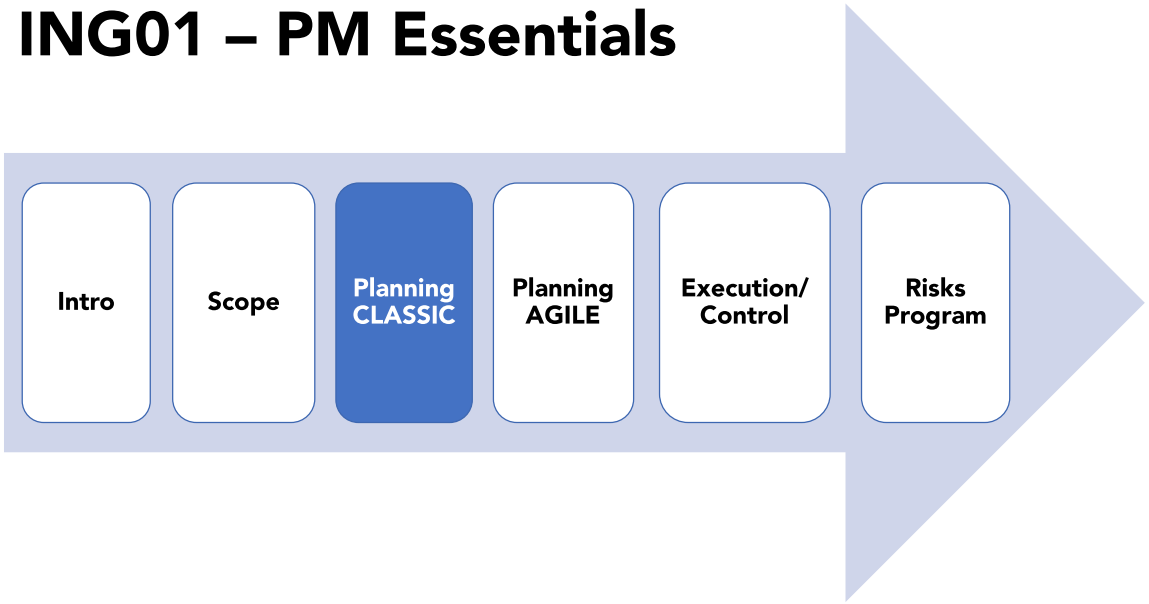
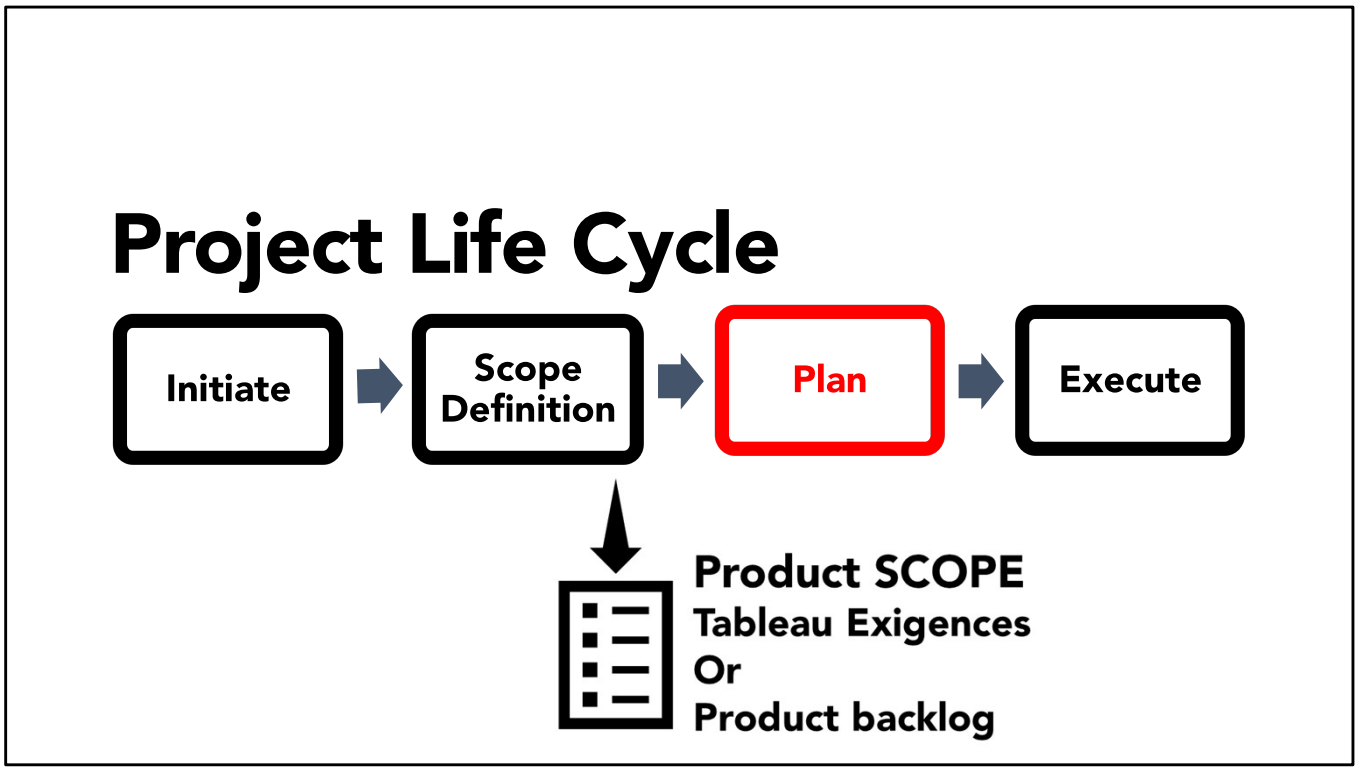
ING01 – PM Essentials



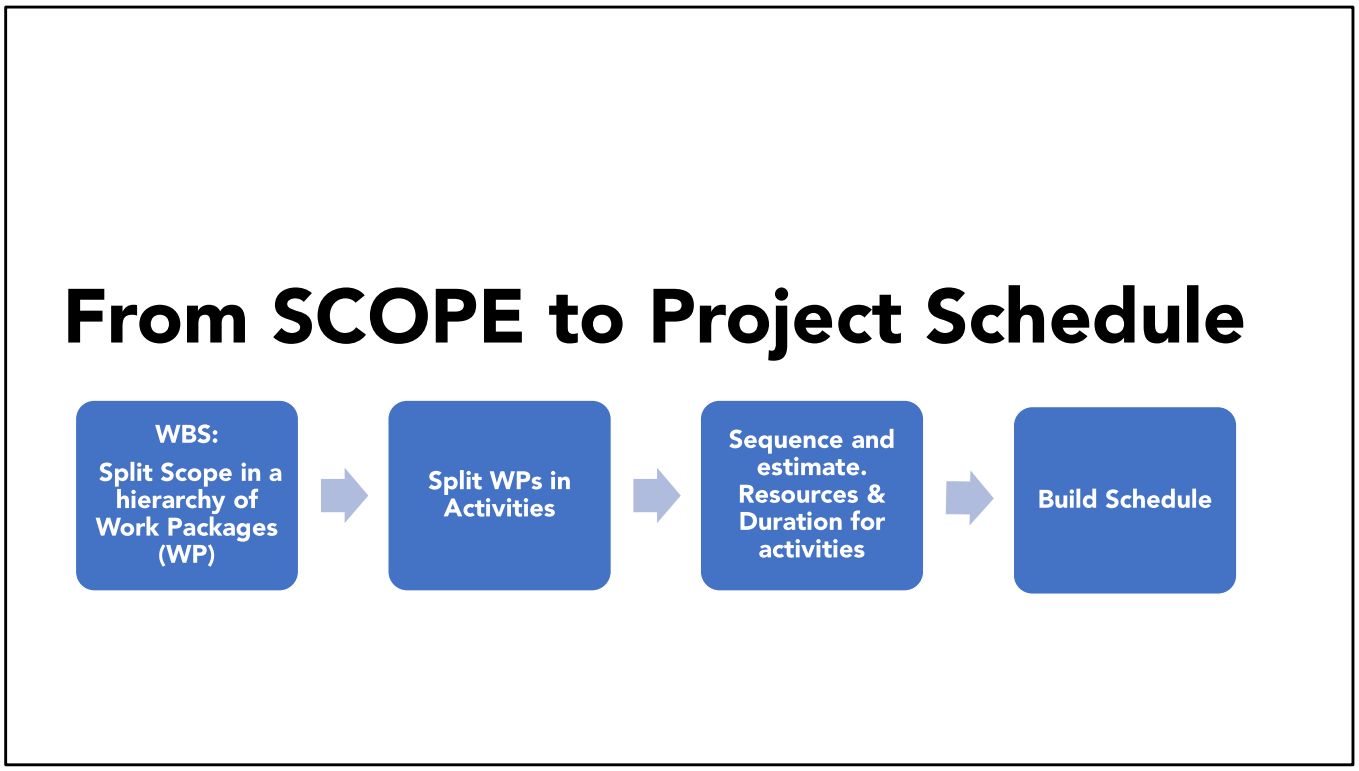
Pierre Roussenq et Jean-Jacques Guélin

ING01 - PM Essentials
Planning: CLASSIC PREDICTIVE

Pierre Roussenq et Jean-Jacques Guélin



In Classic Predictive, we will take the « Requirements Table as Input for Scope Baseline.



