

Earned Value Explained

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Outline

- Why earned value
- Developing an earned value plan
- Rules for earning value
- Tracking project status
- Projecting completion dates
- Determining root cause of schedule variation
- Earned value vs. burn-down charts

Why Earned Value?

- You have just finished a planning session
- You have used the best estimation methods
- You have developed a beautiful plan
 - Detailed short term
 - High-level long term
- You are ready to start executing the plan
- But how do you know how well you are doing?
 - Ahead? Behind? Why? Re-plan? When will we finish?

Watts Humphrey

- Traditional earned value planning and tracking is based on “cost of work”.
- For software development, the principal cost of work is the effort spent to develop the software.
- Watts Humphrey tailored traditional earned value planning and tracking to a method most suited for software development.

Task Plan

Task List	Estimated Effort Hours
Task 1	9
Task 2	5
Task 3	8
Task 4	10
Task 5	6
Task 6	8
Total Estimated Effort	46

Planned Value

- Each task is assigned a Planned Value (PV).
- A task's planned value is the percentage the estimated effort for that task contributes to the total effort.

Planned Value (PV)

Task List	Estimated Effort Hours	Planned Value (%)
Task 1	9	20%
Task 2	5	11%
Task 3	8	17%
Task 4	10	22%
Task 5	6	13%
Task 6	8	17%
Total	46	100%

The diagram illustrates the calculation of Planned Value (PV) for Task 1. It shows that the 9 hours estimated for Task 1 are divided by the total estimated effort of 46 hours, resulting in a fraction of 9/46. This fraction is then converted to a percentage of 20%.

Planned Schedule

- When will this list of tasks be completed?
- Well, that depends on how much time is available to work on this plan.

Hours Available

Week	Estimated Hours Available
Week 1	10
Week 2	10
Week 3	10
Week 4	0
Week 5	10
Week 6	10
Total	50

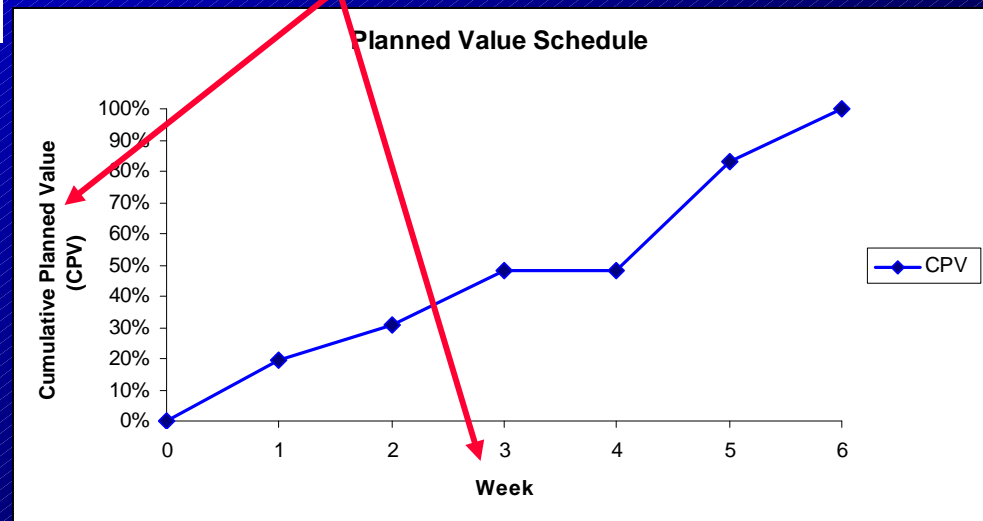
Vacation
Week!



Cumulative Planned Value (CPV)

Task List	Estimated Effort Hours	Planned Value (%)
Task 1	9	20%
Task 2	5	11%
Task 3	8	17%
Task 4	10	22%
Task 5	6	13%
Task 6	8	17%
Total	46	100%

Week	Hours Available	CPV
Week 1	10	20%
Week 2	10	31%
Week 3	10	48%
Week 4	0	48%
Week 5	10	83%
Week 6	10	100%



Earned Value (EV)

As you finish tasks, you earn value (EV).

