Critical Chain Project Management

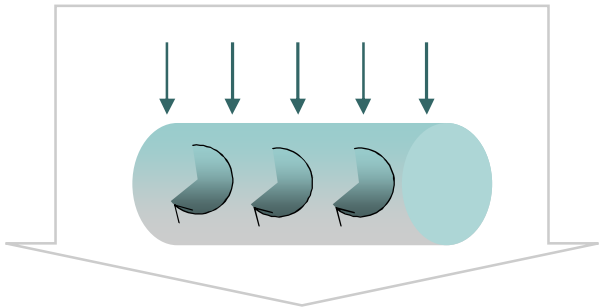
A new approach to project and programme management and the implications for HR

Dr Ted Hutchin – TOC-Lean Institute

The reality of projects today

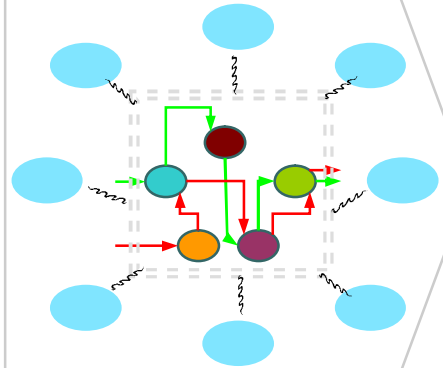
- Time to market is now a critical success factor for most companies
  - This applies to both internal and external projects
- Applies to all aspects of the organisation, not just IT or product development
- Opportunity time for maximising profit is reducing
- However, the time to develop new products/services has not reduced, and in many cases has actually increased
- So what are the drivers that lie behind this scenario?

COMPLEXITY IS INCREASING



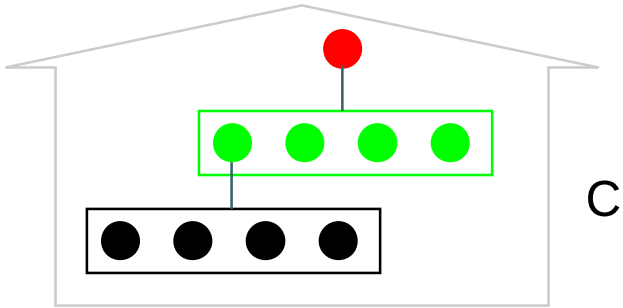
Dynamic Market

Distributed Development



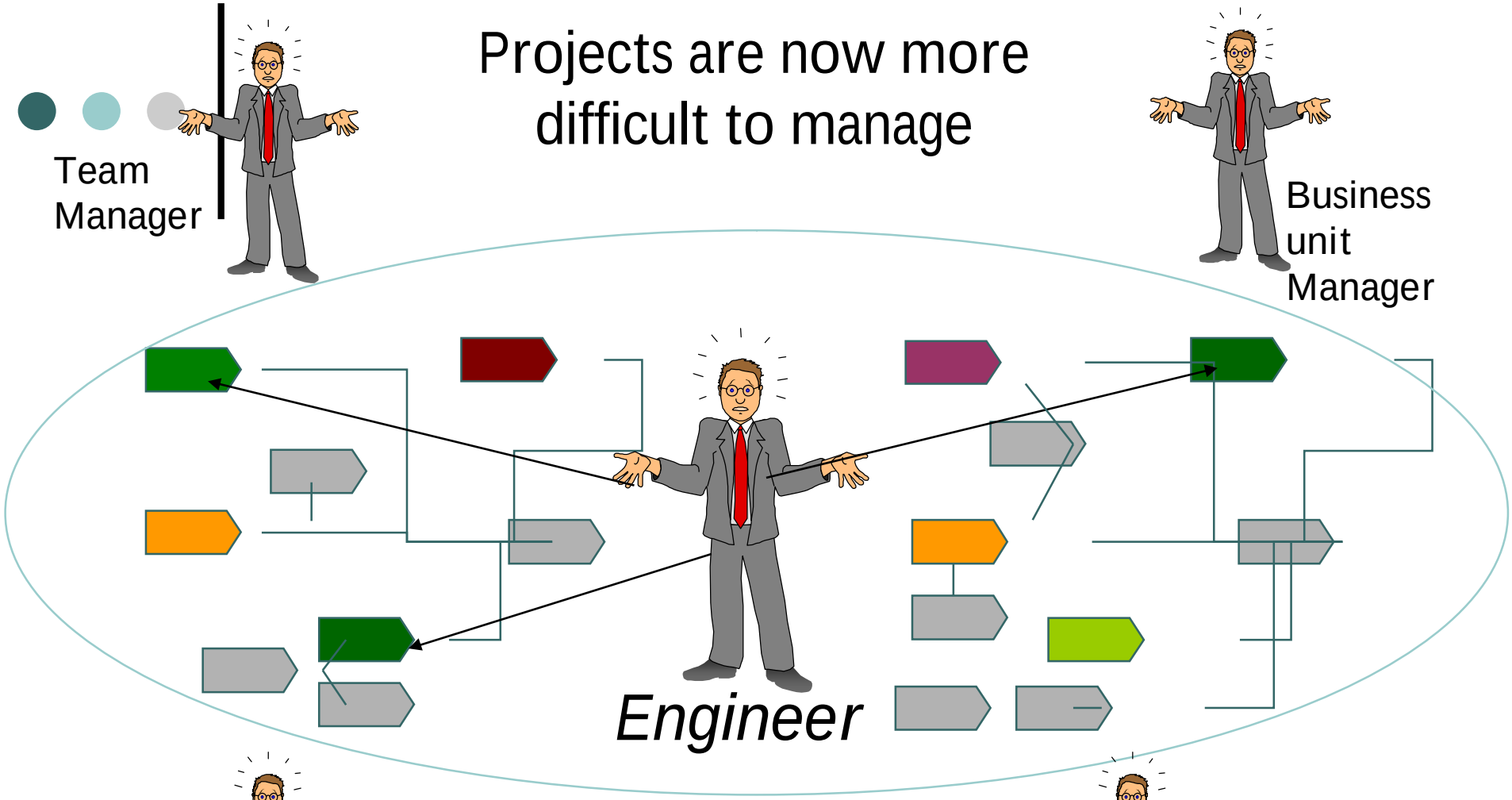
Resource Constraints

Need for Integrated Solution



Complex Product/ Projects

Projects are now more difficult to manage



A reality check: how many of these do you suffer from?

1. Increasing difficulty to meet project deadlines.
2. Constant pressure to increase resources.
3. Project scope too often compromised to meet dates.
4. Frequent conflicts between people.
5. Existing work is not complete before new projects force a shift in priorities.
6. Organization is too slow in responding to important market opportunities.
7. Too much rework activity, dragging key people away from new projects to repair old ones
8. Promised times longer than desired.

Are you searching for answers to the following questions?

- Should we reduce product's features in order to meet promised delivery date or promised launching date?
- Will adding resources reduce our company's Time to Market?
- How can we quantify impact of local decision on our company's performance?
- How should we deal with constant shortage of critical resources?

The Challenge

- Complexity and the problems of managing scarce resources lie at the heart of the problem
- Speed is mandatory—old methods don't work
- Resources and data are not a source of competitive advantage
- The essential differentiator of companies and performance are the decisions they make in terms of the following:
  - Speed
  - Effectiveness
  - Ability to "effect and align" decisions throughout the company

Critical Chain Project Management

- Critical Chain Project Management (CCPM) has been around for almost twenty years
- Fastest growing installed base in project management
- Used by leading companies to gain competitive edge over those using critical path
- USA Department of Defense is now a CCPM organisation and will soon require all suppliers to work with the same system

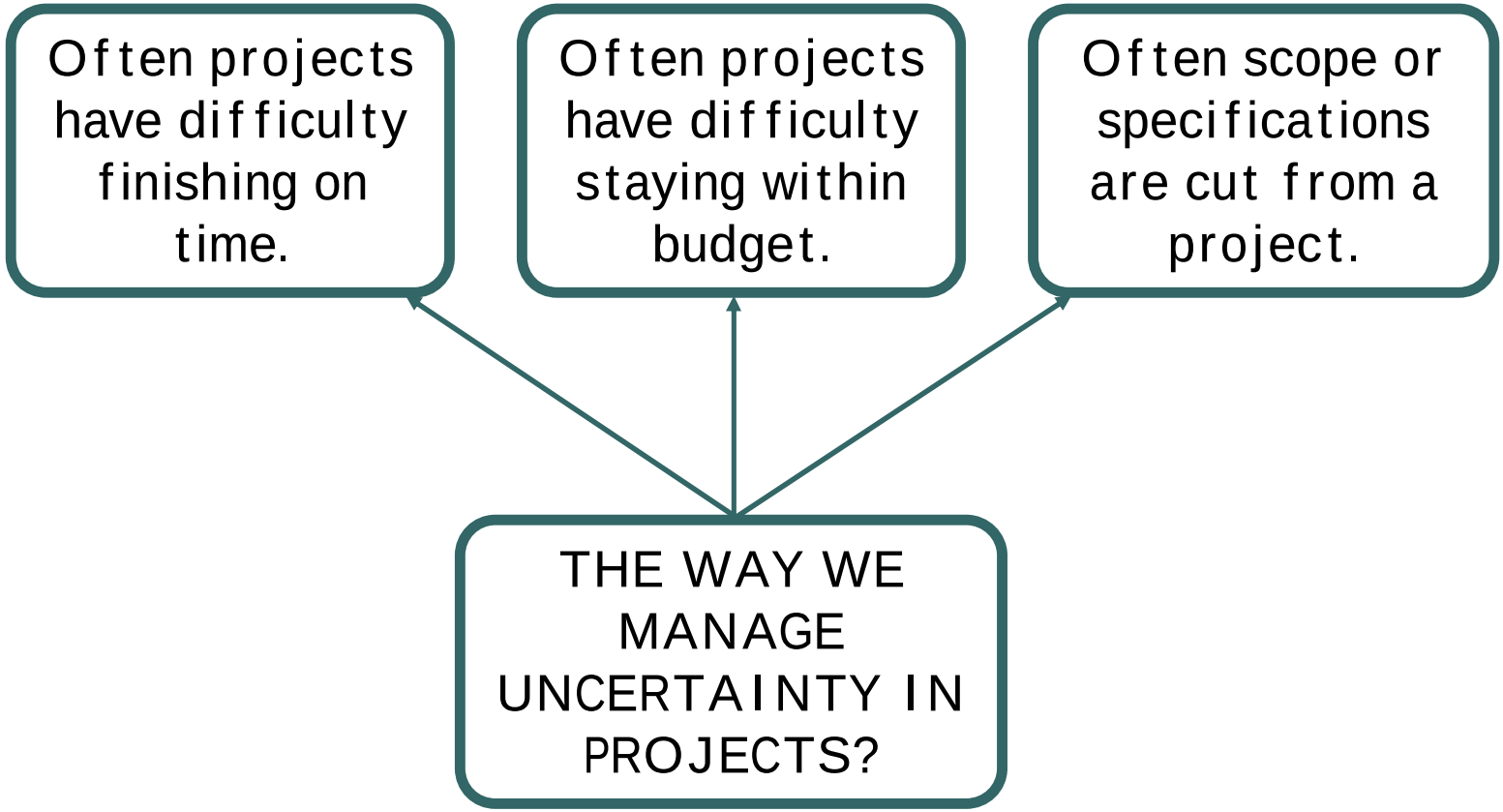
What is the goal of project driven organisations?