Frome Requirements Table to the Schedule Baseline we will apply a 4 steps process:

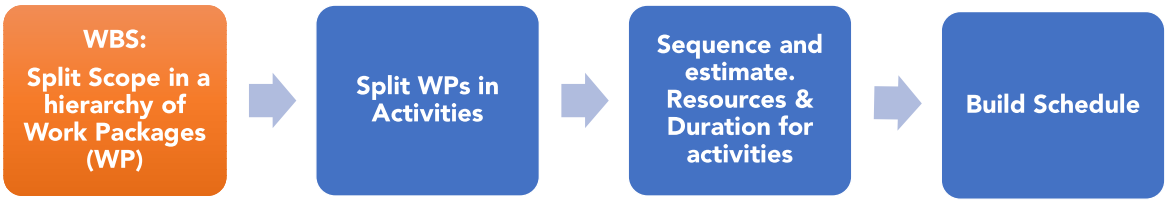
1) We will split the Scope in a hierarchy of Work Packages that we will link to Project deliverables
2) These WP will be further split in Activities : an amount of work that can be estimated
3) These activities will be ordered , resources will be affected and finally a duration will be estimated
4) When all these attributes to Activities are distributed, then we can build and present the project Schedule Baseline

On commence par définir un ensemble de Work Packages, qui sont associés à des livrables,
Ces WP ou lots de travaux sont ensuite décomposées en **activités**,
Puis ces activités sont **classées par ordre d'exécution puis estimées** (combien de temps, combien de ressources) en termes **de durée et de charges** pour finalement établir un **Project Schedule** qui détaille la planification dans le temps de l'ensemble des activités.

La différence avec le mode **AGILE** c'est que l'on rentre dans les détails de l'estimation des temps d'éxécution dès la première phase de planification. Cela permet de préparer un

planning plus précis dans le temps mais il faut le suivre avec précision parce qu'on a plus de chances de se tromper.
On voit également que l'on peut faire une estimation complète des charges de réalisation certes avec une certaine incertitude. Cette estimation peut servir de base à une proposition contractuelle de réalisation avec engagement cout délai…

From SCOPE to Project Schedule



Take Scope definition result as INPUT

Product SCOPE
Tableau Exigences
Or
Product backlog

→ WBS

Work Breakdown Structure: WBS
Work Package: WP

ALL the work to be done in the project (SCOPE) *including project Management* is decomposed, divided and subdivided into a hierarchical STRUCTURE

This structure is called WBS: WORK BREAKDOWN STRUCTURE *(Arborescence de tâches)*

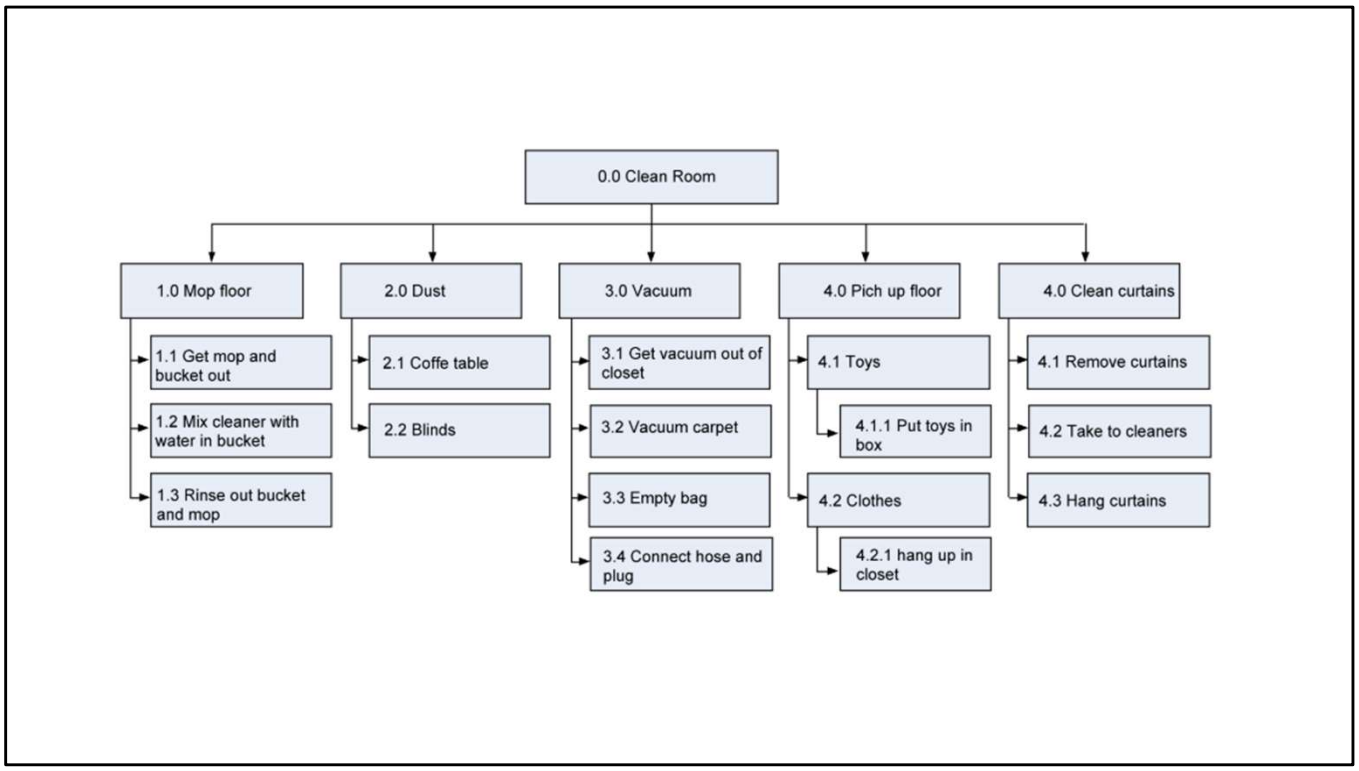
The lowest level found in WBS is called a

WORK PACKAGE *(Lot de travaux)*

Now that we have the deliverables and requirements well defined, the process of breaking down the work of the project via a work breakdown structure begins. The work breakdown structure (WBS) defines the scope of the project and breaks the work down into components that can be scheduled and estimated and easily monitored and controlled. The idea behind the work breakdown schedule is simple. You subdivide a complicated task into smaller tasks, until you reach a level that cannot be further subdivided. Anyone familiar with the arrangements of folders and files in a computer memory, or who has researched their ancestral family free, should be familiar with this idea. You stop breaking down the work when you reach a low enough level to perform an estimate of the desired accuracy. At that point, it is usually easier to estimate how long the small task will take and how much it will cost to perform than it would have been to estimate these factors at the higher levels. Each descending level of the WBS represents an increased level of detailed definition of the project work.

For One project, there are different ways to build the WBS : there is no single solution

Once established, the WBS is also called the Scope baseline.