There are four rules for earning value

1. 0% or 100% (no partial credit)
2. $EV = PV$ (no matter how long it takes to finish a task)
3. Task order does not matter
4. Future rate of $EV =$ past rate of EV

Plan vs. Reality

Task List	Estimated Effort Hours	Actual Hours to Complete Task
Task 1	9	12
Task 2	5	4
Task 3	8	9
Task 4	10	10
Task 5	6	
Task 6	8	
Total	46	

Most tasks are taking longer than estimated

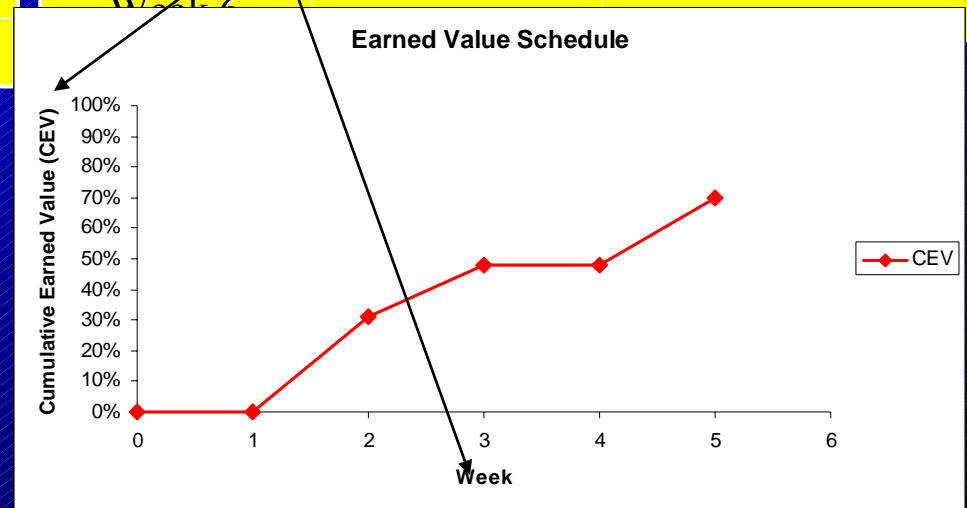
...and because of interruptions, available hours some weeks are less than planned

Week	Estimated Hours Available	Actual Hours Available
Week 1	10	8
Week 2	10	9
Week 3	10	9
Week 4	0	0
Week 5	10	10
Week 6	10	

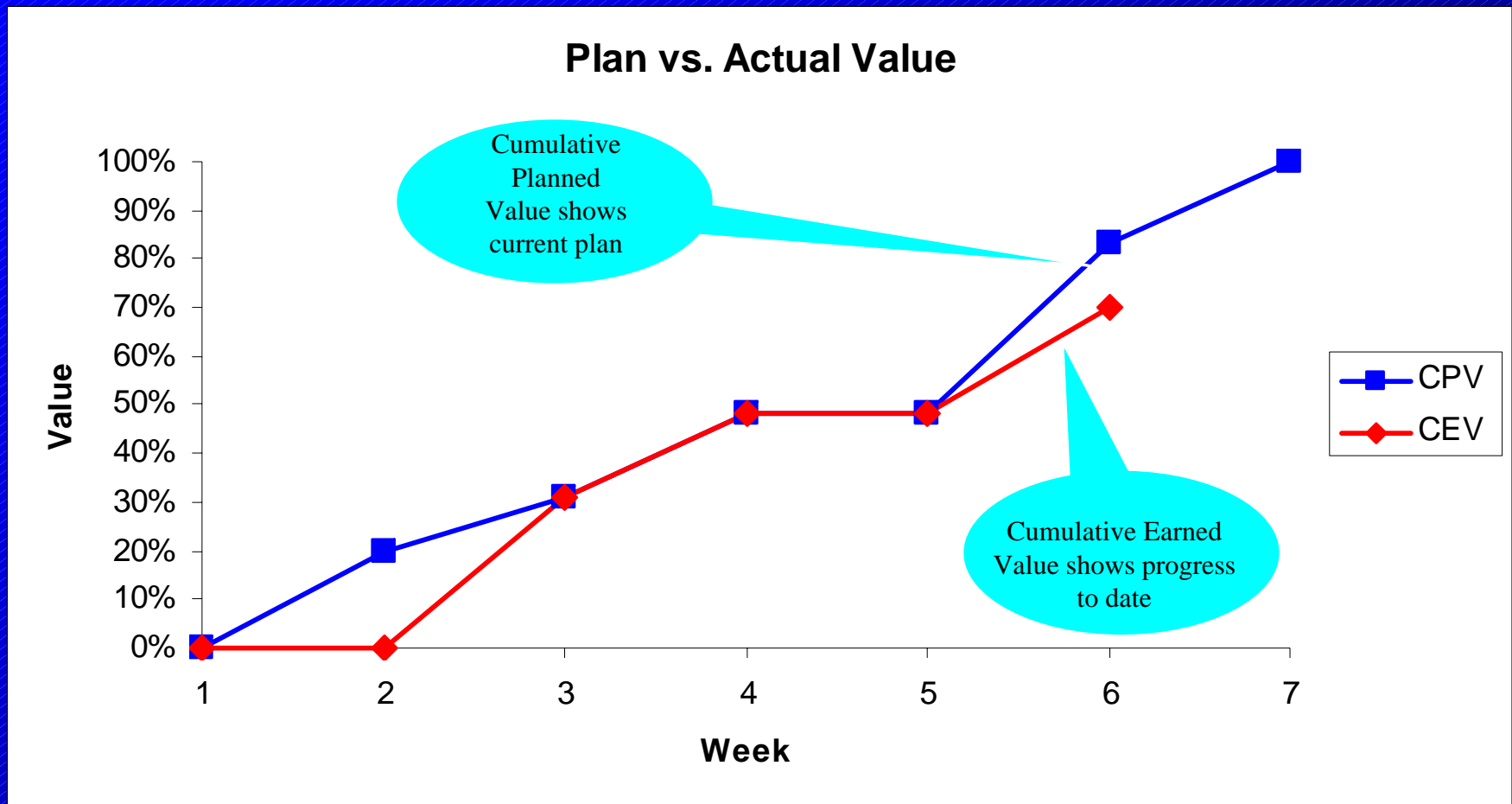
Cumulative Earned Value (CEV)

