Scheduling Issues

The Problem with Dangling Activity Logic

- We need to avoid dangling activities
- Most people do not know what it means to have danglers
- Dangling activities are those for which the logic does not automatically transmit changes (e.g., lengthening) of duration to the proper successor
- With dangling activities we cannot trust the results:
  - Dates
  - Critical path
  - Float

Example of Dangling Activities with S-S Logic

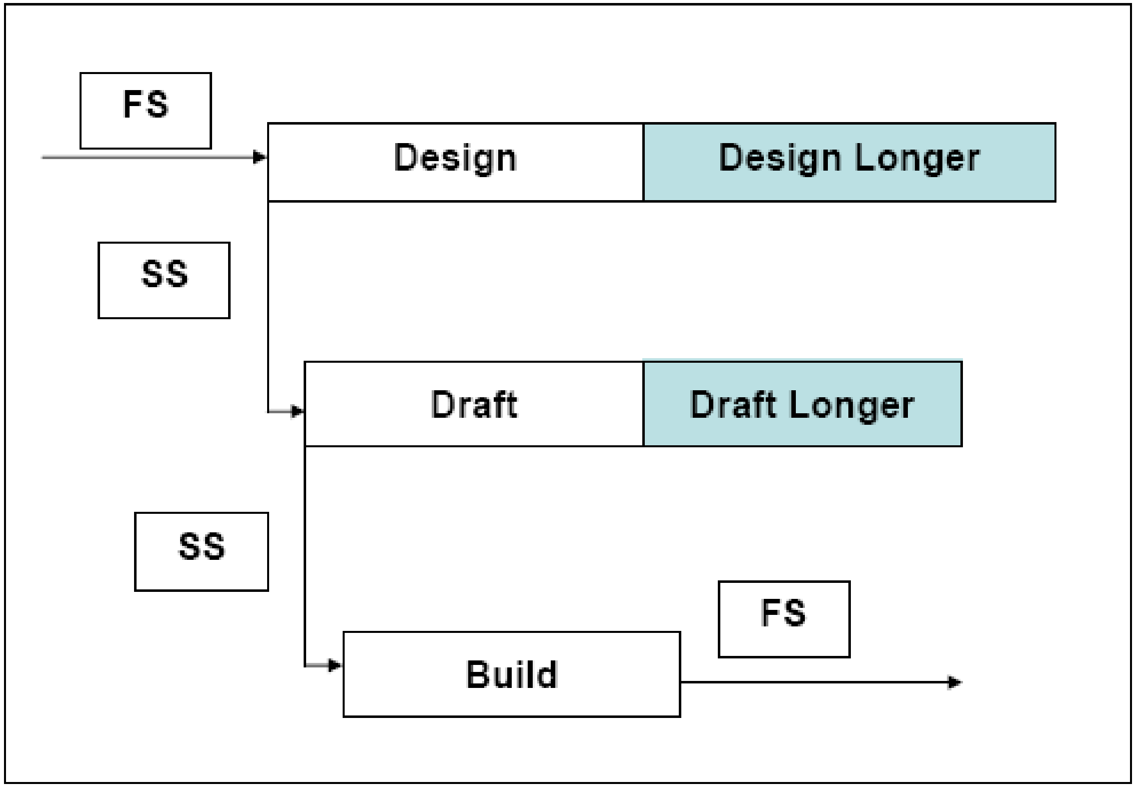
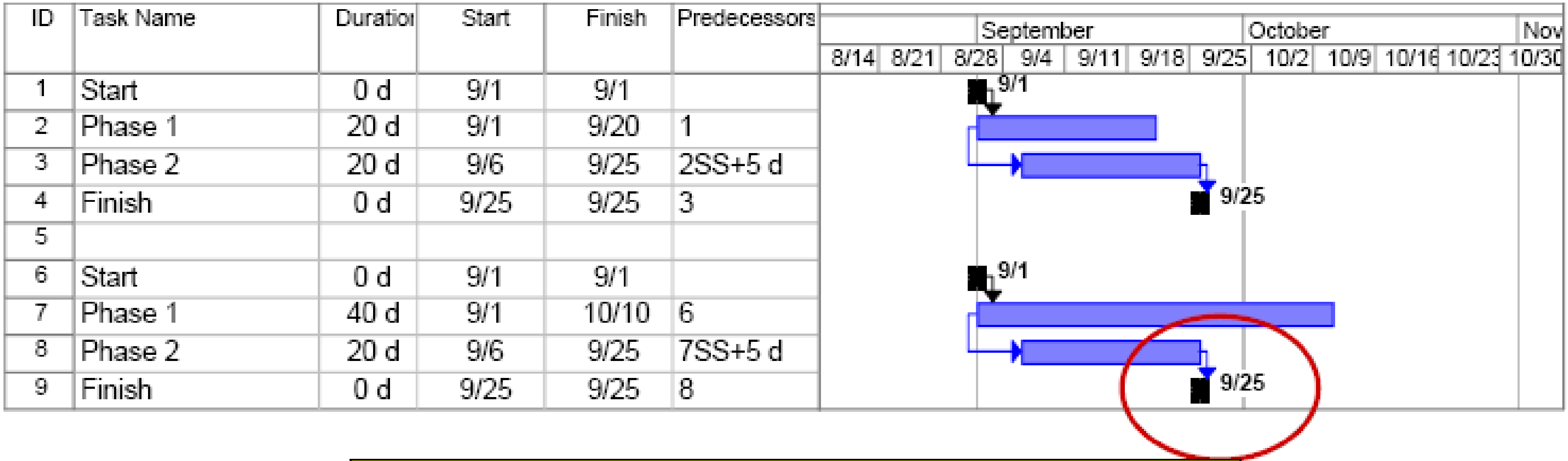


Figure A – Lengthening of S-S Danglers

Can Build finish before Draft and Draft before Design?

