	29784

department listing		payroll
department	name	salary
αρχουντσ	φανε βαλικτ	34628
δδσφιασδδη	σδηφγ ασκφηλκ	16389
τεχνηνιχαλ	αλαν φουν διξ	17284
τεχνηνιχαλ	φοην μαριανι	29784

Jenny drills down a second time through the name field. This time the payroll option is greyed out as this is already expanded.

department listing		payroll
department	name	
αρχουντσ	φαν	<div>payroll.empname</div> <div>projects.member</div>
δδσφιασδδη	σδη	
τεχνηνιχαλ	αλαν	
τεχνηνιχαλ	φοην μαριανι	
		29784

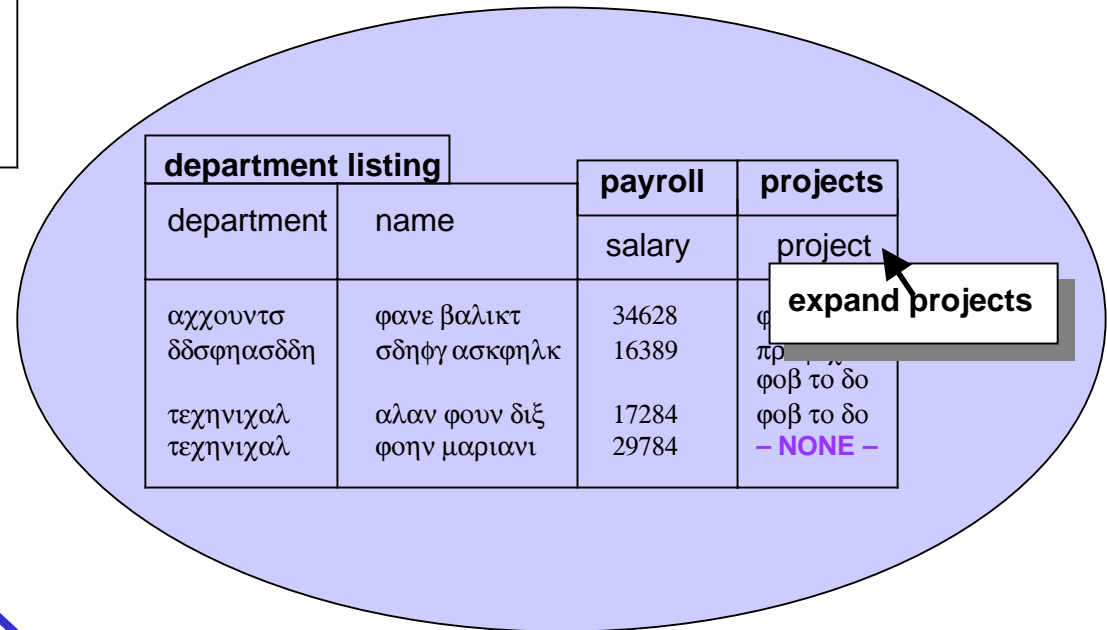
department listing		payroll
department	name	
αρχουντσ	φαν	<div>payroll.empname</div> <div>projects.member</div>
δδσφιασδδη	σδη	
τεχνηνιχαλ	αλαν	
τεχνηνιχαλ	φοην μαριανι	
		29784

She selects projects and against each person is listed the projects they are involved in. Note that there may be several project lines listed per person or none. Note also that the 'projects' title is at the same level as 'payroll' as they are both drilled down from department.

department listing		payroll	projects
department	name	salary	project
αρχουντσ	φανε βαλικτ	34628	φοβ το δο
δδσφιασδδη	σδηφγ ασκφηλκ	16389	προφεχτ
τεχνηνιχαλ	αλαν φουν διξ	17284	φοβ το δο
τεχνηνιχαλ	φοην μαριανι	29784	- NONE -

department listing		payroll	projects
department	name	salary	project
αρχουντσ δδσφιασδδη	φανε βαλικτ σδηφγ ασκφηλκ	34628 16389	φοβ το δο προφεχτ φοβ το δο
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ φοην μαριανι	17284 29784	φοβ το δο - NONE -

It would be possible at this point to drill down through projects, getting a list of people for each project. This would make oot possible to finf all the people who are in the same project as someone. This would not be part of a normal universal relation.



7

Instead, she decides to create a new column. She is sleecting from the name in the department listing so gets a column that has one entry per person. Selecting 'insert column' on the project column would give one field per project.

department listing		payroll	projects
department	name	salary	project
αρχουντσ δδσφιασδδη	σδηφγ ασκφηλκ	16389	φοβ το δο προφεχτ φοβ το δο
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ φοην μαριανι	17284 29784	φοβ το δο - NONE -

department listing		payroll	projects
department	name	salary	project
αρχουντσ δδσφιασδδη	σδηφγ ασκφηλκ	16389	φοβ το δο προφεχτ φοβ το δο
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ φοην μαριανι	17284 29784	φοβ το δο - NONE -

The column is added at the end, but note that its column header is at the same level as 'department' and 'name'. Jenny is able to name the column and enter a formula for it. The formula 'count(project)' is interpreted like and SQL calculation if there were a 'group by name' clause.