Task List	Planned Value (%)	Actual Hours
Task 1	20%	12
Task 2	11%	4
Task 3	17%	9
Task 4	22%	10
Task 5	13%	
Task 6	17%	

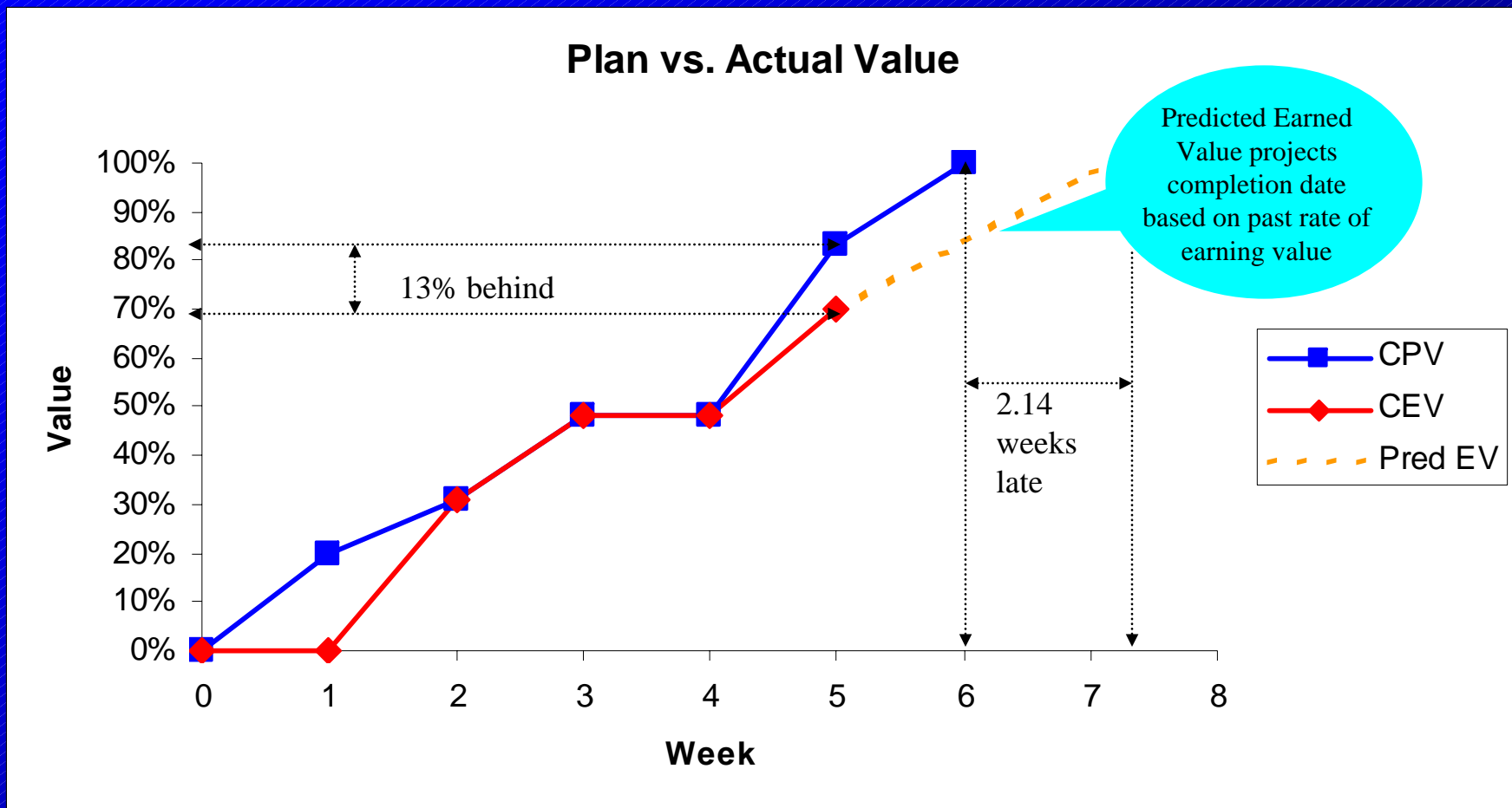
Week	Actual Hours Available	Cumulative Earned Value (CEV)
Week 1	8	0%
Week 2	9	31%
Week 3	9	48%
Week 4	0	48%
Week 5	10	70%
Week 6		



