DCMA 14-Point Schedule Assessment

Understanding and Applying the DCMA Schedule Assessment Metrics

forProject™
forProject Technology, Inc.

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Version 1.2 (March2011)
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Background on the 14-point Assessment

- USD AT&L* has mandated use of an Integrated Master Schedule (IMS) for cost or incentive contracts/subcontracts and intra-government work agreements of at least $20 million
- DCMA has responsibility to ensure that the IMS is at an acceptable level of quality to support compliance with ANSI/EIA-748
- DCMA designed the 14 Point Assessment to improve their ability to assess the quality of IMS submittals

* The Office of the Under Secretary of Defense for Acquisition, Technology and Logistics

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Purpose of DCMA 14 Point Assessment

- Provides a consistent, DoD-wide approach to schedule analysis
- Assess IMS using proven metrics that have been successfully applied on multiple programs
- Catalyst for constructive discussions between the contractor and DCMA
- Baseline for tracking IMS improvement over time
- Support two important OSD Tripwire metrics
  - Critical Path Length Index (CPLI)
  - Baseline Execution Index (BEI)

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First We Need Some Basic Schedule Counts

- Total Tasks - Lowest level tasks, excluding summary tasks, milestones, LOE tasks
- Complete Tasks – Of the Total Tasks, how many have been completed?
- Incomplete Tasks – Of the Total Tasks, how many are not completed?
- Baseline Count – Of the Total Tasks, how many were planned to be done by now?
- BEI Baseline Count – Baseline count plus tasks missing Baseline Finish dates
- Relationship Count – For the Incomplete Tasks, how many FS, FF, SS, and SF relationships are there?

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The DCMA 14 Point Assessment

1. Logic
2. Leads
3. Lags
4. Relationships
5. Hard Constraints
6. High Float (Total Slack)
7. Negative Float (Total Slack)
8. High Duration
9. Invalid Dates
10. Resources
11. Missed Tasks
12. Critical Path Test
13. Critical Path Length Index (CPLI)
14. Baseline Execution Index (BEI)

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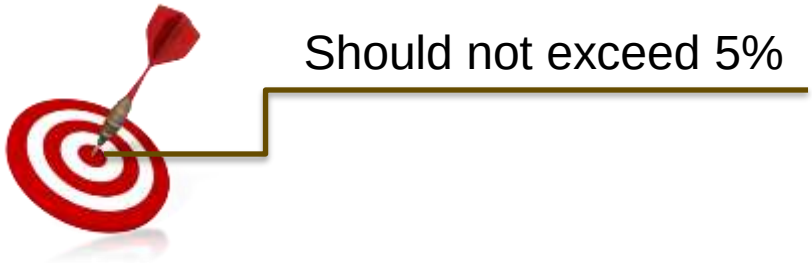
Metric #1: Logic

- What it Measures
  - % of Incomplete Tasks with no predecessor and/or no successor (i.e. "dangling" tasks)
  - Helps measure how well (or poorly) the schedule is linked together. Affects horizontal schedule traceability.
- How it is Calculated

$$\% = \frac{\textit{Number of Incomplete Tasks with Missing Logic}}{\textit{Number of Incomplete Tasks}} \times 100$$

- Target



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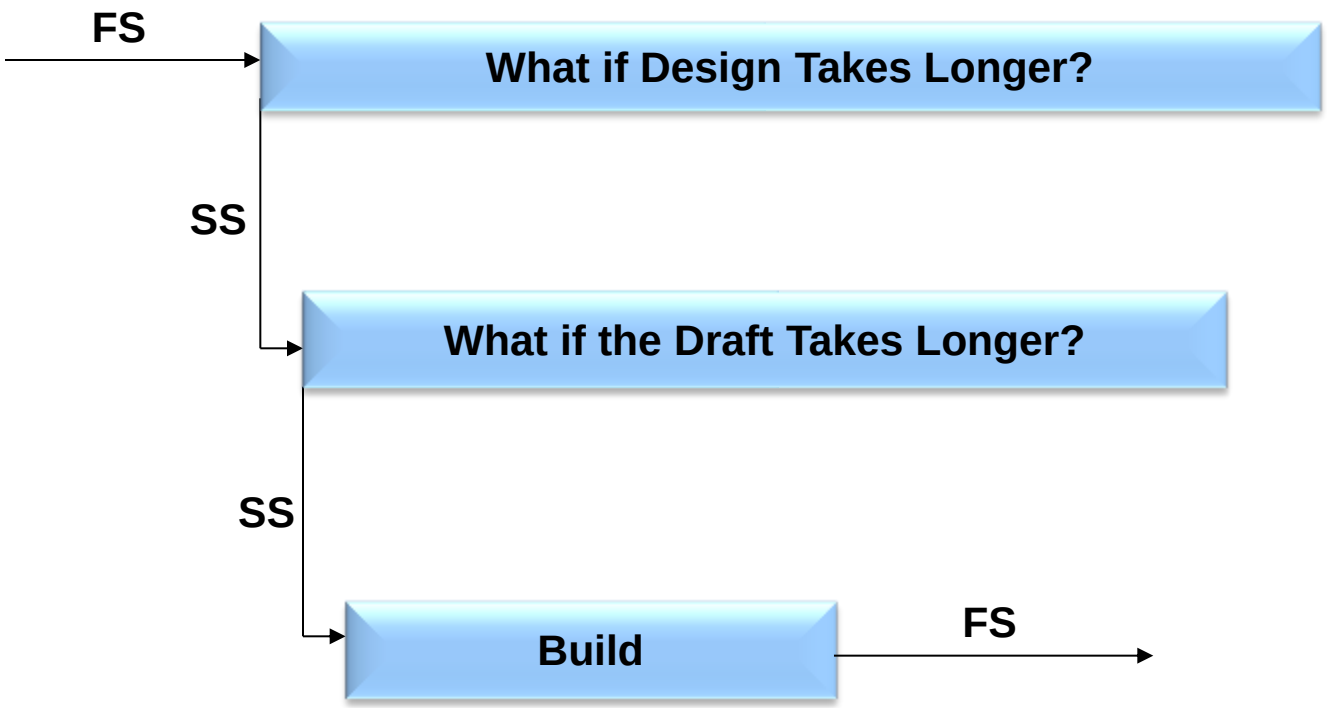
Example - Dangling Tasks