S-S Logic in Software: MS Project



ID	Task Name	Duratioı	Start	Finish	Predecessors
1	Start	0 d	9/1	9/1	
2	Phase 1	20 d	9/1	9/20	1
3	Phase 2	20 d	9/6	9/25	2SS+5 d
4	Finish	0 d	9/25	9/25	3
5					
6	Start	0 d	9/1	9/1	
7	Phase 1	40 d	9/1	10/10	6
8	Phase 2	20 d	9/6	9/25	7SS+5 d
9	Finish	0 d	9/25	9/25	8

Phase 1 should finish before Phase 2 does,
but not with this logic.
Phase 1 is longer, Phase 2 is *unaffected*

Examples of Dangling Activities with F-F Logic

Can Draft Start before Design and Build before Draft?

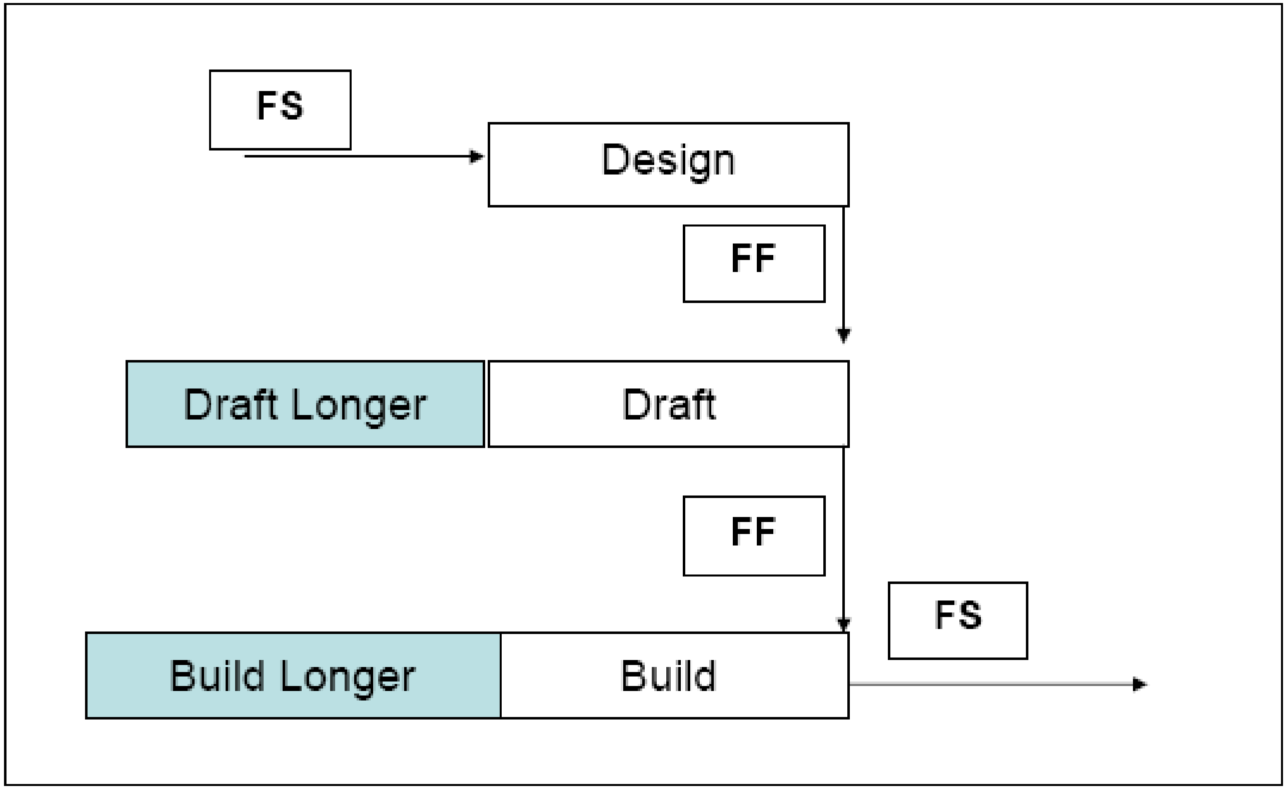
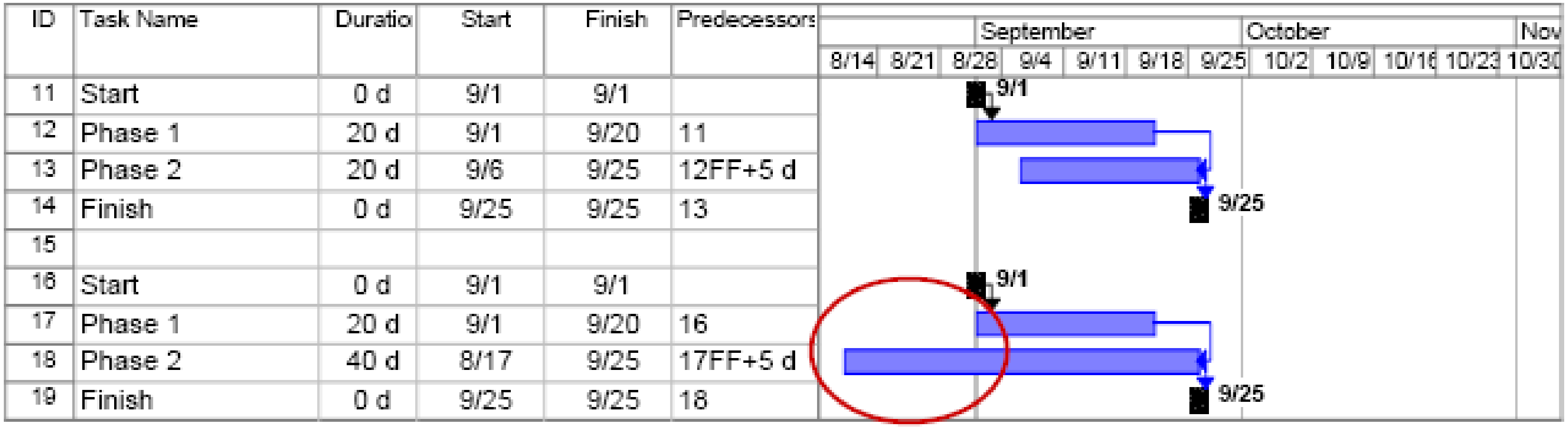


