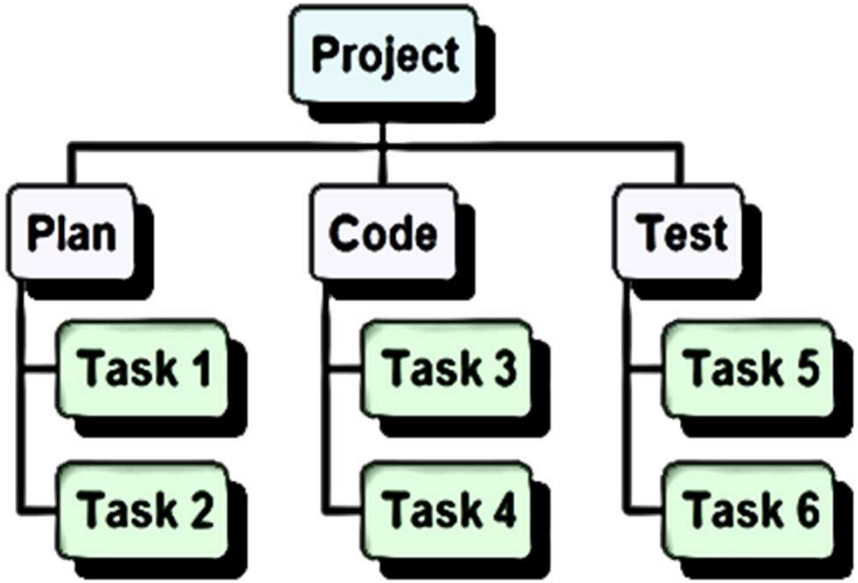
WBS & resources levelling

EIT Digital Master School @Eötvös Lorand University

Business Development Lab

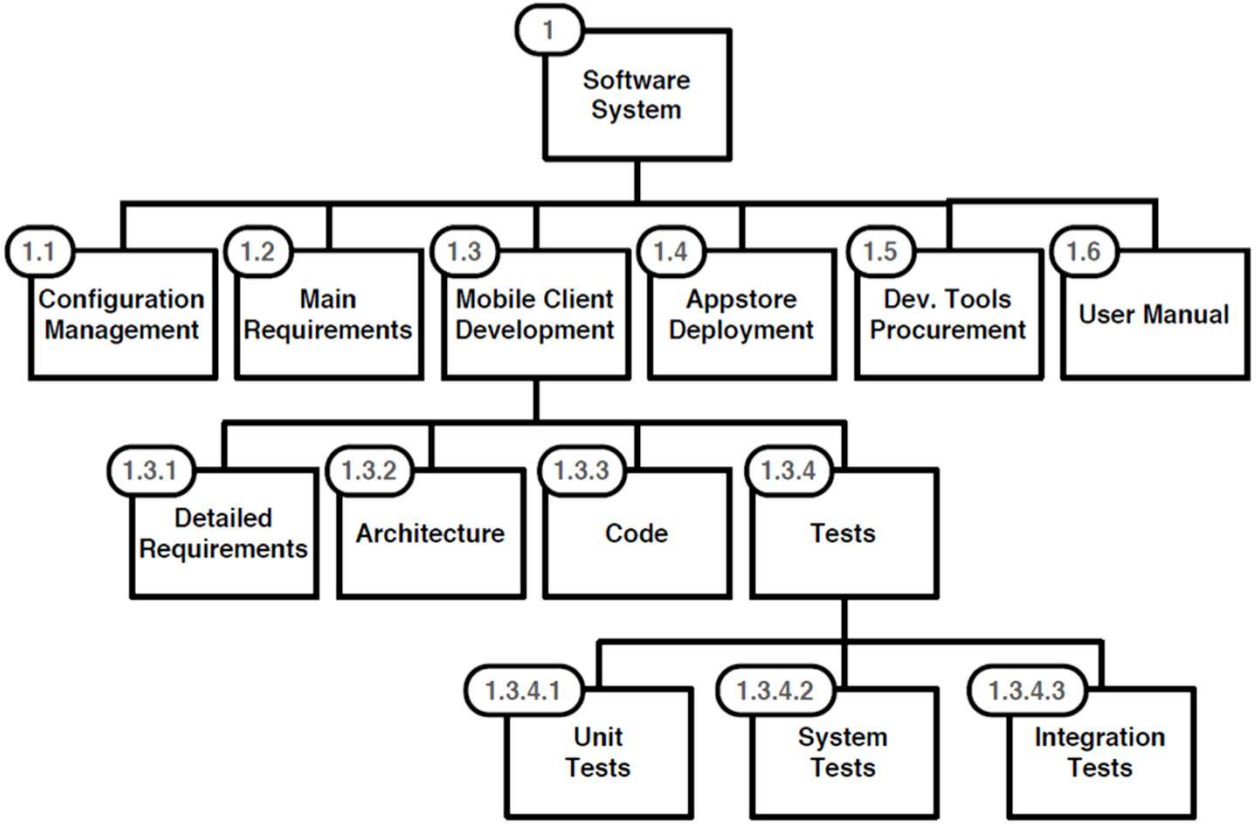
Work Breakdown Structure



"WBS is a hierarchical and **incremental decomposition** of