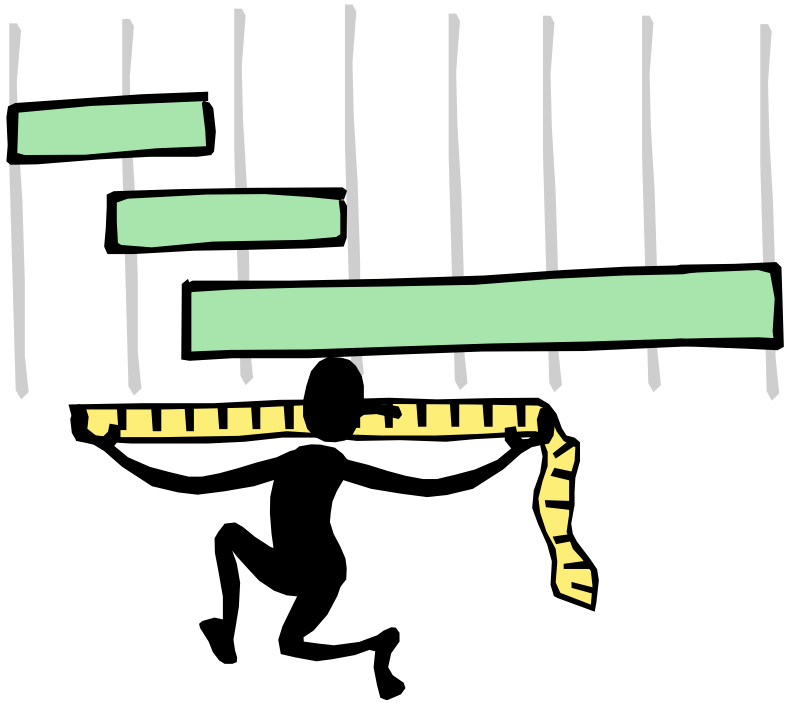
Obtaining Useful Three-Point Estimates for Real Project Activities

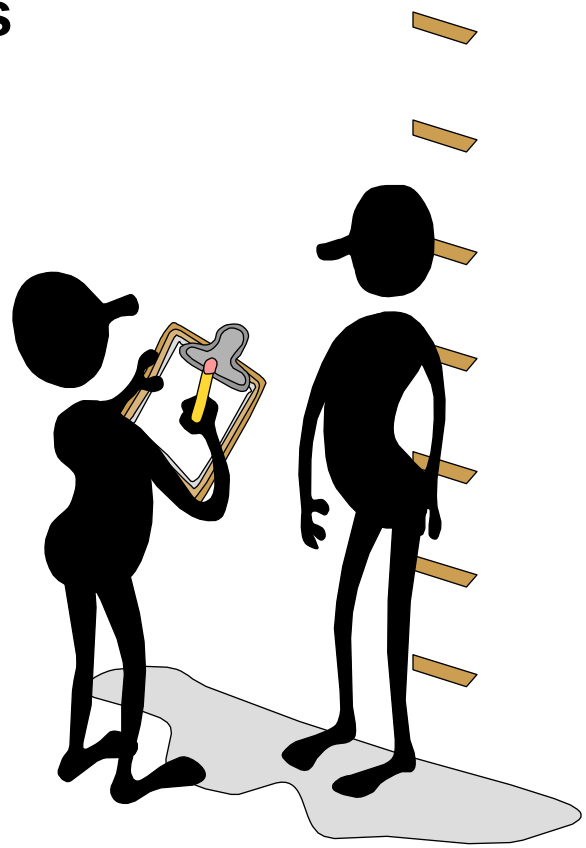


Tom Kendrick, PMP **Director, RiskSIG Region II**

Project Management Consultant, Visa **DirReg2@.RiskSIG.com**

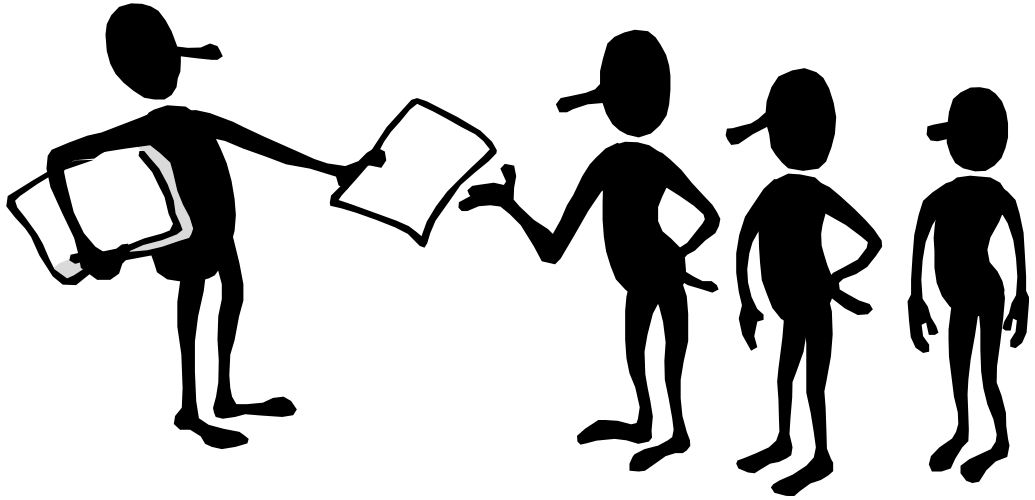
Estimating: Prophetic or Pathetic?

- Prerequisites for good estimates
- Single-point estimating
- Three-point estimates
- Collecting realistic "most likely" estimates
- Managing opportunities using "best case" estimates
- Managing risks using "worst case" estimates
- Employing range estimates



Prerequisites for Good Estimates

- **Clear project objectives and scope**
- **Listed project assumptions and constraints**
- **WBS granularity**
- **Owners for all activities (preferably, willing owners)**
- **Adequate staffing and expertise**
- **Access to relevant history and metrics**



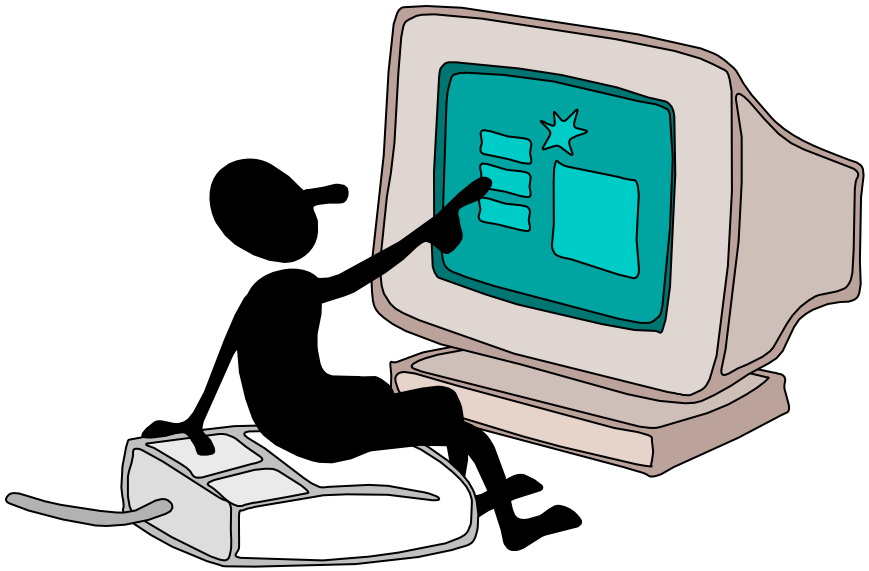
Single-Point Estimating

Advantages:

- **Relatively easy to collect**
- **Consistent with scheduling tools**

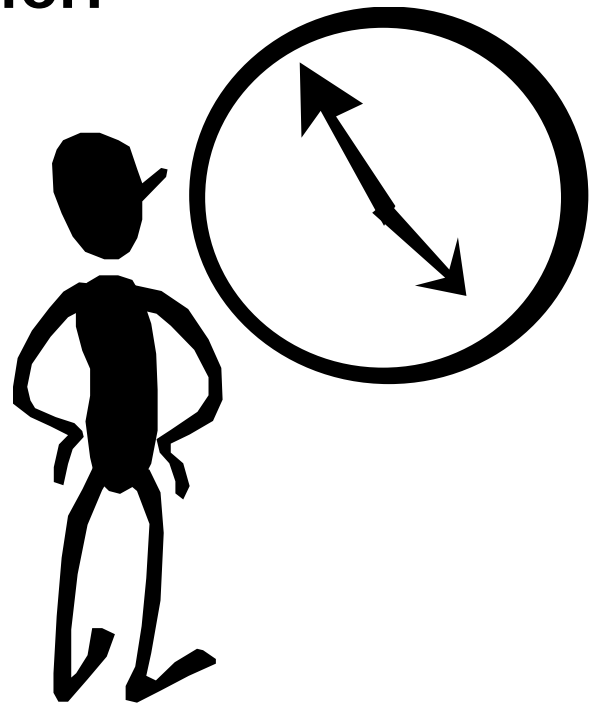
Common issues:

- **Excessive optimism**
- **Illusion of precision**
- **Overlooked risks**
- **Incomplete analysis**



Three-Point Estimates

- **Started in the 1950s with PERT (Program Evaluation and Review Technique)**
- **PERT Time included estimates for:**
  - **Most likely duration**
  - **Optimistic duration**
  - **Pessimistic duration**
- **PERT Cost included the same three estimates for expense**
- **Recognized uncertainty**



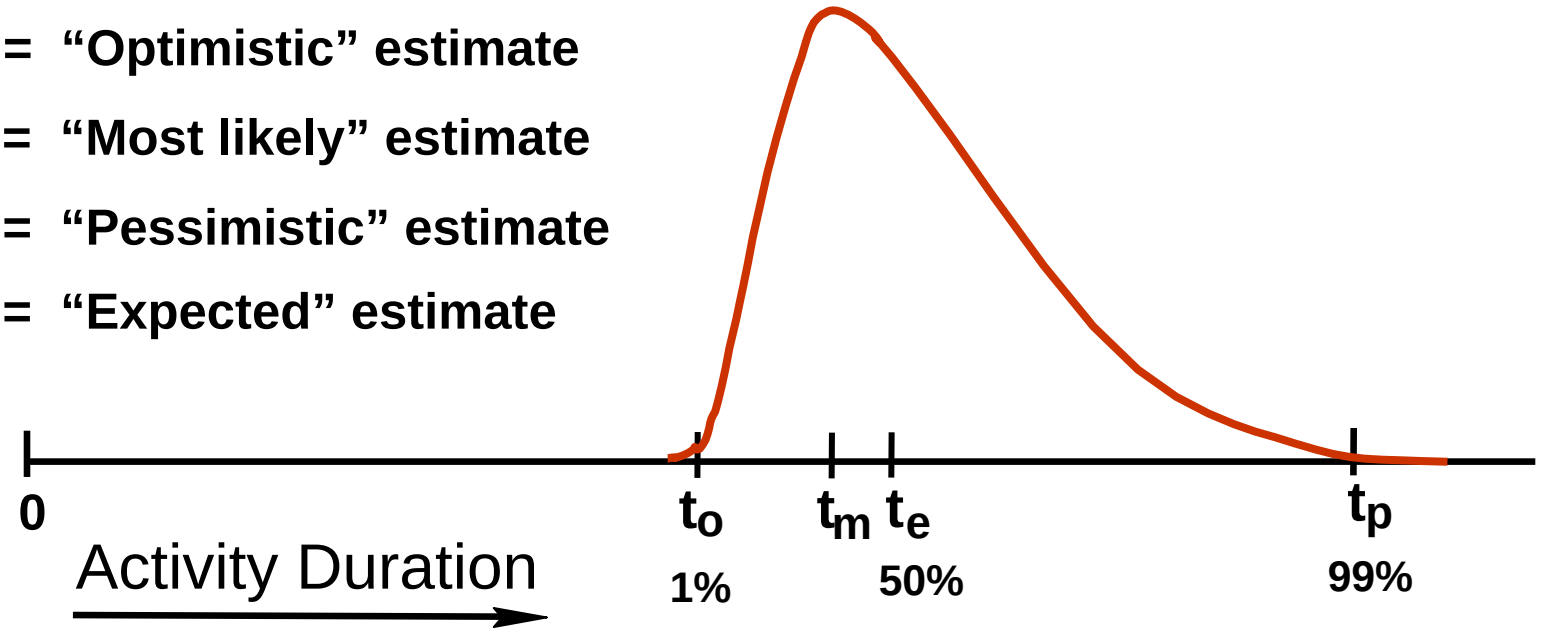
PERT Time Estimating

t_o = "Optimistic" estimate

t_m = "Most likely" estimate

t_p = "Pessimistic" estimate

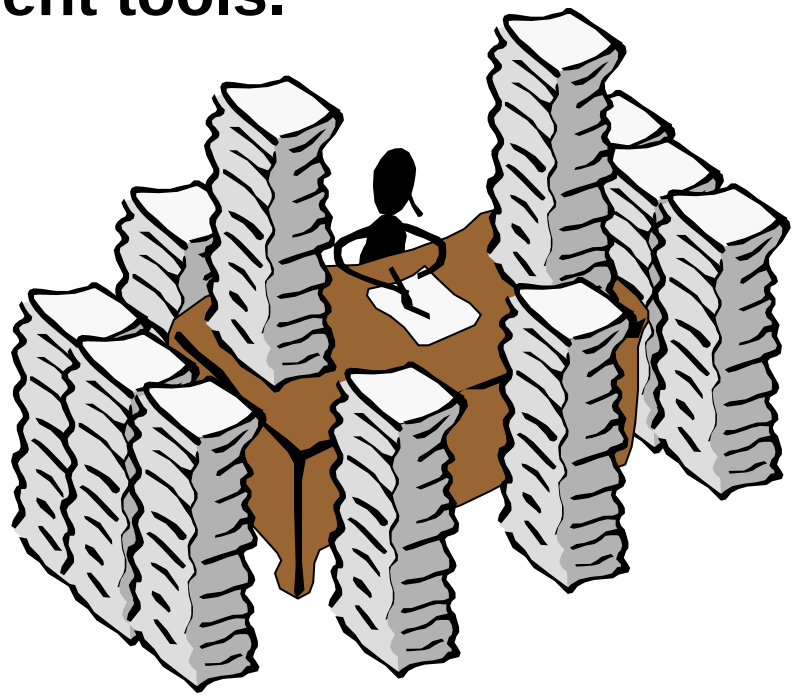
t_e = "Expected" estimate



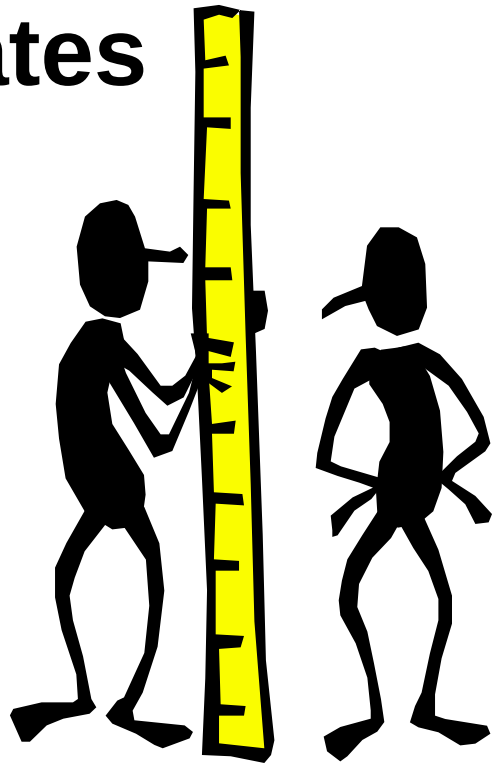
$$t_e = \frac{t_p + 4t_m + t_o}{6}$$

Issues with PERT

- **PERT requires more analysis.**
- **Collecting three estimates is time-consuming.**
- **The collection process annoys the project team.**
- **Three estimates are not easily integrated using common Project Management tools.**
- **Definitions of “Optimistic” and “Pessimistic” are generally inconsistent, arbitrary, and confusing.**
- **When “Garbage goes in, garbage comes out.”**