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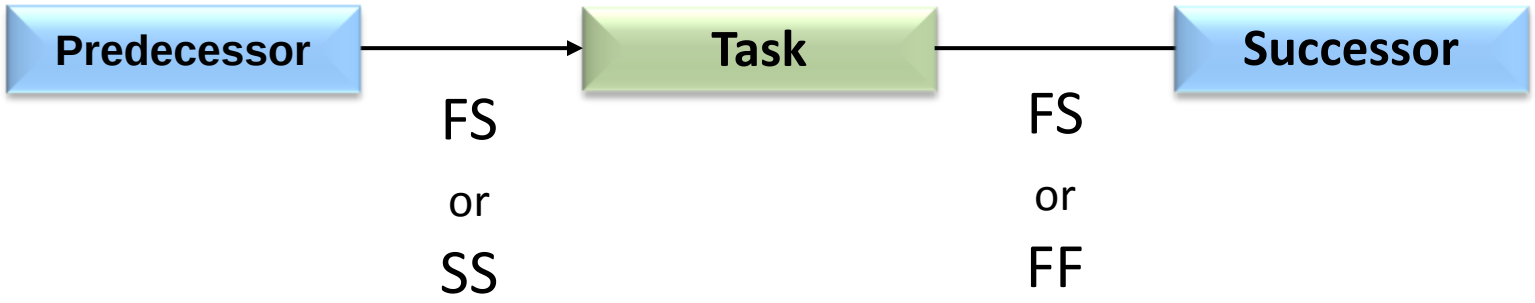
Schedule Logic Best Practice

- To avoid "dangling" tasks, each task should have:
  - At least one FS or SS relationship as its predecessor
  - At least one FS or FF relationship as its successor



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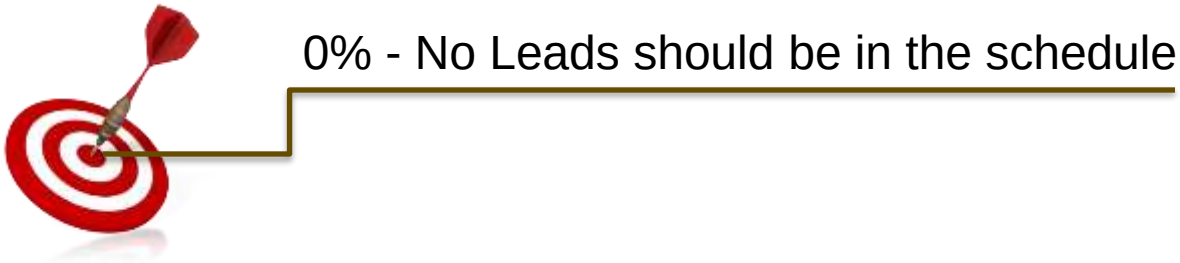
Metric #2: Leads

- What it Measures
  - % of predecessor relationships that have a lead (negative lag) value
  - The critical path analysis can be distorted with excessive use of lags and they should be avoided
- How it is Calculated

$$\% = \frac{\textit{Number of Leads on Incomplete Tasks}}{\textit{Number of Relationships}} \textit{ x 100}$$

- Target



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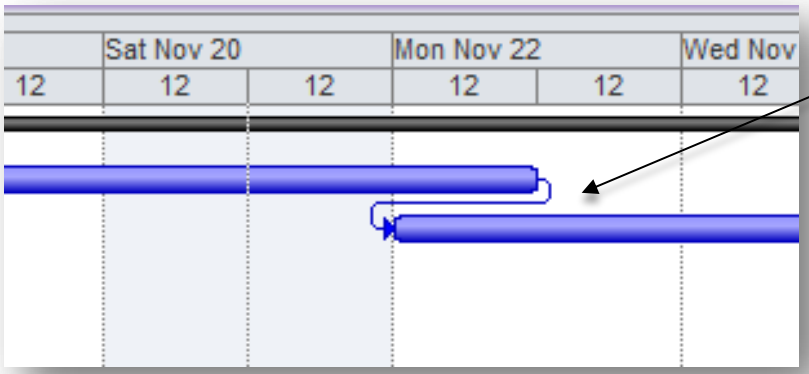
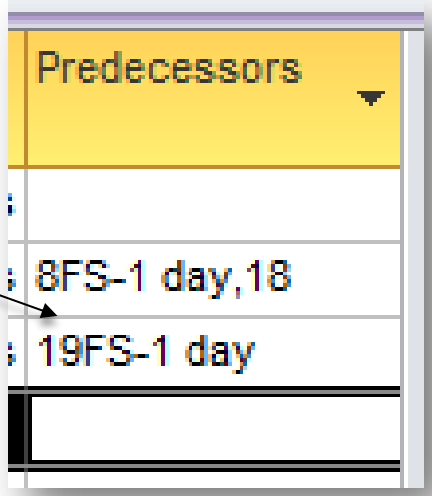
Identifying Leads (Negative Lags)