the project into phases, deliverables and **work packages**. It is a **tree structure**, which shows a subdivision of effort required to achieve an objective

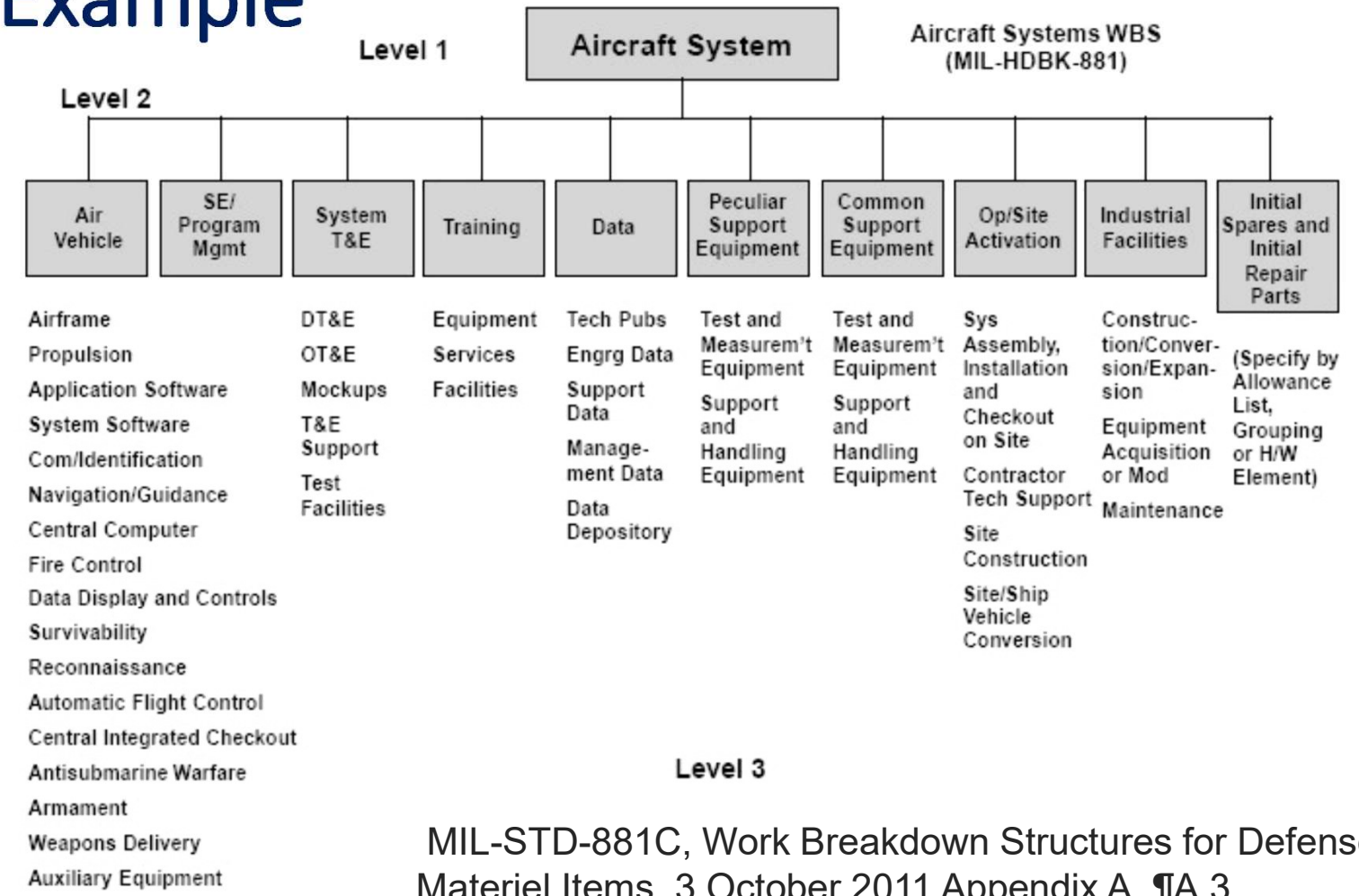
*Wikipedia: https://en.wikipedia.org/wiki/Work_breakdown_structure