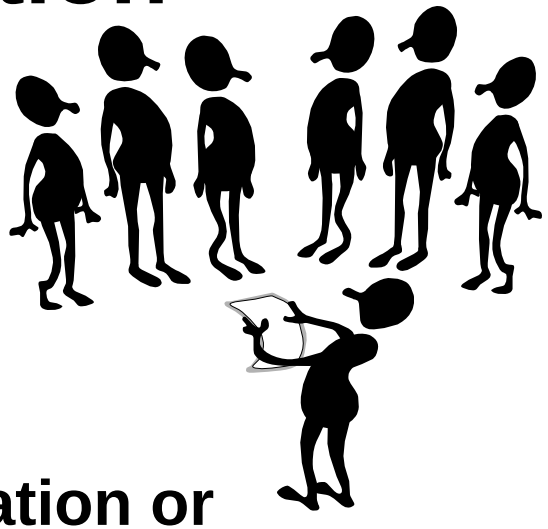


Collecting Realistic "Most Likely" Estimates



- Involve the activity owners.
- Probe for reasons and methods.
- Assess confidence.
- Do part of the work and extrapolate.
- Break the activities down further.
- Discuss with your peers and manager.
- Ask experts.
- Validate with history and metrics.
- Use more than one estimating approach and compare the results.
- Reconcile duration and effort/cost estimates.
- Use collaborative forecasting techniques (Delphi).

Delphi for Estimation



- Gather the "experts."
- Brief team on Delphi process, if needed.
- Discuss the work to be estimated (but *not* your estimate).
- Individuals provide estimates (duration or cost/effort), using the same units.
- Sort the inputs into thirds: Best, Middle, Worst.
- Discuss each cluster of estimates.
  - Best: Possible? Assumptions?
  - Middle: Reasonable? Realistic?
  - Worst: Risks? Deeper knowledge?
- Repeat the process, if desired, to strive for consensus and convergence.

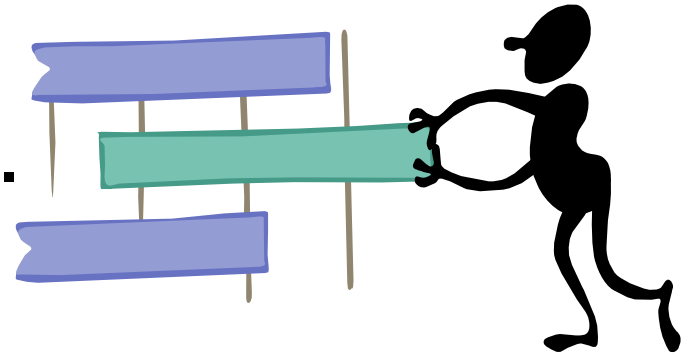
Managing Opportunities Using "Best Case" Estimates

Work to answer two related questions:

- **Are there scheduling compression options?**
- **What overall project opportunities exist?**

When estimating, encourage brainstorming: "What if?"

- **Seek opportunities to:**
  - **Remove "gold plating."**
  - **Lower costs and reduce work.**
  - **Reduce potential problems.**
  - **"Crash" activities.**



- **Look for shortcuts and better, newer methods.**
- **Exploit earlier work through reuse and leverage.**
- **Explore ideas arising from Delphi "optimists."**
- **Brainstorm potentially valuable project by-products.**

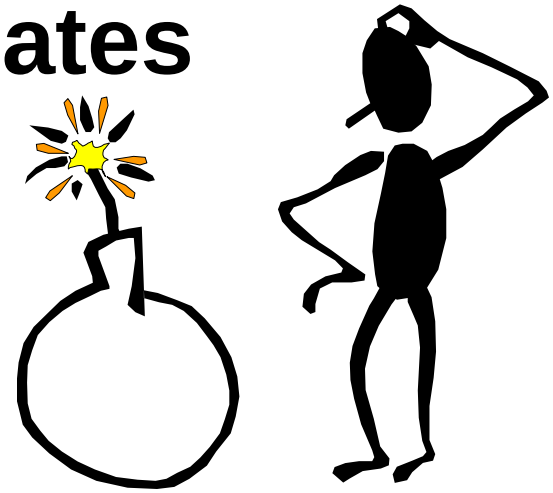
Pitfalls of “Best-Case” Estimates

If you do find plausible support for lower estimates, use them with care:

- **They violate “Parkinson’s Law.”**
- **Aggressive estimates can be demotivating when they lack credibility.**
- **“Optimistic” estimates may be imposed as firm commitments by eager managers and sponsors.**

  (Tom DeMarco refers to this as “What’s the earliest date by which you can’t prove you won’t be finished” estimating.)

Managing Risks Using "Worst-Case" Estimates



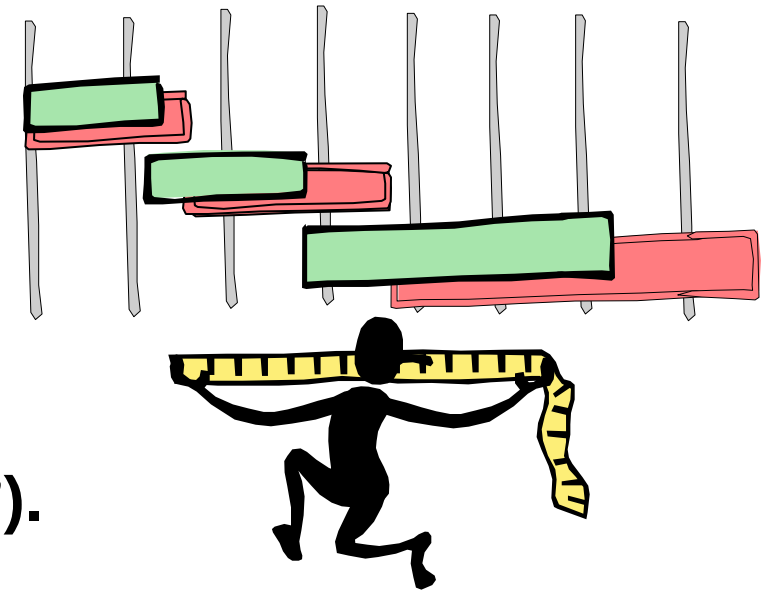
After generating each "Most Likely" estimate, ask questions such as:

- **What might go wrong?**
- **What are the likely consequences should issues arise?**
- **Is the staff involved experienced in this area?**
- **Have we had problems this kind of work before?**
- **Does this activity depend on inputs, resources, or other factors we don't control?**
- **Are there aspects of this work that we don't understand well?**
- **If betting money on it, would your estimate change?**

Capture all potential difficulties as <u>identified risks</u>.