Figure B – Lengthening F-F Danglers

F-F Logic in Software: MS Project



ID	Task Name	Duratio	Start	Finish	Predecessors
11	Start	0 d	9/1	9/1	
12	Phase 1	20 d	9/1	9/20	11
13	Phase 2	20 d	9/6	9/25	12FF+5 d
14	Finish	0 d	9/25	9/25	13
15					
16	Start	0 d	9/1	9/1	
17	Phase 1	20 d	9/1	9/20	16
18	Phase 2	40 d	8/17	9/25	17FF+5 d
19	Finish	0 d	9/25	9/25	18

Phase 1 should start before Phase 2,
but not with this logic.
Phase 2 is longer, It starts *before* Phase 1

A Solution: S-S *and* F-F

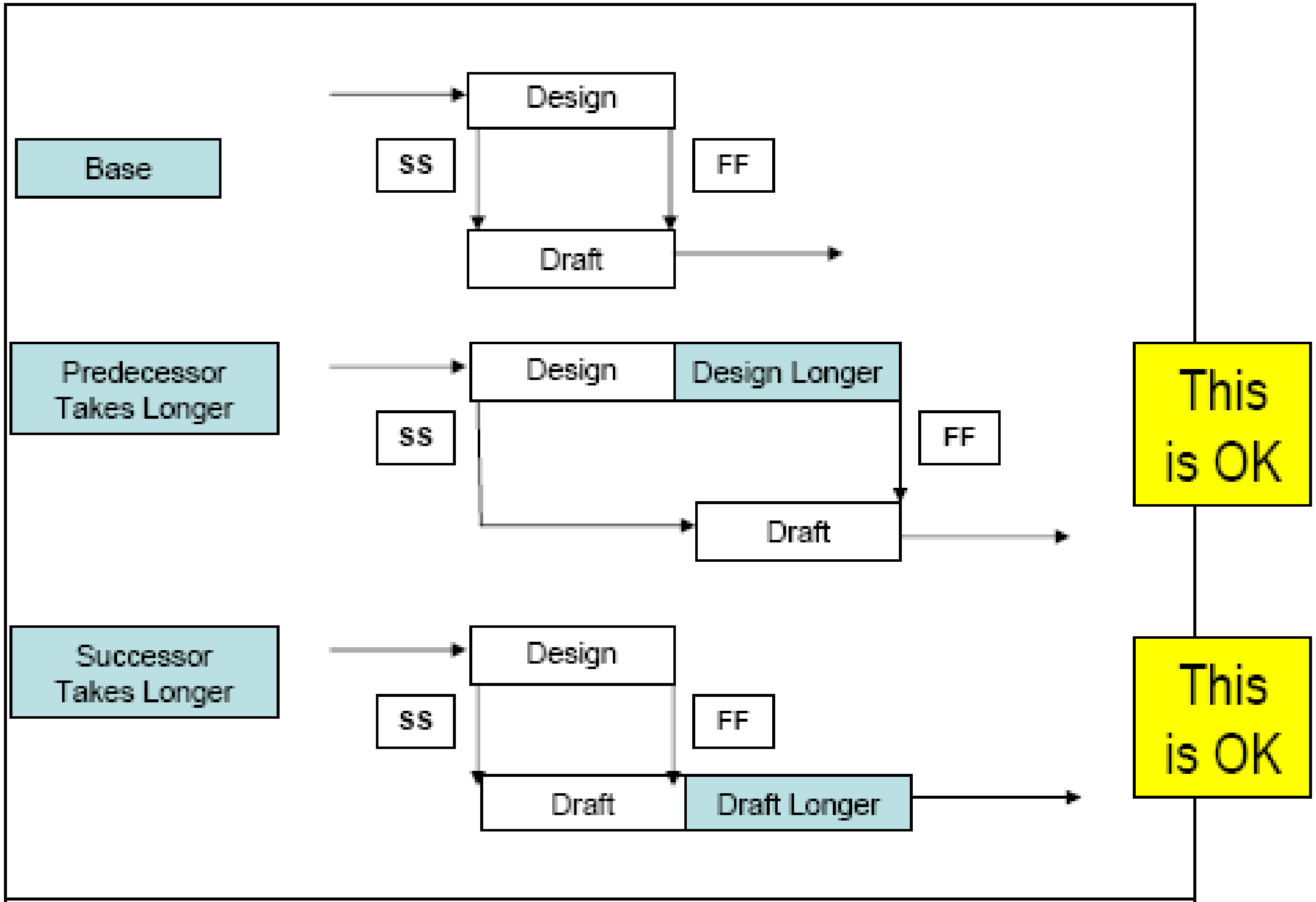
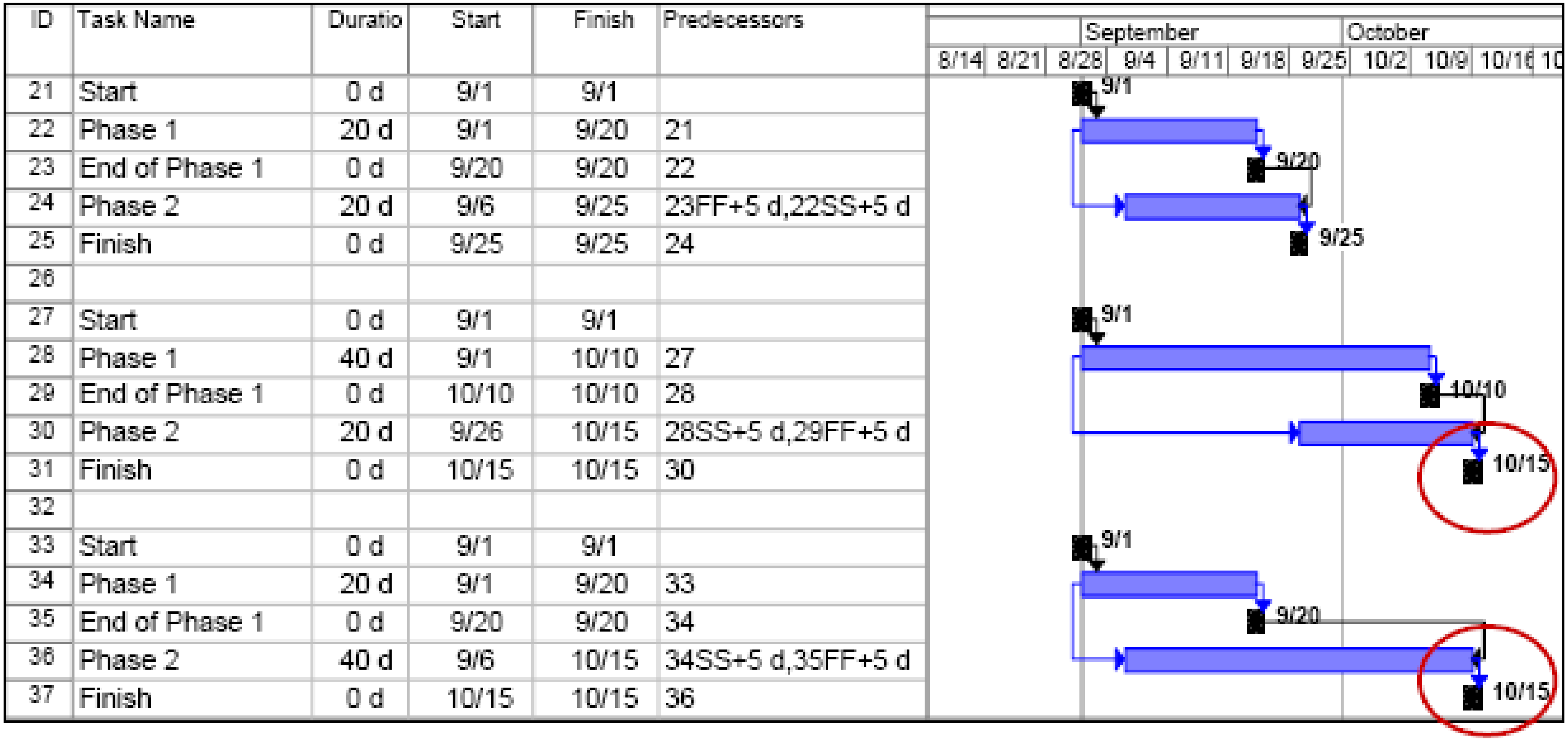