Leads (negative Lags) visible in the Gantt Chart

Leads (negative Lags) visible in the Predecessors column



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Leads – Best Practices

- If some event in the predecessor task is the “trigger” to begin the successor task, consider breaking the predecessor into two discrete tasks

Original

Improved

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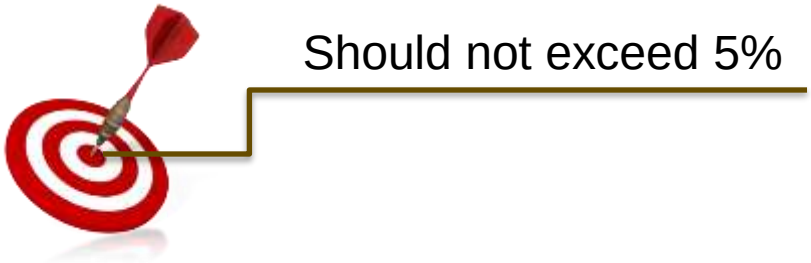
Metric #3: Lags

- What it Measures
  - % of predecessor relationships that have a positive lag value
  - The critical path analysis can be distorted with excessive use of lags and they should be avoided
- How it is Calculated

$$\% = \frac{\textit{Number of Lags on Incomplete Tasks}}{\textit{Number of Relationships}} \times 100$$

- Target



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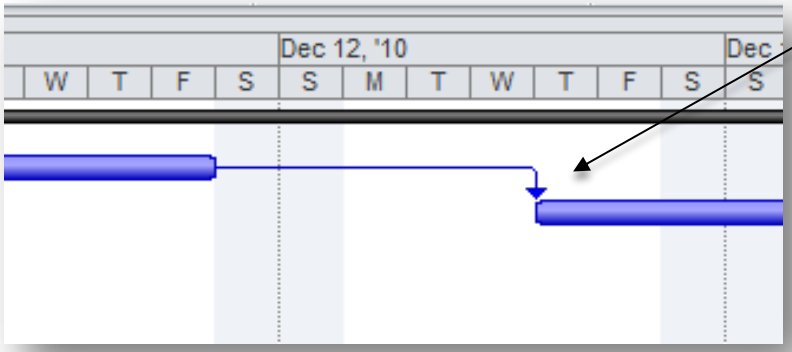
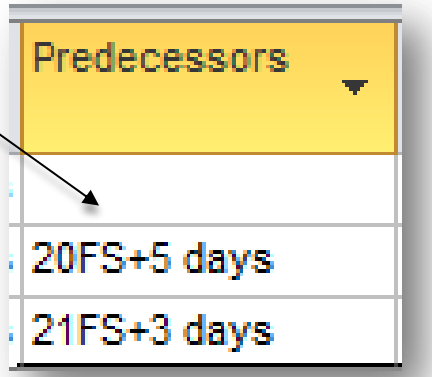
Identifying Lags



Lags visible in the Gantt Chart

Lags visible in the Predecessors column



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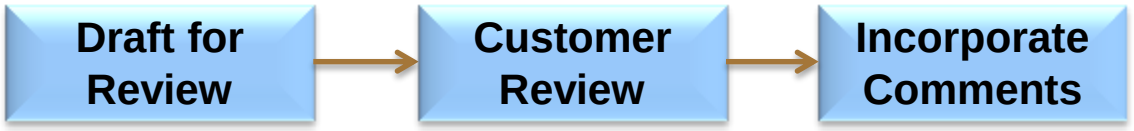
Lags – Best Practices

- If the lag represents some effort or activity, consider representing it as an explicit task

Original

Improved



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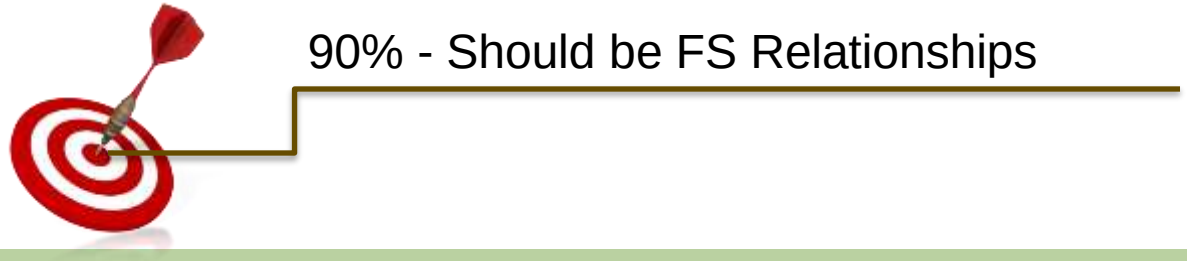
Metric #4: Relationships