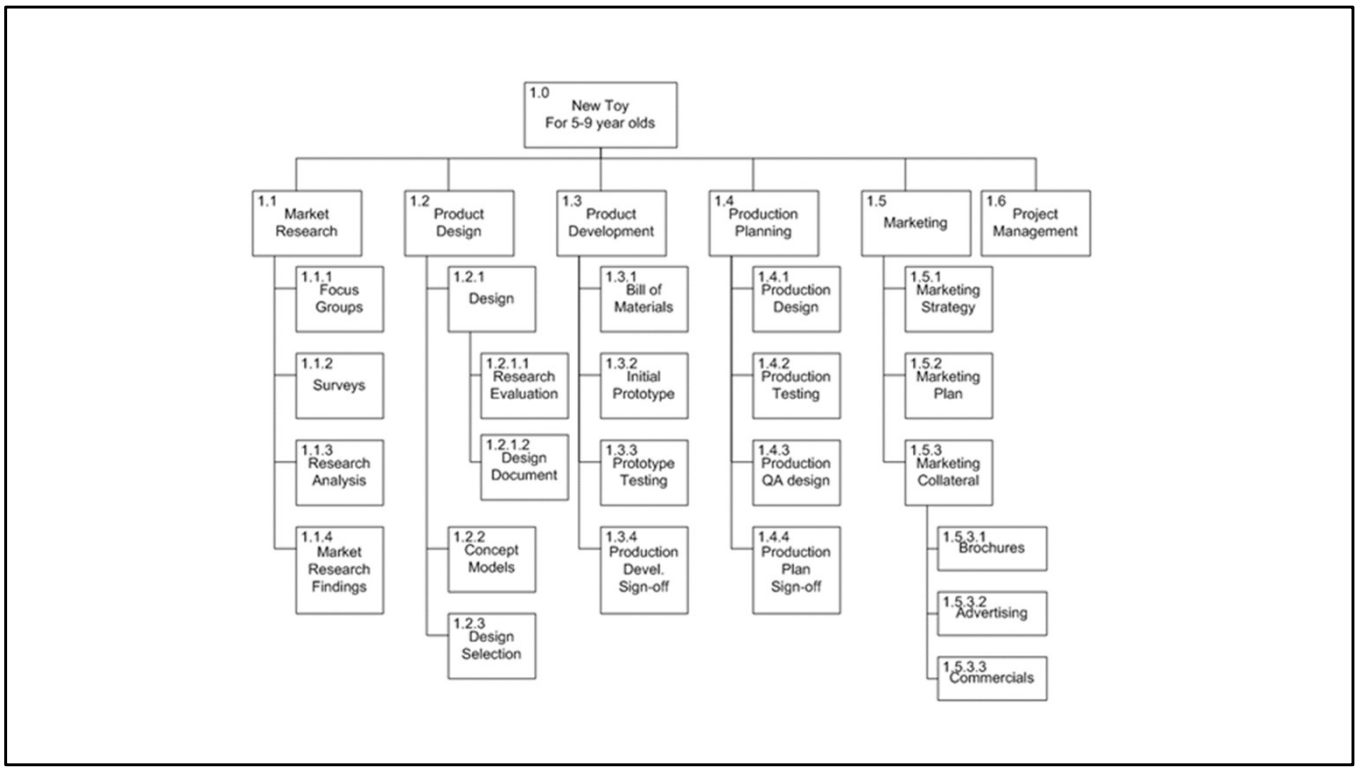
WBS 1st Example: Cleaning a room

Note that each task is assigned a **Unique Identifying Number**

As an example, if I want to clean a room, I might begin by picking up clothes, toys, and other things that have been dropped on the floor. I could use a vacuum cleaner to get dirt out of the carpet. I might take down the curtains and take them to the cleaners, then dust the furniture. All of these tasks are subtasks performed to clean the room. As for vacuuming the room, I might have to get the vacuum cleaner out of the closet, connect the hose, empty the bag, and put the machine back in the closet. These are smaller tasks to be performed in accomplishing the subtask called vacuuming.

It is very important to note that we do not worry about the sequence in which the work is performed or any dependencies between them when we do a WBS. That will be worked out when we develop the schedule. For example, under *3.0 Vacuum* (in Figure), it would be obvious that *3.3 Vacuum carpet* would be performed after *3.4 Connect hose and plug*! However, you will probably find yourself thinking sequentially, as it seems to be human nature to do so. The main idea of creating a WBS is to capture all of the tasks, irrespective of their order. So

if you find yourself and other members of your team thinking sequentially, don't be too concerned, but don't get hung up on trying to diagram the sequence or you will slow down the process of task identification.



WBS 2nd Example: Creating a New Toy

Deliverables

Identify and list DELIVERABLES:

The Deliverables expected by the Customer:

- Final or Main deliverables: the ones that constitutes the PRODUCT expected
- Intermediate deliverables: Deliverables required to build (e.g. Specifications, Demo, Prototype..)

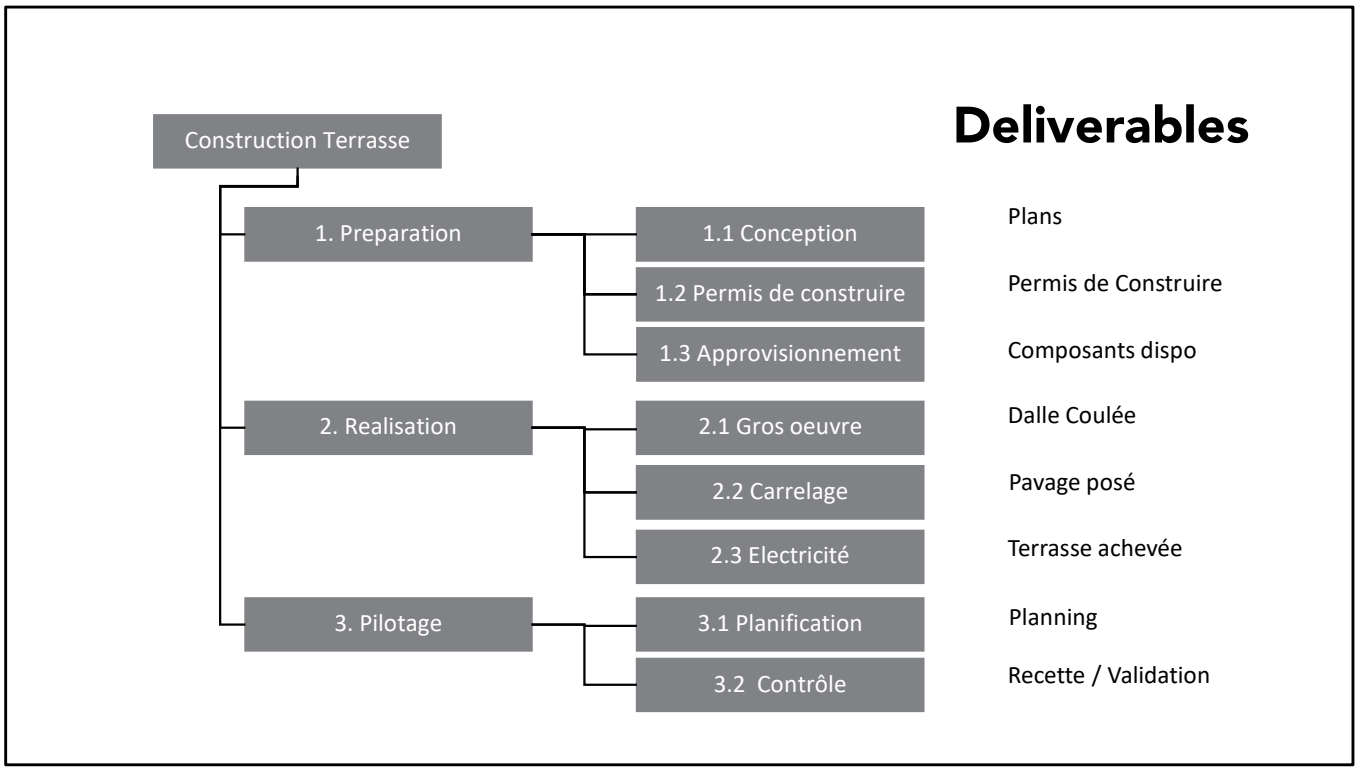
Project Internal Deliverables:

- Deliverables required to realize the project (e.g. Build a development environment)

WP are usually attached to a Project Deliverable

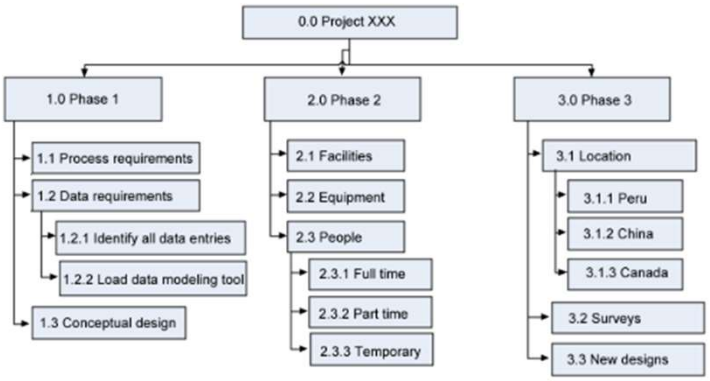
A Work Package is generally linked with one or some **DELIVERABLES** (*Livrable du projet*)
A Work Package is the unit used for **managing the project**
A Work package is often attached to **a line of budget**

But…
There are also many ways you can organize the WBS. For example, it can be organized by either deliverable or phase. The major deliverables of the project are used as the first level in the WBS.
Many projects are structured or **organized by project phases**. Each phase would represent the first level of the WBS and their deliverables would be the next level and so on…