Plan vs. Actual



Predicted Completion Date



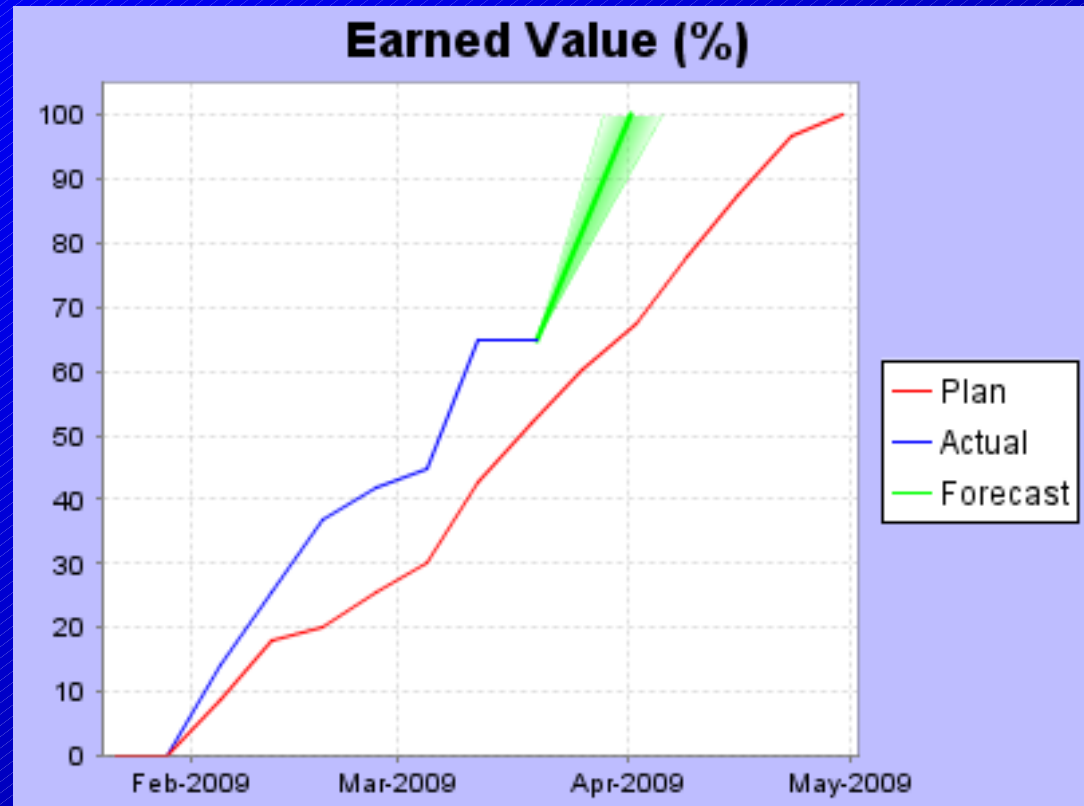
Changing Plans

- Adding tasks lowers the value of all tasks.
- Deleting tasks increases the value of all tasks.
- Re-estimating tasks changes value of all tasks accordingly.