- What it Measures
  - % of predecessor relationships of type Finish-to-Start (FS) on Incomplete Tasks versus total relationships
  - FS relationships provide a simpler, more logical flow through the schedule. Other relationship types are more difficult to trace and understand (especially the SF type)
- How it is Calculated

$$\% = \frac{\textit{Number of FS Relationships on Incomplete Tasks}}{\textit{Total Number of Relationships}} \times 100$$

- Target



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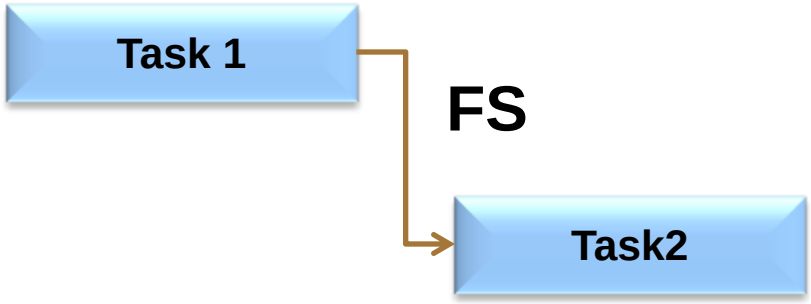
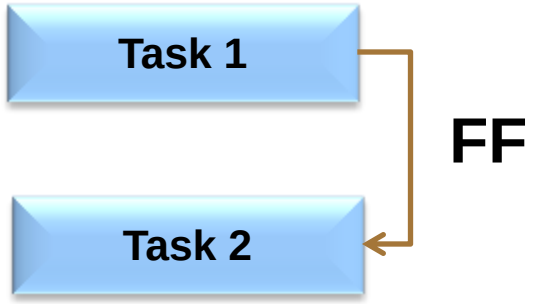
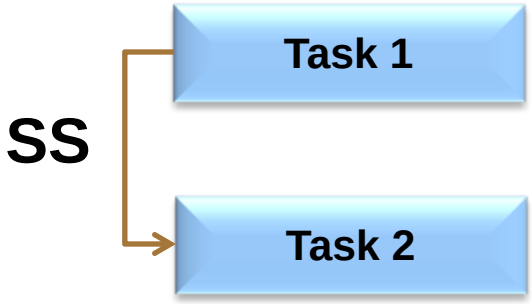
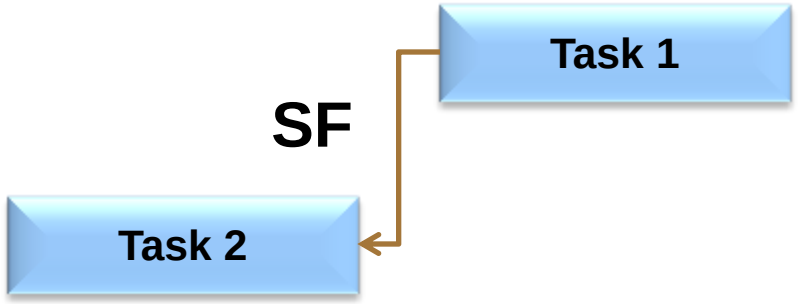
Relationship Types









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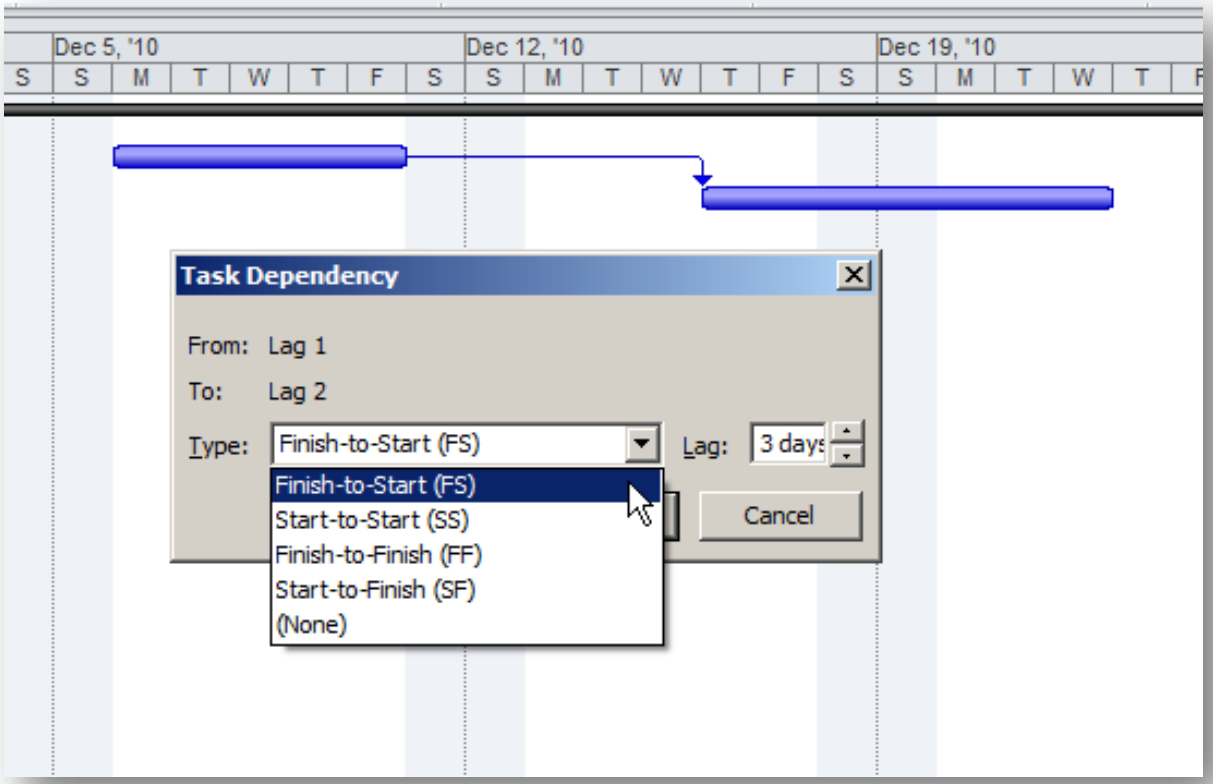
Relationship Types in Microsoft Project