WBS : Example with Deliverables

WBS based on Project Phases



Decompose in Work Packages

Need for expert judgement

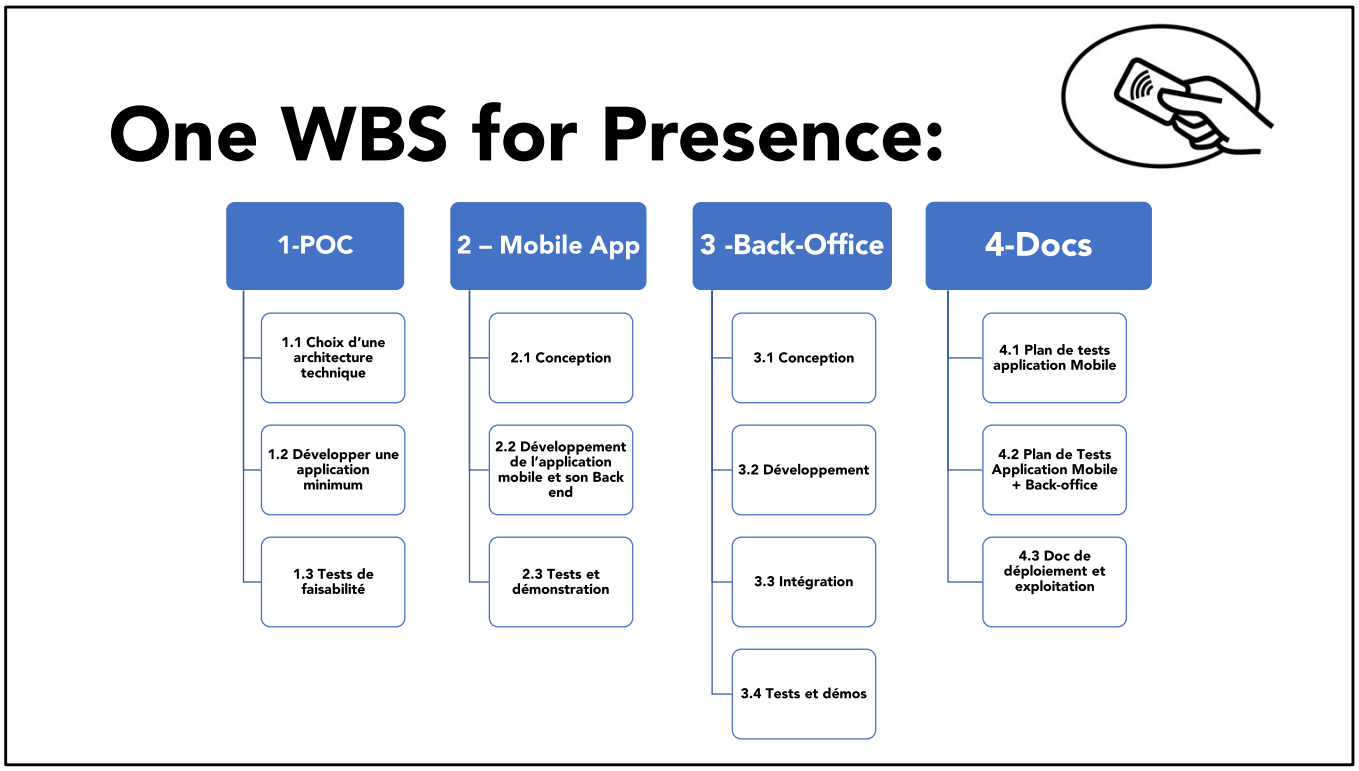
Decompose and Identify the Work Packages:

Check that granularity is correct:
WORK PACKAGE decomposition in micro task (e.g. Hours or one to days) : **is not appropriate**, too much complexity, unmanageable, It is more an action plan (useful for a short period of time when urgent results are expected)

WORK PACKAGE **is too high level** . Not efficient for

managing the project. Often the Workpackage covers a one, or multiple weeks work

TD#1 : WBS for Presence



Un exemple de découpage en lots de travaux:

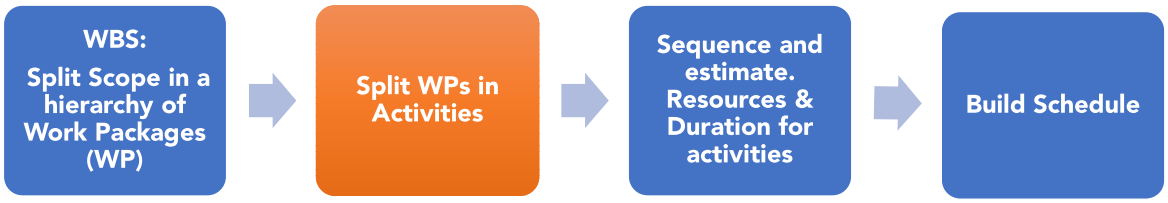
POC: Ces WP ont pour but de choisir et de valider les choix techniques qui seront structurants pour la suite du projet (équivalent au Sprint 0)

Application MOBILE : Il s'agit d'écrire les spécifications fonctionnelles puis de développer et tester la partie Mobile de l'application d'enregistrement des présence aux événements ceci inclus l'application mobile et son back-end . C'est l'équivalent du Sprint 1 et 2 de la démarche AGILE proposée.

Back Office: Conception du modèle de données puis des mockups d'écrans pour les fonctions de création et d'enregistrement des évènements – enfin des fonctions de reporting. C'est le Sprint 3.

Documentation : On regroupe ici les taches de rédaction des documents qui seront nécessaires pour dérouler les tests à chaque étape puis pour permettre la mise en exploitation du logiciel ainsi crée. Pas vraiment d'équivalent dans les Sprint.

From SCOPE to Project Schedule



Defining Activities:
Amount of work that can be estimated

Need for expert judgement

Defining Activities

The activity definition process is a further breakdown of the work package elements of the WBS. It documents the specific activities needed to fulfill the deliverables detailed in the WBS. These activities are not the deliverables themselves but the individual units of work that must be completed to fulfill the deliverables. Activity definition uses everything we already know about the project to divide the work into activities that can be estimated. You might want to look at all the lessons learned from similar projects your company has done to get a good idea of what you need to do on the current one.

Expert judgment in the form of project team members with prior experience developing project scope statements and WBS can help you define activities. If you are asked to manage a project in a new domain, you might also use experts in that particular field to help define tasks so you can understand what activities are going to be involved. You may want to create an activity list and then have the expert review it and suggest changes. Alternatively, you could involve the expert from the very beginning and ask to have an activity definition conversation with him or her before even making your first draft of the list.

Define Milestones
Bornes

Specific type of activity: typically with duration zero.
It will helps measure where we are in the progress of the project:

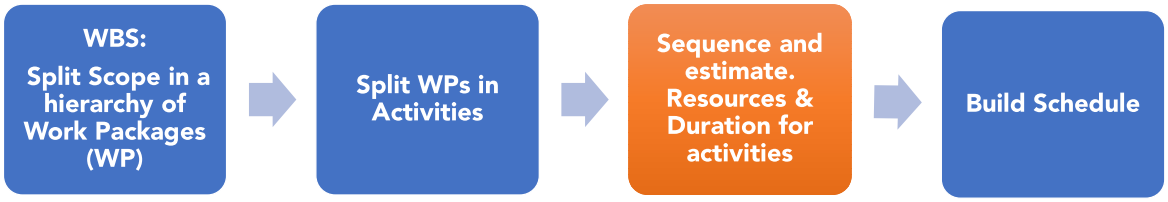
Examples:
- Foundations OK
- Front-end specs validated
- Pilot in production

Milestones
All of the important checkpoints of your project are tracked as milestones. Some of them could be listed in your contract as requirements of successful completion; some could just be significant points in the project that you want to keep track of. The milestone list needs to let everyone know which milestones are required and which are not.

Décomposition en activités Presence 1-POC

Task Name
1- POC
1.1 Architecture technique
Inventaire des contraintes techniques
Investigation sur Etat de l'art
Choix des composants logiciels
Tutos sur composants non connus
Discussions avec mentors
Specs/Schéma d'architecture technique
Architecture technique validée
1.2 Développement d'une application minimum
Création d'un environnement de dev/test
Installation des composants logiciels
Création application minimum
1.3 Tests de faisabilité
Tests technologie d'enregistrement NFC
Tests Tablettes/téléphones
Tests avec Application minimum

