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Features of Critical Path Analysis

The critical path is not enough

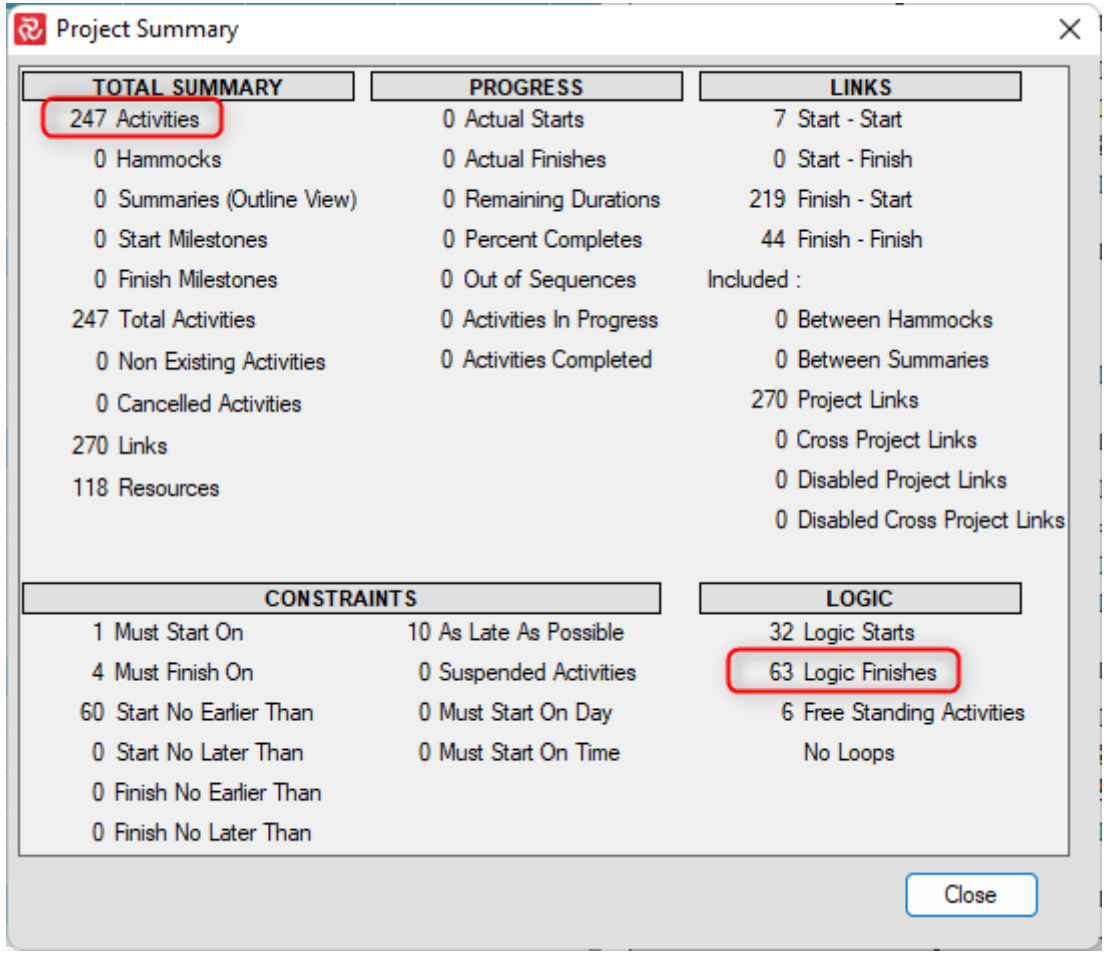
Thomas Aksnes – Nov 2023

Critical Path

- Assignment: Find the critical path in your project

- What is the critical path?
- Lowest common denominator: *if there's a delay in any of the activities on the critical path, it will most likely affect the end date of that chain of activities.*

- What does that mean? "*affect the end date of* that chain of activities"?
- That chain of activities must have a Logic Finish (Activity with no successor)
  - As a planner for a project with 5 deliverables and 247 activities, we have 63 Critical Paths?
  - My manager would not approve a report showing 63 critical paths.