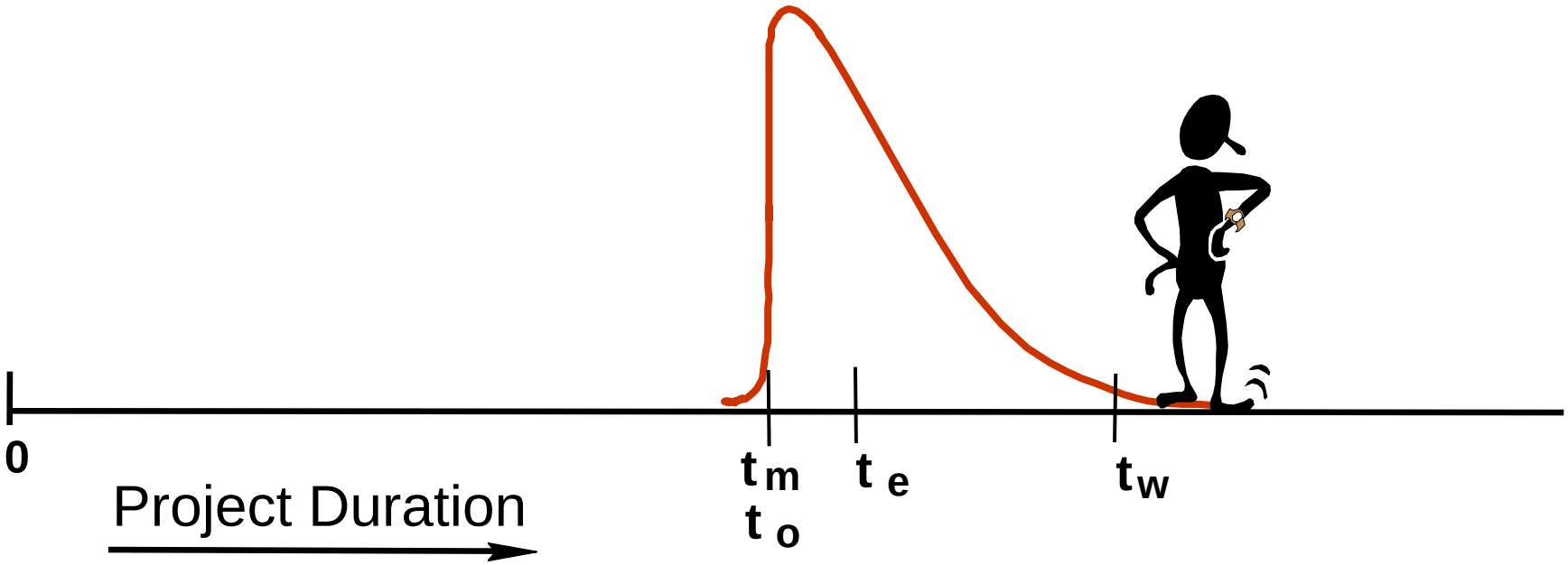
Employing Range Estimates

- **Use initial estimates to define a lower limit for project duration (the "worst *best* case").**
- **Use Worst-Case estimates to define an upper limit for project duration (the "worst *worst* case").**



- **Determine an "Expected" project duration within these limits.**
- **(Use Best-Case or optimistic estimates for public project documents with care.)**

Worst-Case Schedule Analysis



“Worst-Case” Estimating

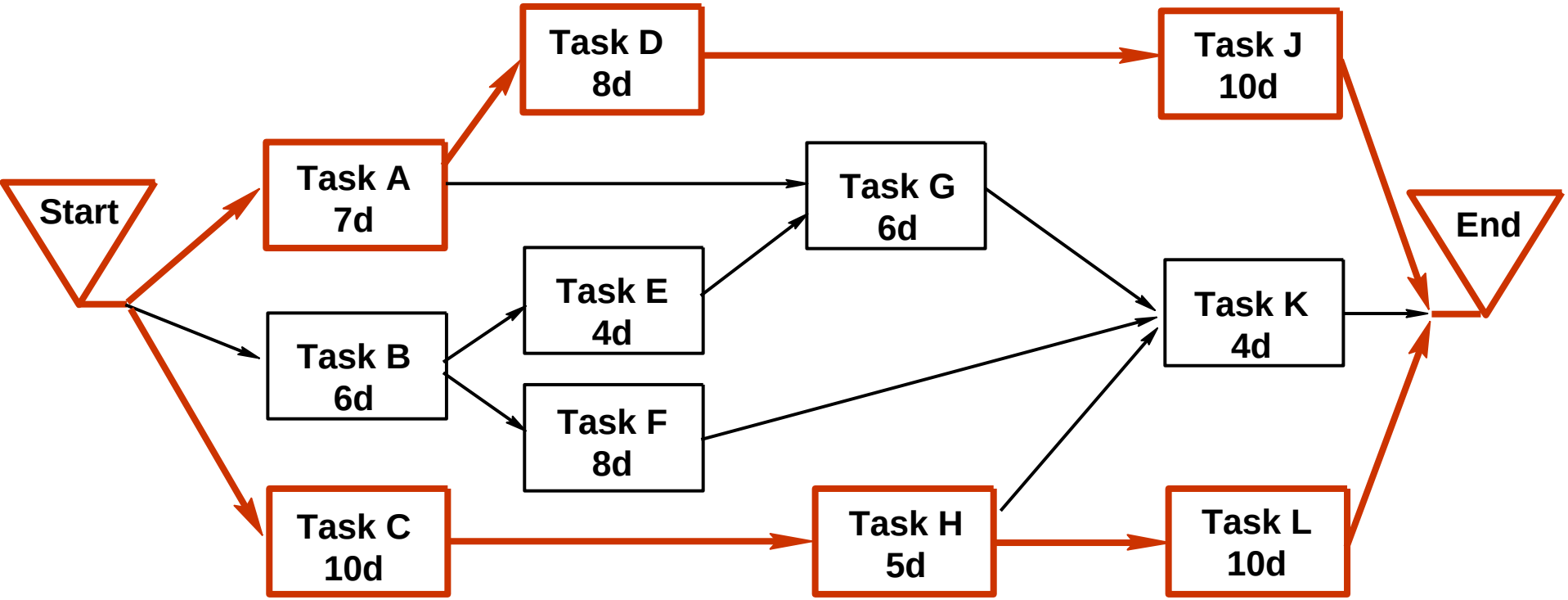
The "Worst *Best* Case"

For all project activities:

- Determine work flow (dependencies)
- Estimate activity durations
- Enter data Into scheduling software

This is the same as standard CPM (critical path methodology) analysis.