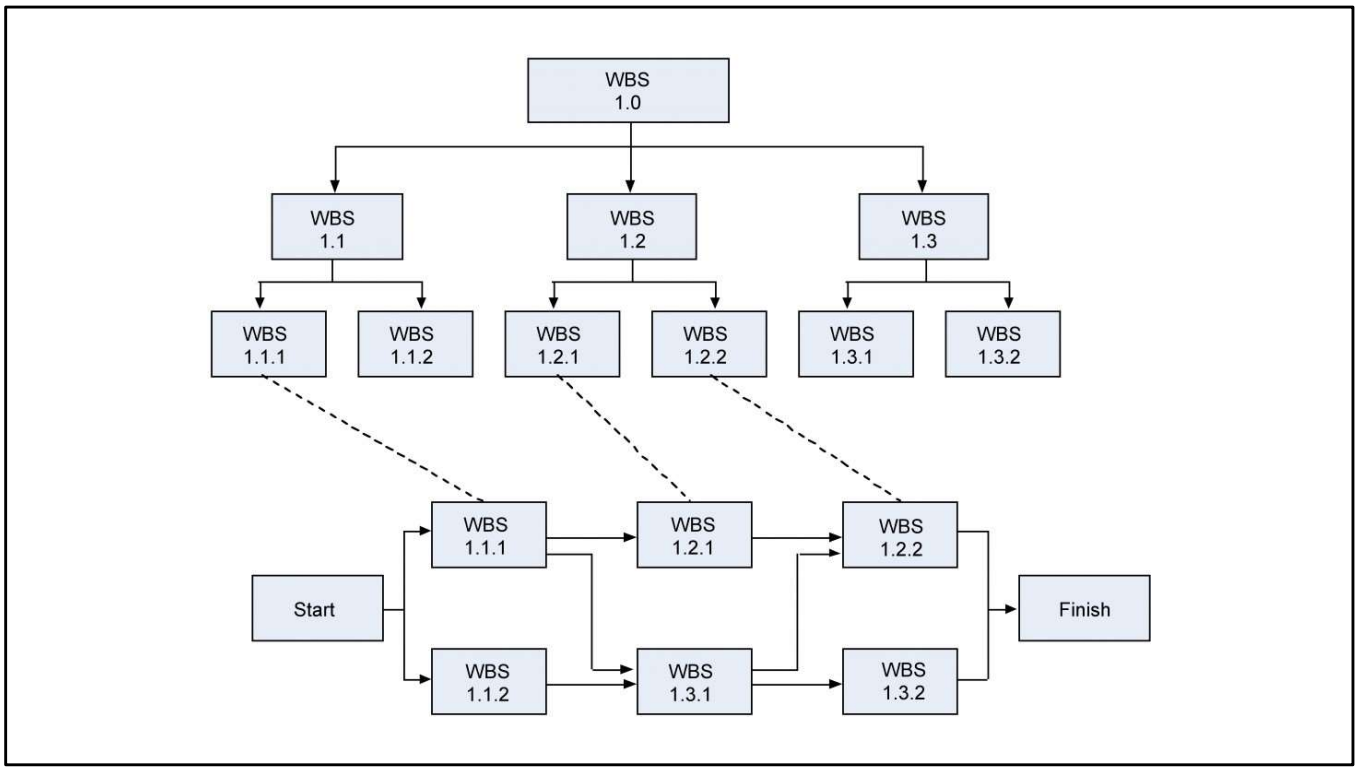
From SCOPE to Project Schedule



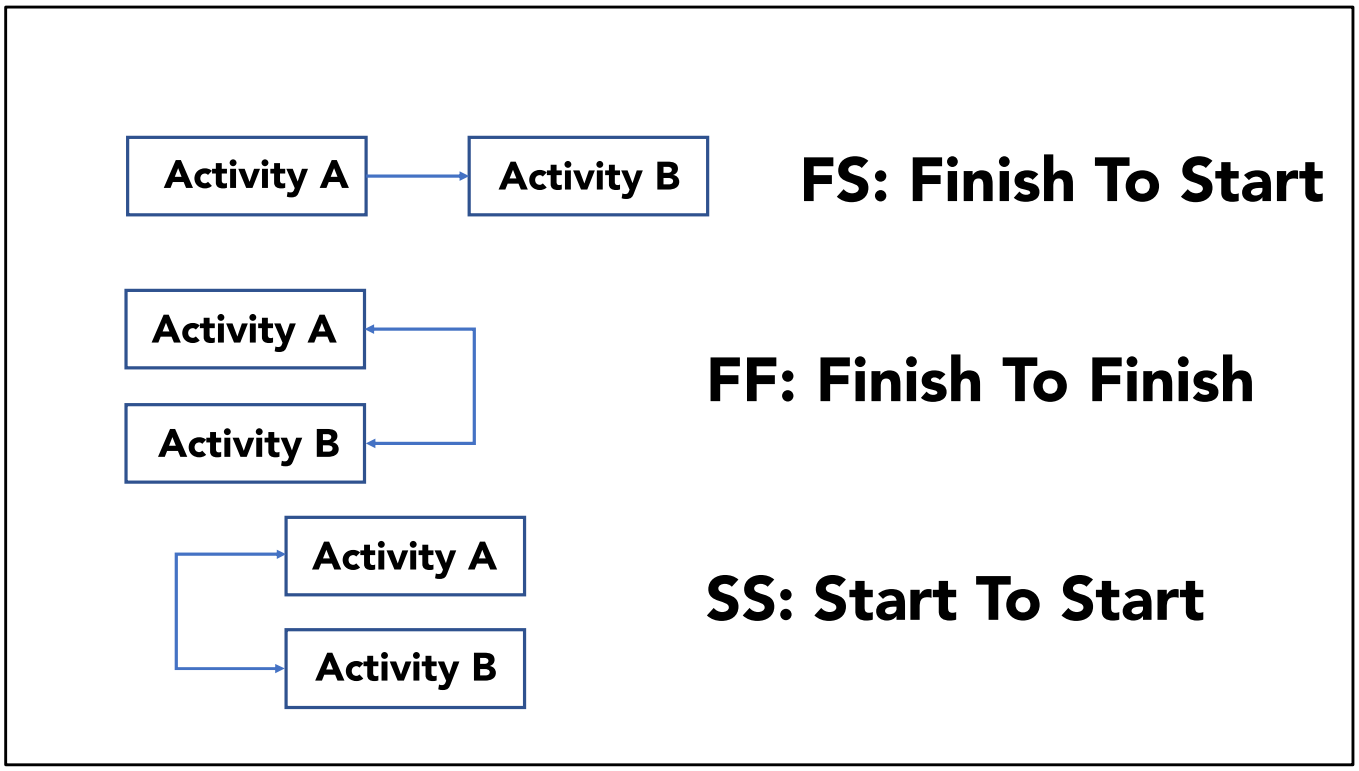
Define the Order the work should be done

Next step is to define **the order of the work should be done**. So any *predecessor* activities, successor activities or constraints should be listed in the attributes along with descriptions and any other information about resources or time that you need for planning.

The three main kinds of predecessors are *finish-to-start* (FS), *start-to-start* (SS) and *finish-to-finish* (FF).



PERT or PERT/CPM Chart

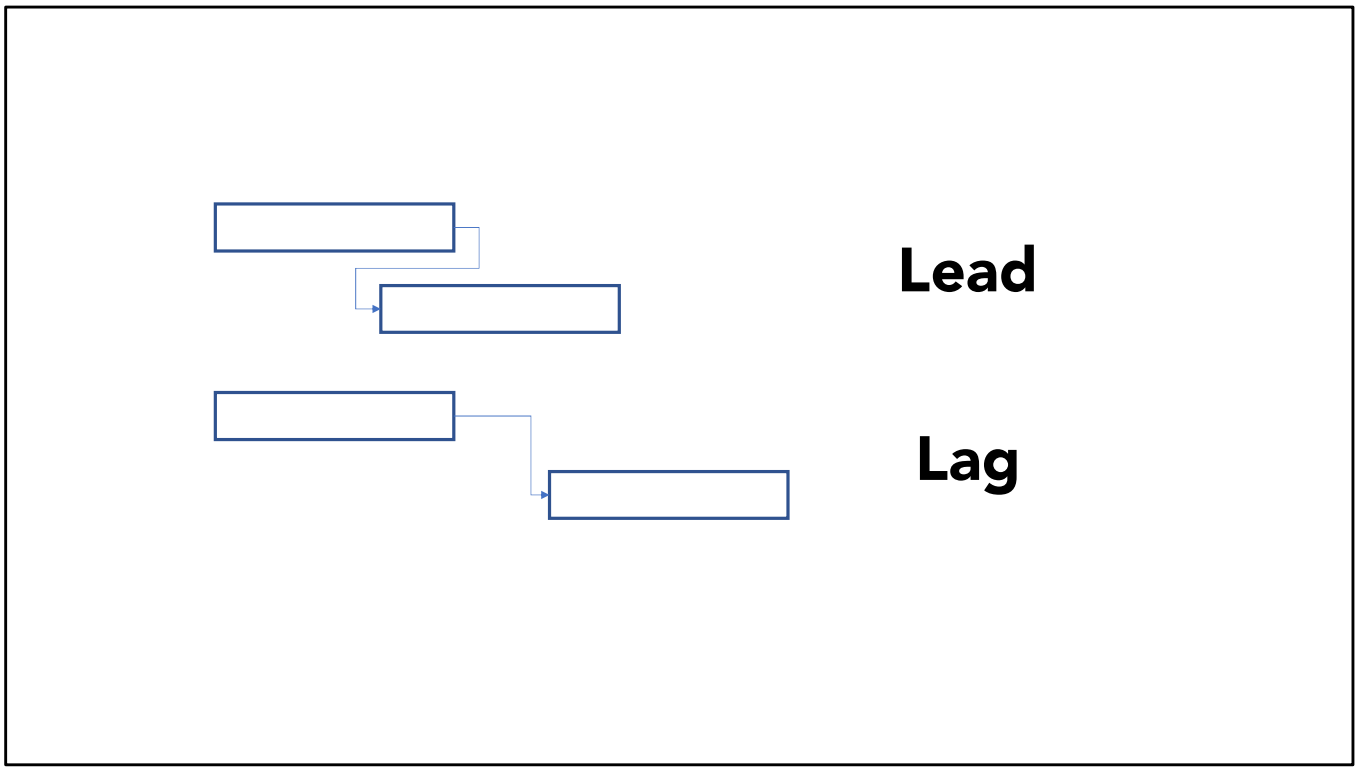


PDM Precedence Diagramming Method (PDM)
(or Network Diagramming methods)
Predecessor relation ships

Finish to Start : **most common**. successor cannot start before predecessor is finished
Finish to Finish : A successor cannot finish until predecessor finishes
Start to Start: Successor cannot start until predecessor has started.
Start to Finish: A successor cannot finish until predecessor has started.

