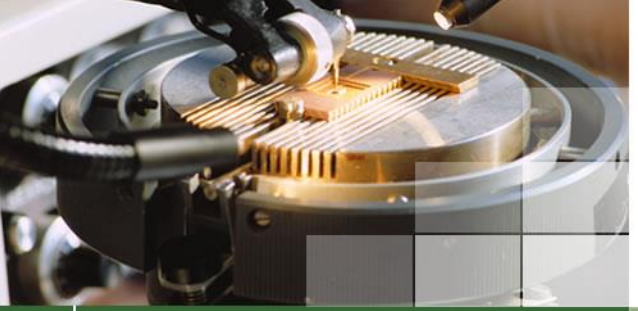


POLITECNICO DI MILANO

Dipartimento di
Elettronica e Informazione

Planning and Managing Software Projects 2012-13

Class 15

Hands on Microsoft Project (Part II)

From a WBS to a Complete Schedule

Emanuele Della Valle, Lecturer: Dario Cerizza

http://emanueledellavalle.org

Credits

- These slides are partially based on CEFRIEL slides for PMI Course and Certification

How to attend MSFT Project Labs lessons

I discuss some slides introducing tool features

- Please, follow the slides
- DO NOT try to use the tool now

I demonstrate the previously discussed features using my PC

- If you feel confident, you can try yourself to reproduce my operations on your/lab PC

I give you enough time to perform a practical exercise

- You have to use the tool on your/lab PC
- Feel free to call me at your desk for on-demand support

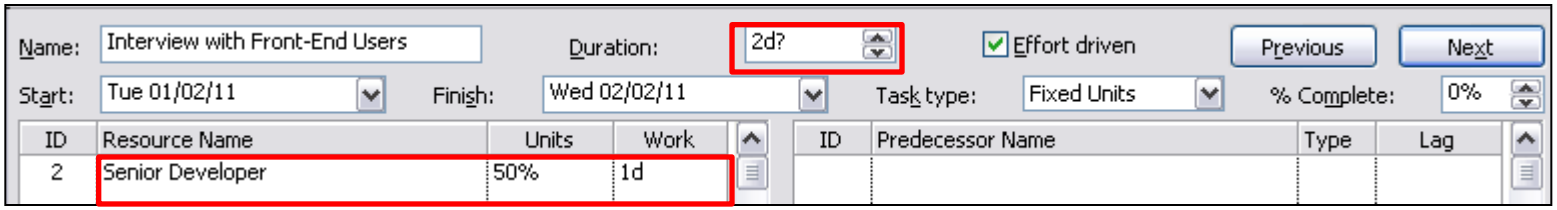
Today Agenda

- Microsoft Project Fundamentals

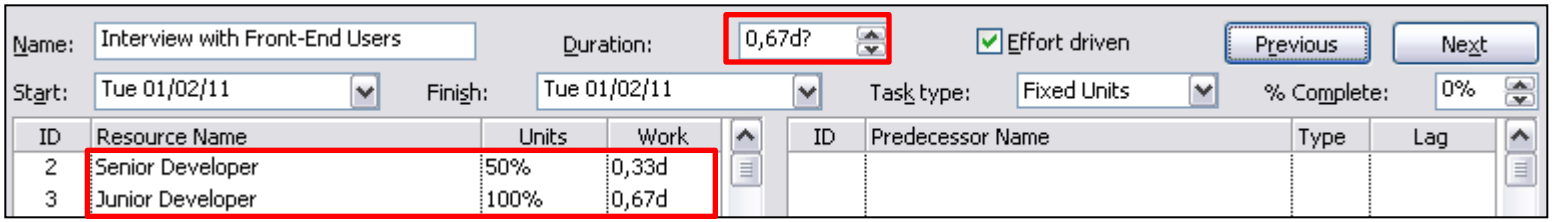
1. Define Activities (WBS)
2. Sequence Activities
3. Estimate Work
4. Define Resources
5. Allocate Resources
6. Inspect Schedule (so far, these have been discussed in class10)
7. **Refine Schedule**
8. Level Resources
9. Control Project (this will be discussed in class 17)

Refine Schedule

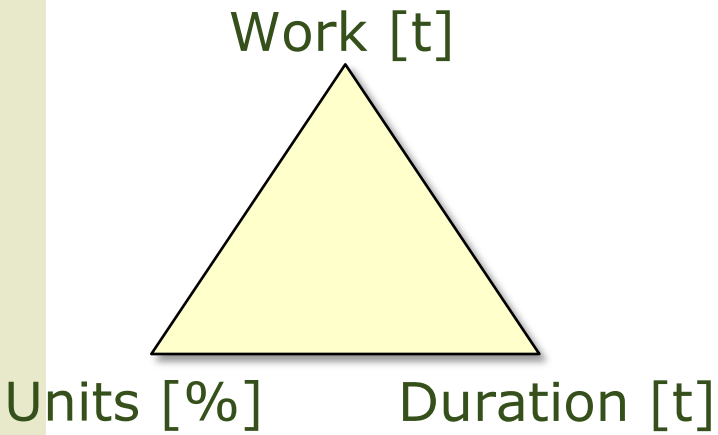
- The Project Manager needs to refine the plan by:
  - Changing the work estimated for a task
  - Changing the units of resources on a task
  - Changing the duration of a task
  - Adding or removing resources to a task
- Let's add the Junior Developer to a Task
  - Resources change from:



  - To:



Duration, Units and Work proportion



$$Duration[t] = \frac{Work[t]}{Units[\%]} * 100$$

$$Work[t] = Duration[t] * \frac{Units[\%]}{100}$$

$$Units[\%] = \frac{Work[t]}{Duration[t]} * 100$$

- If Units = 50% & Work = 1 day ➔ Duration = 2 days
- If Units = 100% & Work = 5 days ➔ Duration = 5 days
- If Duration = 3 days & Units = 50% ➔ Work = 1.5 days
- If Duration = 4 days & Work = 1 day ➔ Units = 25%

This proportion is always kept consistent by MS Project!

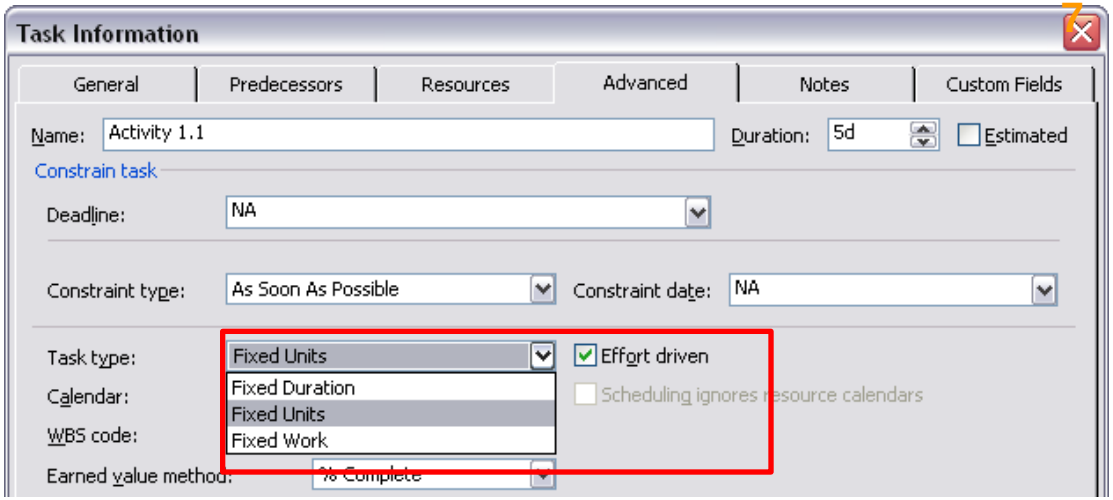
Task Types

Fixed Duration, Fixed Units, Fixed Work

1. Double Click on a task
2. Go to the Advanced tab
3. Open Task Type menu

   or

1. Use the contextual Task Form



- **Fixed Duration**: when the duration of a task is known at priori or defined by external agents
  - E.g. meetings, outsourcing a task with a contract that defines the duration, supporting customers for a defined period, …
- **Fixed Work**: when efforts are estimated on tasks
  - E.g. the majority of tasks where people work (writing docs, development, testing, …)
- **Fixed Units** (MS Project default): when resources are allocated to a task for a fixed unit regardless of duration and work
  - E.g. providing support for undefined period