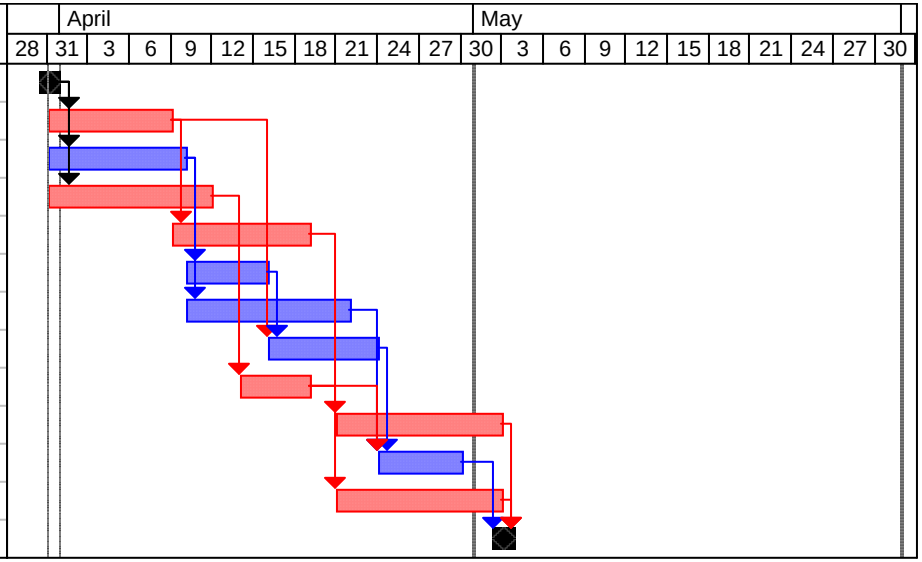
Initial Project Grenache Plan



25 days

Initial Project Grenache Gantt

ID	Task Name	Duration	Start	Finish	Predecessors
1	Start	0 days	Mar 31	Mar 31	
2	A	7 days	Mar 31	Apr 8	1
3	B	8 days	Mar 31	Apr 9	1
4	C	10 days	Mar 31	Apr 11	1
5	D	8 days	Apr 9	Apr 18	2
6	E	4 days	Apr 10	Apr 15	3
7	F	8 days	Apr 10	Apr 21	3
8	G	6 days	Apr 16	Apr 23	2,6
9	H	5 days	Apr 14	Apr 18	4
10	J	10 days	Apr 21	May 2	5
11	K	4 days	Apr 24	Apr 29	7,8,9
12	L	10 days	Apr 21	May 2	9
13	End	0 days	May 2	May 2	10,11,12



May 2

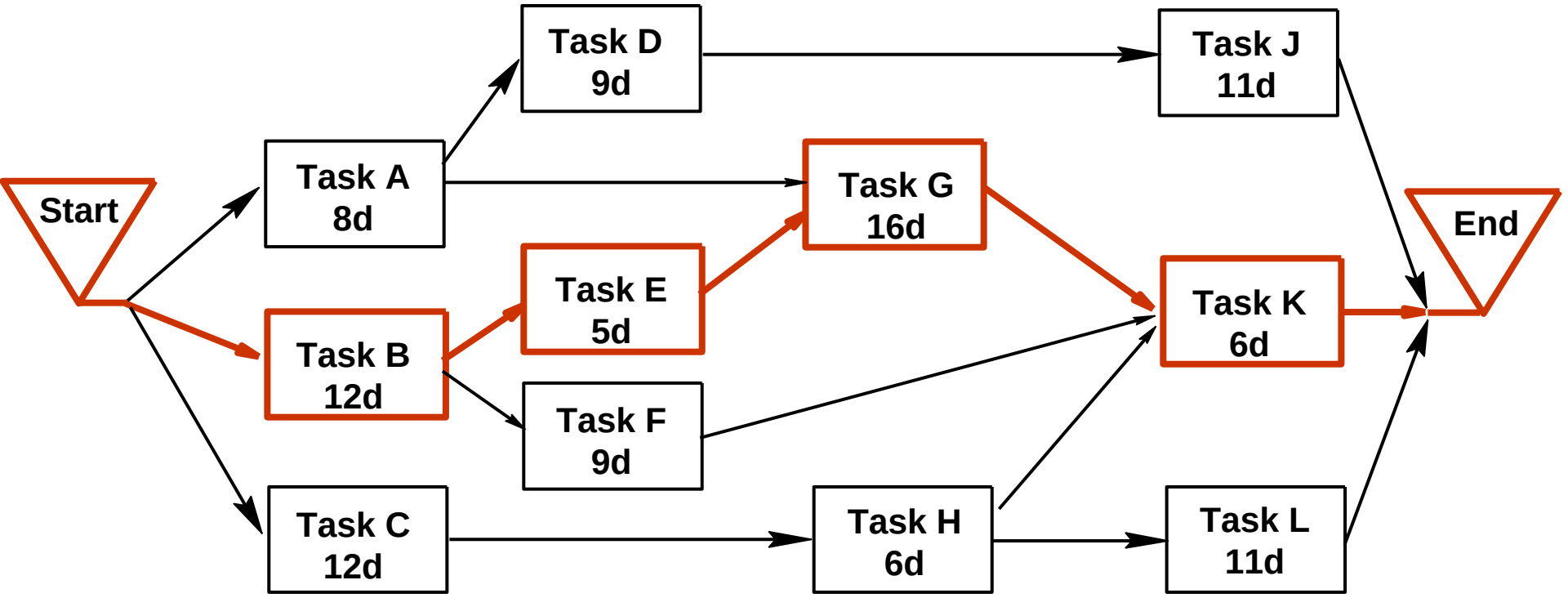
The "Worst *Worst* Case"

Copy the Project Database ("Save As"):

- Retain work flow (dependencies)
- Adjust activity durations for worst cases

The Worst "Worst Case" is *also* determined using standard CPM analysis.

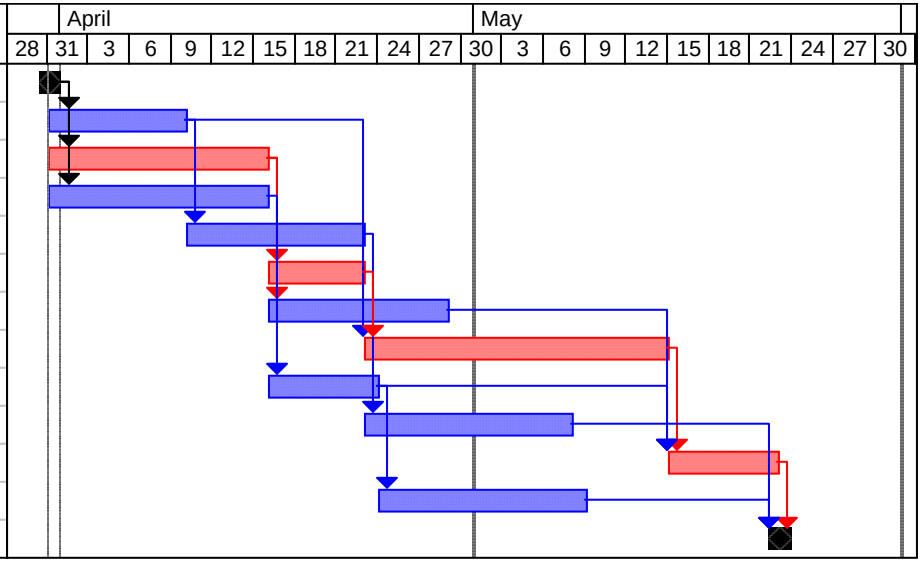
Worst-Case Project Grenache Plan



39 days

Worst-Case Project Grenache Gantt

ID	Task Name	Duration	Start	Finish	Predecessors
1	Start	0 days	Mar 31	Mar 31	
2	A	8 days	Mar 31	Apr 9	1
3	B	12 days	Mar 31	Apr 15	1
4	C	12 days	Mar 31	Apr 15	1
5	D	9 days	Apr 10	Apr 22	2
6	E	5 days	Apr 16	Apr 22	3
7	F	9 days	Apr 16	Apr 28	3
8	G	16 days	Apr 23	May 14	2,6
9	H	6 days	Apr 16	Apr 23	4
10	J	11 days	Apr 23	May 7	5
11	K	6 days	May 15	May 22	7,8,9
12	L	11 days	Apr 24	May 8	9
13	End	0 days	May 22	May 22	10,11,12



May 2 May 22

The “Expected Case”