- To make money from sales related to project driven products and/or services
- To satisfy the market by
  - Delivering on time *(the original time)*
  - Meeting the full specification of the client
  - Meeting the budget *(the original budget)*
- To satisfy the team

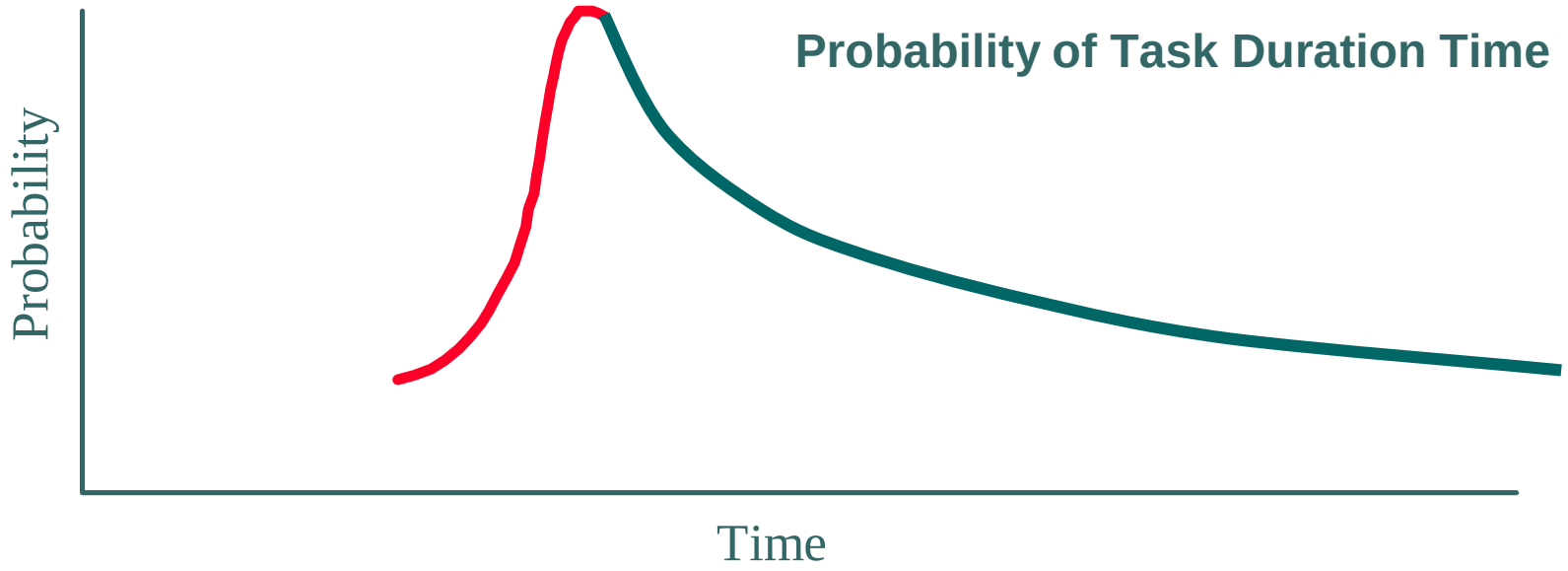
The importance of value

- Certainty of delivery on:-
  - Time
  - Cost
  - Quality
  - Safety
  - Environment
- The ability to do more projects than today with little or no increase in cost/resources
- To enhance the productivity of the resources available to us
- But what of the uncertainty that exists in the market?

How do we manage uncertainty!

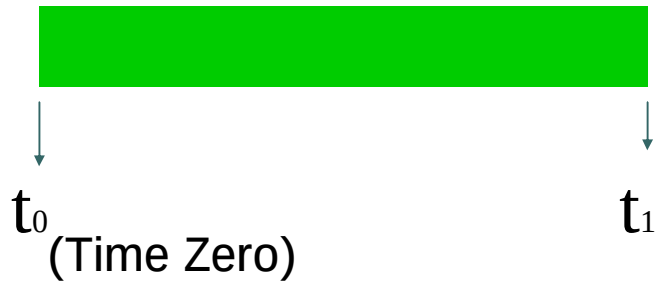


Which time are you likely to promise?



Estimation: What's contained in a task estimate?

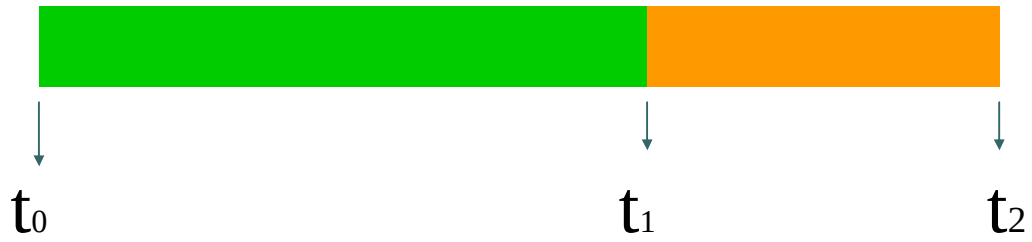
- The amount of time the task will take if everything goes reasonably well.



Determining a task estimate

The amount of time the task will take if everything goes reasonably well.

The amount of time to cope with uncertainty in the task.

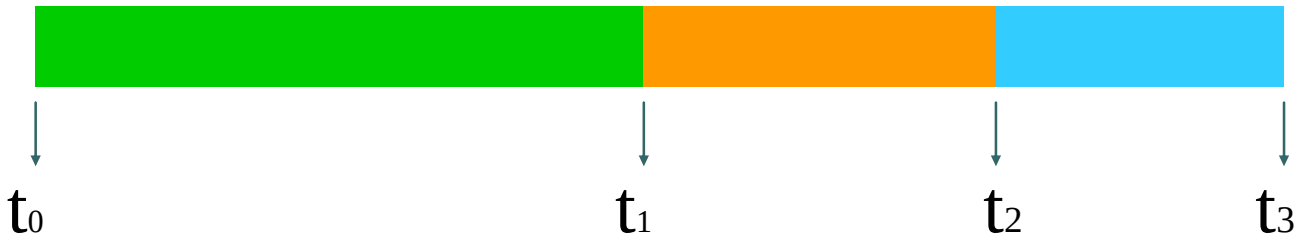


Task estimates

The amount of time the task will take if everything goes reasonably well.

The amount of time to cope with uncertainty in the task.

The amount of time spent working on other activities.



Task estimates

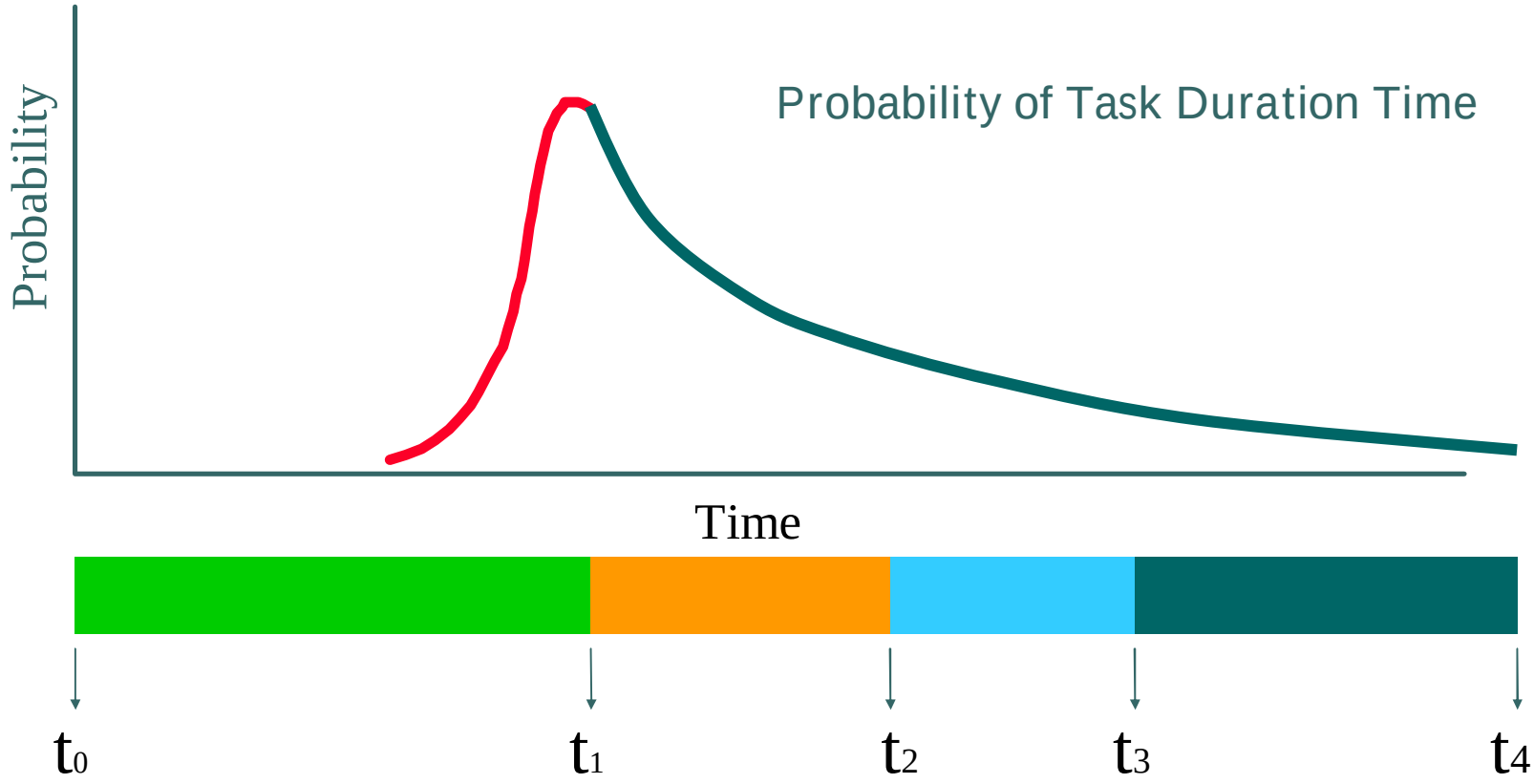
The amount of time the task will take if everything goes reasonably well.

The amount of time to cope with uncertainty in the task.

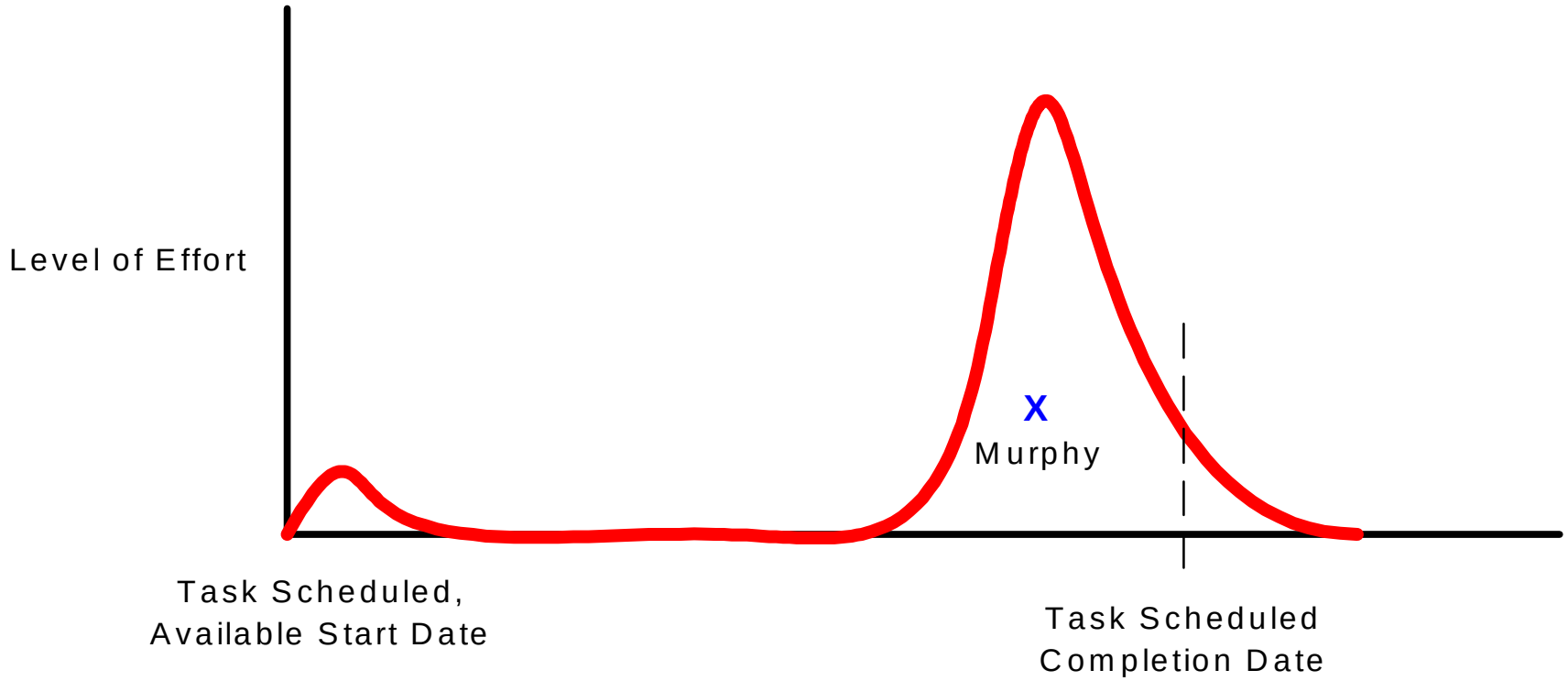
The amount of time spent working on other activities.