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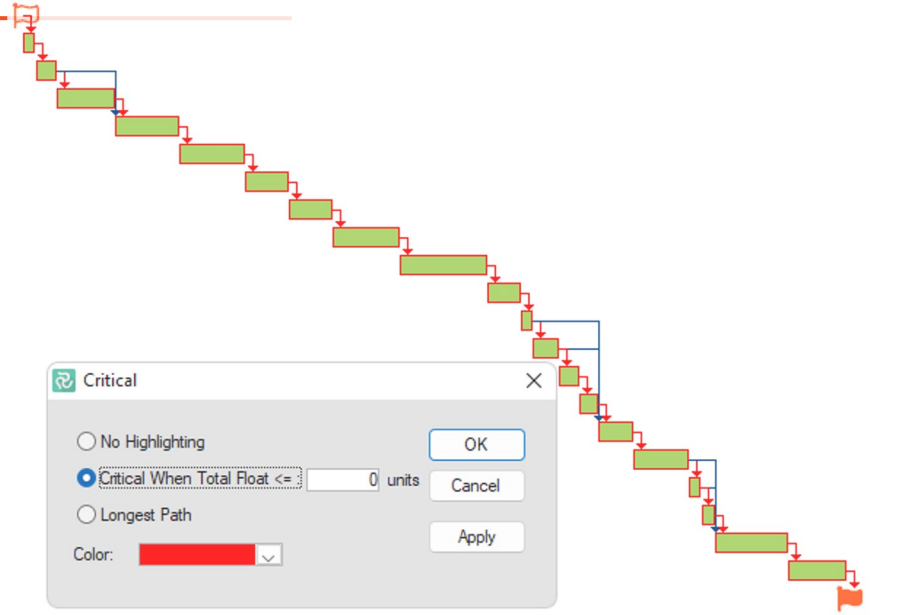
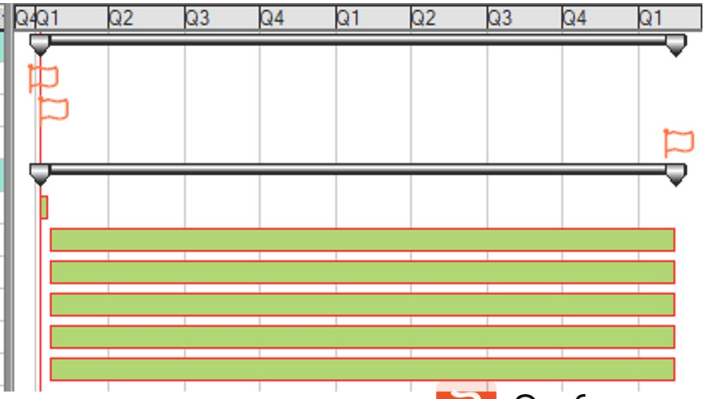
Critical Path - Definition

- Academic:
  - *"A critical path is a sequence of tasks in a project that are required to be completed for the project to finish on time"*
  - *"The critical path is the most important path in the project because any delay in the critical path will delay the project completion date."*

- In Safran we can define the Critical Path where Total Float <=0



Activity ID	Description	Dura	Early Star	Early Finis	Total Float
00	Milestones	543	07.01.2019	14.02.2021	
300	Contract Award	0	07.01.2019	07.01.2019	0
260	Project Kick-off	0	21.01.2019	21.01.2019	0
320	Project Completion/Tunnel Opening	0	14.02.2021	14.02.2021	0
01	Administration and Management	543	07.01.2019	14.02.2021	
310	Project Start-Up	10	07.01.2019	18.01.2019	0
060	Cost control	533 d	21.01.2019	14.02.2021	0
050	Planning	533 d	21.01.2019	14.02.2021	0
080	Document control	533 d	21.01.2019	14.02.2021	0
010	Project management	533 d	21.01.2019	14.02.2021	0
020	Engineering Team Lead (ETL)	533 d	21.01.2019	14.02.2021	0



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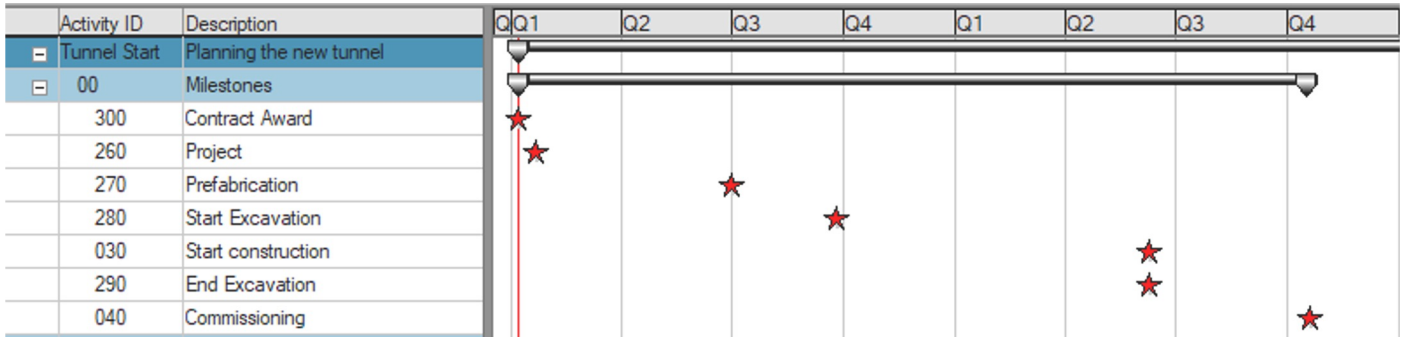
Critical Path

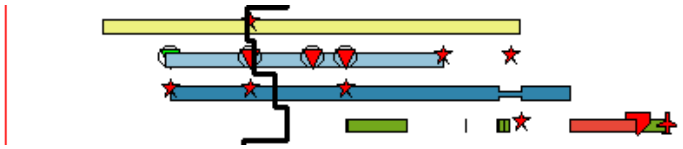
- My favorite:
  - *"Well, it depends"*
- Critical Path can for example be defined as a set of milestones



Activity ID	Description
Tunnel Start	Planning the new tunnel
00	Milestones
300	Contract Award
260	Project
270	Prefabrication
280	Start Excavation
030	Start construction
290	End Excavation
040	Commissioning

- Or a few Hammocks
  Hammocks is a group of activities that are tied between two end dates

20 - Engineering	309	04.04.2022	23.08.2023
30 - Procurement	208	03.06.2022	25.04.2023
50 - Fabrication	242	08.06.2022	20.06.2023
60 - Testing and Delivery	190	21.11.2022	20.09.2023



- Milestones are great for defining segments in the schedule for further critical path analysis.

