Project Management

Project Nomenclature

- **Deliverables**: Units that are delivered
- **Activities**: Major work categories
- **Tasks**: Small units of work that make up activity

Activity: Major Unit of Work

Culminates in major project milestone
(a scheduled event used to measure progress)

Examples of Activities

- Major Activities:
  - Planning
  - Requirements Elicitation
  - Requirements Analysis
  - System Design
  - Object Design
  - Implementation
  - System Testing
  - Delivery

  - Sub-activities during requirements analysis:
    - Define scenarios
    - Define use-case model
    - Define object model
    - Define dynamic model
    - Design user interface

Big 3 Diagrams

- Work Breakdown Structure
- Precedence Diagram
- Schedule
  - with staff loading

Work Breakdown Structure (WBS)

- Break up project into activities, sub-activities, ... and tasks.

- The work breakdown structure does not attempt to show the interdependence or sequencing of the activities, only how they sub-divide and how much resources they are expected to require.
Work Breakdown Structure (WBS) Diagram

Activities

- System planning (1.0)
- System design (2.0)
- Coding (3.0)
- Testing (4.0)
- Delivery (5.0)

Tasks

- Review specification (1.1)
- Review budget (1.2)
- Review schedule (1.3)
- Develop plan (1.4)
- Top level design (2.1)
- Prototyping (2.2)
- User interface (2.3)
- Detailed design (2.4)

Successive breakdown into

- Build software

Successive roll up into

- WBS Tradeoffs

- Work breakdown structure allows estimation of costs/time required, by "rolling up" such quantities:

\[ \sum \text{(children resources)} = \text{parent resource} \]

- A WBS that is too coarse makes it difficult to assign tasks and utilize resources.

What’s wrong with this picture?

Precedence Diagram (PERT chart)

- List all the tasks.
- For each task:
  - List the tasks that must (immediately) precede that task
  - Remove implied dependencies (called the "transitive reduction" of the graph)

Precedence Chart with Milestones (ovals)

Task durations and dependencies

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (days)</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>15</td>
<td>T1</td>
</tr>
<tr>
<td>T3</td>
<td>15</td>
<td>T1</td>
</tr>
<tr>
<td>T4</td>
<td>10</td>
<td></td>
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<tr>
<td>T5</td>
<td>10</td>
<td>T2, T4</td>
</tr>
<tr>
<td>T6</td>
<td>5</td>
<td>T1, T2</td>
</tr>
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<td>T7</td>
<td>20</td>
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<td>T11</td>
<td>7</td>
<td>T9</td>
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<tr>
<td>T12</td>
<td>10</td>
<td>T11</td>
</tr>
</tbody>
</table>

source: Ian Sommerville, Software Engineering, 5th Ed.
Critical Path

- A "critical path" on a Precedence chart is one in which the sum of durations of the tasks on the path equals the shortest overall project-completion time.
- The critical path is shaded on the preceding diagram.
- If your project’s critical path is too long, what can you do to reduce it?

Gantt chart (schedule)

- Schedule (or Gantt chart) shows a particular scheduling of the tasks to time lines, subject to all of the constraints (not just precedence)

Staff Loading & Resources

- Staff loading and resource constraints are two aspects of scheduling not represented directly on Gantt chart.
- Generally they have the effect of providing added sequencing due to resource contention, and therefore lengthening overall project time
3 Diagrams in 1

- If you choose the right tool, you can avoid duplicating work in creating diagrams.
- Some tools, such as Microsoft Project, allow you to show the work breakdown and precedence on directly on the schedule.
- You enter the information just once.

Some Tools

- Microsoft Project
  - Handles WBS
  - Handles PERT to Gantt
  - Sort of handles staff loading
  - Does earned value tracking (to be described)
- Planner (http://www.imendio.com/projects/planner/) open source tool, for the Gnome Linux & Unix desktop
- TopDown (Mac) or Visio (PC) can be used for drawing any kind of diagram.
- PowerPoint is often useful for diagrams.
- Post pdf's of diagrams to your Wiki.

Tracking How Well We Are Doing

Troubles Shown by Gantt Chart

- Mostly long bars, and few of them
  - Difficult to track project status, since the longer the bar, the more likely there is error in the estimate
  - Solution: Break long bars into to smaller ones and reassign

Troubles Shown by Gantt Chart

- Long bars not in parallel with each other:
  - Is the whole team really doing that one task?
  - Or are a couple doing it while the others are idle?
  - Is it really not possible to describe in any finer detail?
Troubles Shown by Gantt Chart

- Long chains of short bars with one person assigned to each bar
- Not enough parallelism among tasks
- Solution: Reduce dependence between bars as much as possible.

Troubles Shown by Gantt Chart

- No specific staff assignment to bars
  - Difficult to know who on the team is actually doing the work
  - How do you know who to ask for status?

Think Carefully about Staff Assignments

- Idle staff now may mean that everyone pays later to make up for the lost resource.