The amount of time we allow for interruptions.

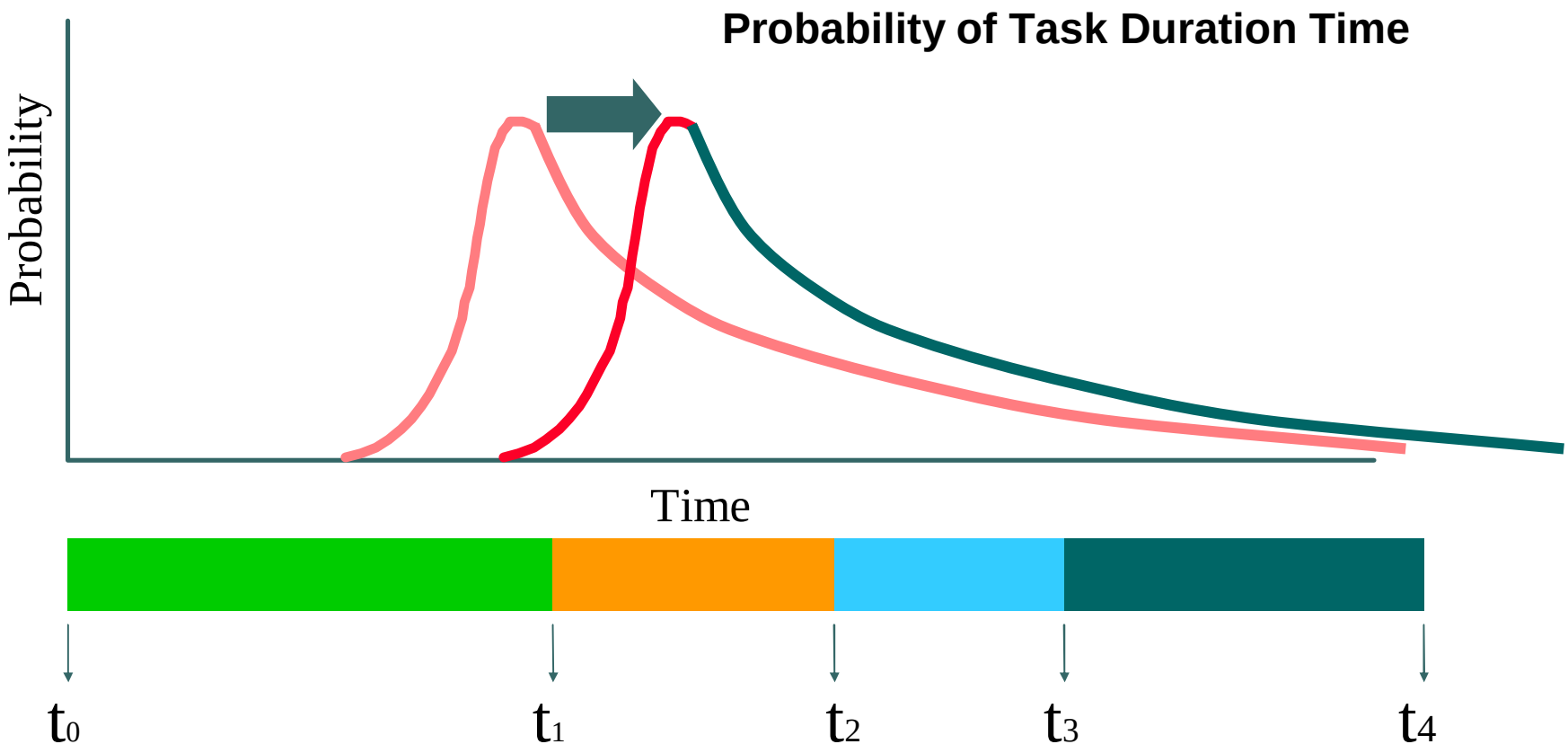
Which Time Are You Likely to Promise?



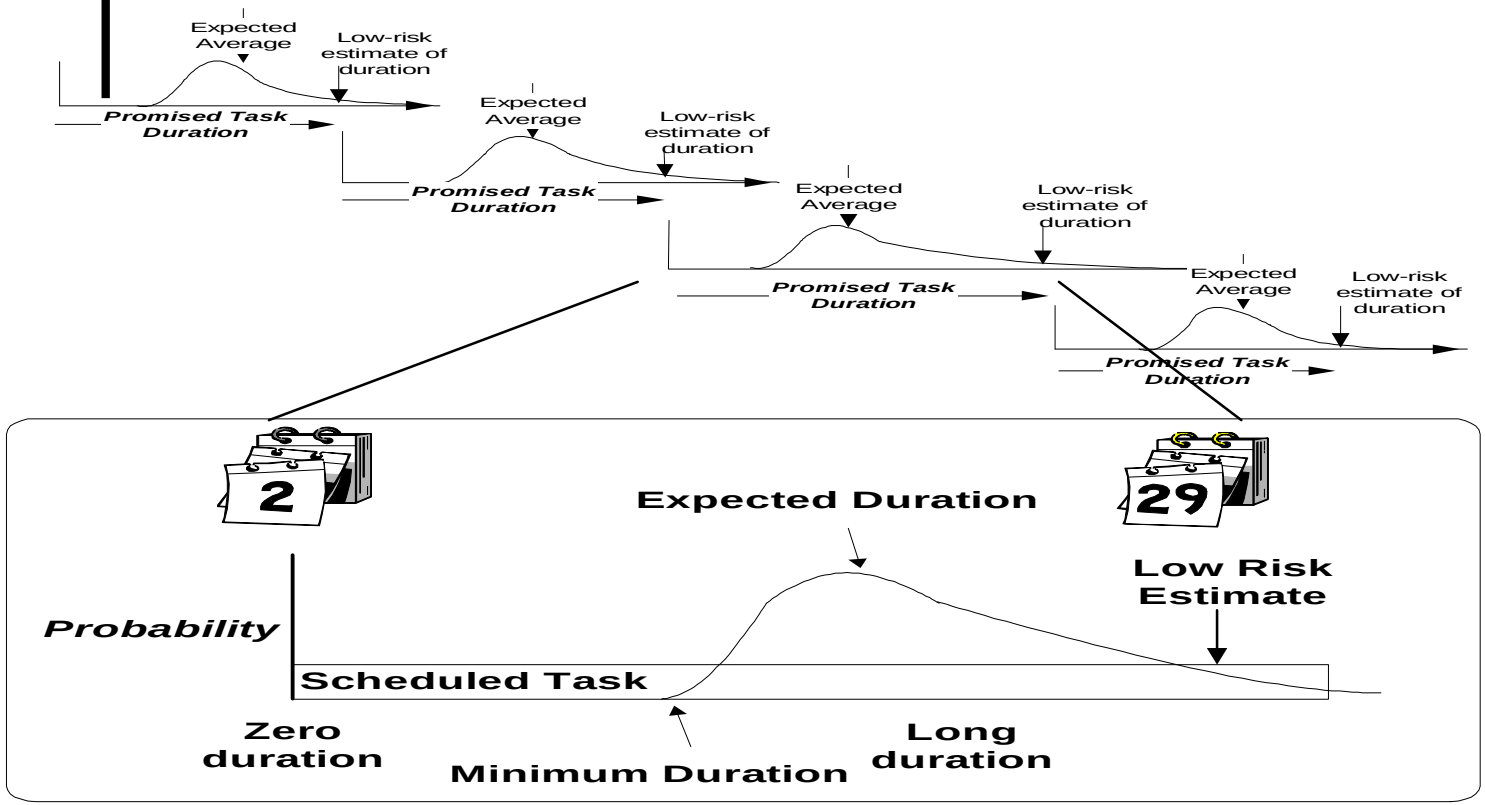
The “last minute” or “student” syndrome



The effect of student syndrome!

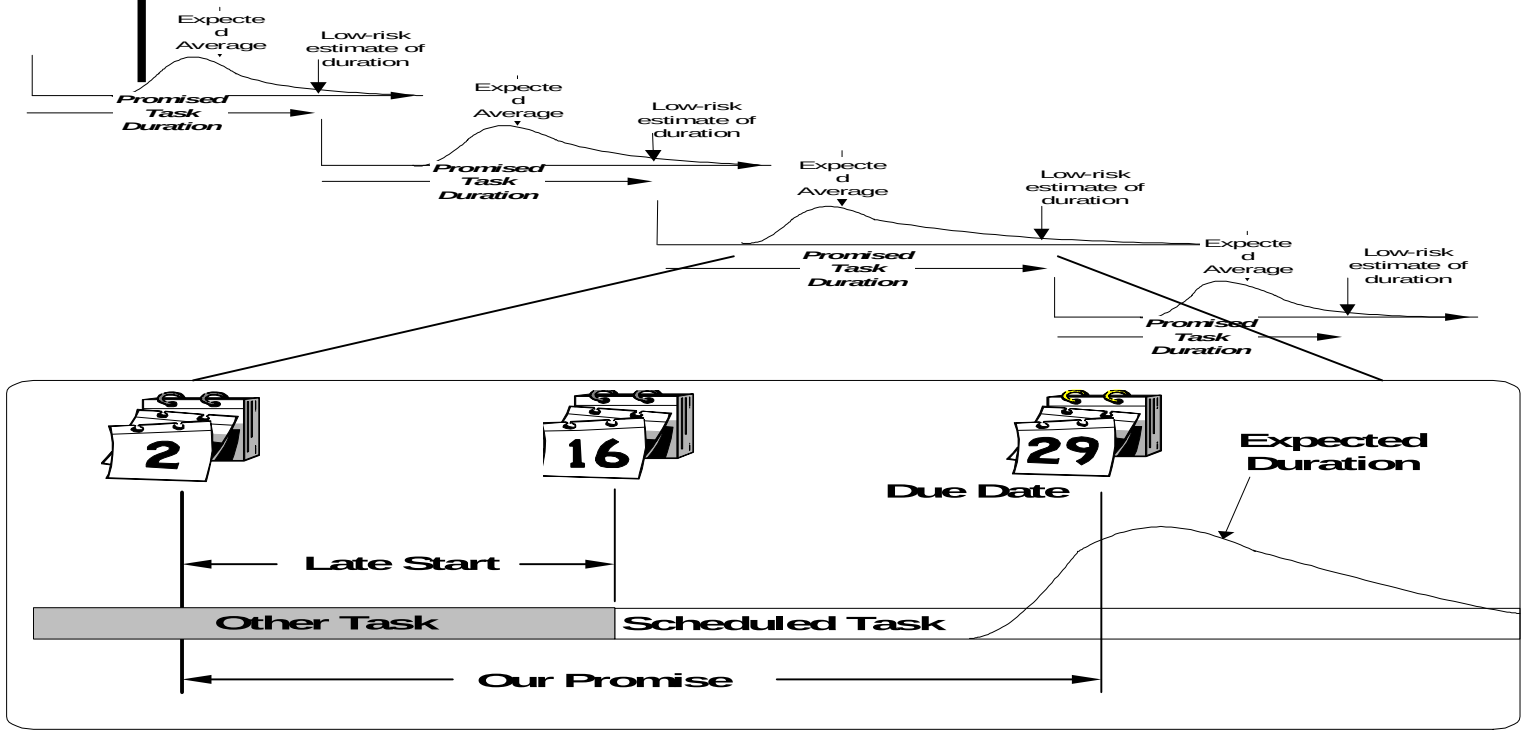


Our response to the System



- Does it ever happen that we get dragged off onto some other task when we begin the currently scheduled task?