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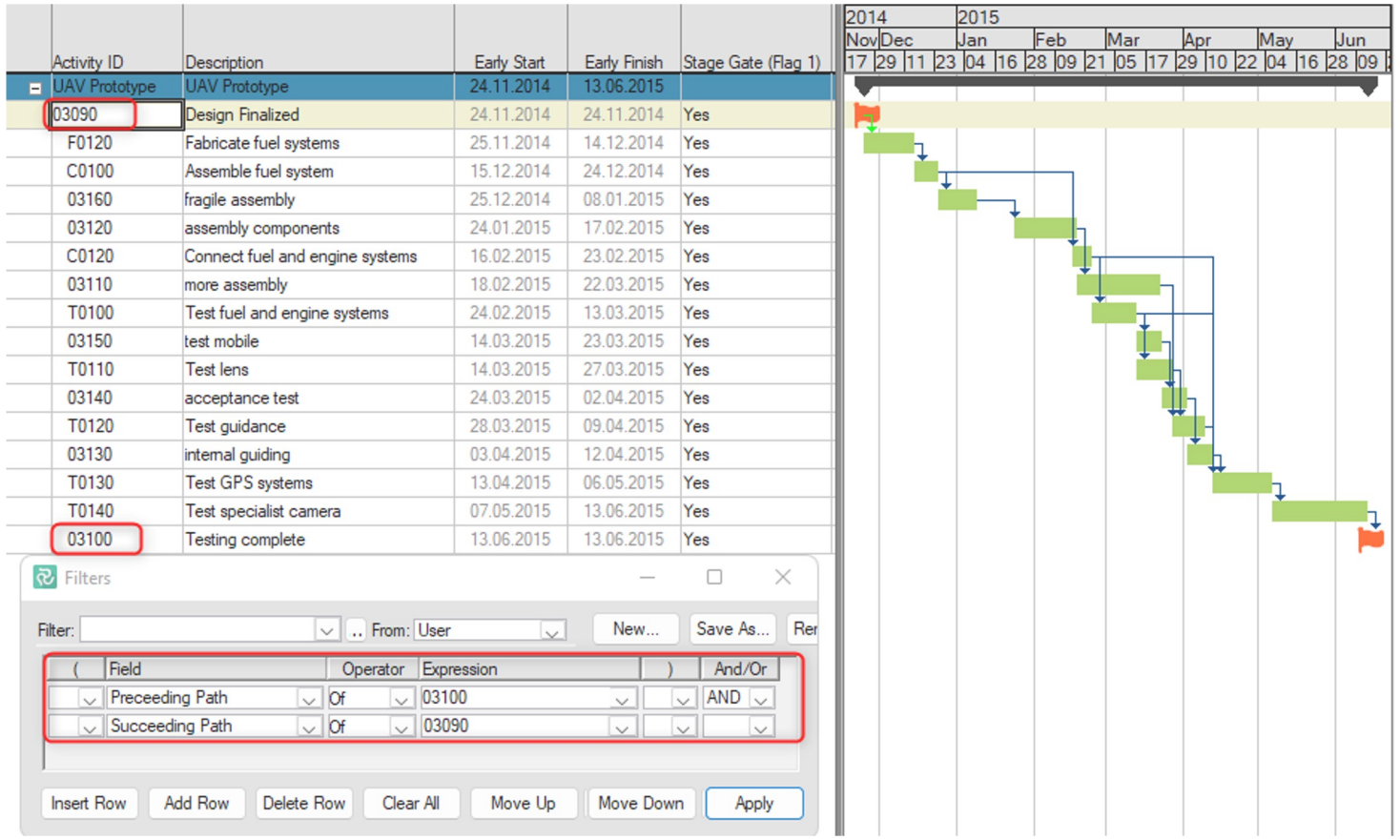
Critical Path - Filter

- If it is difficult to split the project between two milestones, you have the possibility to use a general filter to narrow down the selection:
- Predeeding path Of [Activity ID]
- AND
- Succeeding Path Of [Activity ID]
- If these activities don't fit in any easy WBS/metadata set, create a flagfield