WBS Example



*Adolfo Villafiorita

WBS Example



MIL-STD-881C, Work Breakdown Structures for Defense Materiel Items, 3 October 2011 Appendix A, ¶A.3

*https://en.wikipedia.org/wiki/Work_breakdown_structure

WBS Example

1.0 Aircraft System
- *1.1 Air Vehicle*
  - *1.1.1 Airframe*
    - *1.1.1.1 Airframe Integration, Assembly, Test and Checkout*
    - *1.1.1.2 Fuselage*
    - *1.1.1.3 Wing*
    - *1.1.1.4 Empennage*
    - *1.1.1.5 Nacelle*
    - *1.1.1.6 Other Airframe Components 1..n (Specify)*
  - *1.1.2 Propulsion*
  - *1.1.3 Vehicle Subsystems*
  - *1.1.4 Avionics*
- *1.2 System Engineering*
- *1.3 Program Management*
- *1.4 System Test and Evaluation*
- *1.5 Training*
- *1.6 Data*
- *1.7 Peculiar Support Equipment*
- *1.8 Common Support Equipment*
- *1.9 Operational/Site Activation*
- *1.10 Industrial Facilities*
- *1.11 Initial Spares and Repair Parts*

This is the same!

MIL-STD-881C, Work Breakdown Structures for Defense Materiel Items, 3 October 2011 Appendix A, ¶A.3

*https://en.wikipedia.org/wiki/Work_breakdown_structure

WBS

- Two formats:
  - Graphical tree
  - Textual outline
- Uses a decimal numbering system to identify elements (Ex: 3.1.5)
- Shows “is contained in” relationships
- Does **not** show **dependencies** nor **durations**

Why WBS?

