

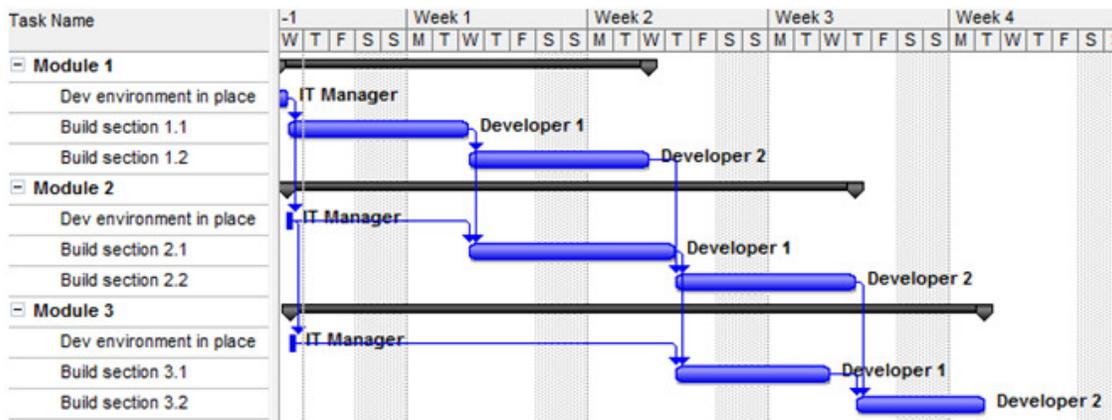
Hammocks, LOE and Summary Activities in Schedules

Hammocks, LOE and Summary Activities are three completely different types of activity – unfortunately the ignorance of many software developers (or developers placing their marketing needs ahead of accuracy) has resulted in mass confusion to the point where even the current *PMBOK® Guide* is confusing. This paper is focused on defining the correct use of the terms.

All three activity types can be used to carry resources for a period of time and both summary activities and hammocks can be used to create summary reports, but the differences in the way these three activity types are created and used is significant.

Summary activities

Summary activities are part of the schedule’s coding structure, and roll up a series of directly related activities within the schedule’s coding structure into one summary task (sometimes called ‘Main Activities’). Most tools have the ability to incorporate several layers of summary activity which can be designed to align with the project’s Work Breakdown Structure (WBS)¹.



Summary activities do not have a set duration; the duration is calculated from the underlying activities in the coding structure and where float is shown the summary float is based on the float on the last activity. The summary activities start is the earliest ES of the underlying activities, its finish if the latest EF of the underlying activities and its late finish is the latest LF of the underlying activities. Summary activities should not be linked, the logical linking in the schedule should always occur at the activity level.

The advantage of Summary Activities is if changes in the schedule rearrange the sequence of activities, the summary still picks up the ‘first and the last’ activities with the appropriate coding, there is no need to re-link logic. **Note:** Summary Activities should not be logically linked – logic should be at the detail activity level (as per the network above).

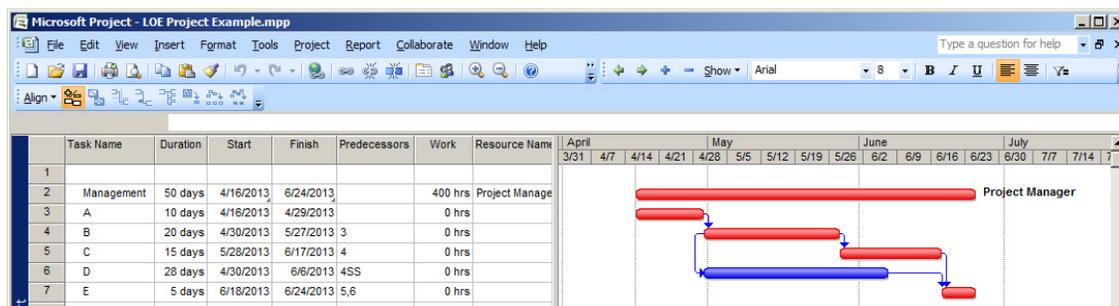
Summary activities are used for reporting purposes and can also carry costs and resources attributed to the portion of the schedule they summarise.