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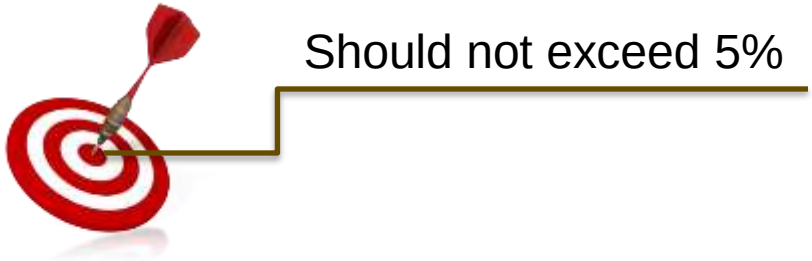
Metric #5: Hard Constraints

- What it Measures
  - Hard Constraint types include *Must Start On* (MSO), *Must Finish On* (MFO), *Start No Later Than* (SNLT), *Finish No Later Than* (FNLT)
  - Hard constraints prevent tasks from being moved by their logic relationships as the schedule is progressed
- How it is Calculated

$$\% = \frac{\textit{Number of Incomplete Tasks with Hard Constraints}}{\textit{\# of Incomplete Tasks}} \textit{ x 100}$$

- Target



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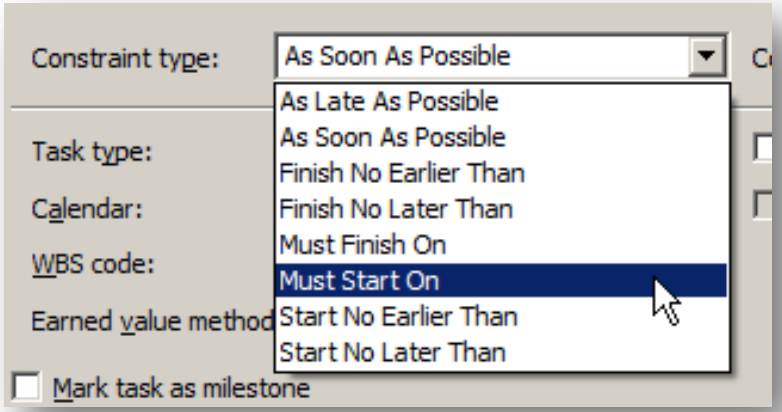
What are “Hard Constraints”?

- “Hard” Constraint Types include:
  - Must Start On (MSO)
  - Must Finish On (MFO)
  - Start No Later Than (SNLT)
  - Finish No Later Than (FNLT)
- Hard Constraints block the logical flow of the schedule, preventing delays from impacting downstream tasks
- “Manually Scheduled” tasks may also be considered as Hard Constraints (Project 2010 only)



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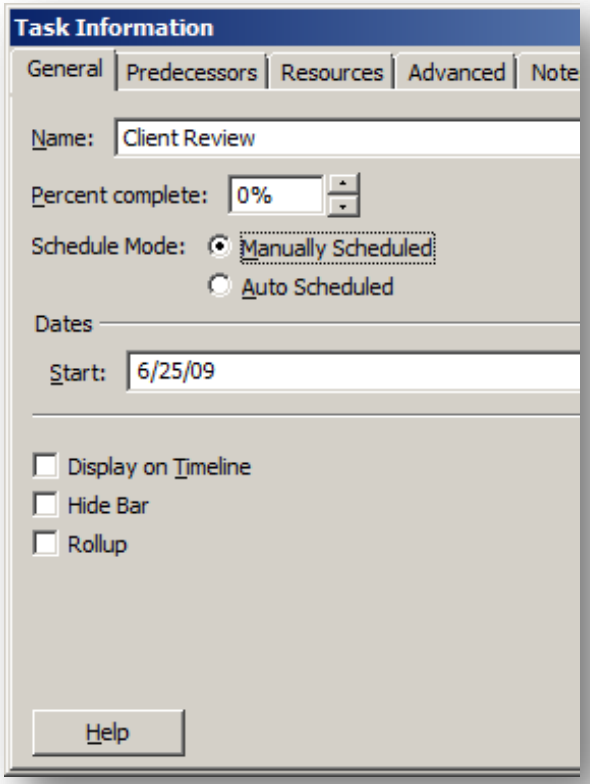
Project 2010: Manually Scheduled Tasks