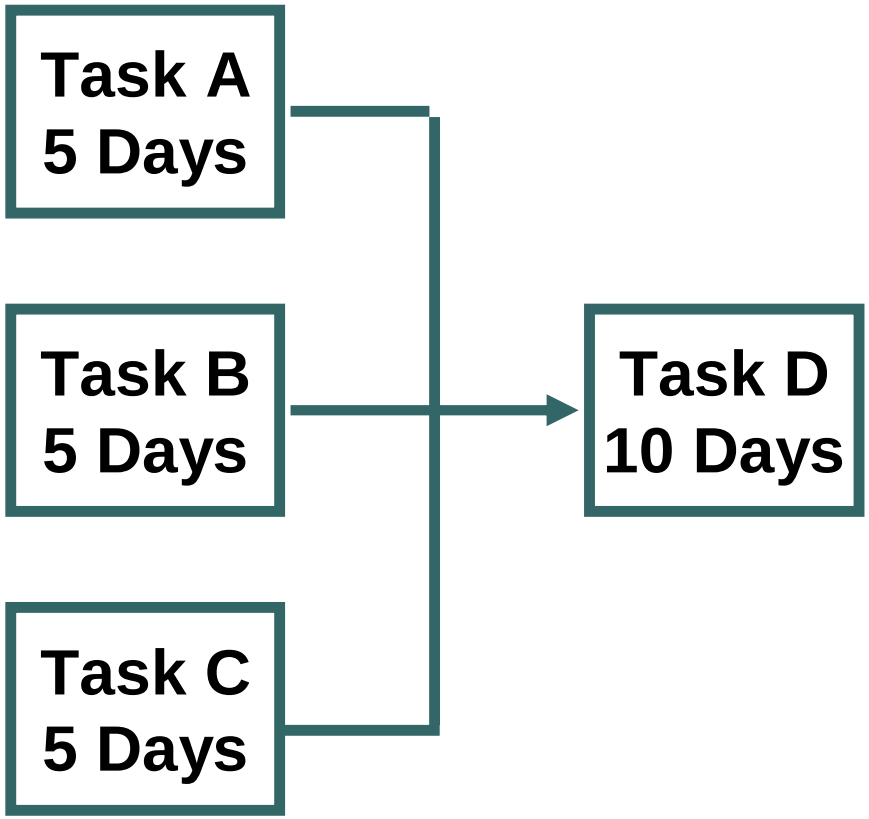
Our response to the System



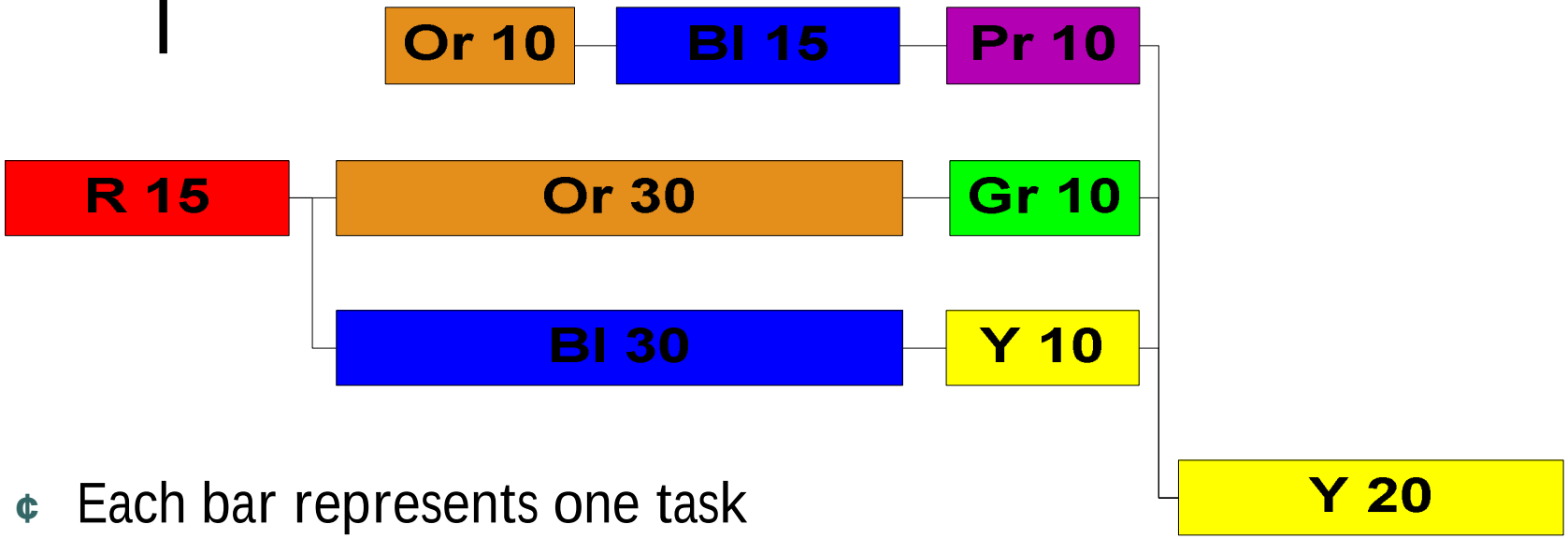
- Does our due date correspond to a low risk estimate now?
- If we start working the currently scheduled task now, do we have any protection against the unforeseen?

Delays Are Passed On — Gains Are Not

- Merging paths don't allow us to benefit from tasks completed early - What's the impact on the total project if Task A is done in only 3 days?
- What if Task C takes 8 days?
- What if Tasks A, B, and C, through some miracle, all get done in 2 days? (Will Task D be ready to start 3 days early?)



A Simple Project



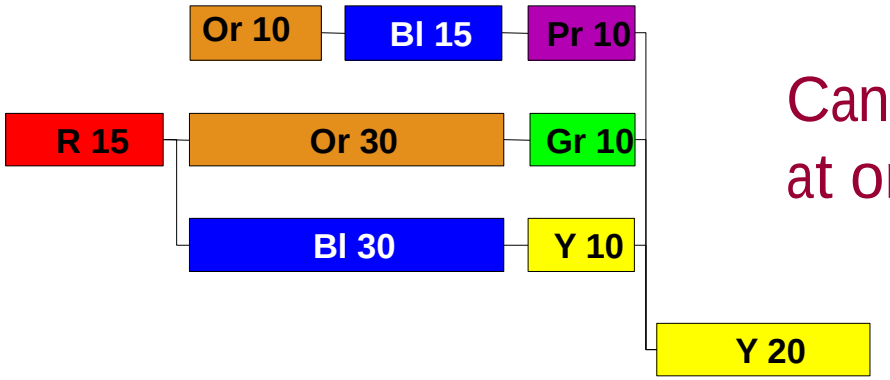
- Each bar represents one task
- The dependencies are indicated by the lines
- Each colour represents one resource
- The number in each bar represents the time to complete the task, assuming that the task has no real difficulties. It is NOT the elapsed time for the task

The five steps of focusing

- Step one: identify the constraint
- Step two: exploit the constraint
- Step three: subordinate all other activities and decisions to the needs of the constraint
- Step four: elevate the constraint
- Step five: prevent inertia – go back to step one

First Pass Schedule

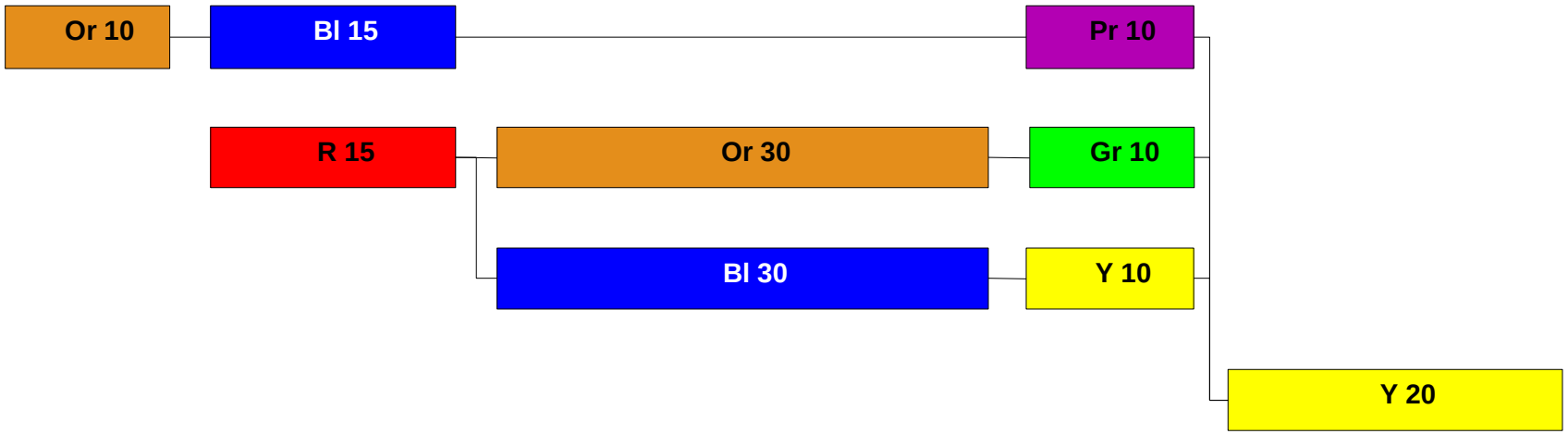
- A project network containing the necessary logic connections
- Tasks are scheduled to their latest start dates
- Task durations that represent the estimate of the actual time, as opposed to elapsed time, are used.



Can one resource do two things at once?

Resolve Resource Contention

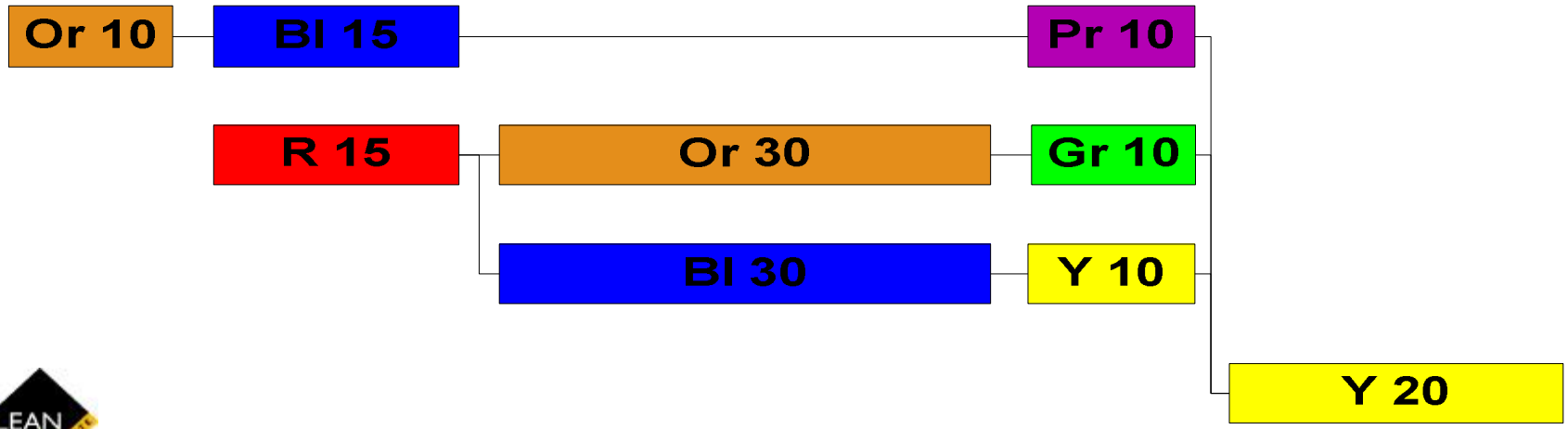
- Allocate Resources and Stagger Resource Conflicts