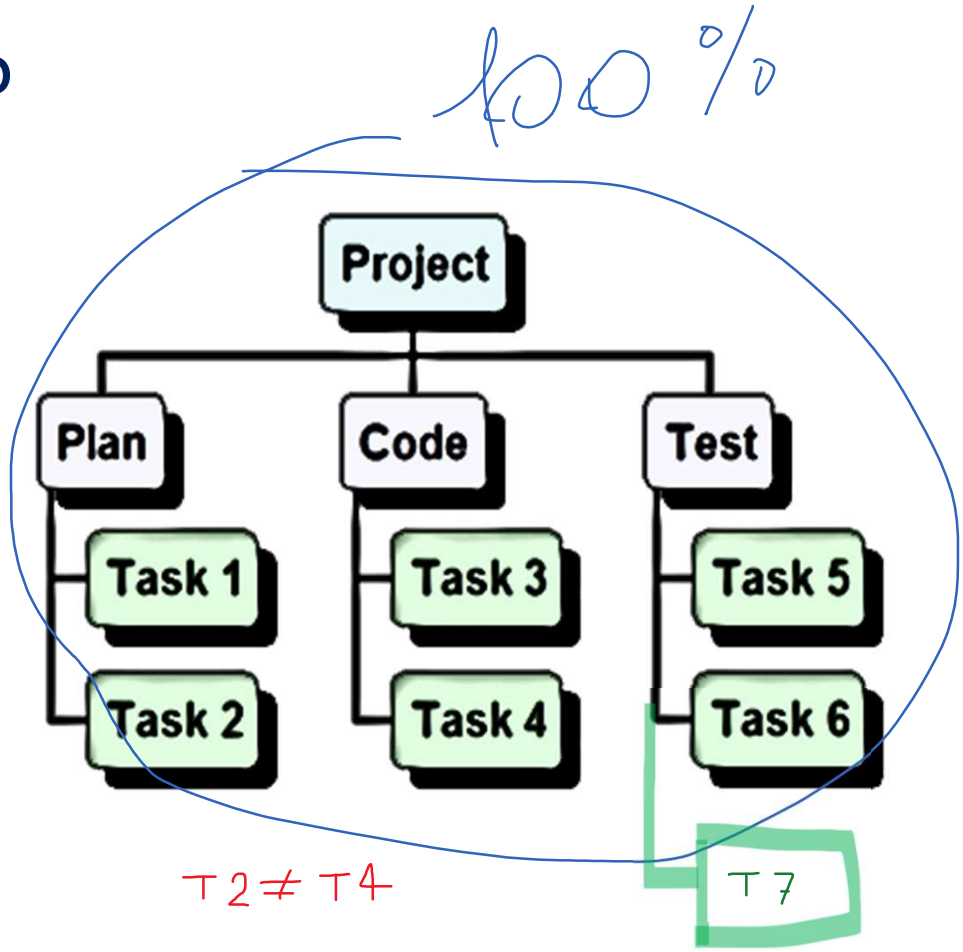
- Defining the work to be performed in a project
- Showing how various activities are related to the project obj.
- Defining, assigning, and monitoring work and costs
- Identifying responsibilities

How to make a good WBS?