Figure C – Closing Off Danglers, Activities Longer, Right Answers

S-S and F-F Logic) in Software: MS Project (with Milestone) – this Works

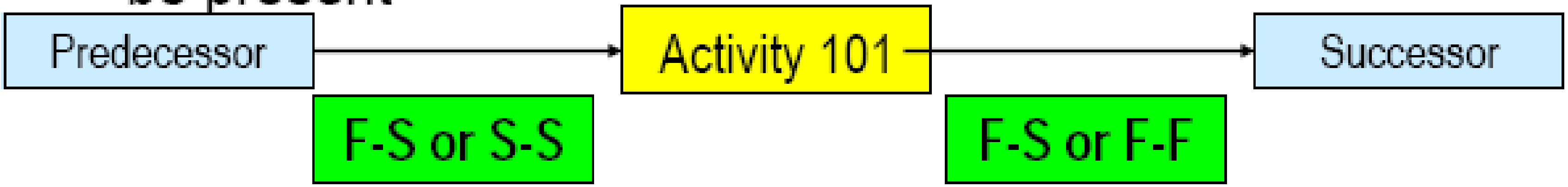


ID	Task Name	Duratio	Start	Finish	Predecessors
21	Start	0 d	9/1	9/1	
22	Phase 1	20 d	9/1	9/20	21
23	End of Phase 1	0 d	9/20	9/20	22
24	Phase 2	20 d	9/6	9/25	23FF+5 d,22SS+5 d
25	Finish	0 d	9/25	9/25	24
26					
27	Start	0 d	9/1	9/1	
28	Phase 1	40 d	9/1	10/10	27
29	End of Phase 1	0 d	10/10	10/10	28
30	Phase 2	20 d	9/26	10/15	28SS+5 d,29FF+5 d
31	Finish	0 d	10/15	10/15	30
32					
33	Start	0 d	9/1	9/1	
34	Phase 1	20 d	9/1	9/20	33
35	End of Phase 1	0 d	9/20	9/20	34
36	Phase 2	40 d	9/6	10/15	34SS+5 d,35FF+5 d
37	Finish	0 d	10/15	10/15	36

Need a Milestone to trick MS Project to accept two types of logic ties between Phases

General Rule with Logic, Best Practice

- ALL activities, except the first and last activity, MUST have at least one "?-S" Predecessor relationship AND one "F-?" Successor relationship, where "?" can be either a S or F, regardless of any other relationships that may be present