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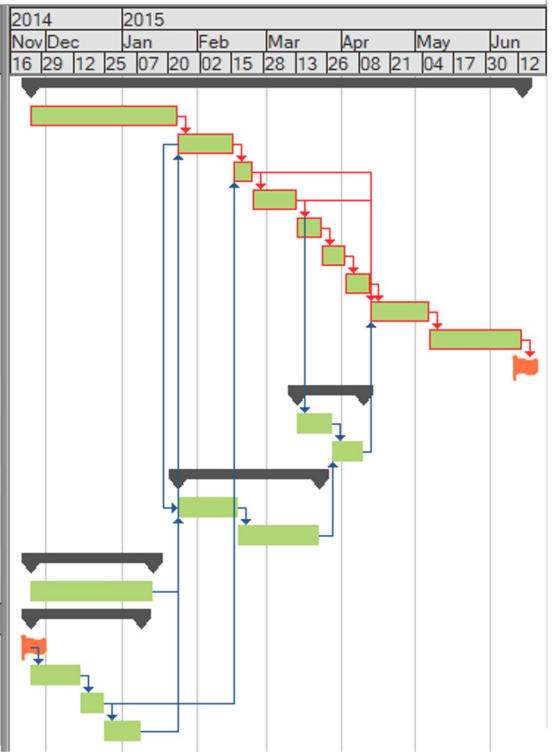
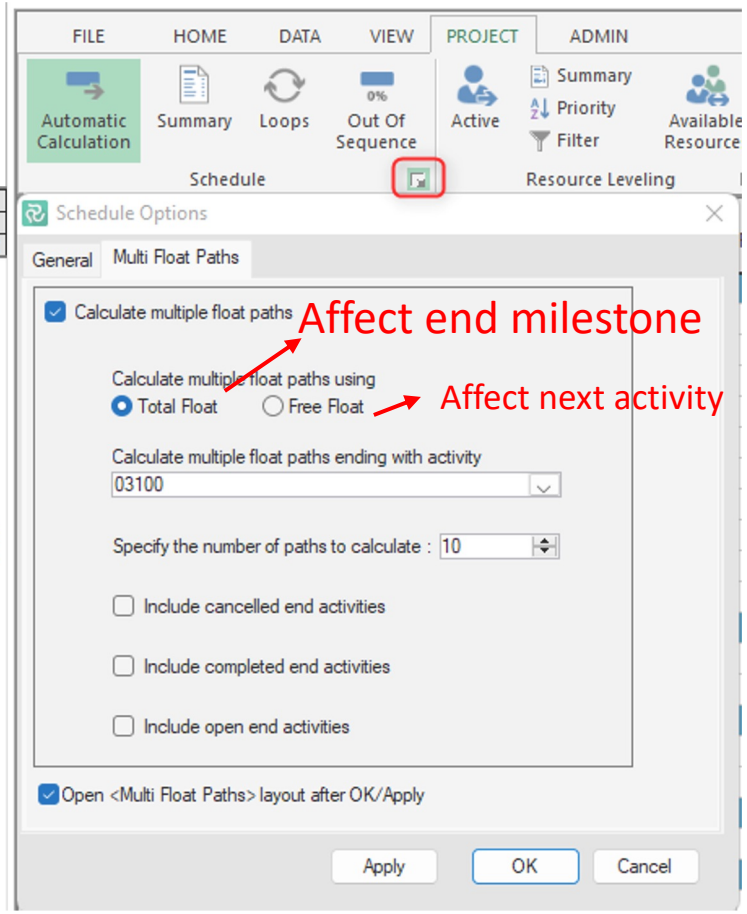
Multiple Float Paths

- When you have the filtered selection, we can utilize the 'Multiple Float Paths' option in Safran to get a better overview for the logic

Activity ID	Description	Longest Path	Float Path	Float Path Order	Early Start	Early Finish	Total Float	Free Float
Float Path 1	Float Path 1				25.11.2014	13.06.2015		
F0100	Fabricate camera lens frame	Yes	1	10	25.11.2014	23.01.2015	0	0
C0110	Assemble engine components	Yes	1	11	24.01.2015	15.02.2015	0	0
C0120	Connect fuel and engine systems	Yes	1	12	16.02.2015	23.02.2015	0	0
T0100	Test fuel and engine systems	Yes	1	13	24.02.2015	13.03.2015	0	0
03150	test mobile	Yes	1	14	14.03.2015	23.03.2015	0	0
03140	acceptance test	Yes	1	15	24.03.2015	02.04.2015	0	0
03130	internal guiding	Yes	1	16	03.04.2015	12.04.2015	0	0
T0130	Test GPS systems	Yes	1	17	13.04.2015	06.05.2015	0	0
T0140	Test specialist camera	Yes	1	18	07.05.2015	13.06.2015	0	0
03100	Testing complete	Yes	1	19	13.06.2015	13.06.2015	0	0
Float Path 2	Float Path 2				14.03.2015	09.04.2015		
T0110	Test lens	No	2	1	14.03.2015	27.03.2015	3	0
T0120	Test guidance	No	2	2	28.03.2015	09.04.2015	3	3
Float Path 3	Float Path 3				24.01.2015	22.03.2015		
03120	assembly components	No	3	1	24.01.2015	17.02.2015	8 d	0
03110	more assembly	No	3	2	18.02.2015	22.03.2015	8 d	5 d
Float Path 4	Float Path 4				25.11.2014	13.01.2015		
F0110	Fabricate engine subframe	No	4	1	25.11.2014	13.01.2015	10	10
Float Path 5	Float Path 5				24.11.2014	08.01.2015		
03090	Design Finalized	No	5	1	24.11.2014	24.11.2014	23 d	0
F0120	Fabricate fuel systems	No	5	2	25.11.2014	14.12.2014	23 d	0
C0100	Assemble fuel system	No	5	3	15.12.2014	24.12.2014	23 d	0
03160	fragile assembly	No	5	4	25.12.2014	08.01.2015	23 d	15 d