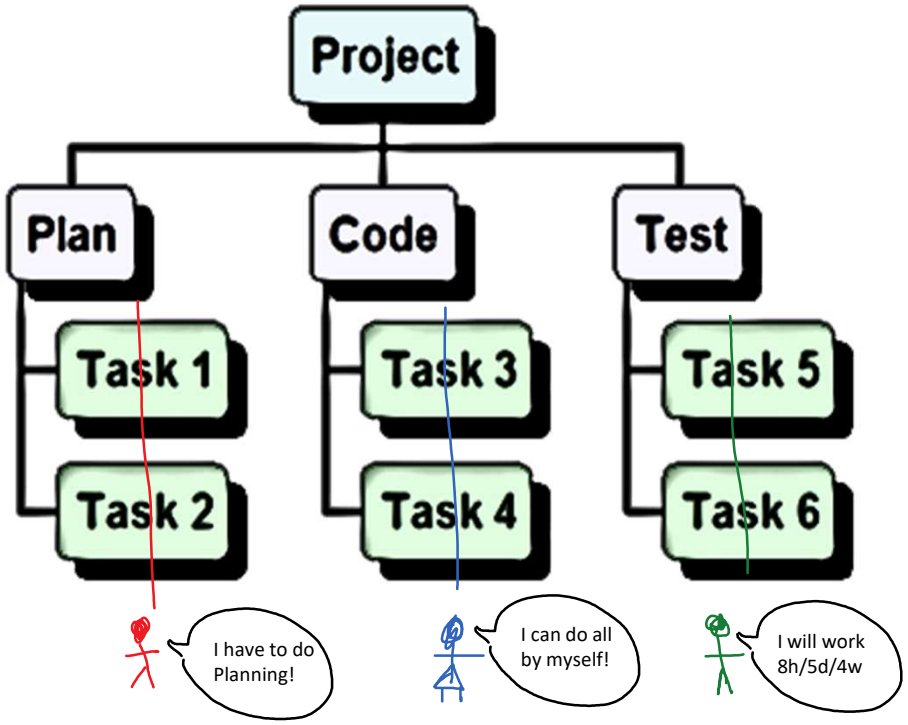
–**100%** : all work must be there

–**Mutually Exclusive** : no overlaps in the definition of the elements

– All paths do not have to go to the same level

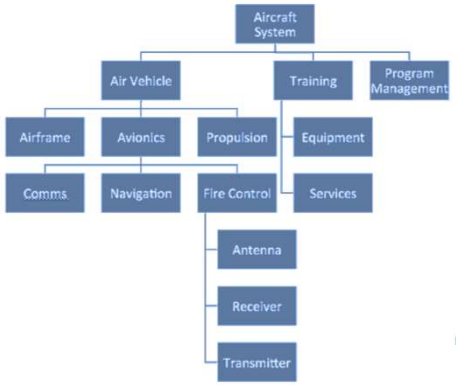


How to make a good WBS?



– **Coherence**: tasks within a work package should have the same goal;
– **Coupling**: work package dependencies should be minimized, so team members can work independently;
– **Continuity**: production work packages should be full-time to maximize efficiency;

WBS Dictionary



WBS Level	WBS Code	WBS Name	WBS Description	PWS/SOW Mapping
1	1	Aircraft System	X Series Aircraft System to fly to the moon	
2	1.1	Air Vehicle	X Series Air Vehicle to fly to the moon	
3	1.1.1	Air Frame	X seriese air frame	
3	1.1.2	Avionics	Brains behind the air frame	
4	1.1.2.1	Comms	Communications	
5	1.1.2.1.1	Antenna	Thinging to pick up signals	1.1, 1.2, 1.3.1, 1.13.1
5	1.1.2.1.2	Receiver	Box to interpert signals picked up by Antenna	1.1, 1.2, 1.13.2
5	1.1.2.1.3	Transmitter	Box to send out signals when we talk	1.1, 1.2, 1.3.1, 1.13.3
4	1.1.2.2	Navigation	Back seat driver	
4	1.1.2.3	Fire Control	Off/Def weapons in case we run into aliens	
3	1.1.3	Propulsion	Engine to propel x series air frame	
2	1.2	Training	Training for operation and maintenance of X Series Air Vehicle	

*https://tensix.com/2014/09/what-is-a-wbs-dictionary/

When do we stop breaking down?

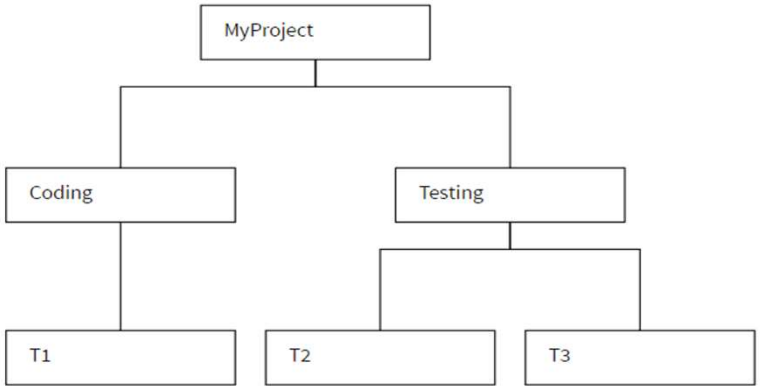
– Beware of Cost & Time:
bottom level work packages should require between one man- week and one man-month of effort.

– The level of details depends on the size of the project!