Step 1: Identify the Constraint

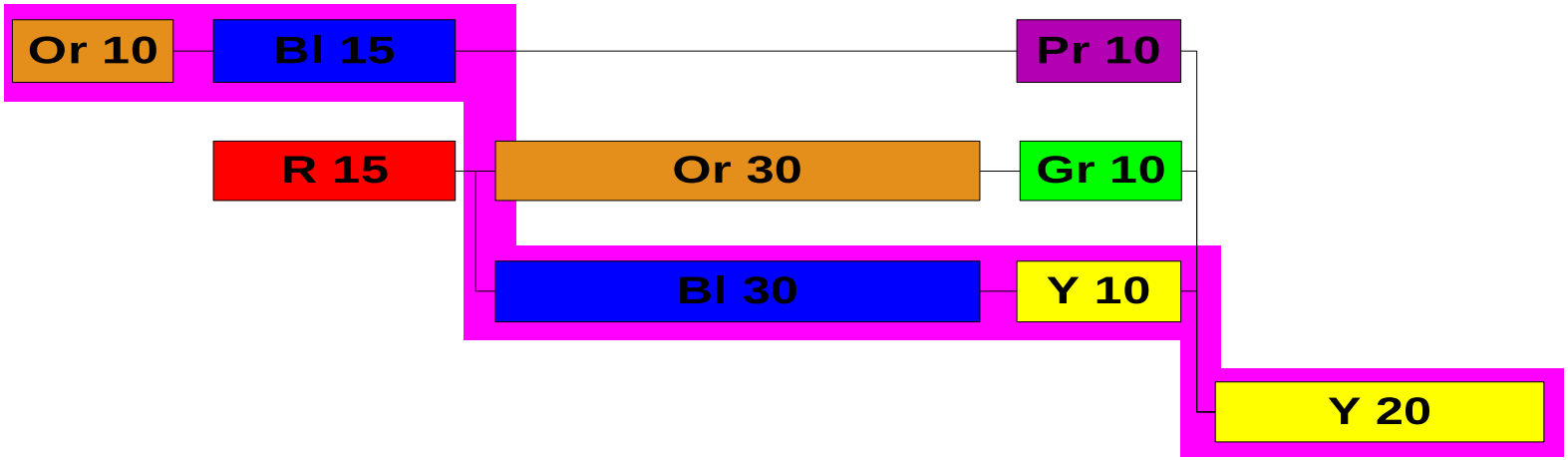
- If the goal of a project team is to finish a project as soon as possible, within specifications, and if the CRITICAL CHAIN is what prevents the project team from making further progress toward its goal,

  then the CRITICAL CHAIN must be the constraint of the project team.



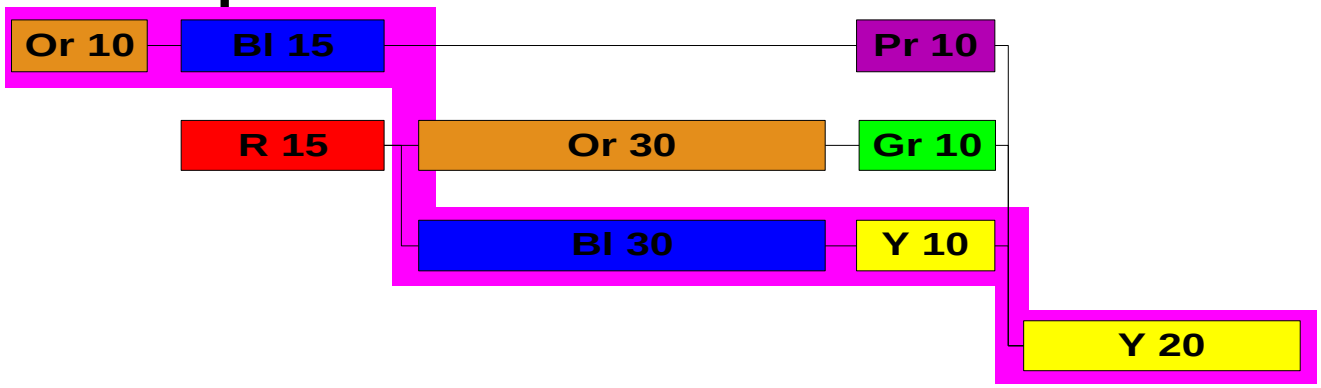
Step 1: Identify the Constraint

- The Critical Chain is the sequence of dependant events that prevents the project from being completed in a shorter interval, given finite resources.



How must people perform their work?

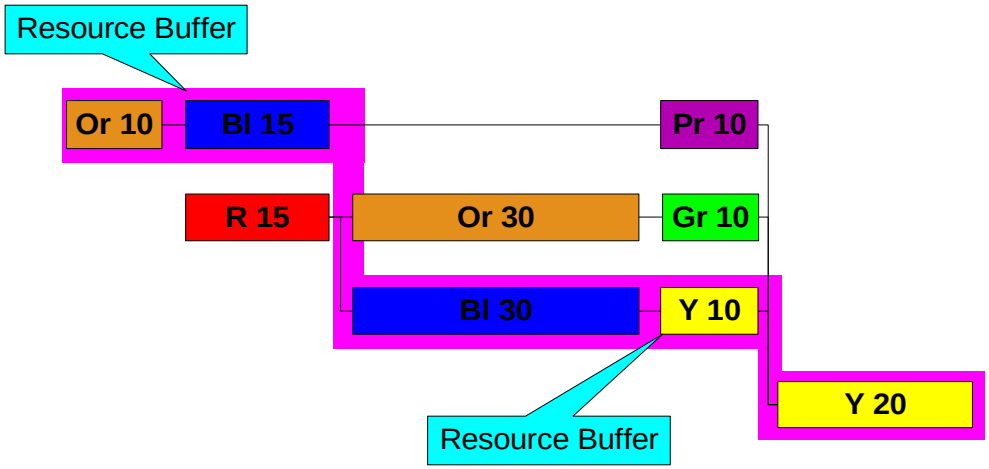
Step 2: Exploit the Constraint



- People work at a full level of effort for the entire duration of each task.
- People turn over their output as soon as that output is ready.

Do people always show up on time?
What happens to the duration of the project if Mr. Blue is late for the start of the Blue-15 task?

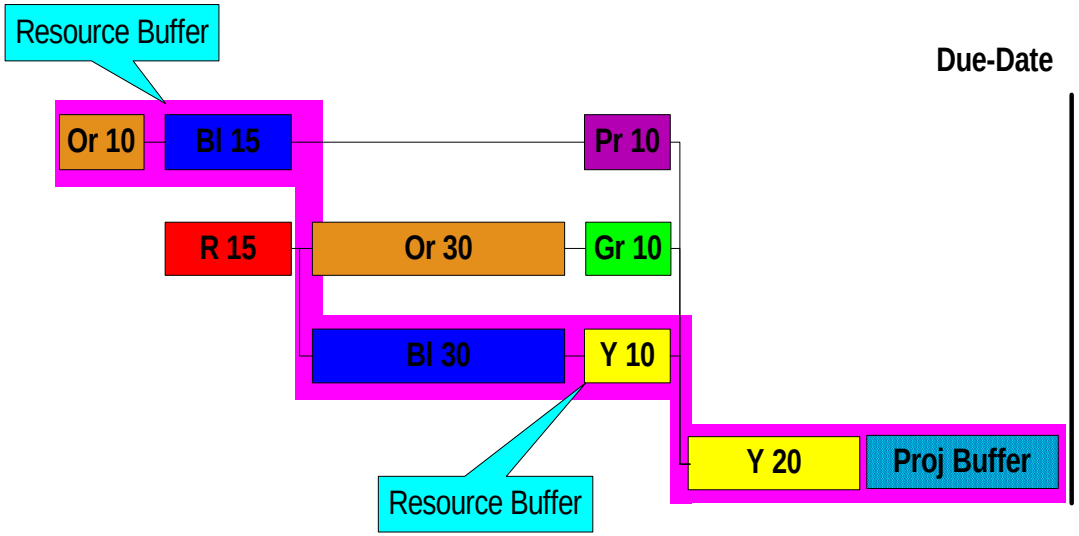
Step 2: Exploit the Constraint



- Protect the start-dates of the Critical Chain tasks, from the untimely availability of resources, with resource buffers.

If we've used estimates that assume everything goes well, what is the probability the project will finish when this layout shows it finishing? Should we promise the project for the duration indicated here?

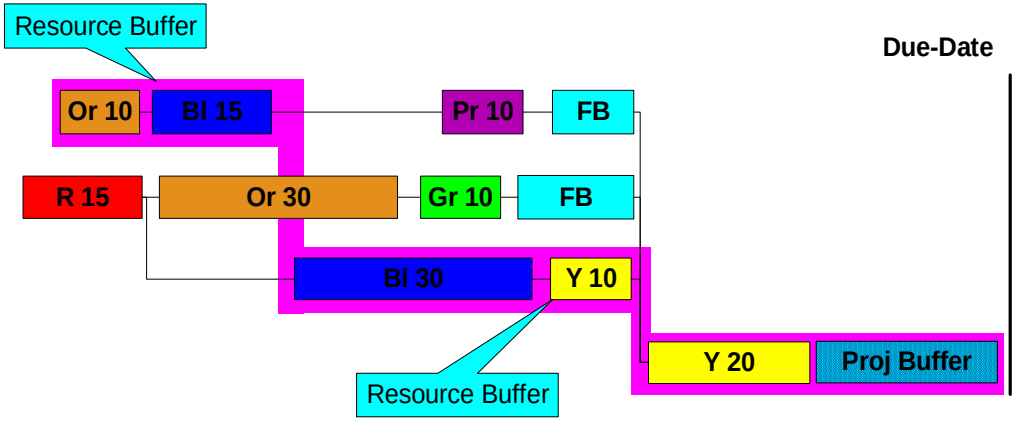
Step 2: Exploit the Constraint



- Protect the entire project from variability in the duration of the Critical Chain tasks, with a project buffer.

What about the non-critical chain tasks?
What happens to the project if Gr10 takes longer than planned?
How can we protect the start-dates of the Critical Chain tasks from variability in the non-Critical Chain tasks?

Step 3: Subordinate



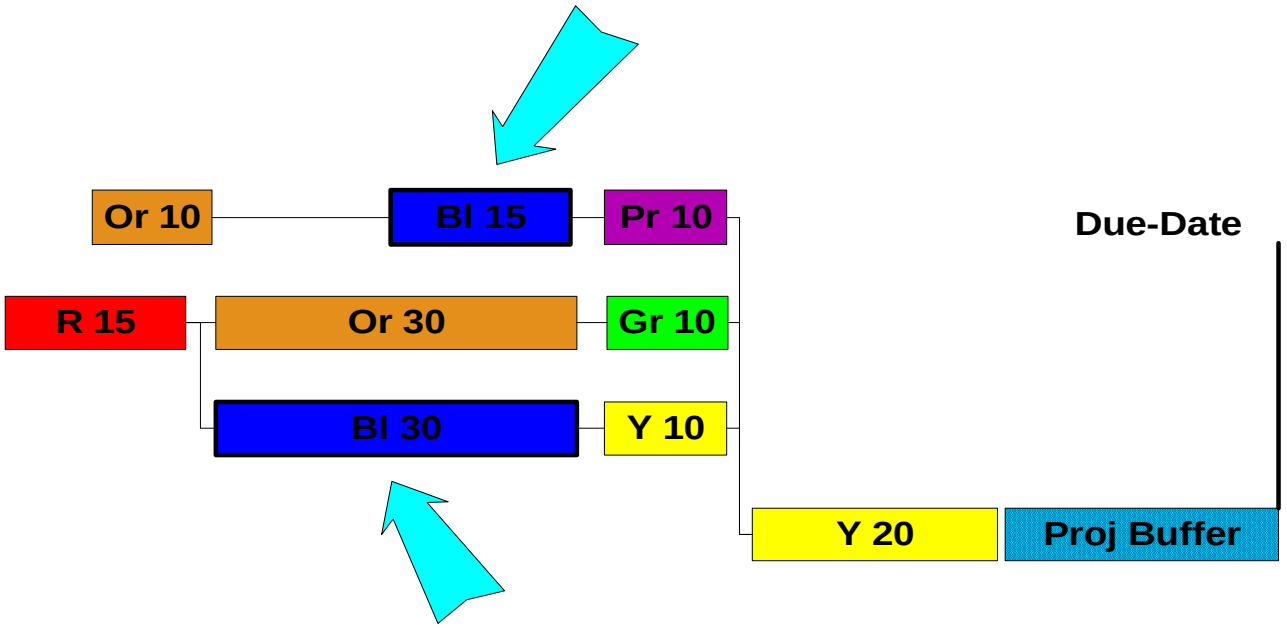
Subordinate everything else to your decision to exploit the Constraint

- Protect the start-dates of the Critical Chain tasks, from variability in the duration of the non-Critical Chain tasks, with feeding buffers.