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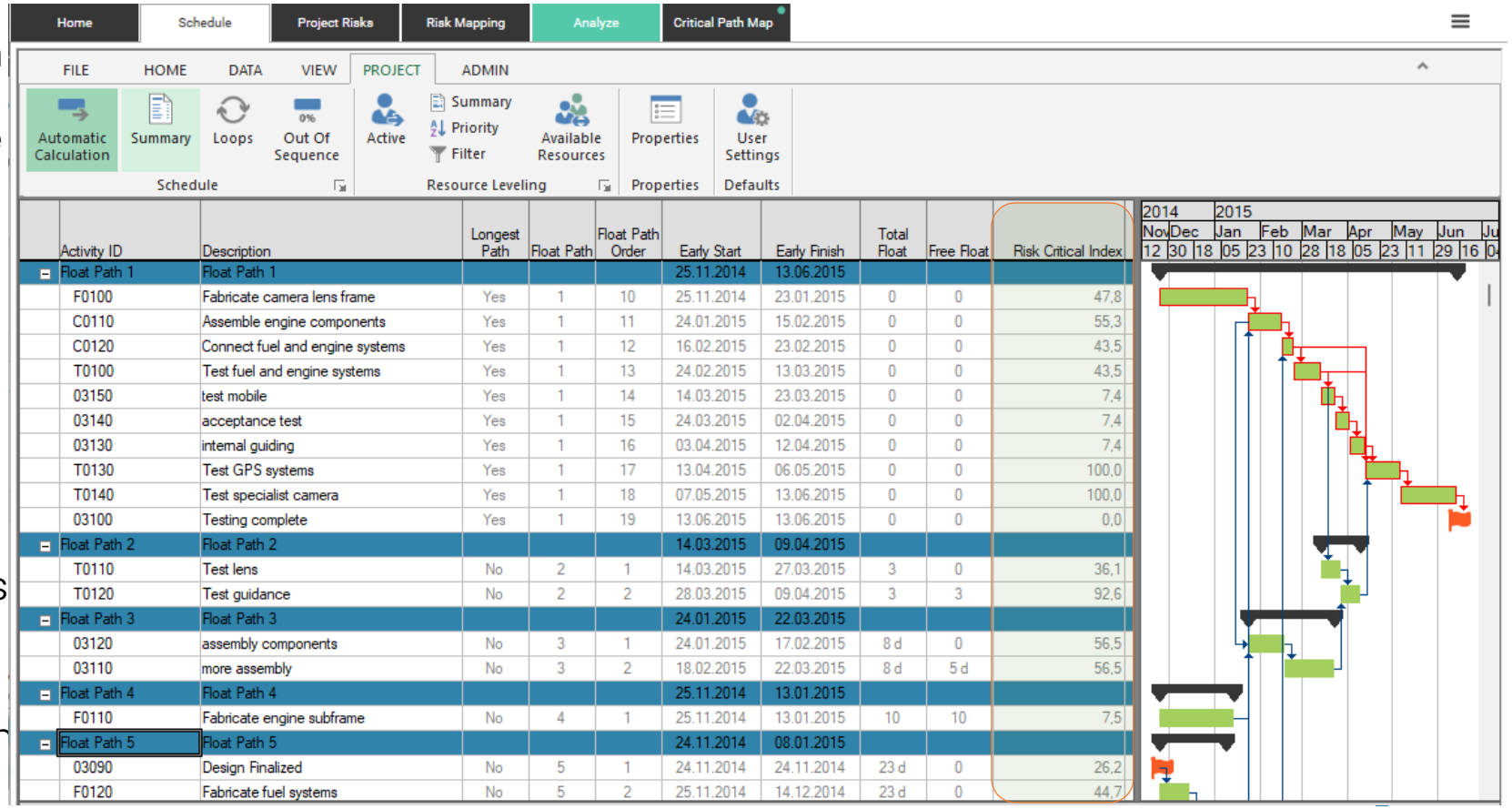
Critical Path Map

- Until now we've been working in the project schedule. For those who are using Safran Risk, there are even more tools available when working with the Critical Path.
- Define Project Risks and uncertainties – what can go wrong?
- Map the risks against relevant activities
- Define the milestone as a Focus Activity, before running the analysis
- Get the result in the Critical Path Map
- Return the results back to the schedule



Activity ID	Description	Longest Path	Float Path	Float Path Order	Early Start	Early Finish	Total Float	Free Float	Risk Critical Index
Float Path 1	Float Path 1				25.11.2014	13.06.2015			
F0100	Fabricate camera lens frame	Yes	1	10	25.11.2014	23.01.2015	0	0	47,8
C0110	Assemble engine components	Yes	1	11	24.01.2015	15.02.2015	0	0	55,3
C0120	Connect fuel and engine systems	Yes	1	12	16.02.2015	23.02.2015	0	0	43,5
T0100	Test fuel and engine systems	Yes	1	13	24.02.2015	13.03.2015	0	0	43,5
03150	test mobile	Yes	1	14	14.03.2015	23.03.2015	0	0	7,4
03140	acceptance test	Yes	1	15	24.03.2015	02.04.2015	0	0	7,4
03130	internal guiding	Yes	1	16	03.04.2015	12.04.2015	0	0	7,4
T0130	Test GPS systems	Yes	1	17	13.04.2015	06.05.2015	0	0	100,0
T0140	Test specialist camera	Yes	1	18	07.05.2015	13.06.2015	0	0	100,0
03100	Testing complete	Yes	1	19	13.06.2015	13.06.2015	0	0	0,0
Float Path 2	Float Path 2				14.03.2015	09.04.2015			
T0110	Test lens	No	2	1	14.03.2015	27.03.2015	3	0	36,1
T0120	Test guidance	No	2	2	28.03.2015	09.04.2015	3	3	92,6
Float Path 3	Float Path 3				24.01.2015	22.03.2015			
03120	assembly components	No	3	1	24.01.2015	17.02.2015	8 d	0	56,5
03110	more assembly	No	3	2	18.02.2015	22.03.2015	8 d	5 d	56,5
Float Path 4	Float Path 4				25.11.2014	13.01.2015			
F0110	Fabricate engine subframe	No	4	1	25.11.2014	13.01.2015	10	10	7,5
Float Path 5	Float Path 5				24.11.2014	08.01.2015			
03090	Design Finalized	No	5	1	24.11.2014	24.11.2014	23 d	0	26,2
F0120	Fabricate fuel systems	No	5	2	25.11.2014	14.12.2014	23 d	0	44,7