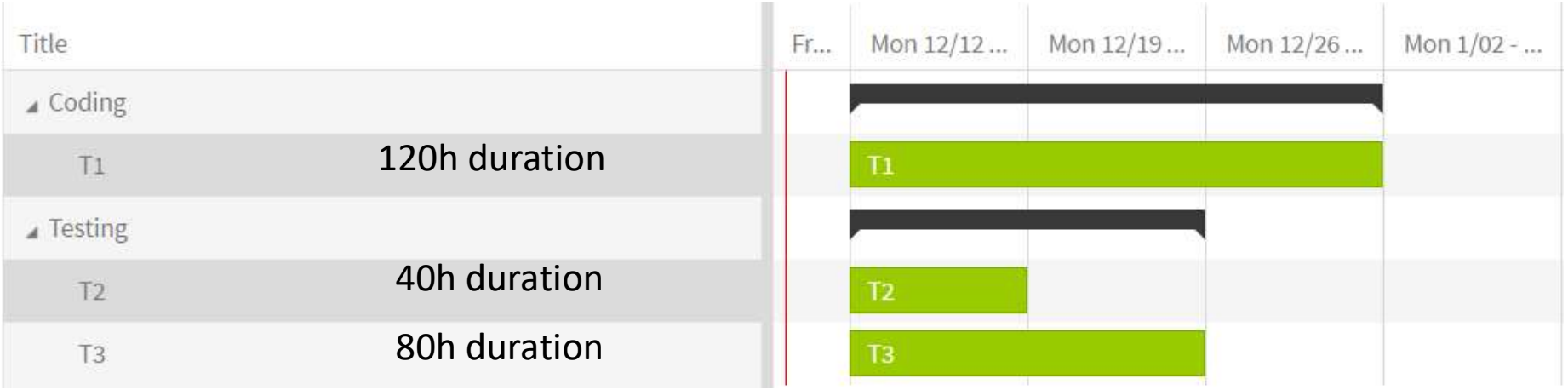
Speaking of measuring and sizes…

	Effort	Duration	Elapsed Time
Defined as	# of work units to complete an activity	t taken to complete the activity (can reduce if more resources allocated)	t between designating a resource to a task and its completion
Measured in	Staff *hours, days or weeks	Work H, Days or Weeks (no holidays)	Work H, Days or Weeks (+ holidays)
2 Person *6 h a day *9 days	108 h	9 days	11 days (1 Saturday and 1 Sunday)

From WBS to Gantt

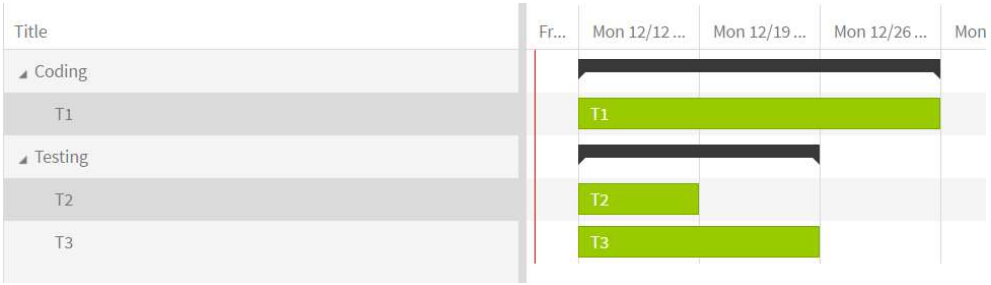


- **Coding**
  - T1 — 1p*120h effort
- **Testing**
  - T2 — 1p* 40h effort
  - T3 — 1p* 80h effort

