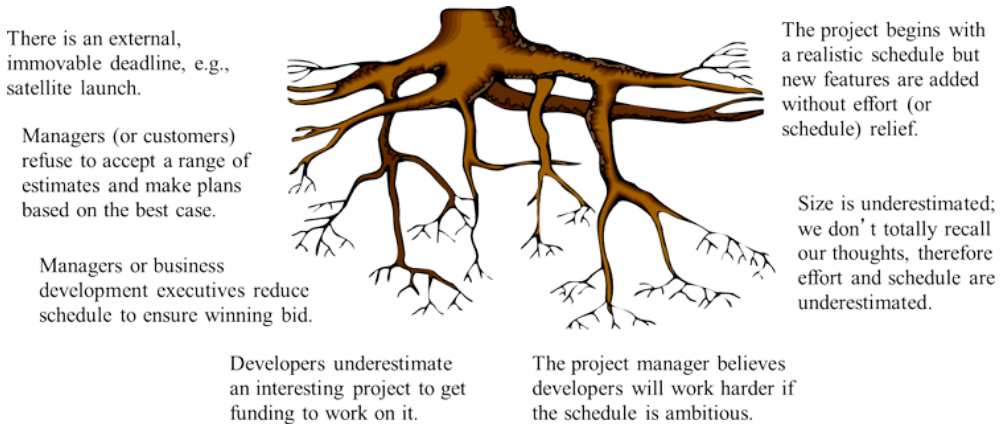
Scheduling

Cost and schedule estimation performed during proposal activity defines the initial software development schedule. This project plan or SDP must include a detailed software development schedule consistent with the program schedule. But beware...

> "Most IS people I know —managers or not— don't control their own schedules. Schedules are handed down, like stone tablets (or, some would say, like bat guano) from on high — where 'on high' could mean the marketing department or top management." — *Robert L. Glass, Software Practitioner, 1994*

> "Excessive or irrational schedules are probably the single most destructive influence in all of software." — *Capers Jones, 1994*

Software schedules are often overly optimistic. Some of the root causes are:



Scheduling Techniques

A variety of scheduling techniques are available, each supported by automated tools. Common scheduling tools include:

- Milestone Chart
- Gantt Chart, most common technique
- Critical Path Method (CPM) or Program Evaluation and Review Technique (PERT), both precedence network techniques

Milestone chart is the simplest of the scheduling techniques. It shows the due dates for the activities and these easy to manually change. It is difficult to see the relative time spans for each task or activity and it is hard to see the overlap in the activities. It is most suited for small projects. In this case, the team has completed the Preliminary Design Review (PDR) for Release 1. You can also see that while the Release 1 CSCI Integration and Test is due in November, the Software Requirements Review is due in December. Generally the next release can begin as soon as the previous release has begun coding, that is after the Critical Design Review (CDR). You will also note that the System Requirements Review and the System Design Review are not needed after Release 1. Typically the system requirements and design are defined in the first release and will not be changed in subsequent releases like the software details.

Milestone Chart

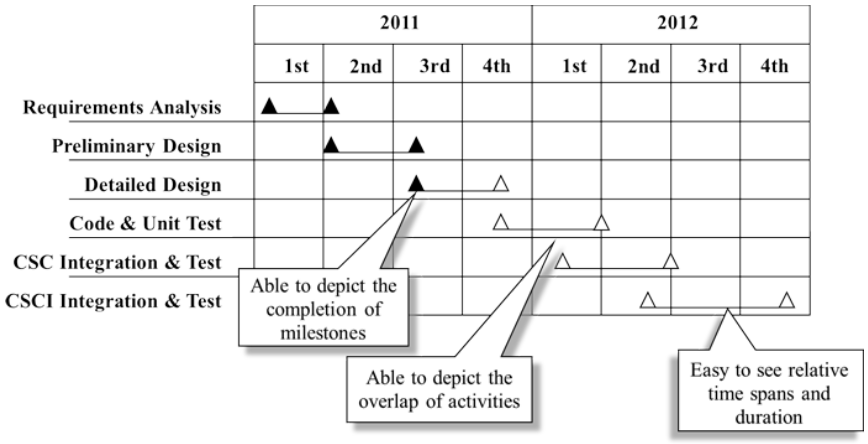
	System Requirements Review (SRR)	System Design Review (SDR)	Software Requirements Review (SWRR)	Preliminary Design Review (PDR)	Critical Design Review (CDR)	CSCI Integration and Test (I&T)	System Test
Release 1	**03/15/2010**	**06/15/2010**	**09/15/2010**	**01/15/2011**	06/01/2011	11/01/2011	01/01/2012
Release 2	NA	NA	12/01/2011	03/01/2012	08/01/2012	01/01/2013	03/01/2013
Release 3	NA	NA	01/01/2013	03/01/2013	07/01/2013	09/01/2013	11/01/2013

Difficult to see overlap in activities

Difficult to see relative time spans

Gantt chart is the most common technique, partially because it is used as part of the popular product, Microsoft Project. It provides a timeline across the top and the activities can be listed in hierarchical order on the left hand side. It shows the relative time spans and durations for each task and the overlap in the activities. This method also allows you to quickly identify if a task has started, in progress, or complete, by the shading of the triangle. A black triangle means that part of the task is complete. Thus in this example, the project has completed the Preliminary Design and Detailed Design has begun but is not yet complete.