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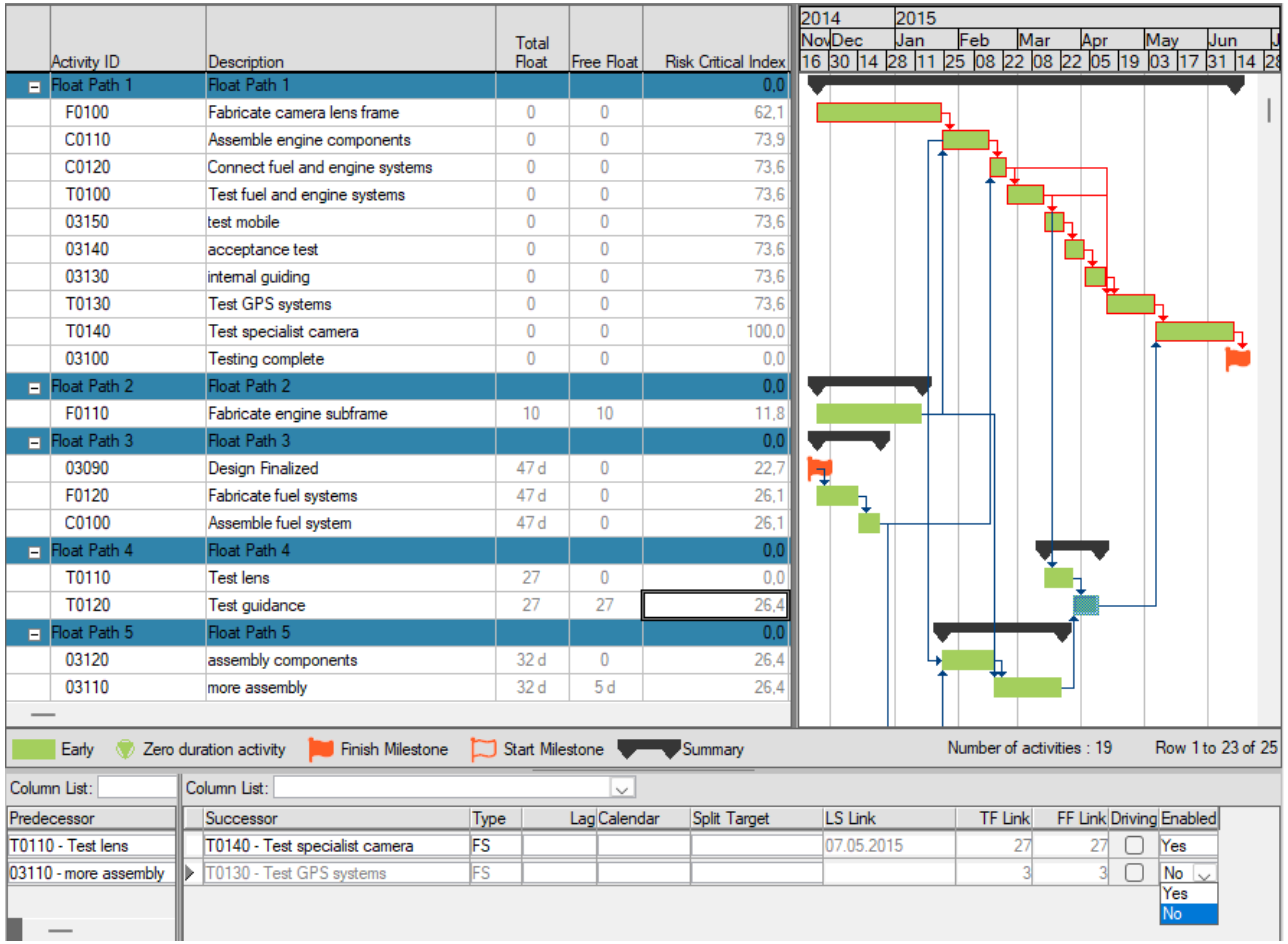
Enabled/disabled links

- Working with risks and uncertainties can definitely affect the Critical Path.
- But let's not forget the schedule logic! Creating and testing different logical paths in the schedule allows us to see how each dependency affects the end milestone.
- By changing the dependency (Enable/Disable), and then rerunning the analysis, we get a new Risk Critical Index
- This can be a viable solution to find a less volatile Critical Path in the schedule and/or an alternative schedule option.