- In Project 2010, there is an option to mark task as "Manually Scheduled"
- This is essentially another type of Hard Constraint (similar to applying a Must Start On constraint)
- DCMA Schedule Analyzer forProject provides the option to treat Manually Scheduled tasks as a Hard Constraint



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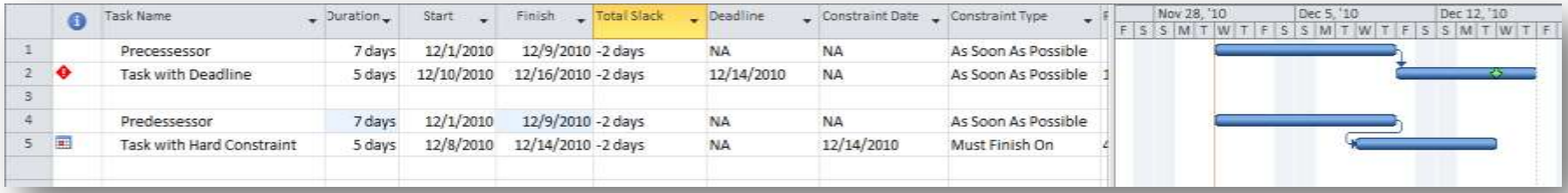
Constraints – Best Practices

- Avoid hard constraints unless absolutely necessary
  - Breaks the schedule logic and interferes with downstream critical path analysis
  - Can introduce negative lags into the schedule
- Consider using the "Deadlines" capability in MS Project as a way of modeling target dates
  - Allows the task to slip to the right if predecessors slip
  - Does not disrupt the logical flow of the schedule
  - Highlights negative float/slack if the deadline is at risk



	Task Name	Duration	Start	Finish	Total Slack	Deadline	Constraint Date	Constraint Type
1	Precessessor	7 days	12/1/2010	12/9/2010	-2 days	NA	NA	As Soon As Possible
2	Task with Deadline	5 days	12/10/2010	12/16/2010	-2 days	12/14/2010	NA	As Soon As Possible
3								
4	Predessessor	7 days	12/1/2010	12/9/2010	-2 days	NA	NA	As Soon As Possible
5	Task with Hard Constraint	5 days	12/8/2010	12/14/2010	-2 days	NA	12/14/2010	Must Finish On

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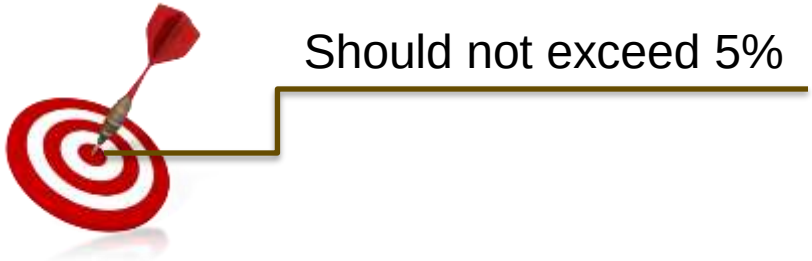
Metric #6: High Float

- What It Measures
  - Percentage of Incomplete Tasks with Total Float (Total Slack) greater than 44 working days
  - A task with total float over 44 working days may be a result of missing predecessors and/or successors
- How It Is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ High\ Float}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target



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High Float – Best Practices

- Create views and filters in MS Project to highlight excessive float (total slack)
- If found, review the schedule logic to ensure that predecessor/successor relationships are defined properly
- Check to see if successor relationships are missing or defined incorrectly
- Are the task durations realistic?

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Metric #7: Negative Float

- What it Measures
  - Percentage of Incomplete Tasks with Negative Float (i.e. Total Slack less than zero)
  - Negative float indicates a risk of delay on a key milestone or end date, and should have an explanation and corrective action plan
- How it is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ Negative\ Float}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target

0% - There should be no negative float

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Negative Float – Best Practices

- Create views and filters to highlight negative total slack and then review regularly
- Negative float (total slack) sometimes indicates that hard constraints have been applied to the schedule
  - Minimize hard constraints to allow the logic to flow naturally
  - Use “deadlines” instead of hard constraints
- Negative float indicates that some key target date is no longer feasible with the schedule as planned
- Revise the schedule logic or work plan to avoid or minimize negative slack

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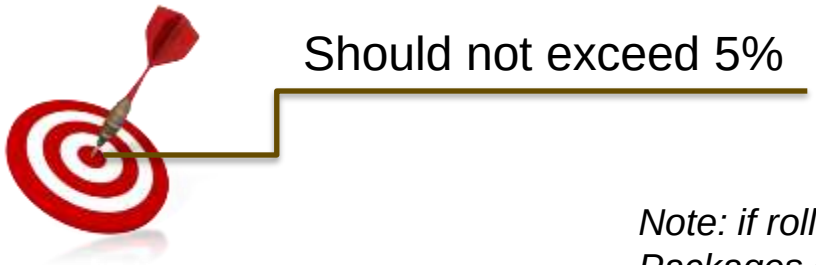
Metric #8: High Duration

