Longest Path Algorithm

START Assign a potential of 0 to the start vertex S; label each vertex v reached only from S with the distance from S to v and make all these labels potentials.

GENERAL STEP Consider all vertices which can be reached *only* from vertices of known potential. For each such vertex w that can be reached from v along an arc vw, and assign w the label
(potential of v) + (distance vw)
unless w already has a *larger* label;
When all such arcs vw have been considered make the label at w a potential.

Longest Path Algorithm Continued

REPEAT the general step with the new potentials.

STOP when the terminal vertex T has been assigned a potential; this is the longest distance from S to T

To find a longest path, trace backwards from T and include an arc vw whenever
(potential of w) - (potential of v) $=$ distance vw
until S is reached.

Scheduling

Consider S the start of a project, and T denotes the termination of the project.

The vertices represent intermediate stages, or events. The arcs represent **activities**, and the weight of the arc represents the time needed to carry out the activity.

The length of the longest path represents the amount of time needed to complete the project. The arcs on the longest path need to be completed on time, and hence it is known as a **critical path**.

Scheduling Continued

The earliest start time for an activity XY is the length of the longest path from S to X.
(This is the potential assigned to X in the longest path algorithm)

The latest start time for an activity XY is
(total time for the project) - (length of the longest path from X to T via XY)

The float time for an activity is the difference between the earliest and latest start times.
(The float time for any activity on a critical path is zero (0)).