Fixed Duration, Fixed Units, Fixed Work

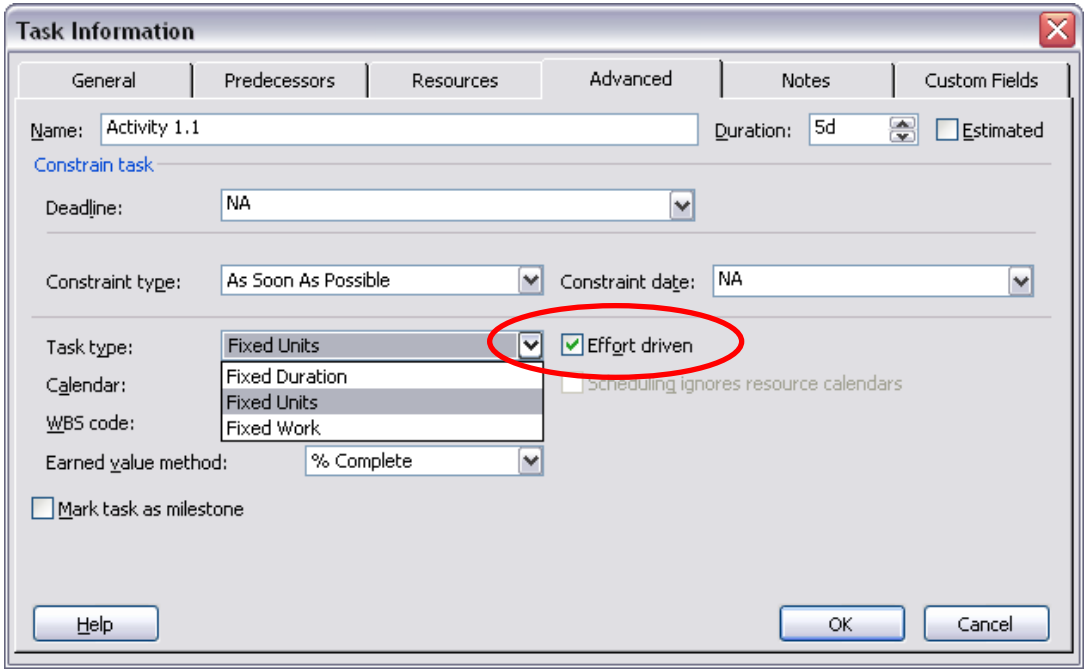
In a	If you revise Duration	If you revise Units	If you revise Work
Fixed Duration task	Work is recalculated	Work is recalculated	Units are recalculated
Fixed Units task	Work is recalculated	Duration is recalculated	Duration is recalculated
Fixed Work task	Units are recalculated	Duration is recalculated	Duration is recalculated

Cases on the diagonal are not trivial:

- If the task is not a "Fixed Duration" task → Microsoft Project recalculates Duration
- If the task is a "Fixed Duration" task → Microsoft Project recalculates Work

Effort Driven

1. Double Click on a task
2. Go to the Advanced tab
3. Check or uncheck Effort Driven



- If Effort Driven is selected (default)
  - Adding or removing resources to the task <u>does not affect</u> the total work associated to the task (duration and units change depending on the task type)
- If Effort Driven is not selected
  - Adding or removing resources to the task <u>affects</u> the total work

Summary of Task Types

Fixed Duration, Effort Driven (e.g. support with defined duration and work)

- Duration is never changed automatically
- Changing duration or Units changes task work
- Changing work or adding or removing resources changes resource units

★ Fixed Duration, Non-Effort Driven (e.g. meetings)

- Duration is never changed automatically
- Changing duration or changing, adding or removing resources changes task work
- Changing work changes resource units

★ Fixed Unit, Effort Driven (Microsoft Project default option)

- Units are never changed automatically
- Changing duration changes task work
- Changing work or changing, adding or removing resources changes duration

Fixed Unit, Non-Effort Driven (e.g. rented resources)

- Units are never changed automatically
- Changing duration or adding or removing resources changes task work
- Changing work or changing resources changes duration

★ Fixed Work, Effort Driven (my preference for common tasks)

- Work is never changed automatically
- Changing duration changes resource units
- Changing work or changing, adding or removing resources changes duration

Fixed Work, Non-Effort Driven (this case is not allowed by MS Project)

Source: Dustin Kassman, http://forums.project.net/showthread.php?t=612

Quick selection of task types

1. Right click on the Start Column
2. Insert Column
3. Select Type
4. Right click on the Start Column
5. Insert Column
6. Select Effort Driven

	Task Name	Duration	Work	Type	Effort Driven	Start	Finish
1	**– Requirements Analysis and Software Specification**	**7 days?**	**13 days**	**Fixed Duration**	**No**	**Tue 01/02/11**	**Wed 09/02/11**
2	Interview with Front-End Users	2 days?	1 day	Fixed Units	Yes	Tue 01/02/11	Wed 02/02/11
3	Interview with Back-End Users	1 day?	1 day	Fixed Units	Yes	Tue 01/02/11	Tue 01/02/11
4	Interview with Stakeholders	2 days?	1 day	Fixed Units	Yes	Wed 02/02/11	Thu 03/02/11
5	Write Requirements Analisys document	4 days?	5 days	Fixed Units	Yes	Fri 04/02/11	Wed 09/02/11
6	Define and write Software Specification	5 days?	5 days	Fixed Units	Yes	Thu 03/02/11	Wed 09/02/11
7	Requirement Analysis and Specification Document	0 days	0 days	Fixed Units	Yes	Wed 09/02/11	Wed 09/02/11

Refine Schedule

1. Per each Task
    1. Change the type of the task
        1. On meetings and milestones, set Fixed Duration and set the Duration
        2. On other tasks, set Fixed Units or Fixed Work
    2. Per each resource on the task
        1. Distribute effort concentrating operative work to juniors
        2. Change units and/or Change work appropriately
2. Add or remove allocated resources if necessary
3. Inspect how Microsoft Project update duration, units, work

	Task Name	Duration	Work	Type	Effort Driven
1	**– Requirements Analysis and Software Specification**	**6 days?**	**15 days**	**Fixed Duration**	**No**
2	Interview with Front-End Users	1 day	2 days	Fixed Duration	No
3	Interview with Back-End Users	1 day	1 day	Fixed Duration	No
4	Interview with Stakeholders	1 day	2 days	Fixed Duration	No
5	Write Requirements Analisys document	4 days?	5 days	Fixed Work	Yes
6	Define and write Software Specification	4 days?	5 days	Fixed Work	Yes
7	Requirement Analysis and Specification Document	0 days	0 days	Fixed Duration	Yes
8	**– High-Level Design**	**3,5 days?**	**11 days**	**Fixed Duration**	**No**
9	Define General Architecture, Layers and Common Data	2 days?	3 days	Fixed Units	Yes
10	Define Interactions and Data Flows	2,5 days?	3 days	Fixed Units	Yes
11	Mock Graphic User Interfaces	2,5 days?	3 days	Fixed Units	Yes
12	Collect feedbacks from users and revise High-Level Design	1 day	2 days	Fixed Duration	No
13	High-Level Design Document	0 days	0 days	Fixed Duration	Yes

Practical Exercise n.3

- Refine the schedule
  1. Change tasks types
  2. External constraints are imposed to you and you have to refine your project:
     - Add another resource to a meeting
     - Increase effort on a task
     - Add a supporting resource to a task
     - Reduce the units% of a resource on a task
     - Make a task with shorter duration by adding a new resource (and increasing also the work)

     (Update each task and make your prediction before clicking the OK button)