Gantt Chart

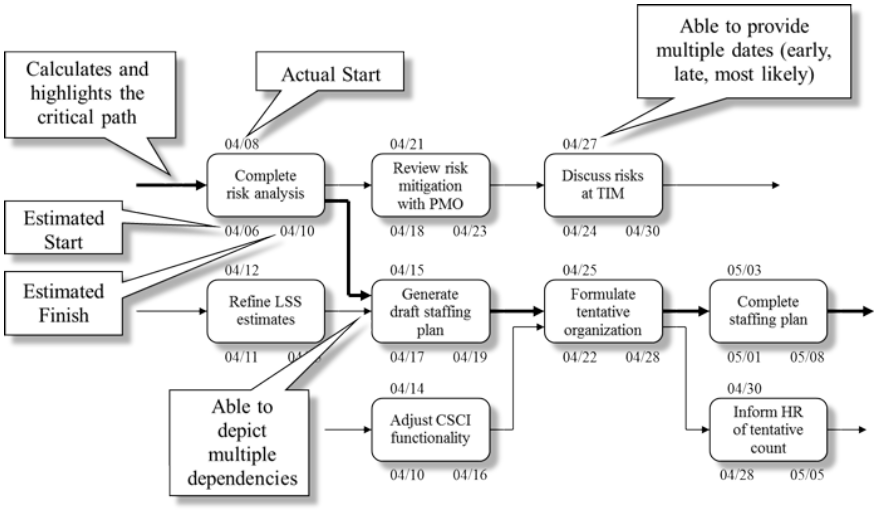


Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT) are both precedence networks. Originally they were not the same, but today CPM and PERT are essentially the same. CPM was created in the late 1950s by Morgan R. Walker of DuPont and James E. Kelley, Jr. of Remington Rand. About the same time, Booz Allen Hamilton in conjunction with the US Navy developed PERT. CPM and PERT require a schedule to be developed that shows all activities, their durations, and the relationships between the activities, that is the relationship when a task ends and the subsequent task begins. It is important to note that CPM can have two meanings:

1. The **longest path through the network**, that is, the longest time to complete the entire project from the earliest start date to the last finish date so that any activity expansion or delay will extend the project time or
2. The more common definition that is the **minimum project time**, that is the least amount of total float such that any activity expansion or delay lengthens the project duration

For each activity, you determine the earliest start time, the earliest finish time, the latest start time and the latest finish time. You must perform a forward pass beginning with the earliest start date to find the earliest end date and then doing a backwards pass starting with the latest due date to determine the latest start date. **Float** or **slack** is the amount of time that an activity in a network can be delayed without causing a delay to subsequent tasks (free float) or the project completion date (total float). The critical path is the resulting path with the least amount of float or slack time allowing you to complete the activities before the project due date. The shortest time through the network is the most **optimistic time**, the longest time is most **pessimistic time**, and the time with the highest probability is the **most likely time**.

Precedence Networks:
Critical Path Network (CPM) or
Program Evaluation and Review Technique (PERT)



Here is a comparison of the scheduling techniques:

	Milestone Chart	**Gantt Chart**	**CPM**	**PERT**
	Generally used on small projects, no activity relationships	Most widely used, no activity relationships, depicts overlapping activities	Show task dependencies & provide means to identify the critical path	Show task dependencies & provide means to identify the critical path
Characteristics				
Complexity	Simplest	Simple	Complex	Complex
Suitable for large projects	Poor	Poor	Excellent	Excellent
Degree of control	Very low	Low	High	Highest
Easy to learn	Best	Excellent	Fair	Poor
Ease of manual calculations	Easiest	Easy	Hard	Hardest
Cost to prepare/maintain	Lowest	Low	High	Highest
Project scope	Poorest	Poor	Good	Excellent
Critical completion date	Fair	Fair	Good	Excellent
Frequent updating required	Easiest	Easy	Hard	Harder
Accuracy of projections	Fair	Fair	High	Highest
Appeal to Client	Good	Good	Excellent	Excellent