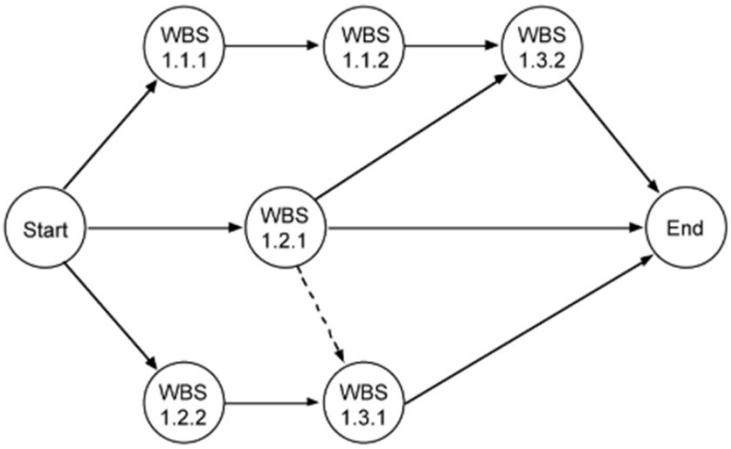
Example: Finish to Finish

Documentation cannot finish before development is finished



Leads and lags:
Sometimes you need to give some extra time between activities. *Lag time* is when you purposefully put a delay between the predecessor task and the successor.
Lead time is when you give a successor task some time to get started before the predecessor finishes

Network Diagram: AON



Activity on Node (vs Activity on Arrow)

Resources

Need for expert judgement

Resources are people, equipment, locations, or anything else that you need in order to do all of the activities that you planned for. Every activity in your activity list needs to have resources assigned to it. Before you can assign resources to your project, you need to know which ones you're authorized to use; that's called **resource availability**. Resource availability includes information about what resources you can use on your project and when they're available to you. Don't forget that some resources like consultants or training rooms have to be scheduled in advance, and they might only be available at certain times. You'll need to know this before you can finish planning your project.

Estimating the resources :

The goal of activity resource estimating is to assign resources to each activity in the activity list. There are five tools and techniques for the activity resource estimating process. Some of them have technical sounding names, but they're all actually pretty sensible when you think about it. They should make sense to you when you think about what you have to do when you have to figure out what resources your project needs.

Expert judgment means bringing in experts who have done this sort of work before and

getting their opinions on what resources are needed (Figure).
Alternative analysis means considering several different options for how you assign resources. This includes varying the number of resources as well as the kind of resources you use. Many times, there's more than one way to accomplish an activity and alternative analysis helps decide among the possibilities.
Published estimating data is something that project managers in a lot of industries use to help them figure out how many resources they need. They rely on articles, books, journals, and periodicals that collect, analyze, and publish data from other people's projects.
Project management software such as Microsoft project will often have features designed to help project managers estimate resource needs and constraints and find the best combination of assignments for the project.
Bottom-up estimating means breaking down complex activities into pieces and working out the resource assignments for each piece. It is a process of estimating these individual activities or costs and then adding these up together to come up with a total estimate. Here you estimate every scheduled activity individually and then roll up that estimate; or add them all together, to come up with a total. Bottom-up estimating is a very accurate means of estimating, provided the estimates at the schedule activity level are accurate. However, it takes a considerable amount of time to perform bottom-up estimating because every activity must be accessed and estimated accurately to be included in the bottom-up calculation. The smaller and more detailed the activity, the greater the accuracy and cost of this technique.

Duration

Estimating activity durations

Once you're done with *activity resource estimating*, you've got everything you need to figure out how long each activity will take. That's done in a process called *activity duration estimating*. This is where you look at each activity in the activity list, consider the scope and the resources and estimate how long it will take to perform.
Estimating the duration of an activity means starting with the information you have about that activity and the resources that are assigned to it, and then working with the project team to come up with an estimate. Most of the time you'll start with a rough estimate and then refine it to make it more accurate.

Estimate

You'll use these five tools and techniques to create the most accurate estimates:

Expert judgment will come from your project team members who are familiar with the work that has to be done. If you don't get their opinion, then there's a huge risk that your estimates will be wrong.

Analogous estimating is when you look at activities from previous projects that were similar to this one and look at how long it took to do similar work before. But this only works if the activities and the project team are similar!

Parametric estimating means plugging data about your project into a formula, spreadsheet, database, or computer program that comes up with an estimate. The software or formula that you use for parametric estimating is built on a database of actual durations from past projects.

Three-point estimates are when you come up with three numbers: a realistic estimate that's most likely to occur, an optimistic one that represents the best-case scenario, and a pessimistic one that represents the worst-case scenario. The final estimate is the average.

Most Likely (tM)
Optimistic (tO)
Pessimistic (tP)

tE = (tO+tM+tP)/3

Reserve analysis means adding extra time to the schedule (called a contingency reserve or a buffer) to account for extra risk.

TOP Down vs Bottom UP

The proposed approach (decompose in activities and estimate each activity) is called

BOTTOM-UP estimation

Method is accurate, but generates often OVER ESTIMATION (trend to slightly over estimate each activity duration and effort)

USEFULL to counterbalance bottom-up with TOP-DOWN

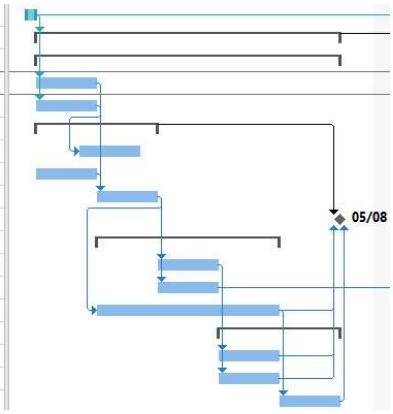
estimation:

Based on experience get an estimation of duration or effort of a complete project phase or full WP and then
See how WP and the activities can match with this estimates.

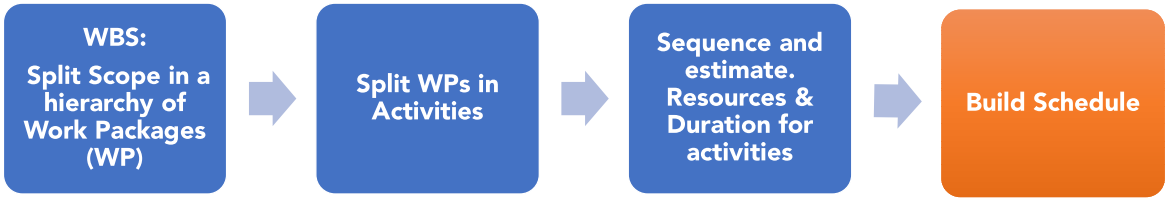
Often actual project duration is a mid term between the two estimations

Ordonner et Estimer

T0 Projet	1 day?	Wed 01/07/2	Wed 01/07/2	
1- POC	**25 days**	**Thu 02/07/20**	**Wed 05/08/2**	**1**
1.1 Architecture technique	**25 days**	**Thu 02/07/20**	**Wed 05/08/2**	
Inventaire des contraintes techniques	5 days	Thu 02/07/20	Wed 08/07/2	1
Investigation sur Etat de l'art	5 days	Thu 02/07/20	Wed 08/07/2	1
Choix des composants logiciels	**10 days**	**Thu 02/07/20**	**Wed 15/07/2**	
Tutos sur composants non connus	5 days	Tue 07/07/20	Mon 13/07/2	5FS-2 days
Discussions avec mentors	5 days	Thu 02/07/20	Wed 08/07/2	
Specs/Schéma d'architecture technique	5 days	Thu 09/07/20	Wed 15/07/2	4;5;8
Architecture technique validée	0 days	Wed 05/08/2	Wed 05/08/2	6;14;18;16;17
1.2 Développement d'une application minimum	**15 days**	**Thu 09/07/20**	**Wed 29/07/2**	
Création d'un environnement de dev/test	5 days	Thu 16/07/20	Wed 22/07/2	9
Installation des composants logiciels	5 days	Thu 16/07/20	Wed 22/07/2	9
Création application minimum	15 days	Thu 09/07/20	Wed 29/07/2	9FS-5 days
1.3 Tests de faisabilité	**10 days**	**Thu 23/07/20**	**Wed 05/08/2**	
Tests technologie d'enregistrement NFC	5 days	Thu 23/07/20	Wed 29/07/2	12
Tests Tablettes/téléphones	5 days	Thu 23/07/20	Wed 29/07/2	12
Tests avec Application minimum	5 days	Thu 30/07/20	Wed 05/08/2	14