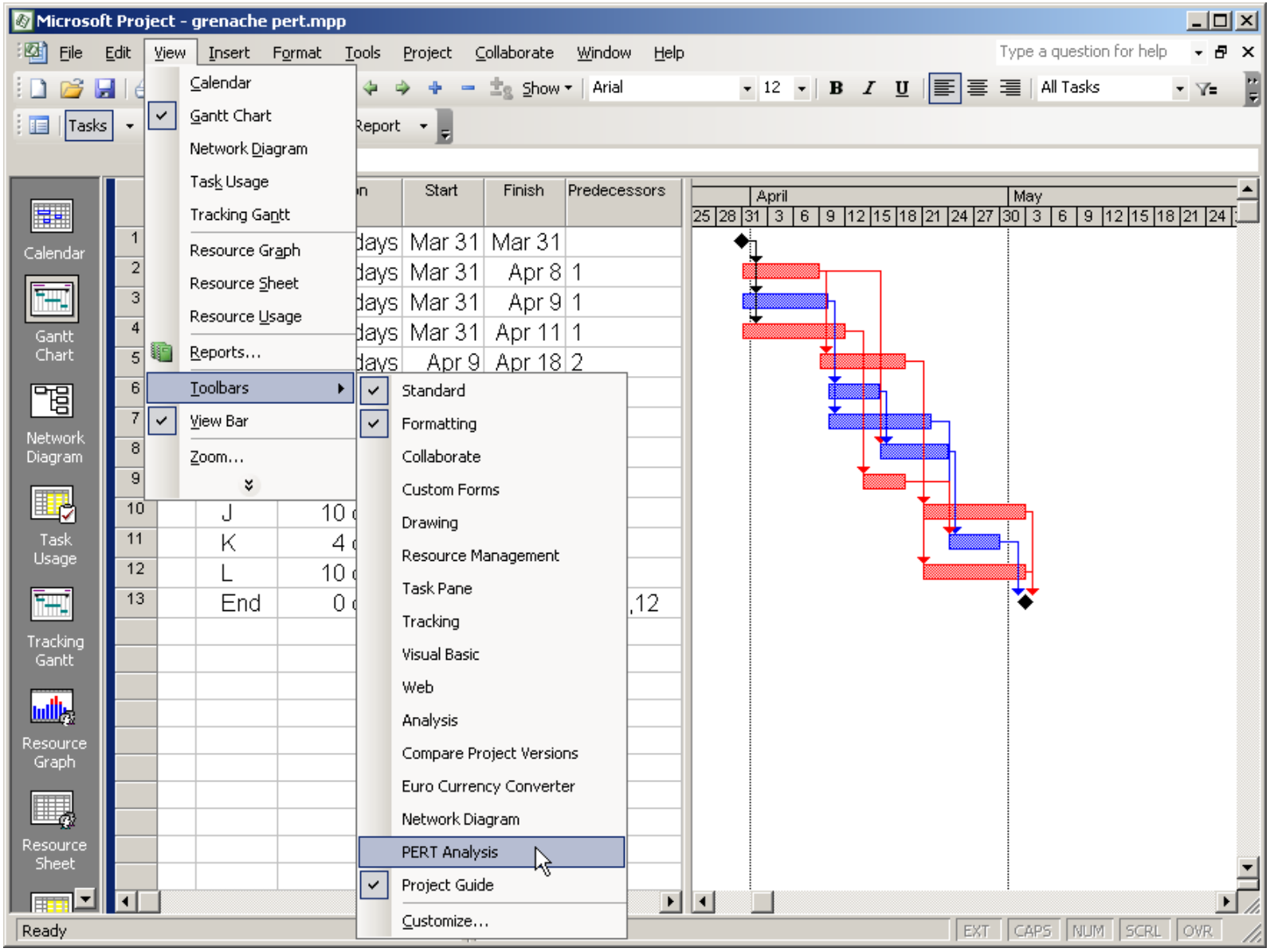
Copy the Project Database Again (“Save As”):

- Retain work flow (dependencies)
- Revise activity durations using PERT formula:

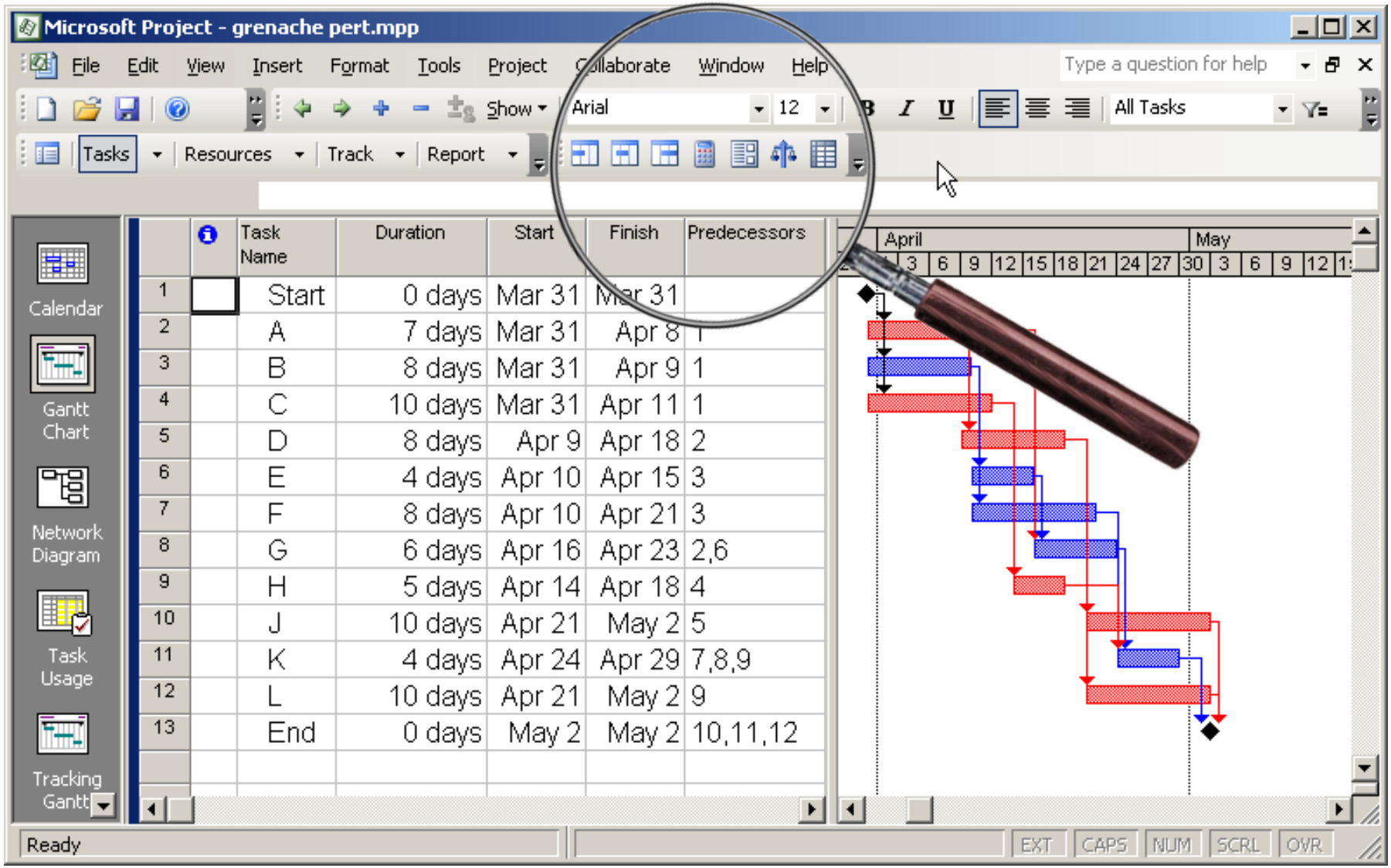
$$t_e = \frac{t_p + 4t_m + t_o}{6}$$

- Or… use something like the “PERT Analysis” Tool Bar in MS Project.