What if the project doesn't meet the necessary due date?

Step 4: Elevate the constraint

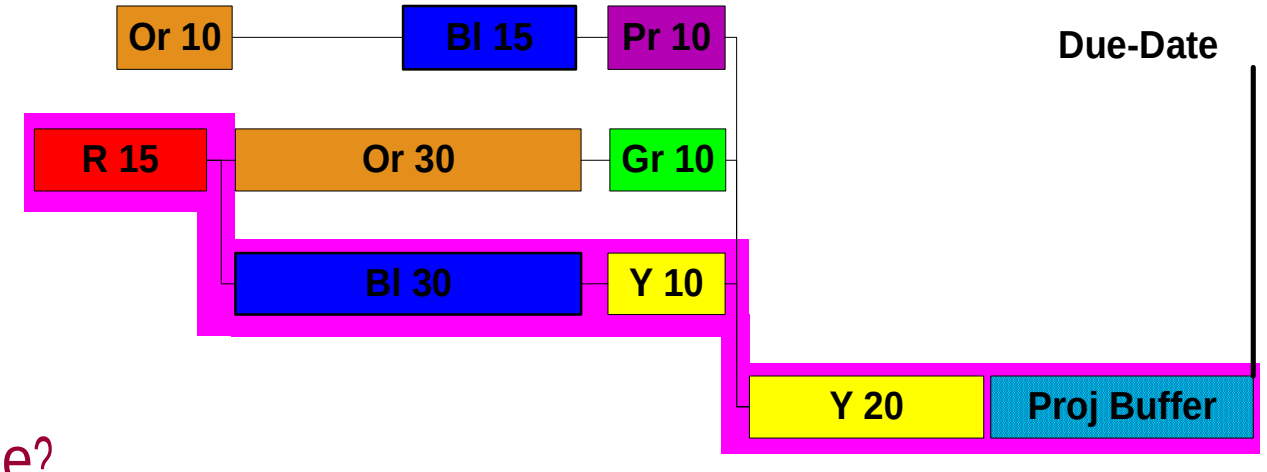
- Get more of the right resources, so that key segments of the Critical Chain can happen in parallel.



Then what?

Step 5: Go Back to Step1

- If a constraint is broken, i.e., if it is no longer a constraint, then go back to Step 1, and find the new constraint. In other words, find the new Critical Chain.



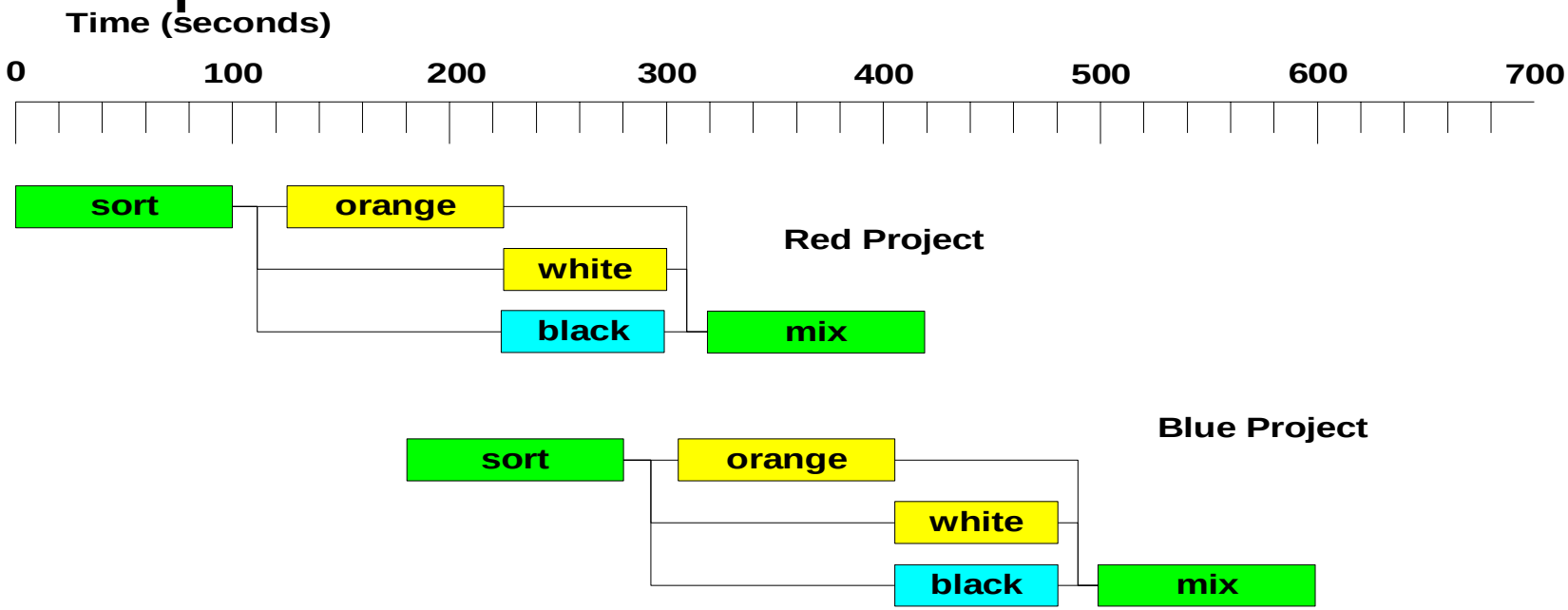
Are we done?

How do we manage the project?

Multi-project environments

How does Critical Chain cope with multi-project environments and programme management?

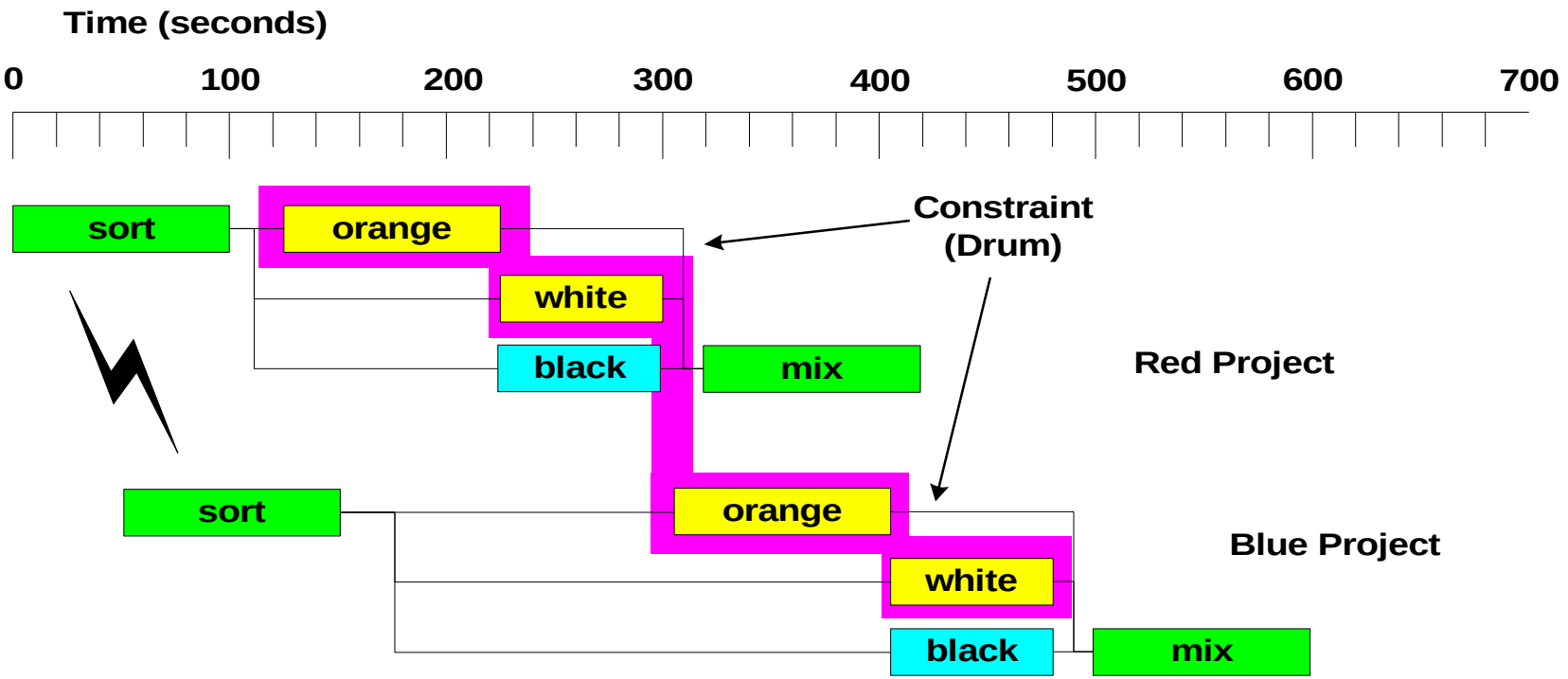
The Multi-Project Solution



- Let's assume that we know that the resource carrying out orange – white is the key resource
- If we use that resource as the drum for the system, will any of the other resources become overloaded?

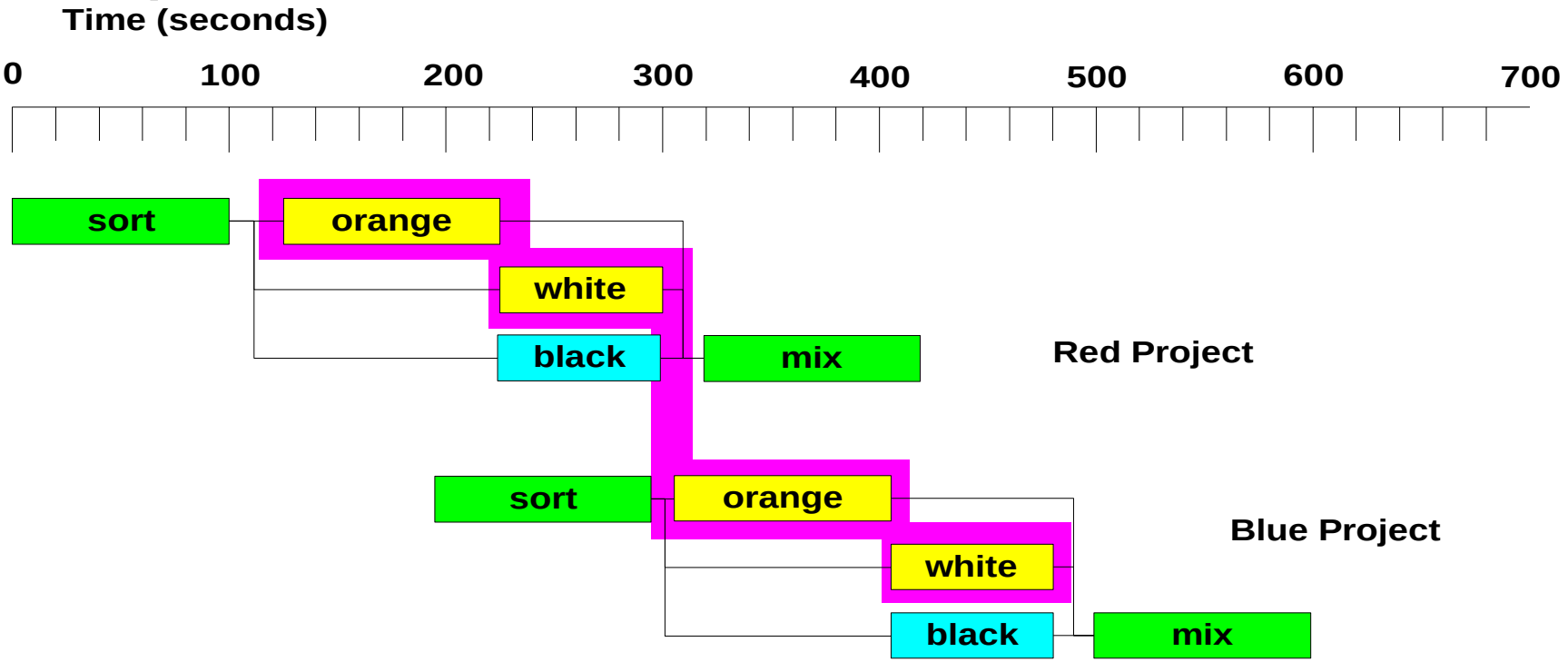
The Multi-Project Solution

What happens if we start the Blue project's sorting task too soon?