8

department listing		payroll	projects	new col
department	name	salary	project	
αρχουντσ δδσφιασδδη	φανε βαλικτ σδηφγ ασκφηλκ	34628 16389	φοβ το δο προφεχτ φοβ το δο	<div> <div>=</div> <div> <div>name</div> <div>nos proj</div> <div>formula</div> <div>count(project)</div> </div> </div>
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ φοην μαριανι	17284 29784	φοβ το δο - NONE -	

9

The column is added and the formulae evaluated. Note that the second employee has a two projects, so 'nos proj' is 2, but the last employee is in no project, so 'nos proj' is zero.

department listing		payroll	projects	nos proj
department	name	salary	project	
αρχουντσ δδσφιασδδη	φανε βαλικτ σδηφγ ασκφηλκ	34628 16389	φοβ το δο προφεχτ φοβ το δο	1 2
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ φοην μαριανι	17284 29784	φοβ το δο - NONE -	1 0

department listing		payroll	projects		
department	name	salary	project	nos proj = ...	new col =
αρχουντσ δδσφιασδδη	σδηφγ ασκφηλκ	34628	φοβ το δο	1	
	σδηφγ ασκφηλκ	16389	προφεχτ φοβ το δο	2	
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ	17284	φοβ το δο	1	
	φοην μαριανι	29784	- NONE -	0	

**name** proj cost

**formula** salary/nos proj

10

Jenny inserts a second column, also at the one per name level, and calls it 'proj cost'. The formula uses the previous inserted column 'nos proj' and the 'salary' field from the payroll.

This field is the employees salary divided by the number of projects to give an approximate cost per project.

Note that one of the employees is in no projects, so has an undefined value for the formula, but this is to be expected.

department listing		payroll	projects		
department	name	salary	project	nos proj = ...	proj cost = ...
αρχουντσ δδσφιασδδη	σδηφγ ασκφηλκ	34628	φοβ το δο	1	34628
	σδηφγ ασκφηλκ	16389	προφεχτ φοβ το δο	2	8194
τεχνηνιχαλ τεχνηνιχαλ	αλαν φουν διξ	17284	φοβ το δο	1	8642
	φοην μαριανι	29784	- NONE -	0	#####

department listing		payroll	projects		
department	name	salary	project	nos proj	proj cost
αρχουντσ	σδηφγ ασκφηλκ	34628			34628
δδσφηασδδη	σδηφγ ασκφηλκ	16389			8194
τεχνηνιχαλ	αλαν φουν διξ	17284	φοβ το δο	1	8642
τεχνηνιχαλ	φοην μαριανι	29784	φοβ το δο	0	#####
			- NONE -		

11

Jenny pivots the table so that it is sorted by project. Notice now that there are three levels of headings, because payroll is drilled from department listing and department listing (one per person) is now drilled from projects.

Notice the 2nd and 4th row are the same employee listed under two different projects. See how the salary has been split between the projects.

projects					
project	department listing		payroll		
	department	name	salary	nos proj	proj cost
φοβ το δο	αρχουντσ	σδηφγ ασκφηλκ	34628	1	34628
	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194
προφεχτ	τεχνηνιχαλ	αλαν φουν διξ	17284	1	8642
	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194
- NONE -	τεχνηνιχαλ	φοην μαριανι	29784	0	#####

projects						
project	department listing		payroll			new col
	department	name	salary	<div><div>nos proj</div><div>= ...</div></div>	<div><div>proj cost</div><div>= ...</div></div>	<div><div>=</div></div>
φοβ το δο	αχχουντσ	σδηφγ ασκφηλκ	34628	1	34628	<div><div>name</div><div>total cost</div><div>formula</div><div>sum(proj cost)</div></div>
	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	
	τεχνηνιχαλ	αλαν φουν διξ	17284	1	8642	
προφεχτ	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	
- NONE -	τεχνηνιχαλ	φοην μαριανι	29784	0	#####	

12

Jenny inserts another column, this time at the project level (one field per project). She enters a formula summing the person by person costs over each project.

See how this gives a single cost for each project.

Noet also the level of the 'total cost' column header and the dashed line to help see what columns are at what level. If the table were going to be left like this Jenny might have moved this column over to the right of the project column to make it easier to read.

projects						
project	department listing		payroll	nos proj	proj cost	total cost
	department	name	salary			= ...
φοβ το δο	αχχουντσ	σδηφγ ασκφηλκ	34628	1	34628	51464
προφεχτ	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	8194
	τεχνηνιχαλ	αλαν φουν διζ	17284	1	8642	
	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	
- NONE -	τεχνηνιχαλ	φοην μαριανι	29784	0	#####	#####

select and hide these columns

projects						
project	department listing		payroll			total cost
	department	name	salary	nos proj = ...	proj cost = ...	= ...
φοβ το δο	αρχουντσ	σδηφγ ασκφηλκ	34628	1	34628	51464
	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	
	τεχνηχαλ	αλαν φουν διξ	17284	1	8642	
προφεχτ	δδσφηασδδη	σδηφγ ασκφηλκ	16389	2	8194	8194
- NONE -	τεχνηχαλ	φσην μαριανι	29784	0	#####	#####

13

Jenny now hides all the columns apart from 'project' and 'total cost'. The 'null' column in the full table no longer corresponds to any selected entity so is suppressed by default.

This is precisely the information Jenny requires for her boss!

projects	
project	total cost = ...
φοβ το δο	51464
προφεχτ	8194