Predecessor

Activity 101

Successor

F-S or S-S

F-S or F-F

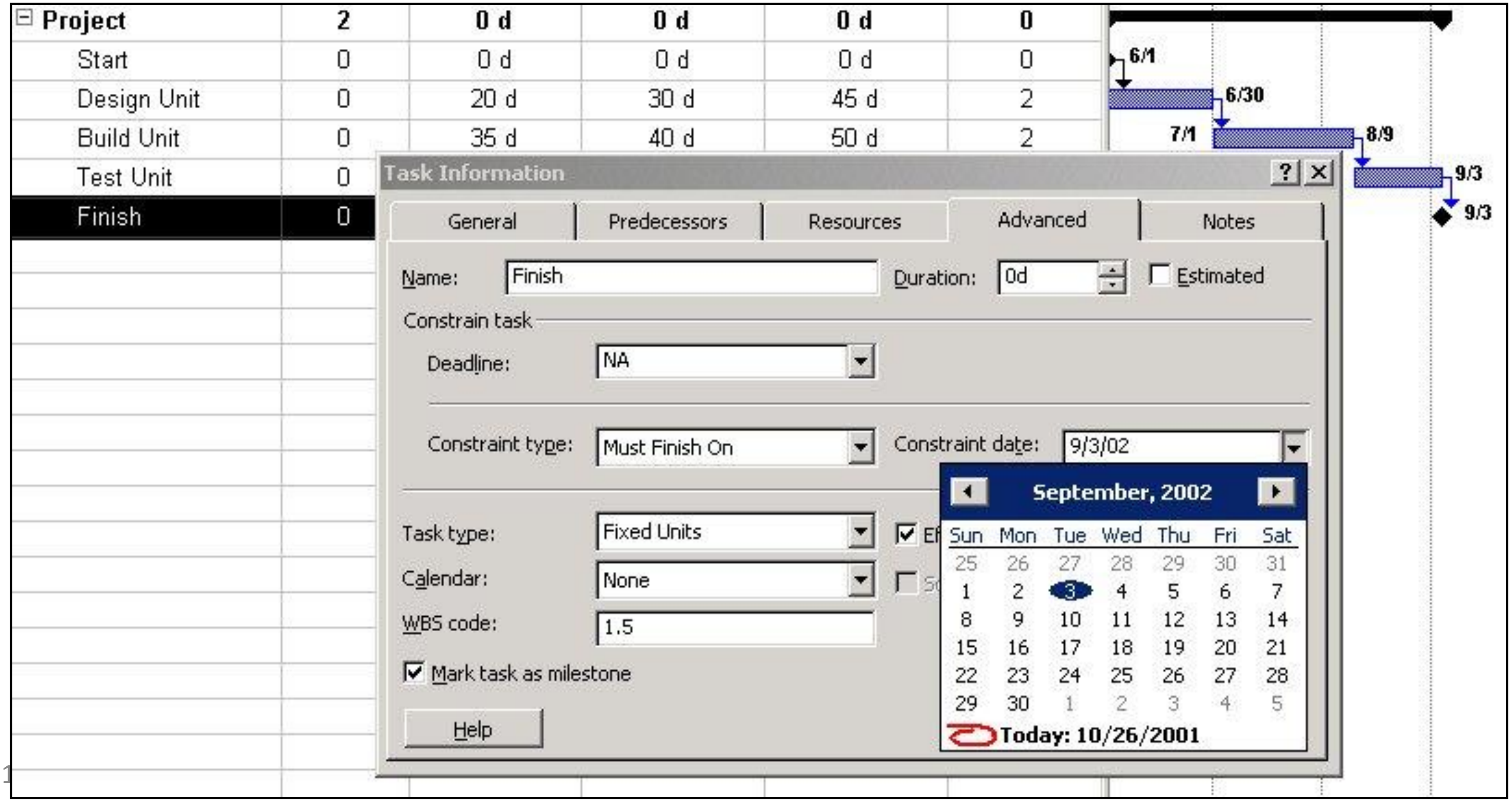
- These relationships must be “driving”
  - A delay or lengthening in the predecessor has the most direct impact on the successor

Imposing Constraint Dates on the Project Finish Date

- Constraints are placed on the important delivery dates
- This can help CPM scheduling
  - Negative float develop feasible schedules
- Constraints are also used to make the project show success
- Constraints left in the schedule frustrate risk analysis of the very items you care about

Imposing Constraint Dates on the Project Finish Date (continued)

- We leave the Must Finish On 9/3/02 constraint on the finish milestone



⊟ **Project**	**2**	**0 d**	**0 d**	**0 d**	**0**
Start	0	0 d	0 d	0 d	0
Design Unit	0	20 d	30 d	45 d	2
Build Unit	0	35 d	40 d	50 d	2
Test Unit	0				
Finish	0				