Do we damage only the next project?

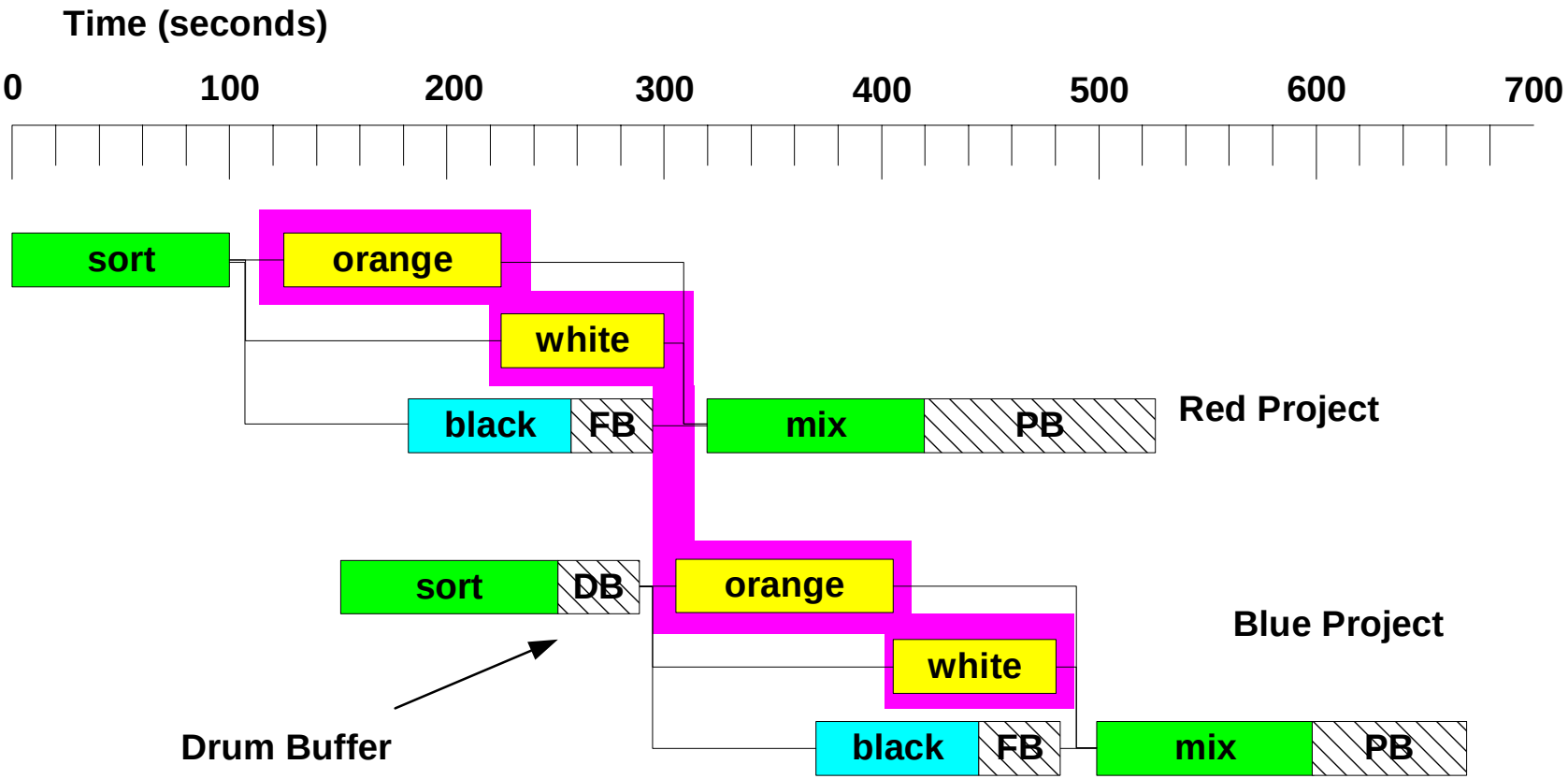
The Multi-Project Solution



Deming principle:Predictability & common cause variation

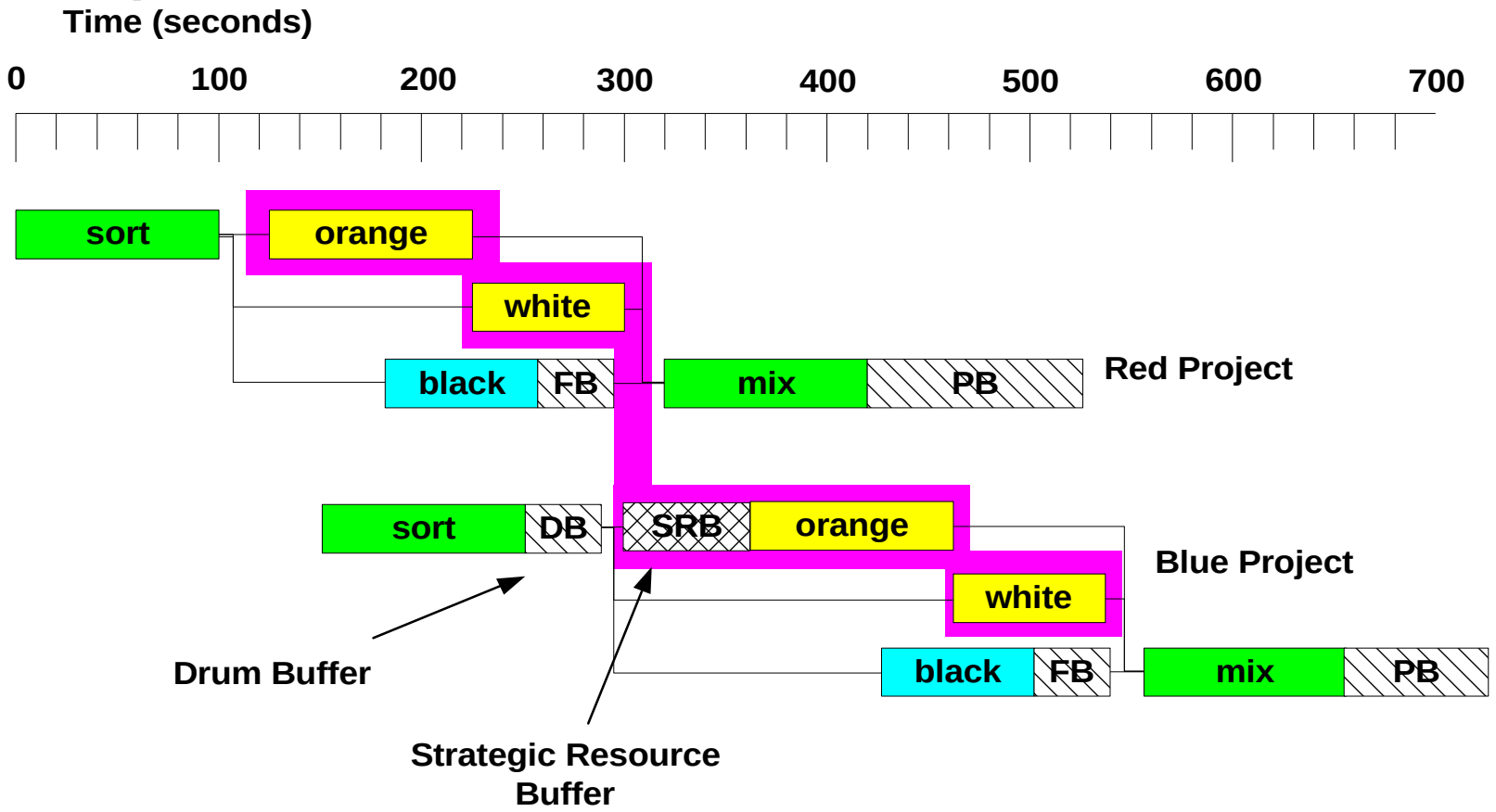
To avoid chaos, where should we buffer?

The Multi-Project Solution



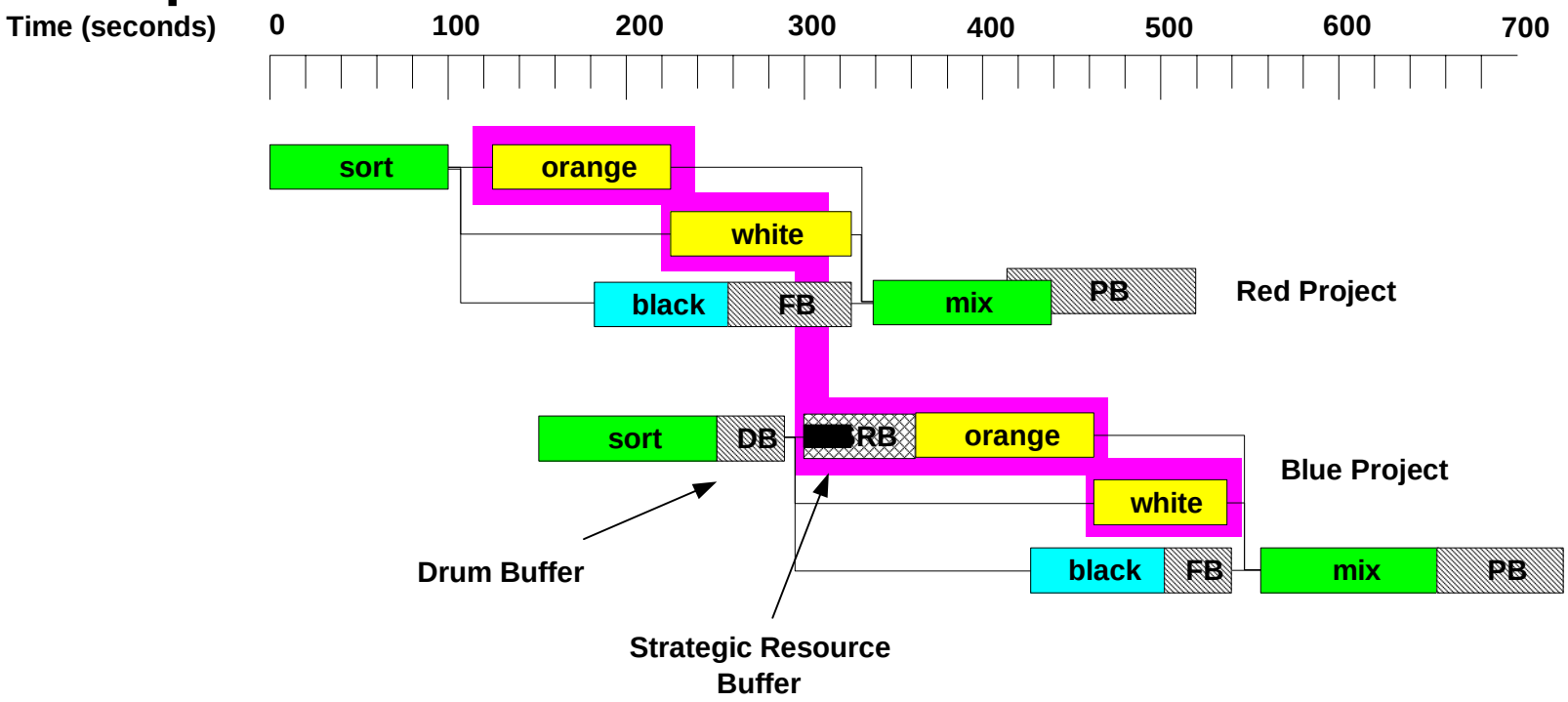
Should we isolate projects from each other?