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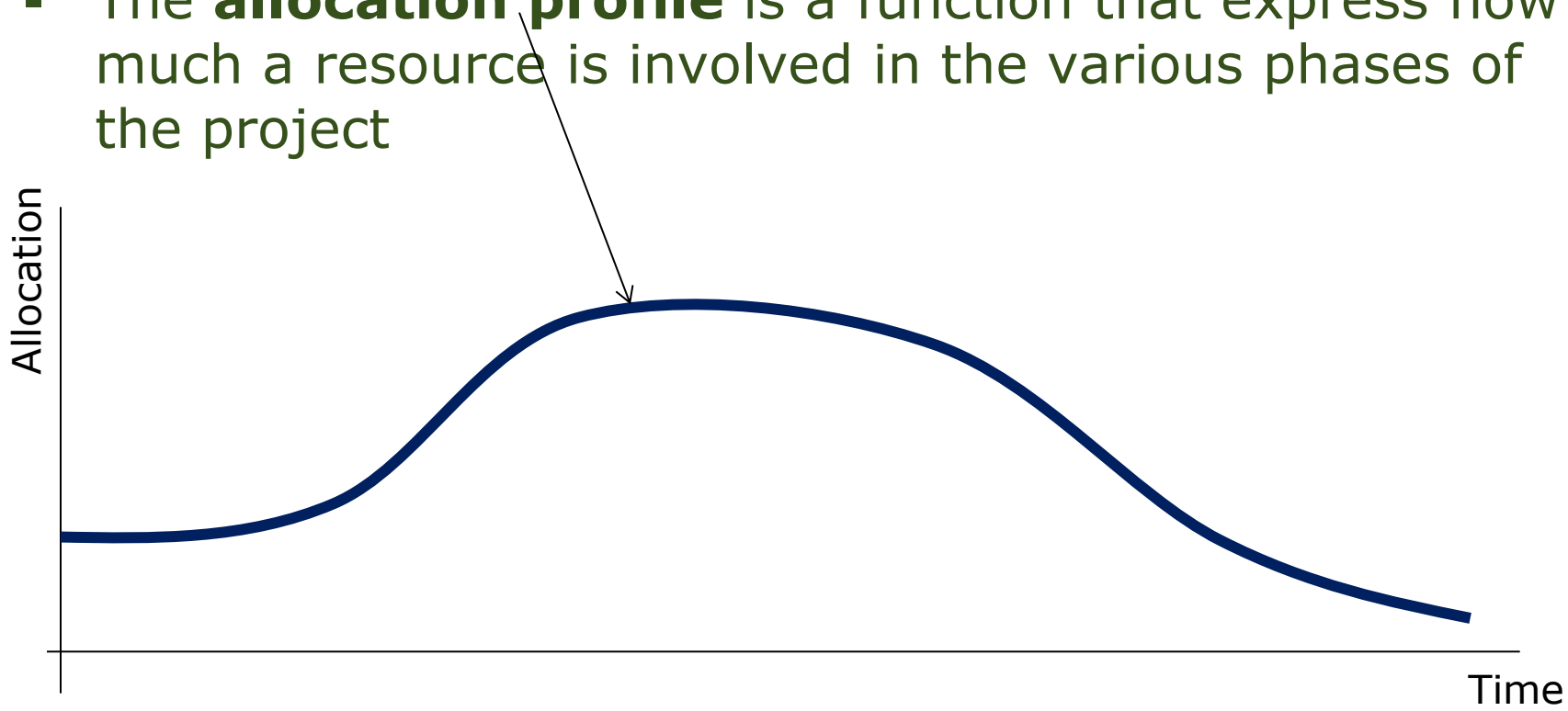
8. **Level Resources**
9. Control Project (this will be discussed in class 17)

Resources Allocation

- Each resource involved in the project has an **allocation** to the project
  - Allocation can be expressed in units (e.g. 50%, 100%) or work/effort in period (e.g. 5 half-days per week, 5 full days per week, 10 days per month, …)
- Resource allocation is derived by a formal or informal contract between the resource and the PM
  - 100% allocation could mean that
    - a resource is hired at full-time by the company (100% or 40 hours per week) and is totally allocated to one single project
  - 50% allocation could mean that
    - a resource is hired at full-time by the company and is totally and equally allocated to two projects
    - a resource is hired at full-time by the company and is totally allocated to five projects, but the current project has the 50% of the total work
    - a resource is hired at part-time by the company (50% or 20 hours per week) and is totally allocated to one project
    - …

Allocation Profile

- The allocation of a resource may vary in function of the phase of the project and the role of the resource
  - Some resources are more allocated at the beginning, others in the middle, others in the end
- The **allocation profile** is a function that express how much a resource is involved in the various phases of the project



Allocation Profiles for Typical Roles

1. **Project Managers** and **Technical Managers** follow the whole project with a slightly major peak at the beginning and near important milestones
2. **Software Architects** and **Software Designers** are mainly involved at the beginning of the project with occasional involvement during project life
3. **Junior developers** are mainly involved in the middle of the project with a medium allocation till the end of the project
4. **Software Integrators** and **Testers** are mainly involved at the end of the project (or at the end of each cycle)
5. **Specialists** and **Subject Matter Experts** (DB admin, System admin, guru) are occasionally involved on demand during project life
6. **Senior developers** may cover roles 2, 3 and 4

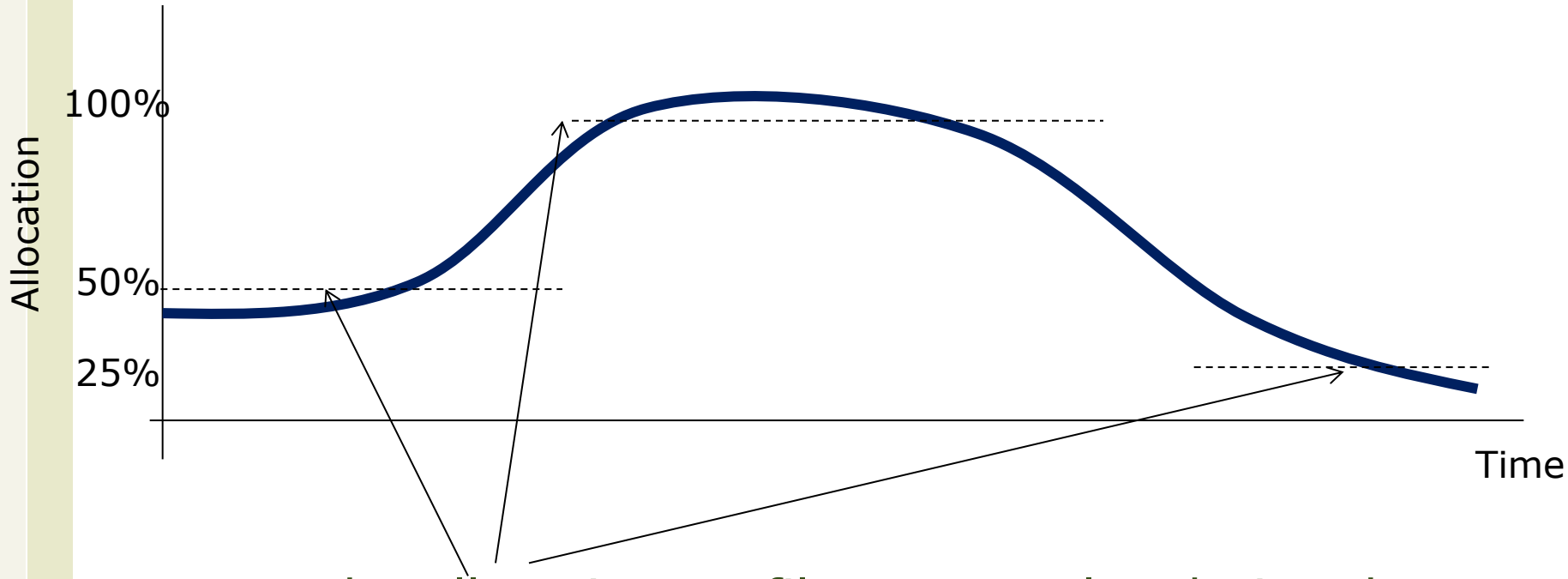
- Note: resources shared with other projects may have allocation peaks for short-terms (few days) provided that their average allocation is respected on longer-terms

What is Resource Leveling

- **Resource Leveling** is a technique:
  - to examine unbalanced use of resources
  - to refine plan to solve over-allocations and conflicts
- Goal: to avoid over-allocation and under-allocation
  - Sub-goal: smooth allocation profile
- When a resource is well allocated to a project?
  - It's well allocated when the following factors are very similar
    1. The theoretical allocation derived by contracts, by resource roles and by project life-cycle
    2. The planned allocation, derived by the project management tool (e.g. MSFT Project)
    3. The real-world allocation
  - Here we focus in coping with factors 1 and 2
    - (factor 3 is part of people dimension and project control)

Theoretical Allocation Profile

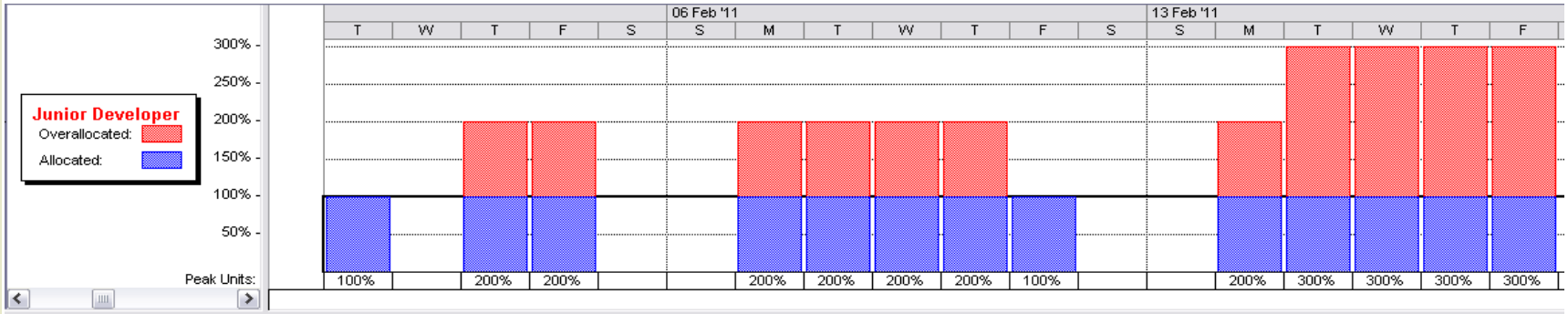
- It's derived by:
  - the contract with the resource (e.g. 50%, 100%, …)
  - the role of the resource in the project
  - the project cycle