¹ For more on **WBS** see: https://www.mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf

Level of Effort (LOE)

Level of Effort (LOE) activities are aligned with Level of Effort work packages in the WBS, and Earned Value systems. The Earned Value standards define LOE work packages as having a set duration and once started, the work package is assumed to progress as planned (there is no schedule variance until after the package is complete). LOE is used for work packages where progress cannot easily be measured and nature of the work is unsuitable for using 'apportioned effort' to calculate progress. Typically, LOE is used for 'overhead' resources and costs such as the project's project management effort, security, quality inspections, etc.

The equivalent use in a schedule is a normal activity with a defined duration that carries a set of resources or costs (based on the LOE work package) and where progress will be assumed to equal plan once the activity starts.



The advantage of LOE over Summary activities is the LOE duration is not dependent on any roll up of underlying activities and each LOE activity is independent of the overall project coding structure. It is not uncommon to see several LOE activities assigned to an 'overhead' section within the overall project coding structure. The use of LOE activities allows the schedule to accurately reflect the data in the WBS and EV systems.

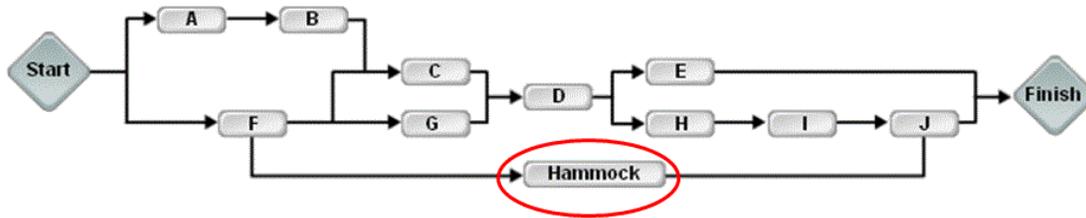
The disadvantage of LOE (seen in the diagram above) is the LOE activity can easily turn into a critical activity based on its unchanging duration. This means the activity has to be carefully managed by the scheduler.

LOE activities should be logically linked into the schedule (in preference to positioning the activity with a constraint) and in most respects are normal activities. LOE activities are used to carry costs and resources attributed to the time period of their set duration.

Hammock Activities

Hammock Activities are a cross between a link and an activity that were developed in the period 1961 to 1965². A *Hammock* is an activity that spans between two points in a schedule. It can be thought of as 'hanging' between these two points in the same way a normal hammock may hang between two trees.

² Hammocks were developed by ICL Ltd in the UK as part of their ICL PERT software program: "The calculation of planned costs so far has been solely in terms of direct activity costs. It is not always easy to include all costs on this basis, since items such as overheads often cannot be assigned to individual activities. In order to overcome this difficulty, the facility of using a hammock activity is provided: This resembles a normal activity in every way, except that its duration is not specified on input nor can progress be reported on it. In the course of the Cost Analysis calculation, the length of a hammock activity for a particular schedule is the difference in time between the occurrence of its preceding and succeeding events, and therefore any resource usages or costs attached to it will be included in the project costs for the calculated duration of the hammock". See: https://mosaicprojects.com.au/Mag_Articles/P040_Extract_ICL_1900_PERT_Manual.pdf



A *Hammock* has no set duration of its own, its duration is derived from the difference in time between the two 'connection points' in the schedule. However, whilst a *Hammock* has no predetermined duration, it can have descriptions, codes, calendars, resources, costs and other attributes of a normal activity. *Hammocks* are very useful for carrying time related costs and determining the duration of supporting equipment needed for a project, as well as being used to create summary reports.