From SCOPE to Project Schedule



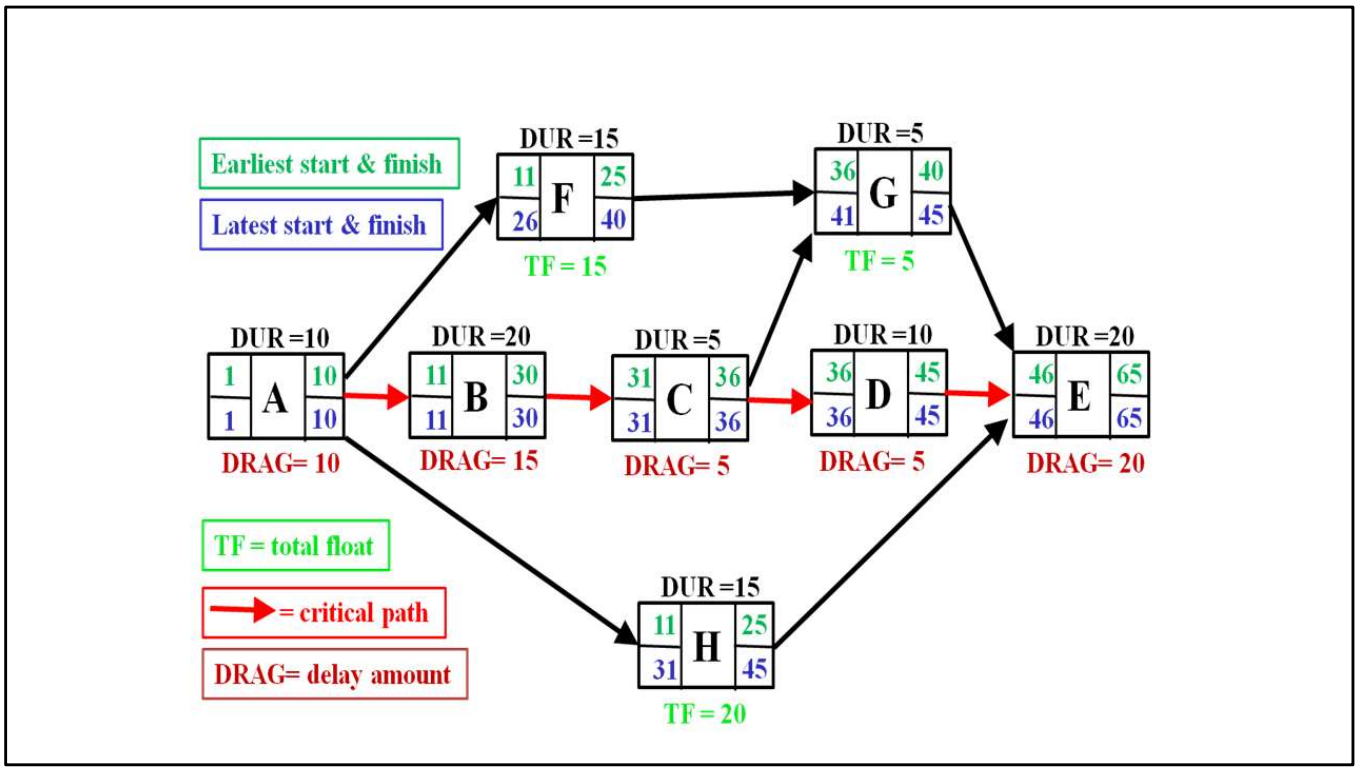
CPM: Critical path method
PERT: Program Evaluation and Review Technique

Late 50s…

Algorithms from 1957 and 1958…

The essential technique for using CPM is to construct a model of the project that includes the following:
A list of all activities required to complete the project (typically categorized within a work breakdown structure),
The time (duration) that each activity will take to complete,
The dependencies between the activities and,
Logical end points such as milestones or deliverable items.
Using these values, CPM calculates the longest path of planned activities to logical end points or to the end of the project, and the earliest and latest that each activity can start and finish without making the project longer. This process determines which activities are "critical" (i.e., on the longest path) and which have "total float" (i.e., can be delayed without making the project longer). In project management, a critical path is the sequence of project network activities which add up to the longest overall duration, regardless if that longest duration has float or not. This determines the shortest time possible to complete the project.
The first time CPM was used for major skyscraper development was in 1966

while constructing the former World Trade Center Twin Towers in New York City



Fast-Tracking : more activities in parallel
Crashing : Add resources
Resource levelling….

Build Schedule Baseline

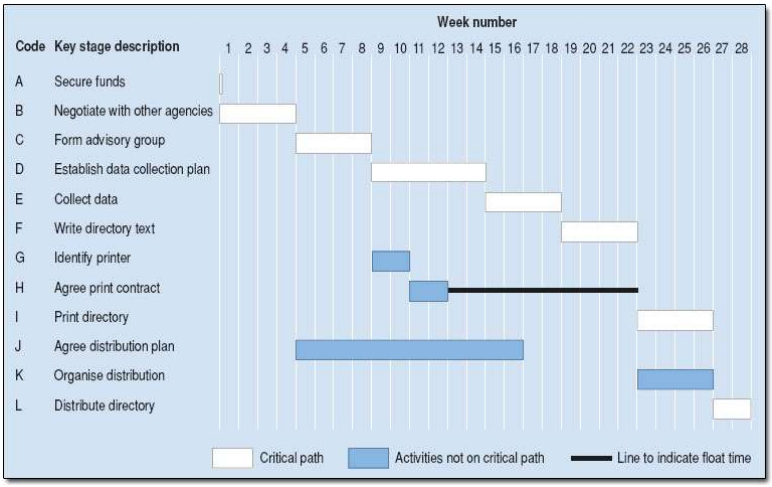
Now that we have gathered all activities attributes:
Id
Name/Description
Duration
Ressources
Predecessors

We will use **Project management Software** to build a reference schedule: usually a GANTT chart.

Project Management Software:

- **Microsoft project**
- **Ganttproject (OpenSource)**

GANTT Chart

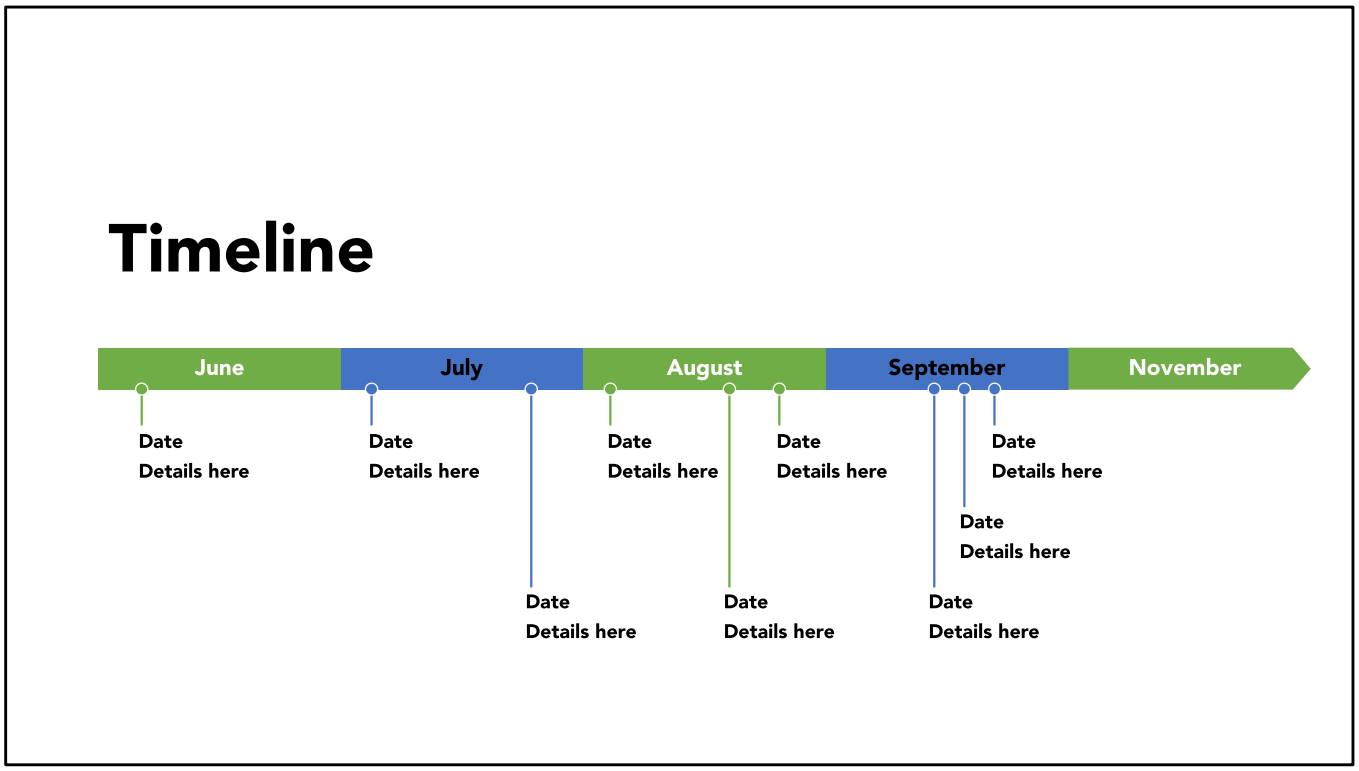


Creating the Gantt Chart

A Gantt chart is a type of bar chart, developed by Henry Gantt, that illustrates a project schedule. Gantt charts are easy to read and are commonly used to display schedule activities. These charts display the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the dependency relationships (i.e., precedence network) between activities.