- From the allocation profile we can also derive the Average Allocation (AA) in a given period of time

Planned Allocation Profile

- Click on the top window -> View (from menu) -> Resource Graph
- Click on the bottom window -> View (from menu) -> Resource Usage
- Zoom and scroll to see daily allocation



	Resource Name	Details	06 Feb '11												13 Feb '11					
			T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
3	Junior Developer	Work	1d		2d	2d			2d	2d	2d	2d	0,5d			1d	1,5d	3d	3d	3d
	Interview with Back-End U	Work	1d																	
	Write Requirements Anali	Work			1d	1d			1d	1d										
	Define and write Software	Work			1d	1d			1d	1d										
	Define General Architectu	Work									1d	1d								
	Define Interactions and D	Work									1d	1d	0,5d							
	Detailed Design	Work														0,5d				
	Development	Work															0,5d	1d	1d	1d
	Testing	Work																		
	Detailed Design	Work														0,5d				
	Development	Work															0,5d	1d	1d	1d
	Testing	Work																		
	Development	Work															0,5d	1d	1d	1d

- The Junior Developer is badly allocated: some days he is over-allocated and other days he is under-allocated
- **This resource must be leveled!**

A process for Resource Leveling

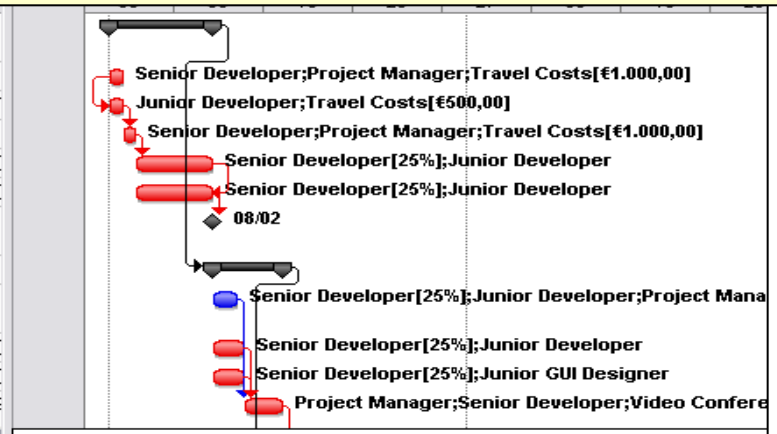
1. Overview the project on a suitable time perspective
2. Identify the first time slot when a resource is badly allocated
3. Identify the tasks on which the resource is highly involved
4. Level the resources on the identified tasks
5. Check if other resources are badly allocated in the time slot and revise previous leveling
6. Repeat from 2 until the end of the project
7. Repeat from 1 with a more detailed time perspective (zoom in)

We are going to detail each step in the following slides

A process for Resource Leveling
1) Overview the project on a suitable time perspective

- Visualize Gantt Chart on top and Resource Usage on bottom
- Hide not necessary columns (e.g. start & finish), show task ID in bottom window
- Act on the zoom level to have between 5 and 20 time slots
  - If a project last 2 weeks, zoom to days
  - If the project last 2 months, zoom to weeks *(as in this case)*
  - If the project last 1 year, zoom to months
  - Microsoft Project supports also intermediate zoom levels

1	**Requirements Analysis and Software Specification**	**6 days?**	**15 days**		
2	Interview with Front-End Users	1 day	2 days		Senior Developer;
3	Interview with Back-End Users	1 day	1 day	2SS	Junior Developer;
4	Interview with Stakeholders	1 day	2 days	3	Senior Developer;
5	Write Requirements Analisys document	4 days?	5 days	4	Senior Developer[
6	Define and write Software Specification	4 days?	5 days	5FF	Senior Developer[
7	Requirement Analysis and Specification Document	0 days	0 days	6	
8	**High-Level Design**	**3,5 days?**	**11 days**	**1**	
9	Define General Architecture, Layers and Common Data	2 days?	3 days		Senior Developer[
10	Define Interactions and Data Flows	2,5 days?	3 days		Senior Developer[
11	Mock Graphic User Interfaces	2,5 days?	3 days		Senior Developer[
12	Collect feedbacks from users and revise High Level Design	1 day	2 days	9;10;11	Project Manager;S

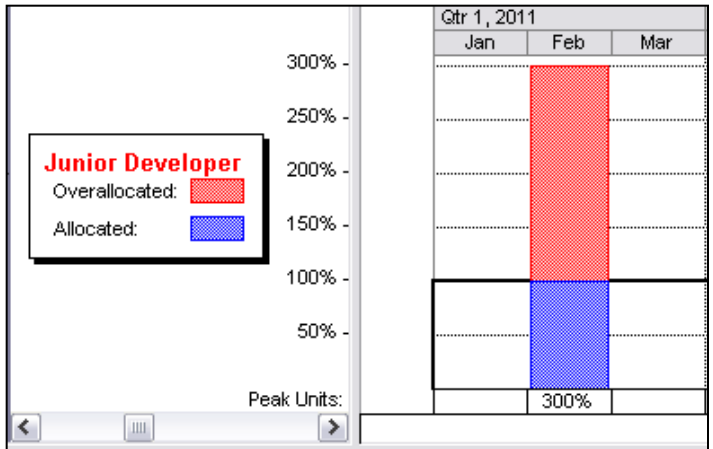


	Resource Name	Type	Material Label	Initials	Group
1	**Project Manager**	**Work**		**PM**	
	Interview with Front-End Users	*Work*		*PM*	
	Interview with Stakeholders	*Work*		*PM*	
	Define General Architecture, Layers an	*Work*		*PM*	
	Collect feedbacks from users and revis	*Work*		*PM*	
	Prepare and Show presentation to users	*Work*		*PM*	
	Collect user feedbacks	*Work*		*PM*	
	Define next evolutions	*Work*		*PM*	
	Project Management, Risk Managemen	*Work*		*PM*	
2	**Senior Developer**	**Work**		**SD**	

Details	Feb '11				Mar '11			
	30	06	13	20	27	06	13	20
Work	2,4d	1,5d	1d	0,63d	1,75d	1,75d	0,53d	
Work	1d							
Work	1d							
Work		0,5d						
Work		0,5d	0,5d					
Work				0,13d	0,88d			
Work					0,38d	0,13d		
Work						1,13d	0,38d	
Work	0,4d	0,5d	0,5d	0,5d	0,5d	0,5d	0,15d	
Work	3d	3d	2d	1,75d	1,25d	1,5d		

Note: Do not use Resource Graph View, Use Resource Usage View

- Zoom out and scroll to see monthly allocation



	Resource Name	Details	Qtr 1, 2011 Jan	Feb	Mar
3	**Junior Developer**	Work		35d	
	Interview with Back-End U	Work		1d	
	Write Requirements Anali	Work		4d	
	Define and write Software	Work		4d	
	Define General Architectu	Work		2d	
	Define Interactions and D	Work		2,5d	
	Detailed Design	Work		0,5d	
	Development	Work		5d	
	Testing	Work		1d	
	Detailed Design	Work		0,5d	
	Development	Work		5d	
	Testing	Work		1d	
	Development	Work		5d	
	Integration and Testing of	Work		1d	
	Integration and Testing of	Work		1d	
	Write user manual	Work		1,5d	

- The graphs shows that Junior Developer is 300% over allocated
- The table shows that he has to work 35 days in February
  - February has 20 working days, this means a real average allocation of 150%, not 300%!
- The graphs shows the maximum allocation in the period, not the average allocation!
  - For this reason, the graph is useful only to have warnings! Use the table to have the real total work of each resource!

2) Identify the first time slot when a resource is badly allocated

1. Select all Tasks
   - Click on the gray area on the left of column names and on the top of task IDs
2. Starting from project start, scroll down the Resource Usage window looking for a resource who is badly allocated. If not found, proceed with next time slot
   - The Junior Developer has to work 8.5 days in the week of 6th February!