Note: A *Hammock* should not be the controlling logic in a network. The logic of the schedule should be designed so that the *Hammock* has no effect on the calculations for time and/or resource analysis.

Hammocks originated in Activity-on-Arrow networks as activities which are connected across a series of activities from the 'i node' of a specific start activity to the 'j node' of the last activity in the span. The *Hammocks* duration is calculated from its 'i node' early start (ES) to its 'j node' late finish (LF), and is derived from the number of working periods in the calendar attributed to the *Hammock* between these two dates.

Hammocks in precedence networks (PDM) have a similar function but are activities linked Start-to-Start (SS) at the beginning to the first activity in the span, and Finish-to-Finish at the end to the last activity in the span.

However, if the schedule logic is changed, care needs to be taken to ensure the *Hammock* is still linked to the 'first' and 'last' of the activities it is intended to span. The effectiveness of the *Hammock* is dependent on the completeness and effectiveness of the schedule logic.

As with both LOE and Summary activities, *Hammocks* can be used to carry overhead costs and resources for a section of the project, rather than trying to spreading them out across all of the associated activities. The example I use when teaching is using a *Hammock* to understand the time a tower crane will be needed on a high-rise construction project. The start of the crane working on the site is driven by the concreting of the foundations and erection of the crane. It is then required through to the time the last heavy lifting to the roof is finished (typically roof mounted plant and equipment) once this activity is finished the crane can be removed. The duration of the *Hammock* is derived from the timing of these two events and is calculated automatically by scheduling tools that implement *Hammocks* correctly (along with the total cost of the resource). Importantly, the duration and cost are recalculated each time the schedule is adjusted during planning or when the schedule is updated during the progress of work on site so the projects overall cost and resource requirements remain accurately aligned to the actual needs of the project.

The benefit of a *Hammock* over LOE is the *Hammocks* duration is flexible and adjusts automatically as the underlying logic in the schedule changes, whereas LOE activities have a set duration that requires manual adjustment.

The benefit of a *Hammock* over a Summary activity is that its connection points do not need to be in the same part of the schedule's coding / summarisation structure. Summary activities are an integral part of the schedule's coding structure and can only summarise lower level tasks that are directly connected within the coding system. *Hammocks* are not dependent on any coding structure and therefore the *Hammock* can connect from any point in the schedule logic to any other point - in the example above, from the part of the schedule dealing with excavation and foundations to the part of the schedule dealing with installing mechanical plant and equipment.

Conclusion

Summary Activities, LOE and *Hammocks* are distinctly different activity types; each has its advantages and limitations and very few tools correctly implement all three types. One of the few tools in the current market that implements *Hammocks* properly is Micro Planner X-Pert³, it's worth downloading a free sample version of this tool to see how they work.

Unfortunately, many software tools that do not have the capability to implement *Hammocks* correctly try to hide this deficiency by confusing a *Hammock* with either a Level of Effort (LOE) or a 'Summary' activity. Others chose to misname functions that are close to one of the three basic options, for example, Primavera calling its implementation of a *Hammock*, 'Level of Effort' - why Oracle would choose to call a task that has a variable duration a LOE task when the key determinate of a LOE work package is a set duration is beyond my comprehension.

More generally, the fundamental question as to why the publishers of scheduling tools continue this confusing practice is hard to understand, is it ignorance, or deliberate misinformation intended to create a perceived competitive advantage?

From the perspective of trying to develop a professional practice around the project controls function, neither of these reasons is acceptable! Every other profession takes great care to ensure their special language and naming conventions are accurate and unambiguous. Until scheduling reaches this basic level of maturity, where one name consistently means one thing, all we are doing is creating confusion and devaluing everything we do.

It's time for a change⁴!



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³ For more on Micro Planner X-Pert see: <http://www.microplanning.com.au>

⁴ For more on the **damage caused by the practice of misusing names** see
<http://mosaicprojects.wordpress.com/2013/03/18/pert-whats-in-a-name/>