

Algorithms for creating Gantt charts

A Gantt (bar) chart is a graphical representation showing when activities start and finish. In order to build the chart, we must be able to calculate start and finish times for each activity. This process is described below.

The Gantt chart is derived from the activity diagram. The activity diagram is a graphical representation of dependency relationships between activities.

Topological sort

The activity chart is a directed acyclic graph (DAG). For such data structures, we can compute a sorted list of nodes (activities) with the following property:

If there is a path from node A to node B then A will appear before B in the sorted list.

This is called a topological order and is used in the following algorithms to calculate start/finish times. The order can be determined by inspection or using any of the standard algorithms present in most Data Structures textbooks.

Calculating earliest start/earliest finish times

For each activity, in topological sort order, calculate

start time = the *latest* value of the start times of
all activities that this activity depends on, or
= the start time of the project
(if this activity does not depend on any others)
finish time = start time + finish time

Note

- The finish time of the project is the *latest* of the finish times calculated above.
- The *critical path* connects an activity starting at the project start time with an activity that ends at the project finish time. There may be more than one path between start and finish times. A critical path has the following property:

if any activity on the path takes longer than the estimated time, then the finish time will become later than the calculated finish time.

Calculating latest start/latest finish times

For each non-critical activity, in *reverse* topological sort order, calculate

latest finish time = the *earliest* value of the *latest* start times of
all activities that depend on this activity, or
= the finish time of the project
(if no activities depend on this activity)
latest start time = latest finish time - activity duration