Rolling-up Plans

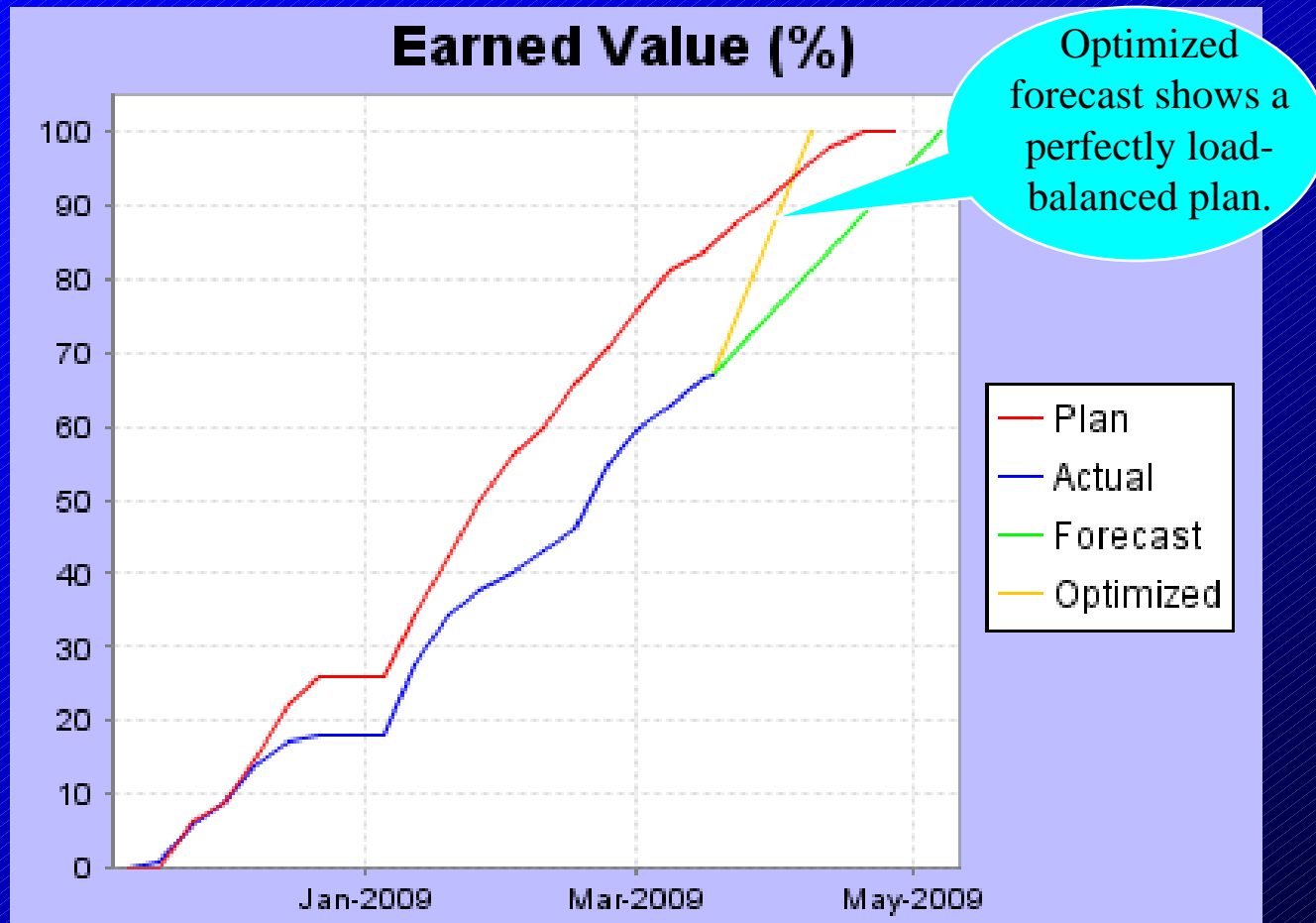
- EV plans are very easy to roll up
 - From individuals to teams
 - From teams to multi-teams
 - From multi-teams to programs
- Combine all the tasks from all the plans
- The value of a task in the new rolled-up plan is the percentage that task contributes to the total in the rolled-up plan.