Task Information

Name: Finish

Duration: 0d

□ Estimated

Constrain task

Deadline: NA

Constraint type: Must Finish On

Constraint date: 9/3/02

Task type: Fixed Units

☑ Ef

Calendar: None

□ Sc

WBS code: 1.5

☑ Mark task as milestone

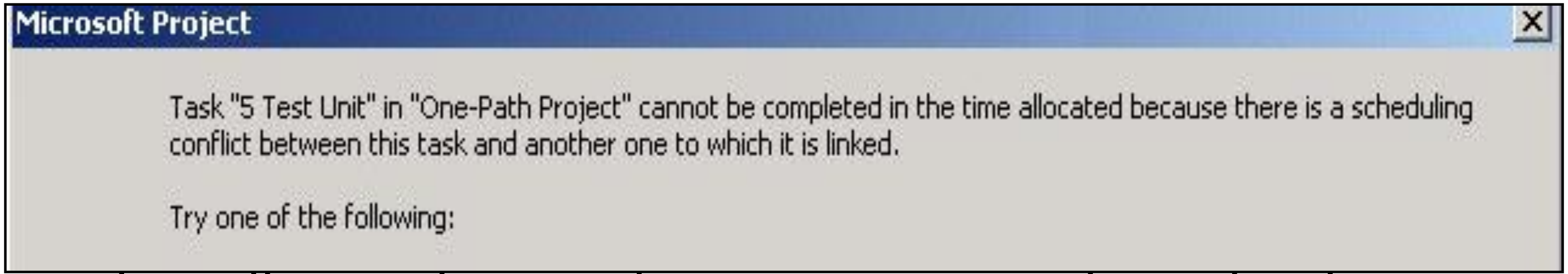
September, 2002

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5

Today: 10/26/2001

Effect of a Not Later Than Or Must Finish On Constraint on the Simulation

- Project gives you a message about the constraint



Task "5 Test Unit" in "One-Path Project" cannot be completed in the time allocated because there is a scheduling conflict between this task and another one to which it is linked.

Try one of the following:

This tells you that you have a constraint that is binding

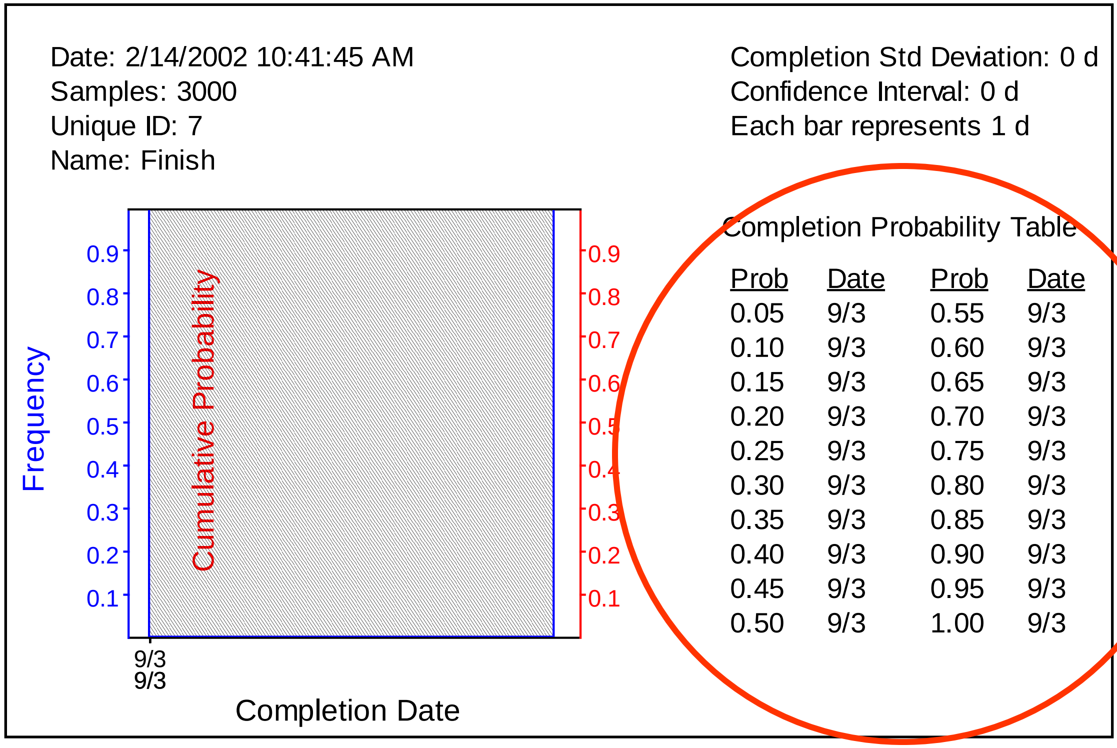
- You can complete if you manually click the message

Do Not Turn Off the Scheduling Messages

- If you turn off messages you will never know whether you have constraints that bind

Effect of a Must Finish On Constraint

- If the results are captured at the milestone, the results are very uninteresting and uninformative



Date: 2/14/2002 10:41:45 AM
Samples: 3000
Unique ID: 7
Name: Finish

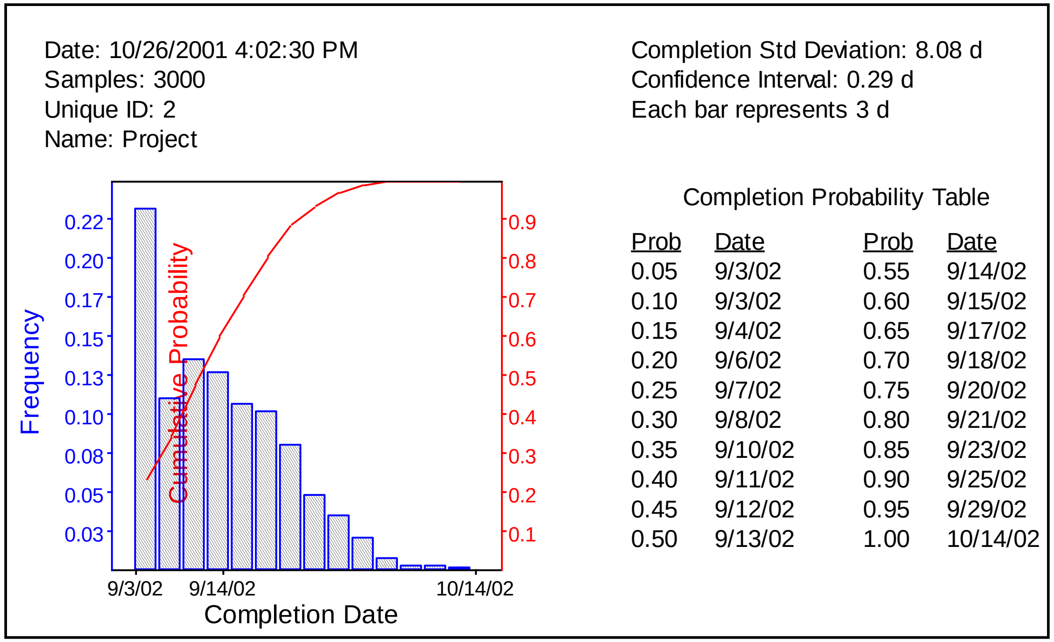
Completion Std Deviation: 0 d
Confidence Interval: 0 d
Each bar represents 1 d