Gantt charts show all the key stages of a project and their duration as a bar chart, with the time scale across the top. The key stages are placed on the bar chart in sequence, starting in the top left corner and ending in the bottom right corner. A Gantt chart can be drawn quickly and easily and is often the first tool a project manager uses to provide a rough estimate of the time that it will take to complete the key tasks. Sometimes it is useful to start with the target deadline for completion of the whole project, because it is soon apparent if the time scale is too short or unnecessarily long. The detailed Gantt chart is usually constructed after the main objectives have been determined.

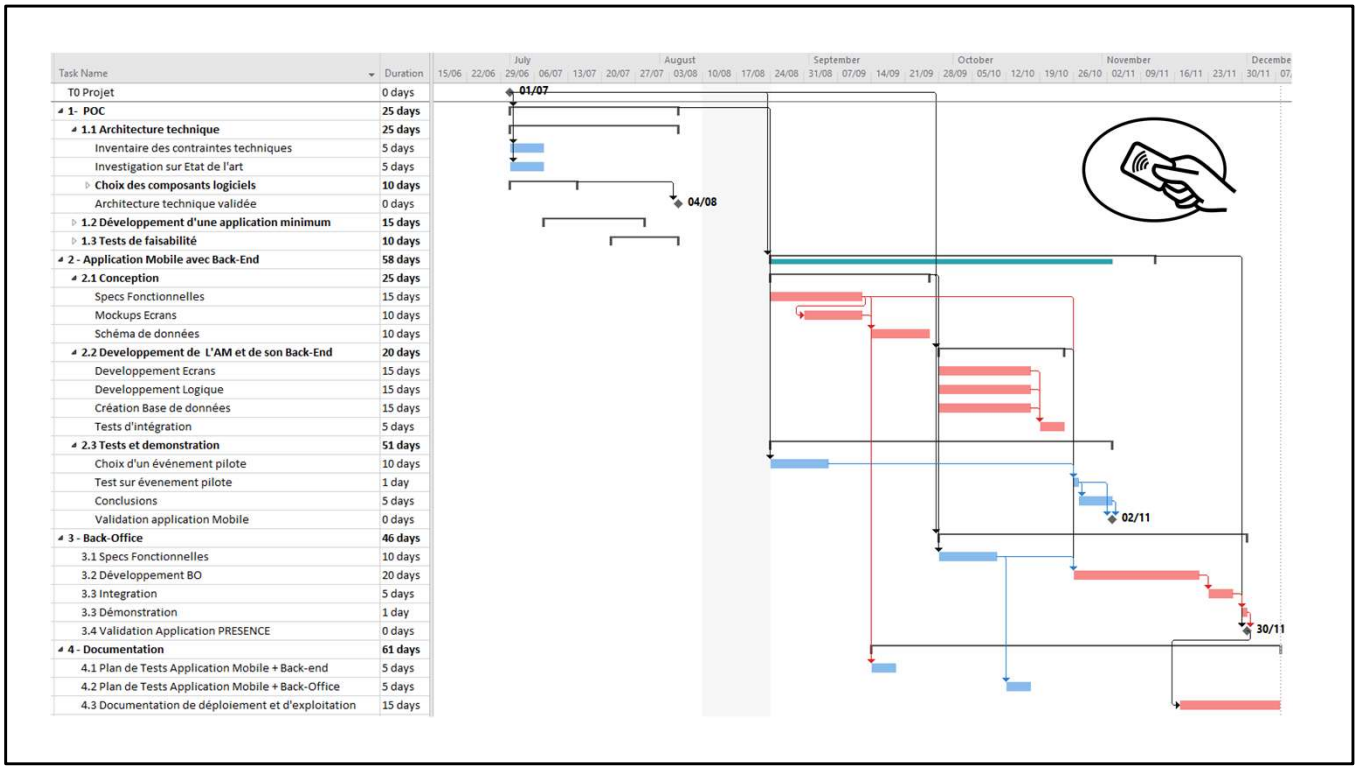
Explain: Critical Path/Slack

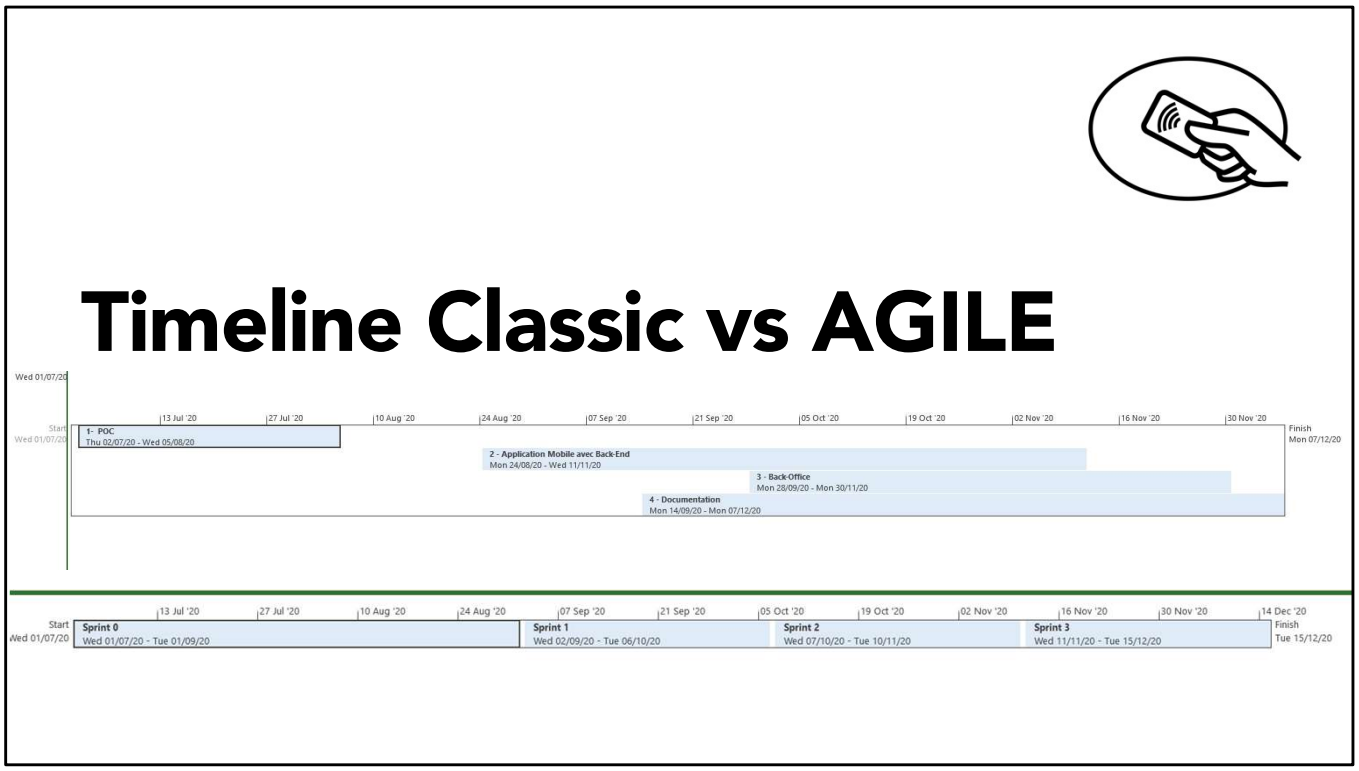


For presentations, and communication to Stakeholders, the GANTT CHART is usually too detailed.
The Timeline Gives a better overview as it shows only major milestones over time.

Project Schedule:
Exemple pour « Présence »

MS Project: Example




Timeline Classic vs AGILE
Wed 01/07/20
13 Jul '20
27 Jul '20
10 Aug '20
24 Aug '20
07 Sep '20
21 Sep '20
05 Oct '20
19 Oct '20
02 Nov '20
16 Nov '20
30 Nov '20
Start
Wed 01/07/20
1- POC
Thu 02/07/20 - Wed 05/08/20
2 - Application Mobile avec Back-End
Mon 24/08/20 - Wed 11/11/20
3 - Back-Office
Mon 28/09/20 - Mon 30/11/20
4 - Documentation
Mon 14/09/20 - Mon 07/12/20
Finish
Mon 07/12/20
13 Jul '20
27 Jul '20
10 Aug '20
24 Aug '20
07 Sep '20
21 Sep '20
05 Oct '20
19 Oct '20
02 Nov '20
16 Nov '20
30 Nov '20
14 Dec '20
Start
Wed 01/07/20
Sprint 0
Wed 01/07/20 - Tue 01/09/20
Sprint 1
Wed 02/09/20 - Tue 06/10/20
Sprint 2
Wed 07/10/20 - Tue 10/11/20
Sprint 3
Wed 11/11/20 - Tue 15/12/20
Finish
Tue 15/12/20