Activity ID	Description	Total Float	Free Float	Risk Critical Index
Float Path 1	Float Path 1			0,0
F0100	Fabricate camera lens frame	0	0	62,1
C0110	Assemble engine components	0	0	73,9
C0120	Connect fuel and engine systems	0	0	73,6
T0100	Test fuel and engine systems	0	0	73,6
03150	test mobile	0	0	73,6
03140	acceptance test	0	0	73,6
03130	internal guiding	0	0	73,6
T0130	Test GPS systems	0	0	73,6
T0140	Test specialist camera	0	0	100,0
03100	Testing complete	0	0	0,0
Float Path 2	Float Path 2			0,0
F0110	Fabricate engine subframe	10	10	11,8
Float Path 3	Float Path 3			0,0
03090	Design Finalized	47 d	0	22,7
F0120	Fabricate fuel systems	47 d	0	26,1
C0100	Assemble fuel system	47 d	0	26,1
Float Path 4	Float Path 4			0,0
T0110	Test lens	27	0	0,0
T0120	Test guidance	27	27	26,4
Float Path 5	Float Path 5			0,0
03120	assembly components	32 d	0	26,4
03110	more assembly	32 d	5 d	26,4

Predecessor	Successor	Type	Lag	Calendar	Split Target	LS Link	TF Link	FF Link	Driving	Enabled
T0110 - Test lens	T0140 - Test specialist camera	FS				07.05.2015	27	27	☐	Yes
03110 - more assembly	T0130 - Test GPS systems	FS					3	3	☐	No / Yes / No

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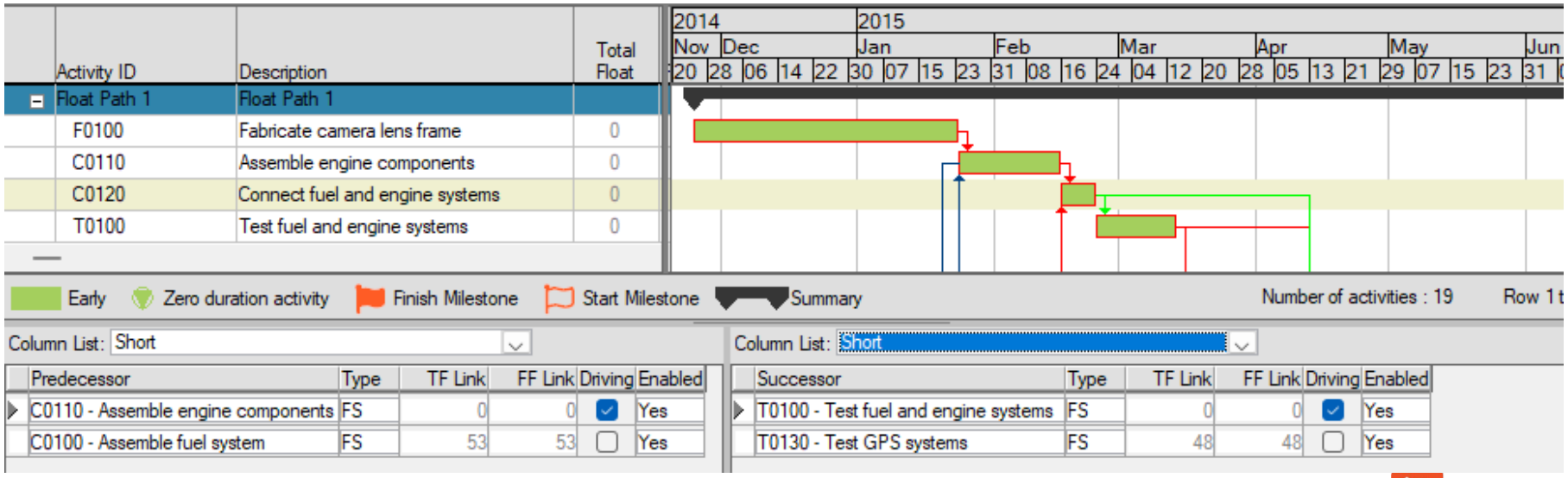
Link Information - Driving

- Driving activities drive the start and finish dates of the activities that follow.
- Logically, critical path relationships are driving
- Driving Activities are now highlighted in the Link Information Window
- Great additional information when navigating through the schedule in the Link Information Window when searching for for example Float eaters