Completion Probability Table

Prob	Date	Prob	Date
0.05	9/3	0.55	9/3
0.10	9/3	0.60	9/3
0.15	9/3	0.65	9/3
0.20	9/3	0.70	9/3
0.25	9/3	0.75	9/3
0.30	9/3	0.80	9/3
0.35	9/3	0.85	9/3
0.40	9/3	0.90	9/3
0.45	9/3	0.95	9/3
0.50	9/3	1.00	9/3

Effect of "Must Finish On" Constraint

If the results are gathered at the summary task, the results show only the "threat" side of the distribution



Date: 10/26/2001 4:02:30 PM
Samples: 3000
Unique ID: 2
Name: Project

Completion Std Deviation: 8.08 d
Confidence Interval: 0.29 d
Each bar represents 3 d

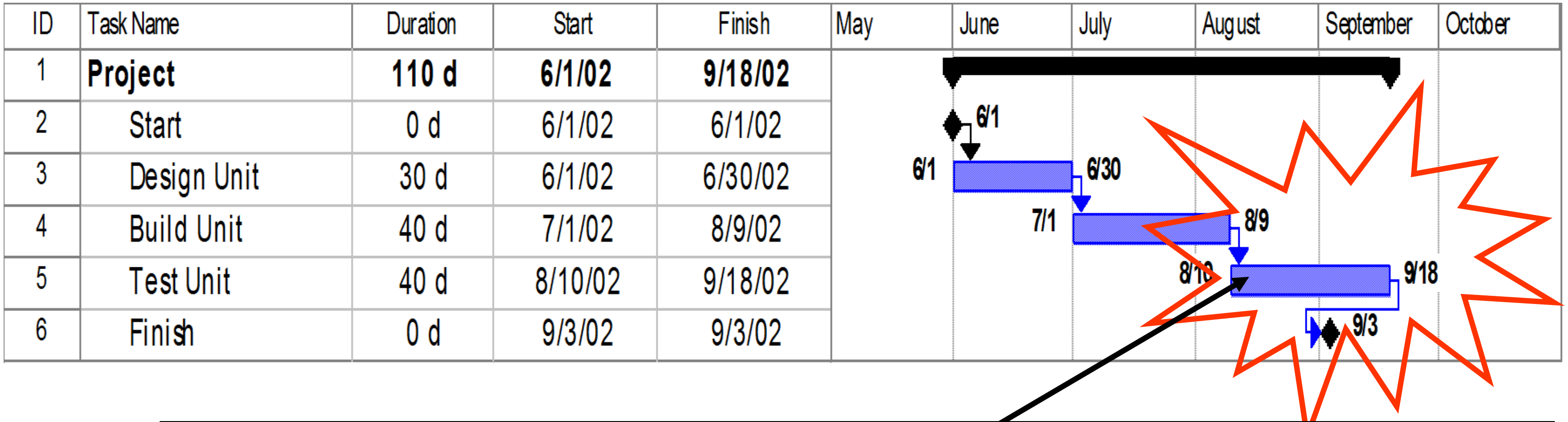
Completion Probability Table

Prob	Date	Prob	Date
0.05	9/3/02	0.55	9/14/02
0.10	9/3/02	0.60	9/15/02
0.15	9/4/02	0.65	9/17/02
0.20	9/6/02	0.70	9/18/02
0.25	9/7/02	0.75	9/20/02
0.30	9/8/02	0.80	9/21/02
0.35	9/10/02	0.85	9/23/02
0.40	9/11/02	0.90	9/25/02
0.45	9/12/02	0.95	9/29/02
0.50	9/13/02	1.00	10/14/02