	Task Name	Duration	Work	Predeces	Resource Names
1	**- Requirements Analysis and Software Specification**	**6 days?**	**15 days**		
2	Interview with Front-End Users	1 day	2 days		Senior Developer;
3	Interview with Back-End Users	1 day	1 day	2SS	Junior Developer;
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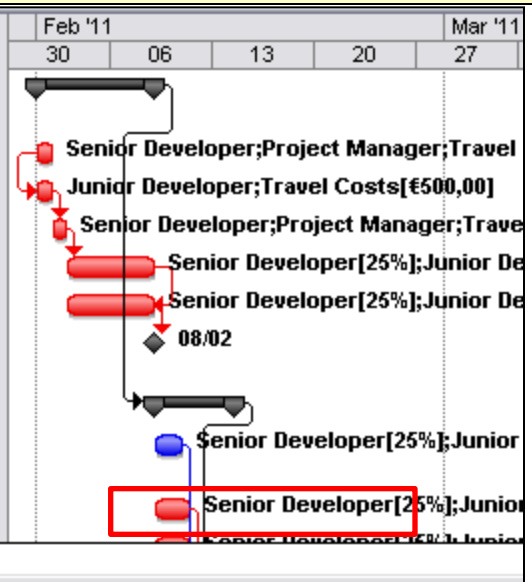
6	Define and write Software Specification	4 days?	5 days	5FF	Senior Developer[
7	Requirement Analysis and Specification Document	0 days	0 days	6	
8	**- High-Level Design**	**3,5 days?**	**11 days**	**1**	
9	Define General Architecture, Layers and Common Data	2 days?	3 days		Senior Developer[
10	Define Interactions and Data Flows	2,5 days?	3 days		Senior Developer[



	Resource Name	Type	Material Label	Initials	Group
3	**Junior Developer**	**Work**		**JD**	
	Interview with Back-End Users	*Work*		*JD*	
	Write Requirements Analisys documen	*Work*		*JD*	
	Define and write Software Specification	*Work*		*JD*	
	Define General Architecture, Layers an	*Work*		*JD*	
	Define Interactions and Data Flows	*Work*		*JD*	
	Detailed Design	*Work*		*JD*	

Details	Feb '11 30	06	13	20	Mar '11 27
Work	5d	8,5d	11,5d	9d	1d
Work	1d				
Work	2d	2d			
Work	2d	2d			
Work		2d			
Work		2,5d			
Work			0,5d		

3) Identify the tasks on which the resource is highly involved

- Identify the tasks on which the resource is highly involved
  - Tasks are highlighted in the red rectangle

	Task Name	Duration	Work	Predeces	Resource Names
1	**- Requirements Analysis and Software Specification**	**6 days?**	**15 days**		
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8	**- High-Level Design**	**3,5 days?**	**11 days**	**1**	
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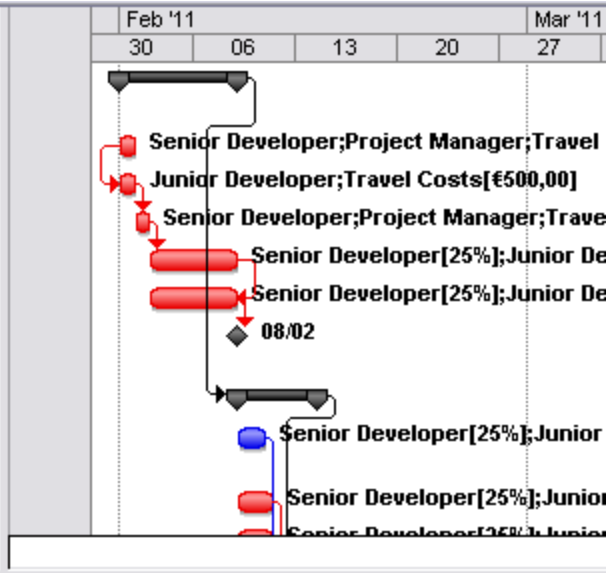
10	Define Interactions and Data Flows	2,5 days?	3 days		Senior Developer[



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	Define and write Software Specification	*Work*		*JD*	
	Define General Architecture, Layers an	*Work*		*JD*	
	Define Interactions and Data Flows	*Work*		*JD*	
	Detailed Design	*Work*		*JD*	
	Development	*Work*		*JD*	
	Testing	*Work*		*JD*	
	Detailed Design	*Work*		*JD*	
	Development	*Work*		*JD*	

Details	Feb '11 30	06	13	20	Mar '11 27
Work	5d	8,5d	11,5d	9d	1d
Work	1d				
Work	2d	2d			
Work	2d	2d			
Work		2d			
Work		2,5d			
Work			0,5d		
Work			3,5d	1,5d	
Work				1d	
Work			0,5d		

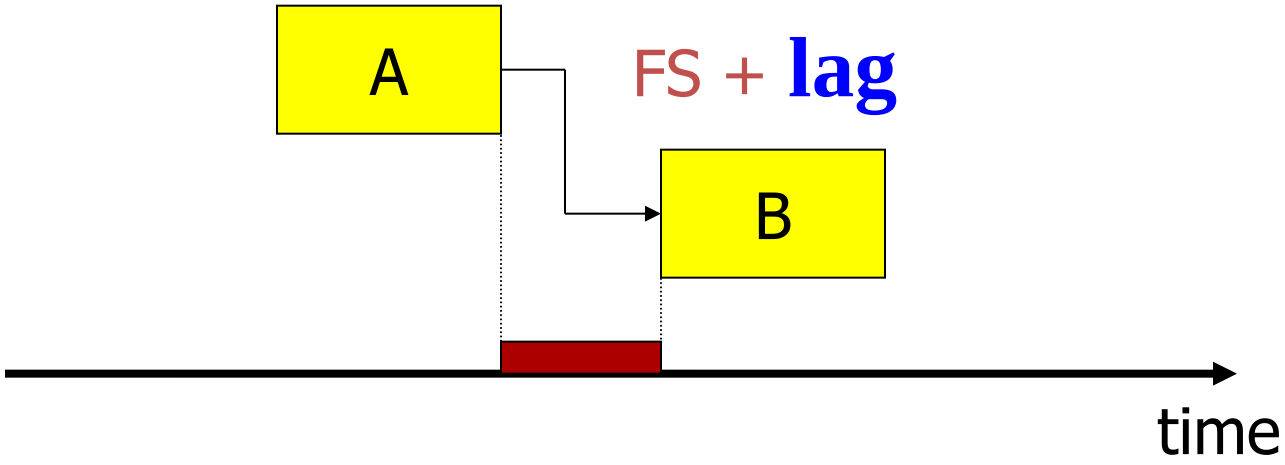
4) Level the resources on the identified tasks

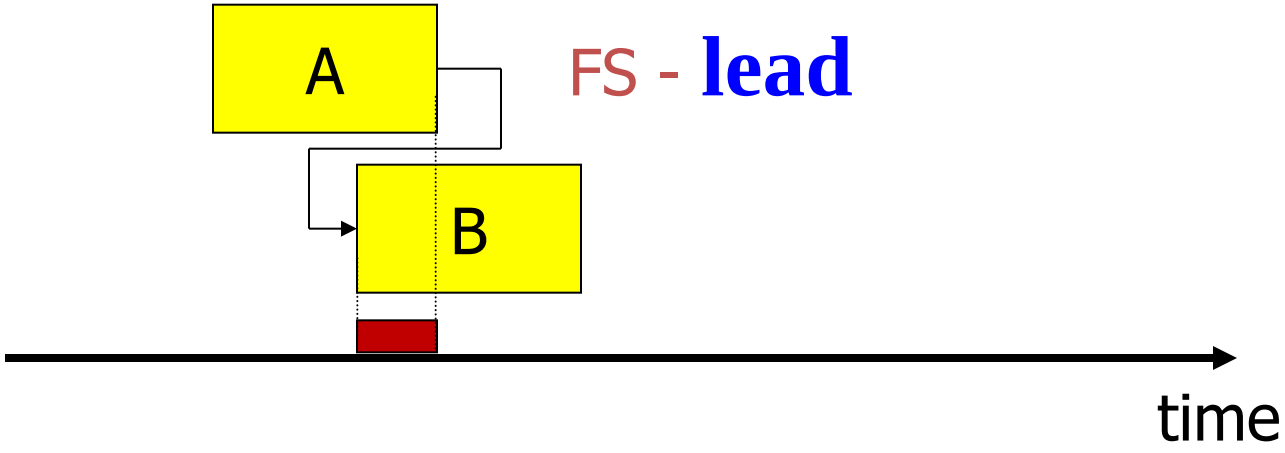
- To level resources there are 3 not-exclusive methods:
  - **a) Act on Time**
    - Resource over-allocated? → Increase task duration
    - Resource under-allocated? → Reduce task duration
  - **b) Act on Costs**
    - Resource over-allocated? → Add new resources
      - Pay attention to increased communication costs!
    - Resource under-allocated? → Remove resources
  - **c) Act on Scope**
    - Resource over-allocated? → Remove tasks or reduce work
      - Reducing the 50% of the functionalities of a component does not imply to reduce the 50% the costs. The task will cost probably the 75% of the original cost
    - Resource under-allocated? → Share resource with other tasks (or other projects if applicable)

a) Act on Time to reduce resource allocation

- Suggestion:
  - Start by taking advantages of Free and Total Slacks
    - This does not impact on project duration
  - If not enough, delay finish date of low priority tasks
    - This may not impact on critical milestones
  - If not enough, delay finish date of other tasks
    - This strongly impacts on milestones
- For each suggestion, the options are:
  1. Stretch tasks duration to reduce units (tasks must be Fixed Work)
  2. Reduce overlapping of concurrent tasks that involve the same resource by shifting a task ahead/aback (i.e. using *lags* and *leads)* or by splitting a task
  3. Sequence concurrent tasks that involve the same resource