Using MS Project “PERT Analysis”



The MS Project “PERT Analysis” Tool Bar



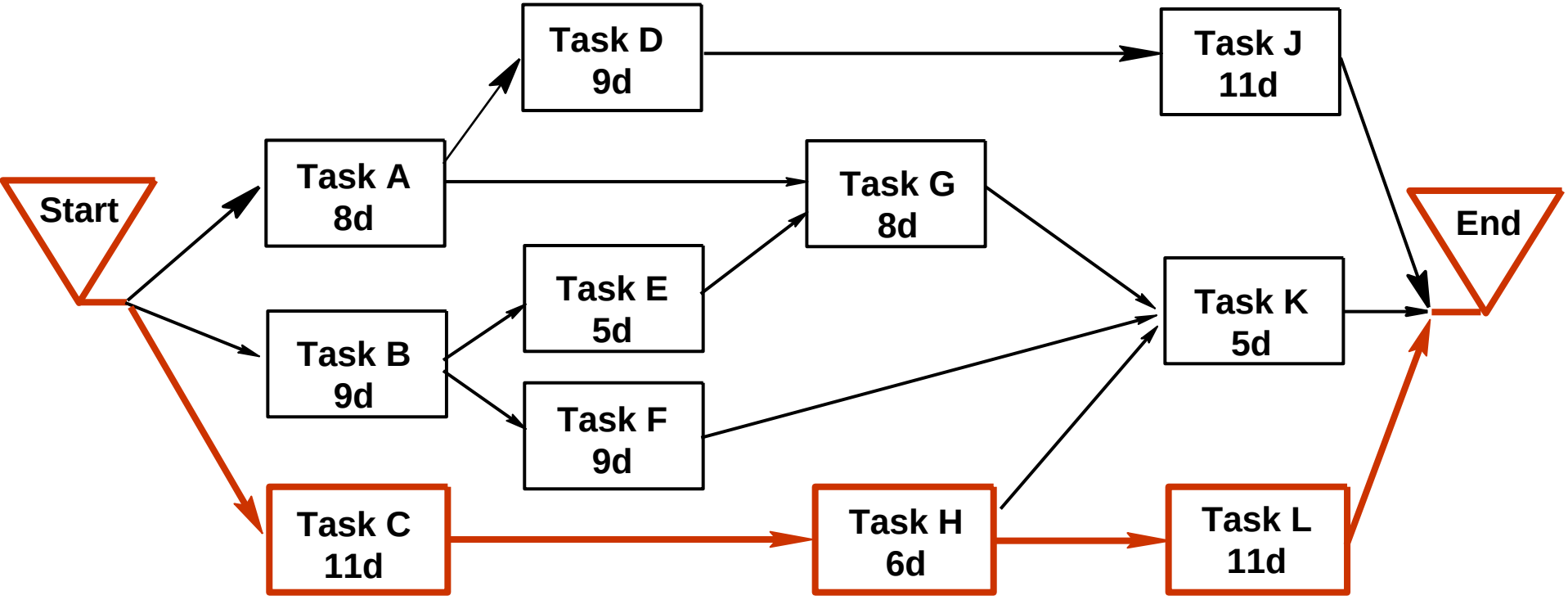
The MS Project “PERT” Tool Bar

- Optimistic Gantt
- Expected Gantt (PERT Methodology “Most Likely”)
- Pessimistic Gantt
- Calculate PERT (uses PERT formulas and recalculates estimates for main MS Project Gantt)
- PERT Entry Form (single activity)
- PERT Weights (Default = 1, 4, 1)
- PERT Entry Sheet (Whole Project)

Project Grenache PERT Entry Sheet

ID	Task Name	Duration	Optimistic Dur.	Expected Dur.	Pessimistic Dur.
1	Start	0 days	0 days	0 days	0 days
2	A	7.17 days	7 days	7 days	8 days
3	B	8.67 days	8 days	8 days	12 days
4	C	10.33 days	10 days	10 days	12 days
5	D	8.17 days	8 days	8 days	9 days
6	E	4.17 days	4 days	4 days	5 days
7	F	8.17 days	8 days	8 days	9 days
8	G	7.67 days	6 days	6 days	16 days
9	H	5.17 days	5 days	5 days	6 days
10	J	10.17 days	10 days	10 days	11 days
11	K	4.33 days	4 days	4 days	6 days
12	L	10.17 days	10 days	10 days	11 days
13	End	0 days	0 days	0 days	0 days

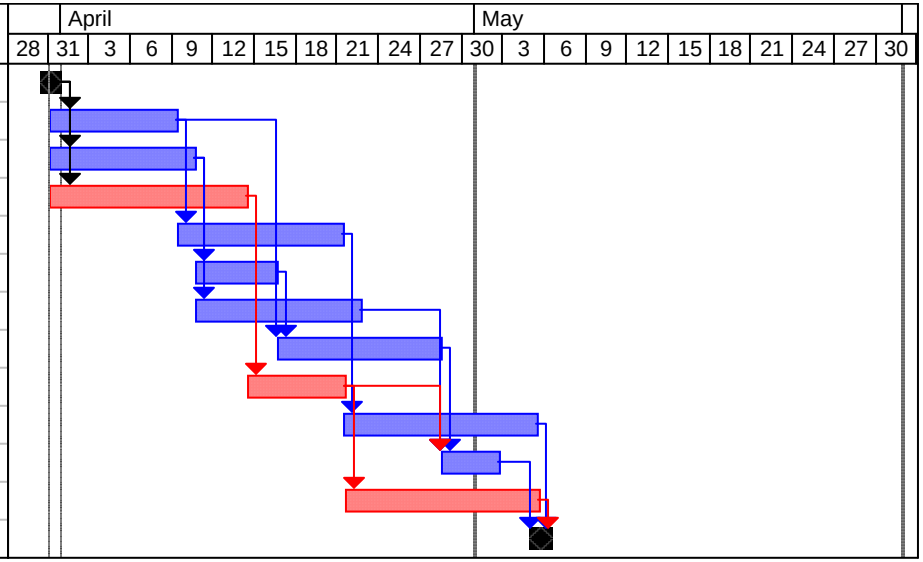
“Expected” Project Grenache Plan (Rounded Up)



~26 days

“Expected” Project Grenache Gantt

ID	Task Name	Duration	Start	Finish	Predecessors
1	Start	0 days	Mar 31	Mar 31	
2	A	7.17 days	Mar 31	Apr 9	1
3	B	8.67 days	Mar 31	Apr 10	1
4	C	10.33 days	Mar 31	Apr 14	1
5	D	8.17 days	Apr 9	Apr 21	2
6	E	4.17 days	Apr 10	Apr 16	3
7	F	8.17 days	Apr 10	Apr 22	3
8	G	7.67 days	Apr 16	Apr 28	2,6
9	H	5.17 days	Apr 14	Apr 21	4
10	J	10.17 days	Apr 21	May 5	5
11	K	4.33 days	Apr 28	May 2	7,8,9
12	L	10.17 days	Apr 21	May 5	9
13	End	0 days	May 5	May 5	10,11,12