Cannot go Earlier since the Milestone does not Move

“Must Finish ON” will have Different Results if you use Summary Bar or Milestone

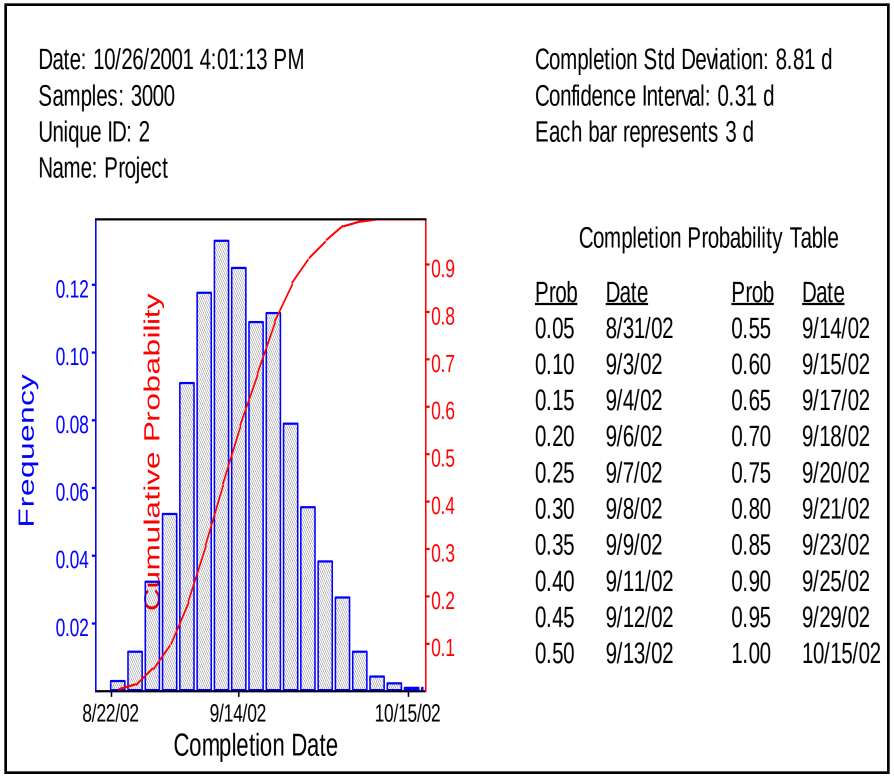
What’s happening here? MS Project allows the predecessor activities extend PAST the FIXED milestone



ID	Task Name	Duration	Start	Finish
1	**Project**	**110 d**	**6/1/02**	**9/18/02**
2	Start	0 d	6/1/02	6/1/02
3	Design Unit	30 d	6/1/02	6/30/02
4	Build Unit	40 d	7/1/02	8/9/02
5	Test Unit	40 d	8/10/02	9/18/02
6	Finish	0 d	9/3/02	9/3/02

Even if finish milestone might not be later, Test Unit can be, in Project. We’re using the <u>Project summary bar</u> for our results

Effect of “Finish Not Later Than” Constraint

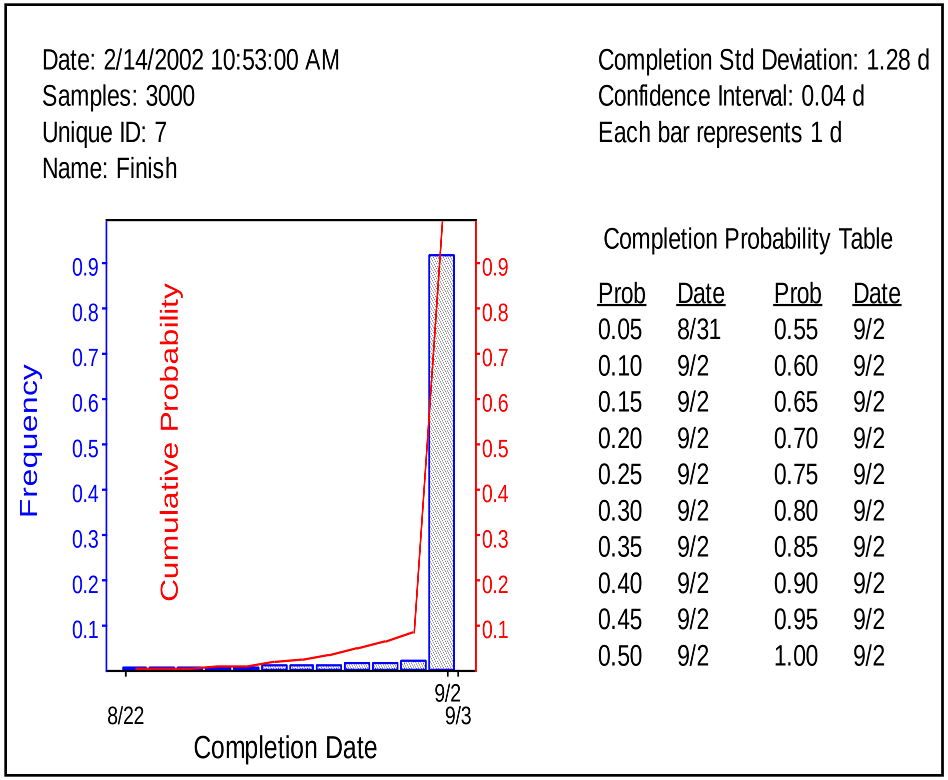


Date: 10/26/2001 4:01:13 PM
Samples: 3000
Unique ID: 2
Name: Project

Completion Std Deviation: 8.81 d
Confidence Interval: 0.31 d
Each bar represents 3 d

Completion Probability Table

Prob	Date	Prob	Date
0.05	8/31/02	0.55	9/14/02
0.10	9/3/02	0.60	9/15/02
0.15	9/4/02	0.65	9/17/02
0.20	9/6/02	0.70	9/18/02
0.25	9/7/02	0.75	9/20/02
0.30	9/8/02	0.80	9/21/02
0.35	9/9/02	0.85	9/23/02
0.40	9/11/02	0.90	9/25/02
0.45	9/12/02	0.95	9/29/02
0.50	9/13/02	1.00	10/15/02



Date: 2/14/2002 10:53:00 AM
Samples: 3000
Unique ID: 7
Name: Finish

Completion Std Deviation: 1.28 d
Confidence Interval: 0.04 d
Each bar represents 1 d

Completion Probability Table

Prob	Date	Prob	Date
0.05	8/31	0.55	9/2
0.10	9/2	0.60	9/2
0.15	9/2	0.65	9/2
0.20	9/2	0.70	9/2
0.25	9/2	0.75	9/2
0.30	9/2	0.80	9/2
0.35	9/2	0.85	9/2
0.40	9/2	0.90	9/2
0.45	9/2	0.95	9/2
0.50	9/2	1.00	9/2

Collecting data at the Summary Bar – Correct because MS Project allows activities to exceed the date

Collecting data at the Finish Milestone – Incorrect because Constraint holds