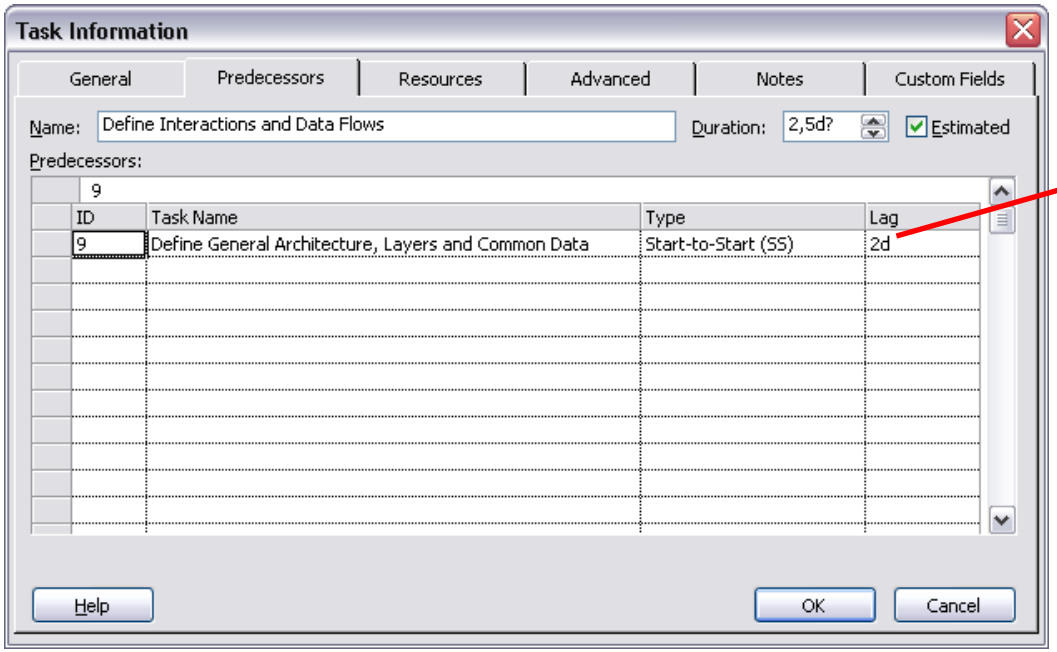
Lag & Lead Time





Lag & Lead Time

1. Double click on a task
2. Go to the Predecessor tab
3. Select the task predecessor ID
4. Enter the value in the Lag column

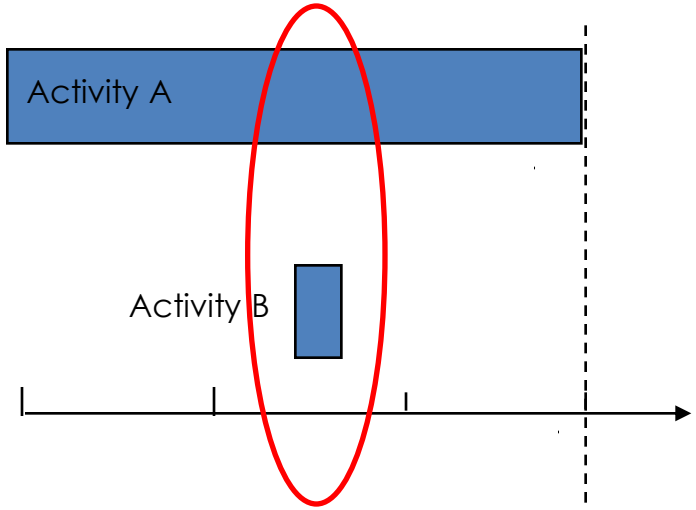


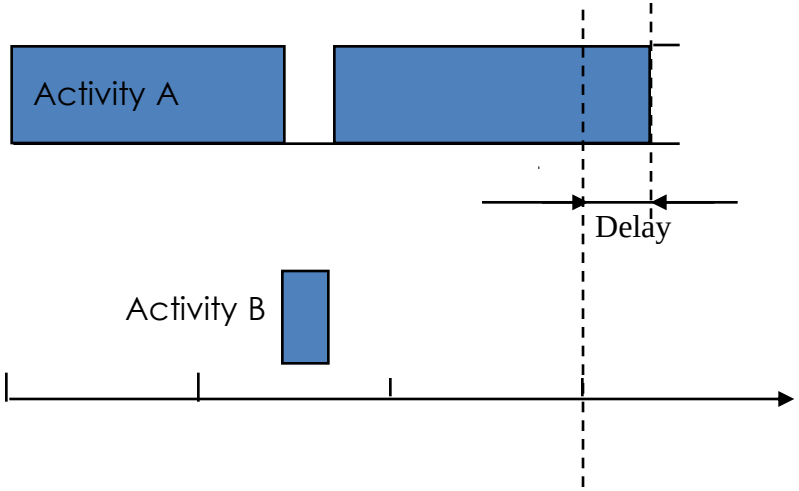
Lags (positive)
Lead (negative)

8	– **High-Level Design**	**5,5 days?**	**11 days**	**1**
9	Define General Architecture, Layers and Common Data	2 days?	3 days	
10	Define Interactions and Data Flows	2,5 days?	3 days	9SS+2 days

Split a task to avoid overlapping

- Activity A is divided into 2 sub-activities to avoid overlapping with activity B
- Total duration of A is increased causing a delay equal to duration of B





To split a task

1. Select the blue task in the Gantt view
2. Right Click -> Split Task
3. Drag and Drop to split the task

b) Act on Costs to reduce resource allocation

- Suggestion:
  4. Start by balancing the work among resources allocated to the same task
     - Move work or units from over-allocated to under-allocated resources (updating the total work if needed)
  5. If not enough, ask a resource to work overtime (max 150%) for a very limited period of time
  6. If not enough, use resources already involved in the project to support over-allocated resources
     - Make under-allocated resources working to additional tasks
     - Verify if this is compatible with resources' roles
       - Do not ask a Web designer to develop code
       - You can ask a senior developer to develop code or test
     - Pay attention to increased communication costs
  7. If not enough, add a new resource to the project
     - Pay greater attention to increased communication costs!

(late project + new resource = later project)

c) Act on Scope to reduce resource allocation

- Suggestion:
  8. Start by removing completely a task
     - Change dependencies to isolate the task before removing it
  9. If not enough, reduce the work on the task (rename it to reflect the new scope)
     - Reducing the 50% of the functionalities of a component does not imply to reduce the 50% the costs. It will cost probably the 75%
  10. If not enough, split a task in two parallel task (e.g. basic and advanced functionalities), copy dependencies, distribute work among the two tasks and delay or remove the task with the advanced functionalities
     - Remember that basic functionalities usually require more work than advanced functionalities
     - This technique complicates the schedule, use with attention

5) Check if other resources are badly allocated in the time slot and revise previous leveling

- Modifying the finish date of a task impacts on:
  - Allocation of resources involved in the current task
  - Allocation of resources involved in subsequent tasks
- If current task started before the current time slot, then past allocations may be changed
- If leveling a resource on a task makes another resource to be under-allocated, then adopt a mixed solution: act on time and on costs
  - Reduce the modification to the task
    - and
  - Move part of the work from the over-allocated resource to the under-allocated resource

  The goal is to balance the two resources on the two concurrent tasks

Resource Leveled (Resource Usage View)