- What it Measures
  - % of Incomplete Tasks with Baseline Duration greater than 44 working days
  - Excessive durations can make it harder to get visibility into status and schedule progress
- How it is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ High\ Duration}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target



Note: if rolling wave planning is used, Planning Packages are excluded from this analysis

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High Duration – Best Practices

- Long duration tasks have several disadvantages
  - Make discrete progress measurement more difficult
  - Can lead to complex logic (e.g. negative lags)
  - Can distort the critical path
  - Increases the need to make changes to in-process work
- Consider breaking long duration tasks into several shorter, more measureable tasks
- Use rolling wave planning and define Planning Packages to represent far-term effort where it is not yet practical to define discrete Work Package

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Metric #9: Invalid Dates

- What it Measures
  - Actual Start or Actual Finish after Project Status Date
  - Start or Finish before Project Status Date without an Actual Start or Actual Finish
  - Indicates incomplete or improper updating of the schedule
- How it is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ Invalid\ Dates}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target

0% - There should be no invalid dates

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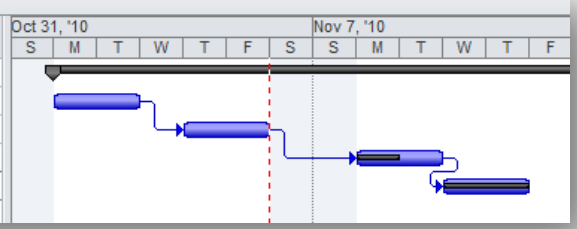
Invalid Dates in Microsoft Project

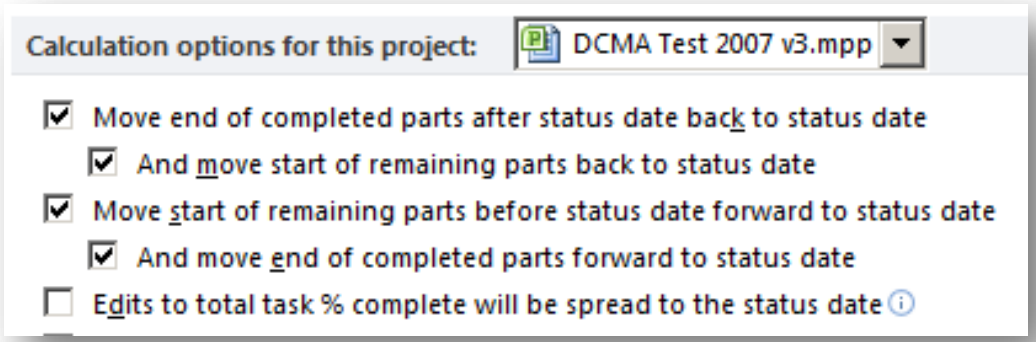
- Ensure that all tasks in the past have been properly updated through the Status Date

DCMA Test 2007 v3.mpp

		Task Name	Duration	Start	Finish	Actual Start	Actual Finish
1		**Summary Task**	**55 days**	**11/1/2010**	**1/14/2011**	**11/1/2010**	**NA**
30	!	Start in Past and no Actual Start	2 days	11/1/2010	11/2/2010	NA	NA
31	!	Finish in Past and no Actual Finish	2 days	11/4/2010	11/5/2010	11/4/2010	NA
32	!	Actual Start in Future	2 days	11/8/2010	11/9/2010	11/8/2010	NA
33	✓	Actual Finish in Future	2 days	11/10/2010	11/11/2010	11/10/2010	11/11/2010



- Use advanced options to help ensure integrity



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Metric #10: Resources

- What It Measures
  - Percentage of Incomplete Tasks that have no Baseline Cost or Baseline Work assigned
- How It Is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ Invalid\ Dates}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target

0% - All Incomplete Tasks should have Resources

Note: This does not require Resource Assignments in the schedule, as long as there is Baseline Work or Baseline Cost at the Task level

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Resources – Best Practices

- Ensure that all discrete (measured) effort in the schedule has baseline work or baseline cost assigned at the task or resource assignment level

  Note: Resource-loaded schedules are not mandatory, but are recommended by DCMA

- Create views and filters in MS Project to highlight discrete tasks that are missing baseline work or baseline cost

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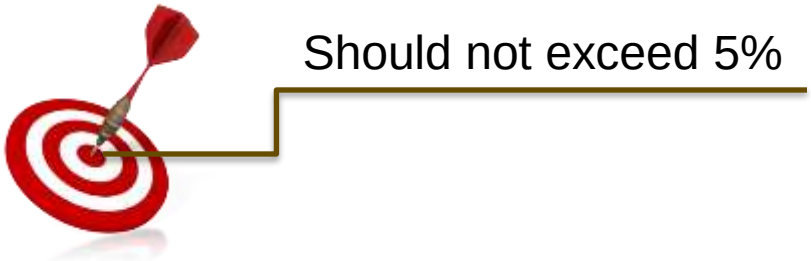
Metric #11: Missed Tasks