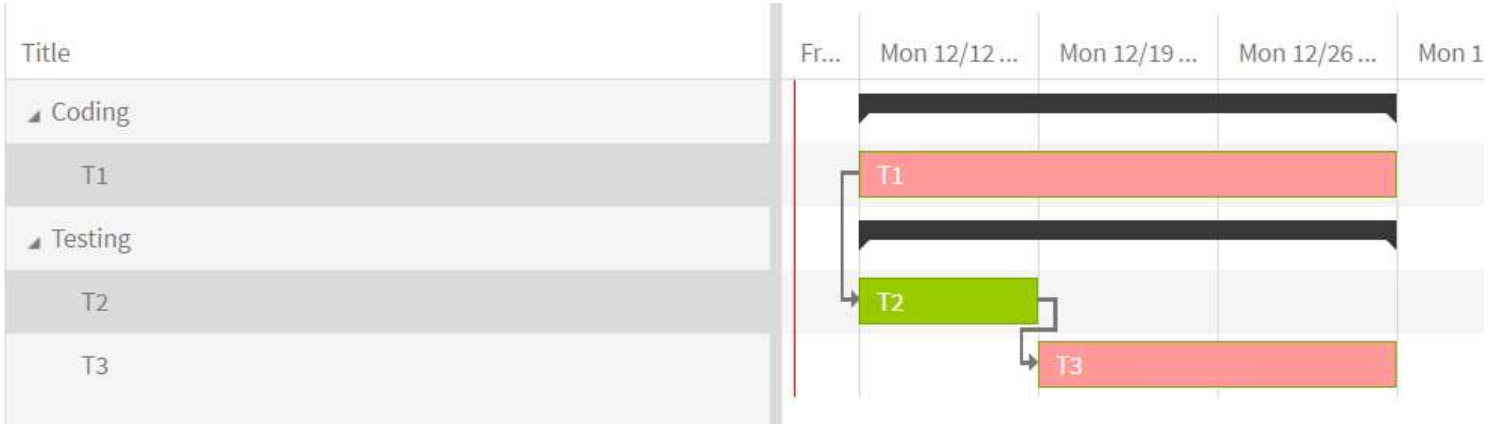


To draw this I used :https://planhammer.io

Adding relationships and constraints



- We start testing as soon as we start coding
- First T2 and with those result decide what to test in T3

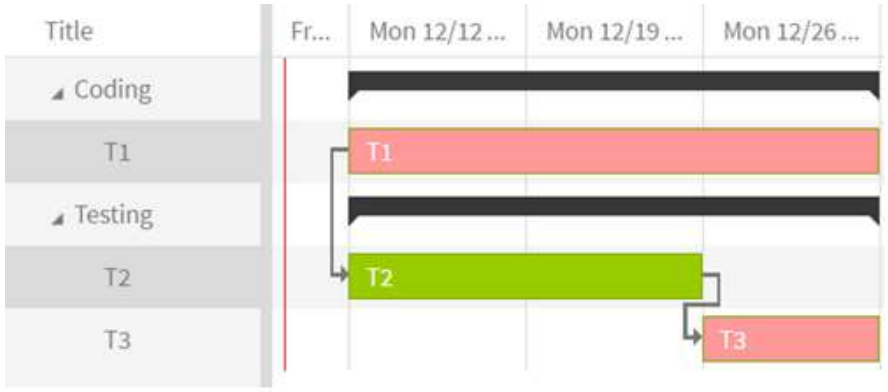


Resources Allocation

"the process by which a resource is assigned to a task, that is, is tasked with carrying out part of the work (effort) defined in a task"

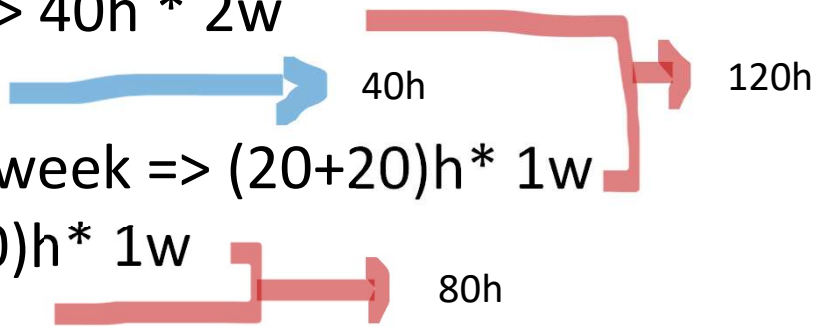
- Inputs:
  - the plan: WBS activities, constraints, effort
  - project team
  - delivery dates (project constraints)
- Resource allocation:
- Constraints:
  - resource availability and needs: the type of resource above maximum availability
  (resource leveling)
- If no solution is found variate some hypotheses (eg. Hire a new guy!)

Resources Levelling



- R1 full time developer (100%)
- R2 R3 testers
- R2 is intern (50%)

- R1 works 2w full time(100%) on T1 => 40h * 2w
- R2 works 2w 50% on T2=> 20h*2w
- R1 and R2 work 50% on T1 the third week => (20+20)h* 1w
- R1 and R2 work 50% on T3 => (20+20)h* 1w
- R3 work 100% on T3 => 40h*1w



Thank you!