May 5

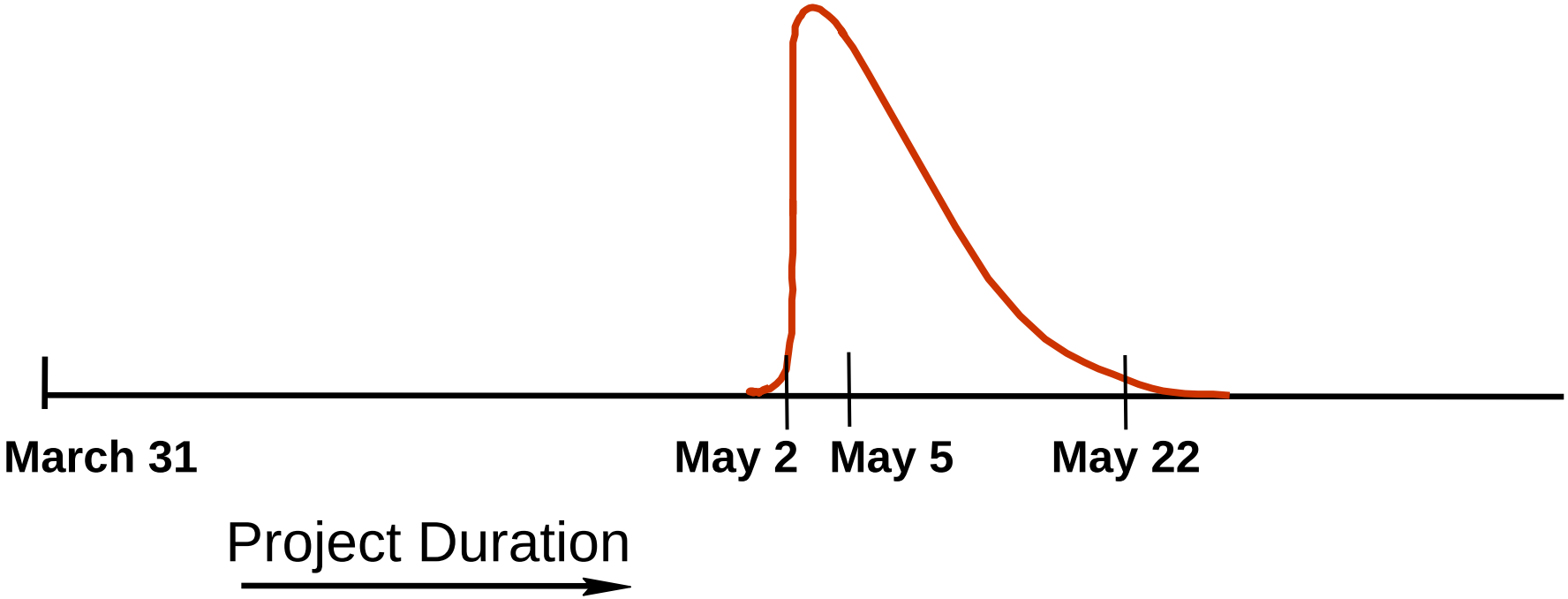
Which Gantt Chart Do You Use?

All three (or at least two)—set the range

- Use the initial Gantt ("Worst Best Case") to determine the shortest realistic project.
- Use the worst-case Gantt to determine an upper limit (based on plans) for project.
- Use PERT calculations to "define the center" for the range of project durations.

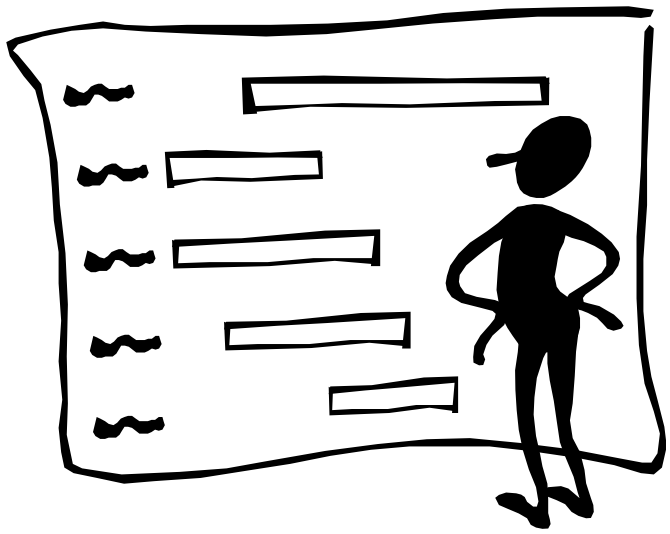
A hand-drawn distribution, consistent with realistic range data, is generally consistent with a full "Monte Carlo" risk simulation.

Project Grenache Schedule Analysis

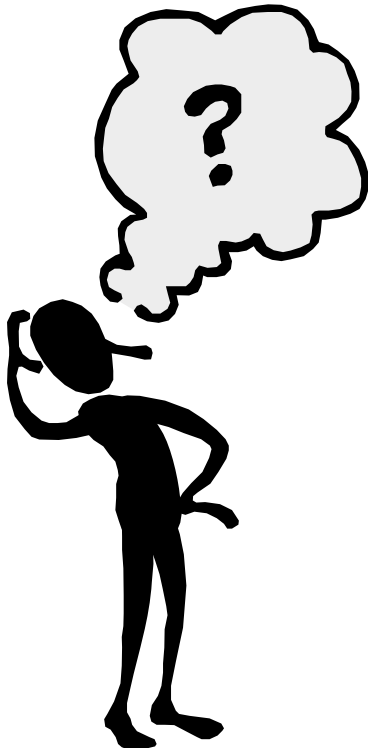


Summary

- **Define and decompose project work.**
- **Collect realistic “Most Likely” estimates.**
- **Uncover opportunities using “Best-Case” estimating and analysis.**
- **Collect “Worst-Case” estimates and list root causes as risks.**
- **Construct multiple schedule views (or perform Monte Carlo risk analysis) to reflect credible duration ranges.**



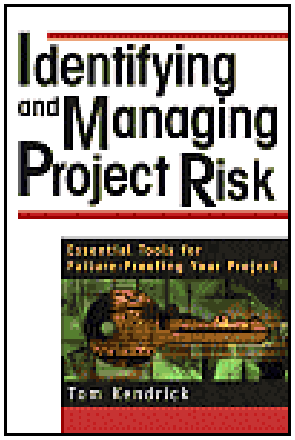
Questions?



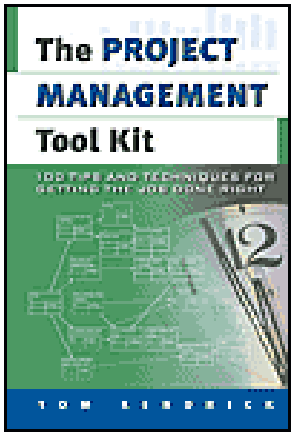
Tom Kendrick, PMP Director, RiskSIG Region II

Project Management Consultant, Visa DirReg2@.RiskSIG.com

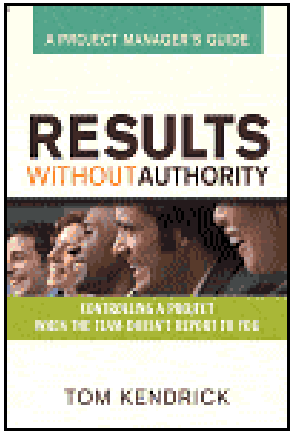
References



Identifying and Managing Project Risk: Essential Tools for Failure-Proofing Your Project by Tom Kendrick AMACOM, April 2003. ISBN 0-8144-0761-7



The Project Management Tool Kit by Tom Kendrick AMACOM, March 2004. ISBN 0-8144-0810-9



Results Without Authority: Controlling a Project When the Team Doesn't Report to You - A Project Manager's Guide by Tom Kendrick. AMACOM, July 2006. ISBN 0814473431