	ID	Resource Name	Details	Feb '11					Mar '11					Apr '11
				23	30	06	13	20	27	06	13	20	27	03
1	1	– **Project Manager**	Work		2,4d	0,88d	1,63d	0,5d	0,5d	0,5d	0,75d	1,75d	1,75d	0,35d
	2	*Interview with Front-End Users*	Work		1d									
	4	*Interview with Stakeholders*	Work		1d									
	9	*Define General Architecture, Layers*	Work			0,38d	0,13d							
	12	*Collect feedbacks from users and re*	Work				1d							
	33	*Prepare and Show presentation to us*	Work								0,25d	0,75d		
	34	*Collect user feedbacks*	Work									0,5d		
	36	*Define next evolutions*	Work										1,25d	0,25d
	37	*Project Management, Risk Managen*	Work		0,4d	0,5d	0,5d	0,5d	0,5d	0,5d	0,5d	0,5d	0,5d	0,1d
2	2	– **Senior Developer**	Work		3d	2d	2,5d	0,5d			2d	1d	1,5d	
	2	*Interview with Front-End Users*	Work		1d									
	4	*Interview with Stakeholders*	Work		1d									
	5	*Write Requirements Analisys docum*	Work		0,5d	0,5d								
	6	*Define and write Software Specificat.*	Work		0,5d	0,5d								
	9	*Define General Architecture, Layers*	Work			0,5d								
	10	*Define Interactions and Data Flows*	Work				0,5d							
	11	*Mock Graphic User Interfaces*	Work			0,5d								
	12	*Collect feedbacks from users and re*	Work				1d							
	16	*Detailed Design*	Work				0,5d							
	20	*Detailed Design*	Work				0,5d							
	24	*Detailed Design*	Work					0,5d						
	28	*Integration and Testing of Logic Laye*	Work								1d			
	29	*Integration and Testing of GUI Layer*	Work								0,5d			
	33	*Prepare and Show presentation to us*	Work								0,5d	0,5d		
	34	*Collect user feedbacks*	Work									0,5d		
	36	*Define next evolutions*	Work										1,5d	
3	3	– **Junior Developer**	Work		5d	5,2d	4,3d	5d	5,17d	3,83d	3,5d	0,5d		
	3	*Interview with Back-End Users*	Work		1d									
	5	*Write Requirements Analisys docum*	Work		2d	2d								
	6	*Define and write Software Specificat.*	Work		2d	2d								
	9	*Define General Architecture, Layers*	Work			1,2d	0,8d							
	10	*Define Interactions and Data Flows*	Work				2,5d							
	16	*Detailed Design*	Work				0,5d							
	17	*Development*	Work					5d						
	18	*Testing*	Work						1d					
	20	*Detailed Design*	Work				0,5d							
	21	*Development*	Work						4,17d	0,83d				
	22	*Testing*	Work							1d				
	25	*Development*	Work							2d	0,5d			
	28	*Integration and Testing of Logic Laye*	Work								1d			
	29	*Integration and Testing of GUI Layer*	Work								1d			
	32	*Write user manual*	Work								1d	0,5d		

Maximum 25% (1.25 d/w)

Minimal guaranteed allocation for the whole project

Peaks at the begin and the end

Maximum 50% (2.5 d/w)

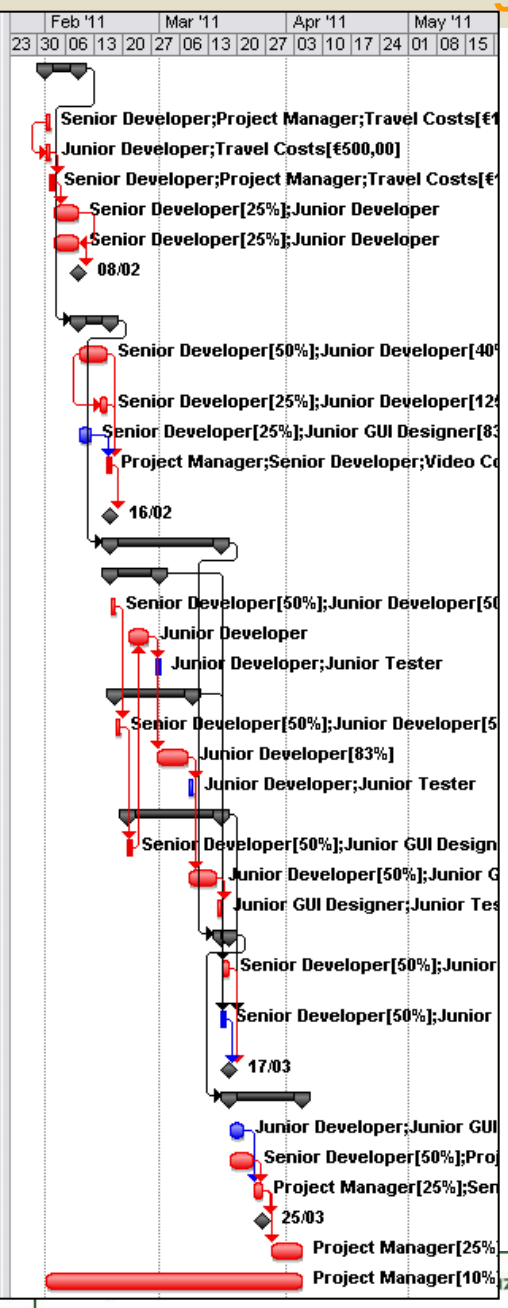
Mainly involved at the beginning (design) and the end (integration)

Maximum 100%

Mainly involved at the beginning (support design) and the middle (development)

Impact of Leveling on Schedule

	Task Name	Duration	Work	Type	Predec	Resource Names
1	**- Requirements Analysis and Software Specification**	**6 days?**	**15 days**	**Fixed Duration**		
2	Interview with Front-End Users	1 day	2 days	Fixed Duration		Senior Developer;Project Manager;Travel Costs
3	Interview with Back-End Users	1 day	1 day	Fixed Duration	2SS	Junior Developer;Travel Costs[€500,00]
4	Interview with Stakeholders	1 day	2 days	Fixed Duration	3	Senior Developer;Project Manager;Travel Costs
5	Write Requirements Analisys document	4 days?	5 days	Fixed Work	4	Senior Developer[25%];Junior Developer
6	Define and write Software Specification	4 days?	5 days	Fixed Work	5FF	Senior Developer[25%];Junior Developer
7	Requirement Analysis and Specification Document	0 days	0 days	Fixed Duration	6	
8	**- High-Level Design**	**6 days**	**11 days**	**Fixed Duration**	**1**	
9	Define General Architecture, Layers and Common Data	5 days	3 days	Fixed Work		Senior Developer[50%];Junior Developer[40%];Project Manager[13%]
10	Define Interactions and Data Flows	2 days	3 days	Fixed Work	9SS+3	Senior Developer[25%];Junior Developer[125%
11	Mock Graphic User Interfaces	3 days	3 days	Fixed Work		Senior Developer[25%];Junior GUI Designer[83
12	Collect feedbacks from users and revise High-Level Design	1 day	2 days	Fixed Duration	9;10;11	Project Manager;Senior Developer;Video Conferencing System[1]
13	High-Level Design Document	0 days	0 days	Fixed Duration	12	
14	**- Detailed Design, Development and Testin**	**19 days?**	**24 days**	**Fixed Duration**	**8**	
15	**- Data Access Layer**	**8 days?**	**8 days**	**Fixed Duration**		
16	Detailed Design	1 day	1 day	Fixed Work		Senior Developer[50%];Junior Developer[50%]
17	Development	5 days	5 days	Fixed Work	24FS-1	Junior Developer
18	Testing	1 day?	2 days	Fixed Work	17	Junior Developer;Junior Tester
19	**- Logic Layer**	**13 days?**	**8 days**	**Fixed Duration**		
20	Detailed Design	1 day	1 day	Fixed Work	16	Senior Developer[50%];Junior Developer[50%]
21	Development	6 days	5 days	Fixed Work	17	Junior Developer[83%]
22	Testing	1 day?	2 days	Fixed Work	21	Junior Developer;Junior Tester
23	**- GUI**	**17 days?**	**8 days**	**Fixed Duration**		
24	Detailed Design	1 day	1 day	Fixed Work	20	Senior Developer[50%];Junior GUI Designer
25	Development	5 days	5 days	Fixed Work	21	Junior Developer[50%];Junior GUI Designer
26	Testing	1 day?	2 days	Fixed Work	25	Junior GUI Designer;Junior Tester
27	**- System Integration and Testing**	**2 days?**	**4,5 days**	**Fixed Duration**	**14**	
28	Integration and Testing of Logic Layer on top of Data Layer	2 days?	2 days	Fixed Work	15;19	Senior Developer[50%];Junior Developer
29	Integration and Testing of GUI Layer on top of Logic Layer	1 day?	2,5 days	Fixed Work	19;23	Senior Developer[50%];Junior Developer;Junior GUI Designer
30	System Integrated	0 days	0 days	Fixed Duration	28;29	
31	**- User Validation**	**12 days?**	**9 days**	**Fixed Duration**	**27**	
32	Write user manual	1,5 days?	3 days	Fixed Work		Junior Developer;Junior GUI Designer
33	Prepare and Show presentation to users	4 days?	2 days	Fixed Work		Senior Developer[50%];Project Manager[25%];
34	Collect user feedbacks	2 days?	1 day	Fixed Work	32;33	Project Manager[25%];Senior Developer[50%];
35	System validated	0 days	0 days	Fixed Duration	34	
36	Define next evolutions	6 days?	3 days	Fixed Work	34	Project Manager[25%];Senior Developer[50%]
37	Project Management, Risk Management	45 days	4,5 days	Fixed Units		Project Manager[10%]