Real-World Example -1



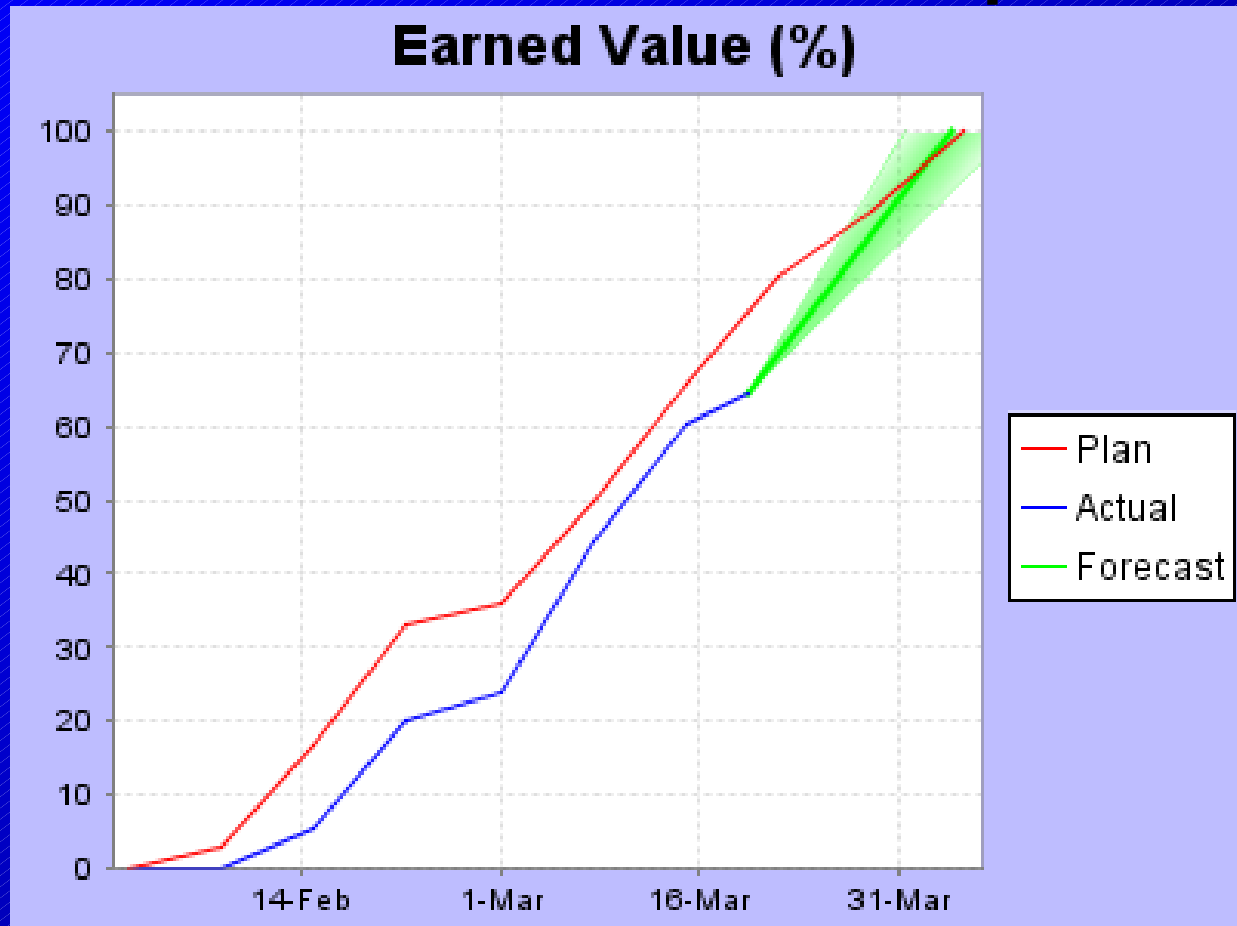
Ahead of plan

Real World Example -2



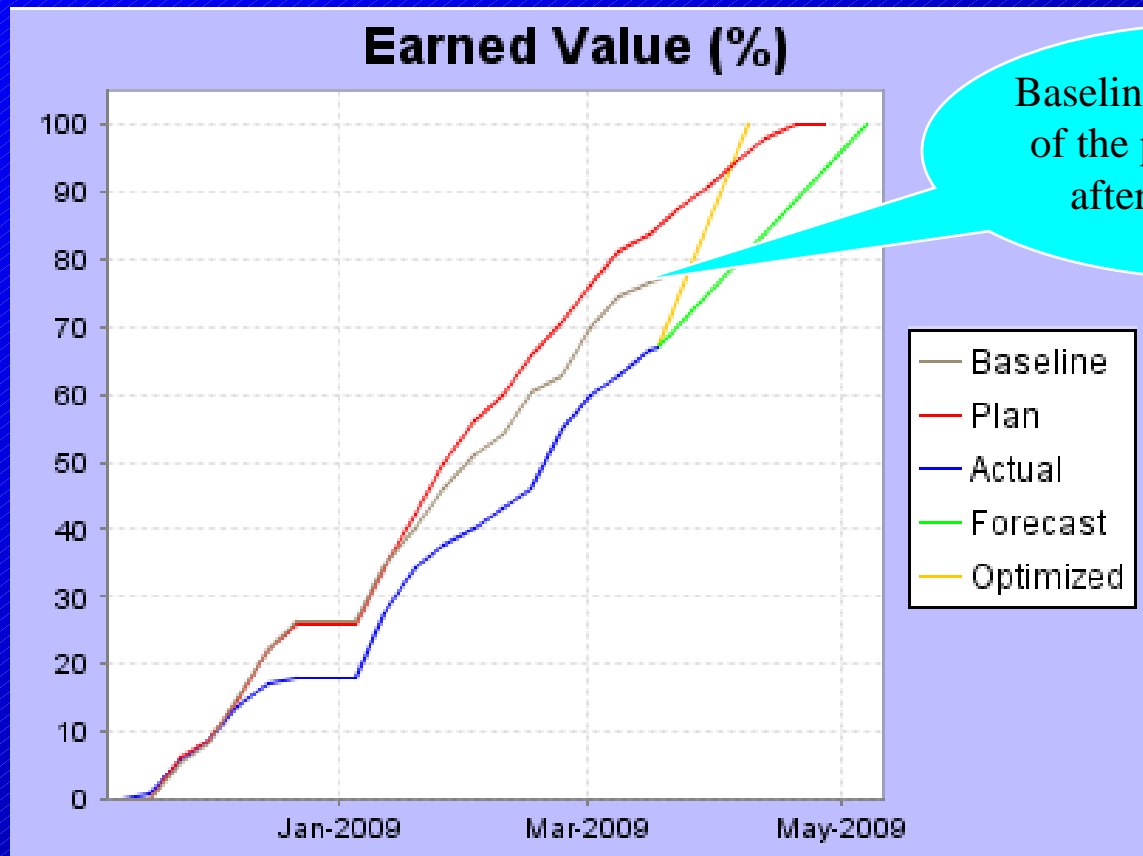
Behind plan

Real World Example -3



Almost on target

Real World Example -4



Baseline shows a snapshot of the plan (usually right after planning or re-planning)

Root Cause

The four main reasons for schedule deviation are

1. Available hours are overestimated
2. Plan growth
3. Tasks are underestimated
4. Too many tasks are in progress

EV and Hours

Task Hours %Change			Weekly Data	Plan	Actual
Baseline	3765.1	① →	Schedule hours for this week	212.0	210.0
Current	3807.4		Schedule hours this cycle to date	1777.0	1563.3
② → %Change	1.1%		Earned value for this week	4.8	5.1
			Earned value this cycle to date	44.0	35.0
		③ →	To-date hours for tasks completed	1333.0	1299.5
			To-date average hours per week	197.4	173.7

1. Team underestimated their work? No ③
2. The plan has grown? Yes ②
3. The team is unable to put in planned task hours? Yes ①
4. There are too many open tasks? No ③ – ①

Burn-down Charts

- Popular in agile methods
- Track “work remaining”
 - Estimated at the end of each day for each task in progress.
- Plan vs. Actual
- Biggest drawback – cannot determine root cause!

Summary

Earned value planning and tracking is a powerful method to determine current schedule status of a project.

- helps project completion dates
- helps determine root cause of schedule deviation
- can be rolled up from individuals to teams to multi-teams

For More Information

- Latest copy of this presentation available at <http://www.davissys.com/reldoc.htm>
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