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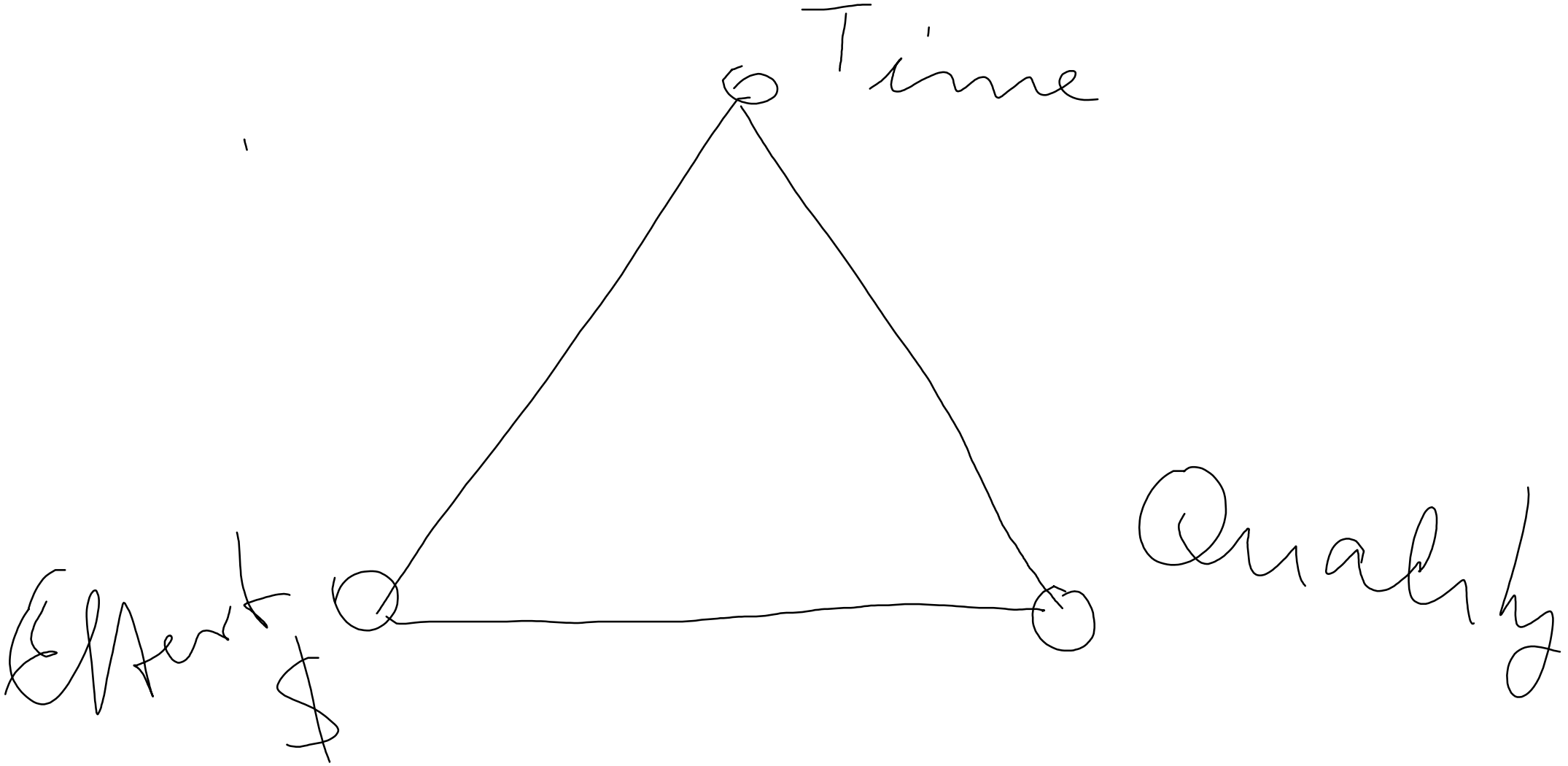
Find me at: anna.reale@inf.elte.hu


Time
Effort $
Quality