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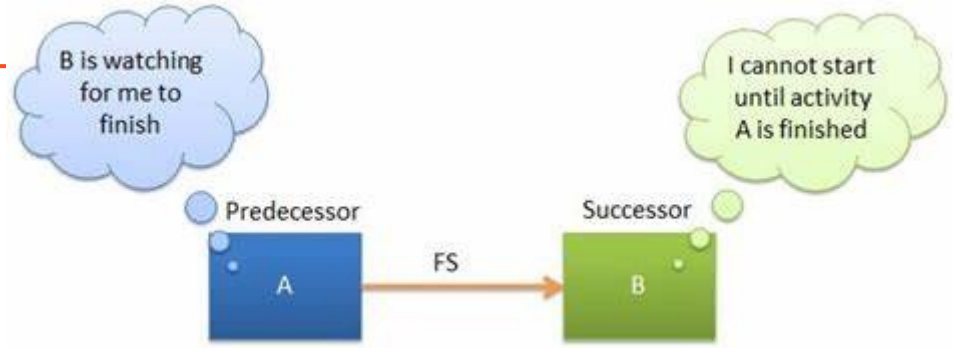
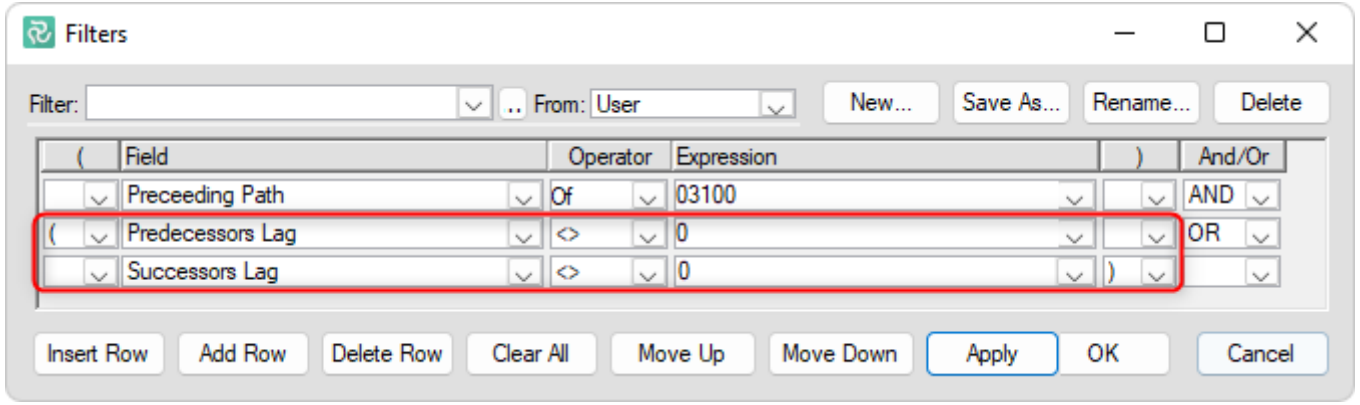
Critical Path – Best practices

- Utilize Finish to Start dependencies for an easy-to-understand and easy to follow logic



- Reduce the use of lag on the critical path
  - Find lag by filtering Predecessors Lag Successors Lag



- Start high level
- Split the schedule
- Then go into details

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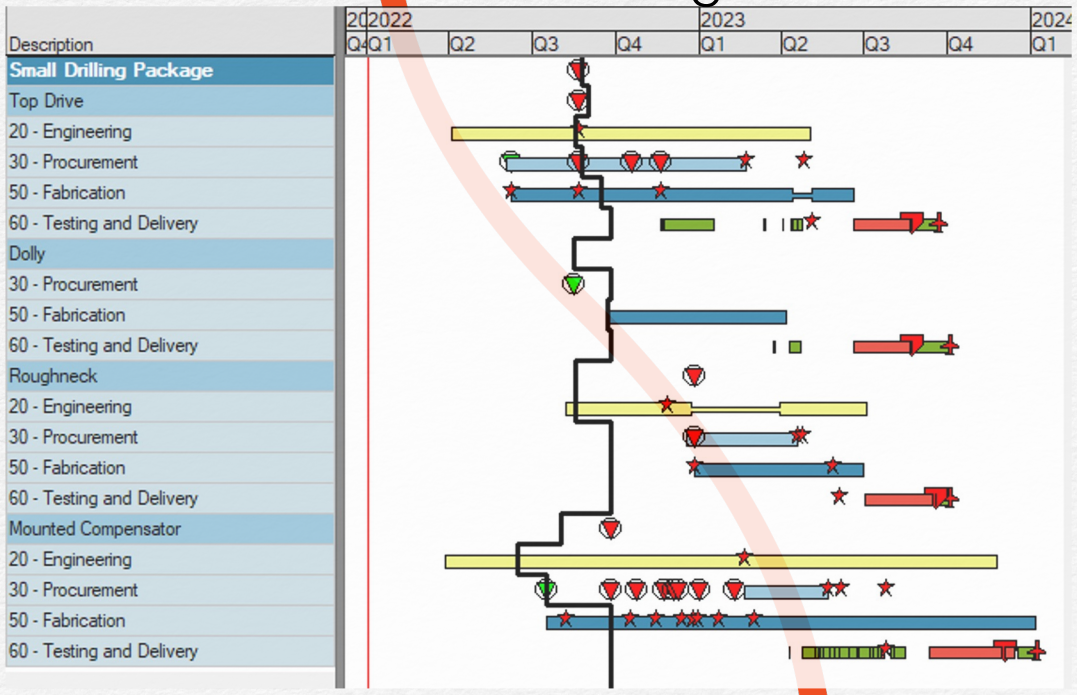
Longest Path

- It is a bit easier with the Longest Path, as there is only one longest path in a project.
  - the Longest Path is a Critical Path, but not all Critical Paths are the Longest.
- For example in a project with several deliveries



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Critical Path Mapping (CPM) – Webinar

Bruno Berroyer - Watch Webinar Recording Here (safran.com)

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