- What it Measures
  - Percentage of Incomplete Tasks that have a Baseline Finish up through the Status Date, and have either no Actual Finish or Actual Finish is later than the Baseline Finish
  - Measure of how well the actual schedule is tracking to the baseline schedule
- How it is Calculated

$$\% = \frac{\#\ of\ Incomplete\ Tasks\ with\ missed\ Baseline\ Finish}{\#\ of\ Incomplete\ Tasks} \times 100$$

- Target



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Best Practices – Missed Tasks

- Create views and filters in MS Project to highlight discrete tasks with a baseline finish date prior to the status date and which also have a forecasted finish date that is later than the baseline finish date
- As appropriate, develop corrective action plans

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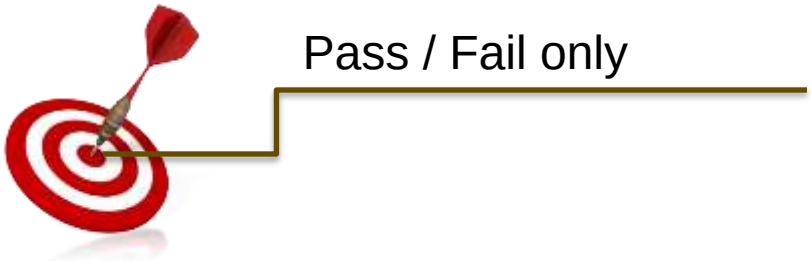
Metric #12: Critical Path Test

- What it Measures
  - Assesses the integrity of the overall network logic. Involves increasing the remaining duration by a very large amount (600 days) on an Incomplete Task on the Critical Path.
  - Ensure that a corresponding increase in the Project Finish is observed. If not, the critical path logic may be broken or faulty.
- How it is Calculated
  - Add 600d to the remaining duration of an open task on the critical path. Verify that the Project completion task slack (float) is affected by the same amount.
- Target



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Critical Path Test – Best Practices

- Broken logic is usually the result of missing predecessors and/or successors
- Create MS Project views and filters to identify tasks missing predecessors/successors

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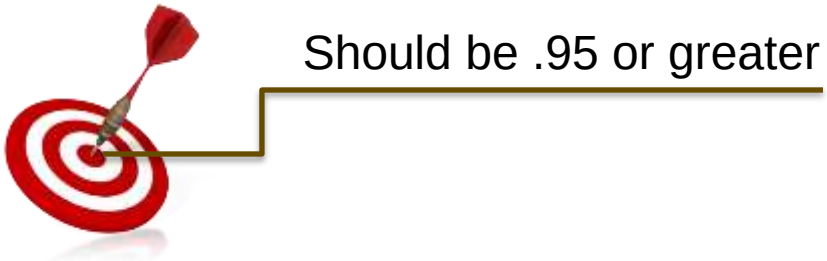
Metric #13: Critical Path Length Index (CPLI)

- What it Measures
  - Assesses the integrity of the overall network logic and the realism of finishing by the project Baseline Finish date
- How it is Calculated
  - Critical Path Length is the duration (in working days) between the Project Status Date and the Baseline Finish of a selected Completion Task or Milestone
  - Total Float is the float on the selected Completion Task or Milestone when it is constrained to Finish No Later Than it's Baseline Finish date

$$\% = \frac{(Critical\ Path\ Length + Total\ Float)}{Critical\ Path\ Length}$$

- Target



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CPLI – Best Practices

- Confirm that the schedule is able to pass the critical path test (Metric 12) and conforms to enough other schedule metrics to demonstrate “realism”

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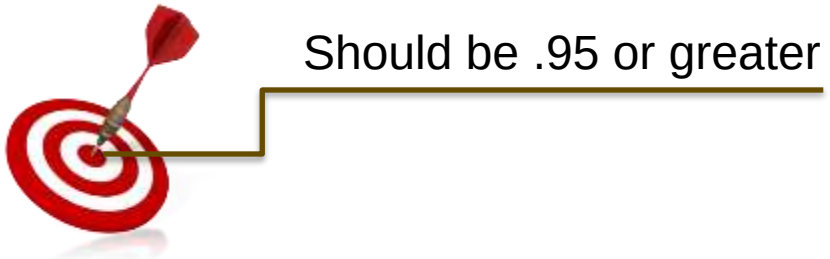
Metric #14: Baseline Execution Index (BEI)

- What it Measures
  - Measures the ratio of tasks that were actually completed to those tasks that should have been completed to date according to the Baseline schedule
  - The BEI is a measure of how consistent performance/execution is relative to the baseline plan.
- How it is Calculated

$$BEI = \frac{\#\ Completed\ Tasks}{BEI\ Baseline\ Count}$$

- Target



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BEI Best Practices

- Create MS Project filters and views to identify tasks which have a Baseline Finish date within 60 days or less of the Project Status Date
  - Assess the likelihood of on time completion
  - Updated forecasted finish dates accordingly
- Further filter the above tasks to identify any with forecast Finish dates later than their Baseline Finish
  - Determine if there is any form of corrective action plan that should be implemented
  - If there is adequate total float, a corrective action plan may not be necessary

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Keep in Mind…

- These 14 metrics are intended to assess:
  - the technical structure of the schedule
  - the degree to which actual progress matches the baseline plan (i.e. the efficiency of performance against the plan)
- The 14 point analysis does not tell you why the schedule has problems and what the project team is doing to fix those problems
- Further analysis is usually required…

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Questions?

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Thank You!

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