Fine-grained Resource Leveling

- By Resource
  - Open Resource Usage view
  - Zoom to see days (or even hours)
  - Modify allocation of each resource for each task

- By Task
  - Open Task Usage view
  - Zoom to see days (or even hours)
  - Modify allocation of each task for each task

	Resource Name	Details	February 201		
			27	30	02
1	**Project Manager**	Work		1d	1d
	Interview with Front-End U	Work		1d	
	Interview with Stakeholder	Work			1d
	Define General Architectu	Work			
	Collect feedbacks from u	Work			
	Prepare and Show presen	Work			
	Collect user feedbacks	Work			
	Define next evolutions	Work			
	Project Management, Ris	Work			
2	**Senior Developer**	Work		1d	1,5d
	Interview with Front-End U	Work		1d	
	Interview with Stakeholder	Work			1d
	Write Requirements Anal	Work			0,5d
	Define and write Software	Work			
	Define General Architectu	Work			
	Define Interactions and D	Work			
	Mock Graphic User Interf	Work			
	Collect feedbacks from u	Work			
	Detailed Design	Work			

	Task Name	V	Details	T	W	T	F
1	**Requirements Analysis**	1	Work	3d	2d	1,25d	1,25d
2	Interview with Front-		Work	2d			
	Project Man		Work	1d			
	Senior Deve.		Work	1d			
	Travel Costs		Work				
3	Interview with Back-I		Work	1d			
	Junior Deve		Work	1d			
	Travel Costs		Work				
4	Interview with Stakel		Work		2d		
	Project Man		Work		1d		
	Senior Deve.		Work		1d		
	Travel Costs		Work				
5	Write Requirements A		Work			1,25d	1,25d
	Senior Deve.		Work			0,25d	0,25d
	Junior Deve		Work			1d	1d
6	Define and write Sofl		Work				
	Senior Deve.		Work				
	Junior Deve		Work				
7	Requirement Analysis		Work				
8	**High Level Design**	1					

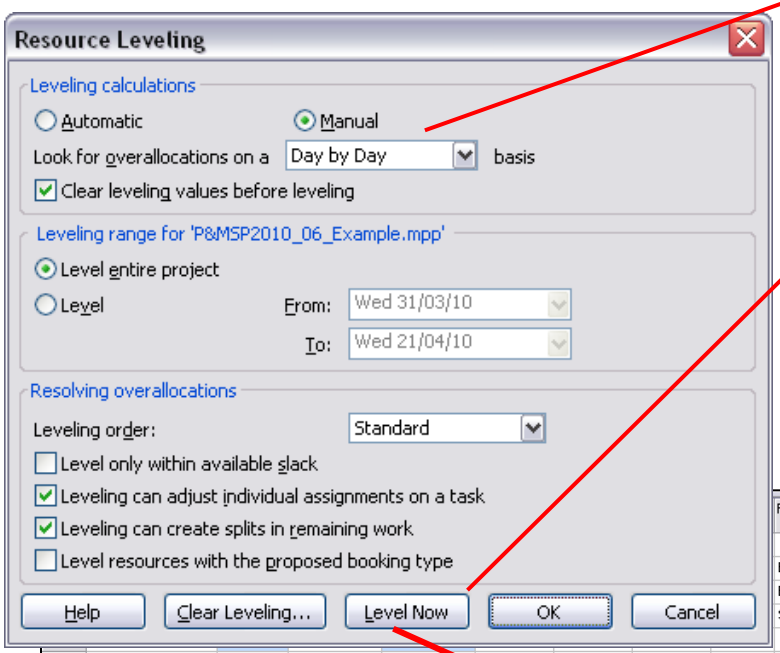
- Be parsimonious with modifications on these sheets

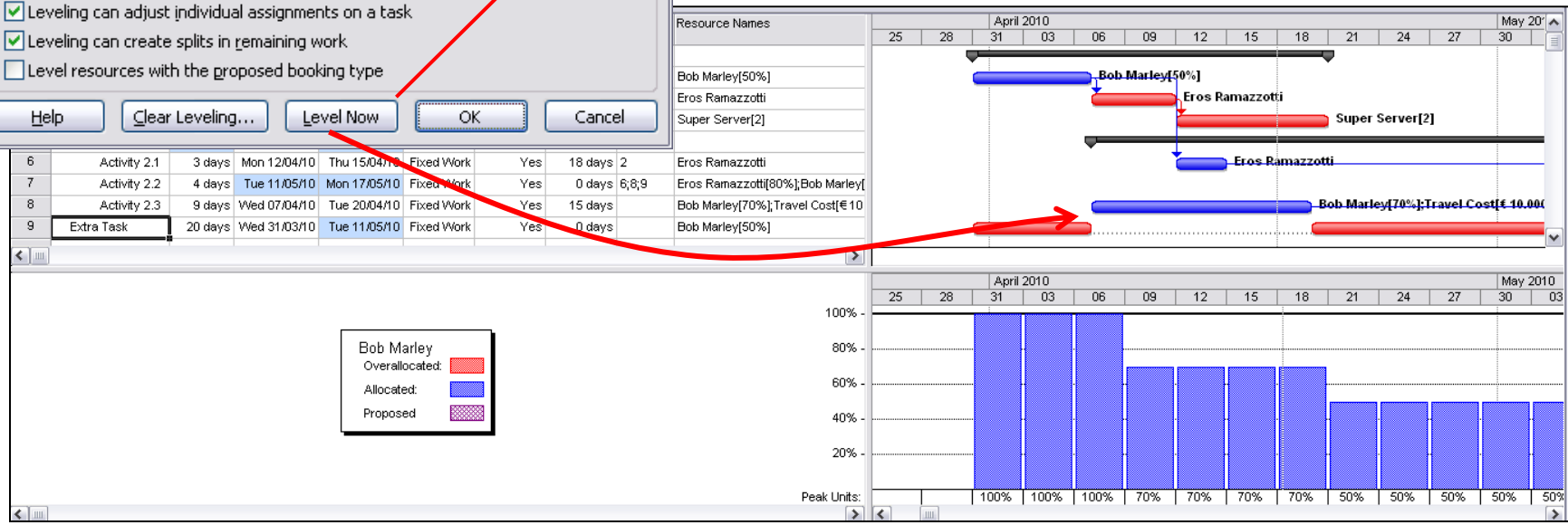
Automatic Resource Leveling

1. Tools → Level Resources

By default, Microsoft Project does not level automatically while you work on the project

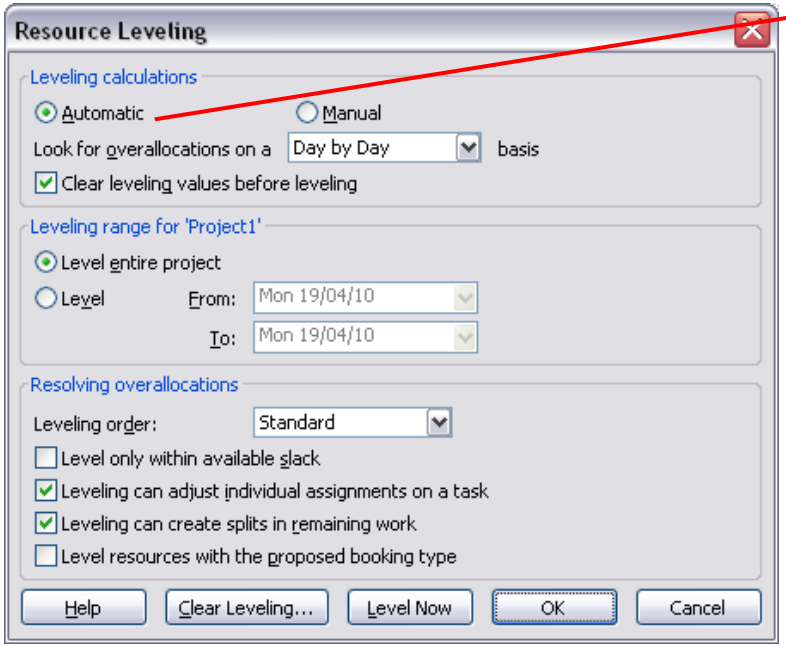
We can explicitly ask Microsoft Project to do levelling based on various options





Automatic Resource Leveling

1. Tools → Level Resources



Automatic leveling acts in background meanwhile we add resources to tasks

This may make you don't understand why tasks are re-scheduled or split!

→ Avoid using it!

Practical Exercise n.4

- Level resources on your project
  - Follow the suggested process
  - Do at least one complete iteration
  - Try to apply each leveling technique at least once

Questions?