The Multi-Project Solution



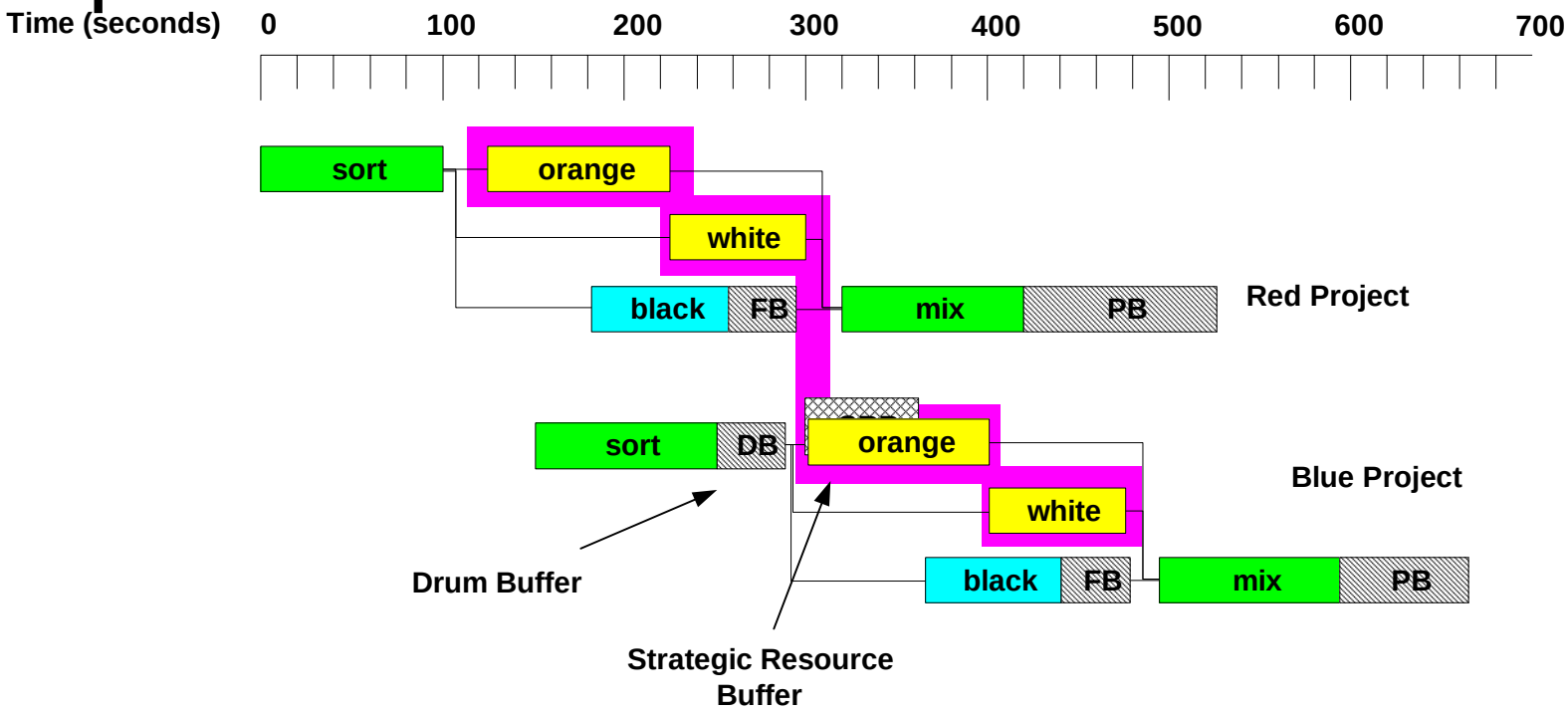
What do we do with all these buffers?

If the Drum is late….



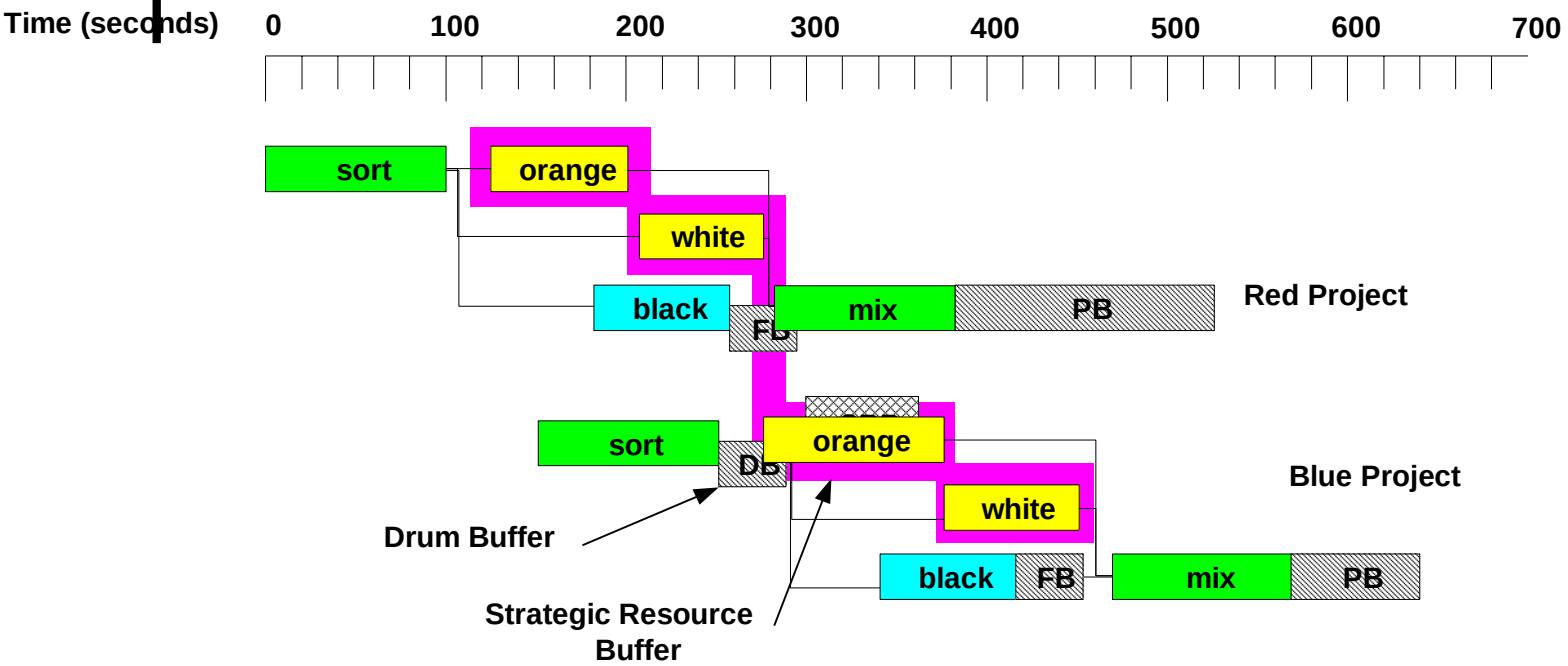
- The Project Buffer for the Red project protects the Red project's due-date.
- The Strategic Resource Buffer protects the blue project
- NO PROBLEMS!

If the Drum is on time….



- The Red project is in great shape.
- The Blue project starts early and is in even better shape!
- ALL future projects move ahead of schedule.
- Earnings from all future projects happen sooner than expected.

If the Drum is early….



- The Red project's feeding buffer shows us where to expedite, so that the Red project can finish early.
- The Drum Buffer in the Blue project shows us where to expedite, so that the Blue project can start early and finish early.
- The Blue project starts earlier still and is in even better shape than before!
- ALL future projects move ahead of schedule even more.
- Earnings from all future projects happen sooner still!

Critical Chain Multi-Projects Solution

- Choose the Drum resource - the real bottleneck for the organization.
- Prepare the layout of a new project as if it were the only project.
- Resolve the major instances of resource contention within the project.
- Determine the availability of the Drum, from previous projects, and add a Strategic Resource buffer.
- Schedule the new project such that the first task for the Drum resource coincides with the end of the Strategic Resource buffer.
- Size the project buffer and feeding buffers.
- Determine the project's due-date.
- Determine start-dates for the non critical chains.
- Manage the buffers.
  - Generate timely, accurate buffer information for all active projects.
  - Distribute all buffer information to all resource managers (make it available to everyone).
  - Ensure that project managers and resource managers manage according to the buffers.

Summary - Multi-Project Environment

1. The Throughput increase potential from managing by a Drum, and eliminating bad multitasking is huge.
2. To reap the benefits, we must identify, exploit the drum resource, and subordinate the organization to this exploitation.
3. In a multi-project environment, exploiting and subordinating requires changing the policies on managing the Drum - how we manage it will determine the Throughput of the company.

Review of ProjectWorld 2007

Execution Management Systems through the application of Critical Chain Project Management (CCPM)

Ted Hutchin

Who reported results?

- USAF Ogden Air Logistics Centre: C130 aircraft
- Action Park Multiforma Grupo
- Alna Software
- Marketing Architects
- Erikson Air-Crane
- BHP Billiton
- Boeing Space & Intelligence systems
- Delta Airlines Engine Maintenance
- LeTourneau technologies
- ASAF Warner Robbins Air Logistics Centre C-17 Aircraft maintenance Squadron
- TATA Steel

Execution Management

- Rule 1:
  - Limit the number of projects in execution
  - Stagger project starts
- Rule 2:
  - Do not turn task estimates into commitments
  - Create aggressive plans with 50% buffers
- Rule 3:
  - Follow task priorities
  - Prevent wastage of buffers in execution

Ogden overview

- C-130 MRO
- 6 models, 12 docks and 6 soft docks
- Throughput 48 per year not including unscheduled maintenance
- Highly unpredictable, impossible to know what will be required
- Workload increasing
- Demand for six more aircraft by reducing cycle time by 30%

Ogden ctd

- Results to date have shown:
  - 21 – 24 aircraft on station
  - Cycle time down from 160 days to 110 days
  - Disciplined procedures for the release of new projects (an aircraft is a project)
  - Buffer management to maintain focus throughout the process
  - Parts mgt has stopped delays in waiting for parts to arrive: no parts = no release

Ogden ctd

- They have flushed a large percentage of WIP out of the system
- Stopped all multitasking
- Now complete ten additional aircraft
- WIP today is 18, was 23 – 25
- OTIF = 25 out of 26
- # early = 191 (cumulative)
- Parts shortages are down from 40 – 45 to 5 or less
- Task completions 45 tasks/day target focus on task completion against schedule

Delta Airlines

- Create the plan with buffers as the starting point
- Control WIP
  - Staggered release
- Manage using buffers
- Exception management

Delta ctd

- You must have a centrally located release area
- Must have a robust process for exception list management
- Get CCPM in early (they had done lean and six sigma first)
- Get the right metrics in place
- Target investment capital
- Management involvement critical for full management, from the top

Delta results

- 25% increase in engine capacity (60 – 75)
- 23% increase in engine production (476 – 586)
- 50+ engines per month (63 in June 07)
- Engine TAT reduction (10 – 26% reduction)
- Disassembly and assembly areas 18 – 38% reduction
- Revenue increased

Delta ctd

- “TOC concepts has given us a clear understanding of where to apply six sigma and lean methods to achieve bottom-line results” *Gary Adams Delta Engineering Maintenance manager*

No more of this!

Programs

Resources

What does the CCPM solution comprise?

- *Solid Managerial Methodology* rooted in the TOC Critical Chain approach
- *Proven Enterprise Decision-Support system* which supports the Critical Chain approach and delivers decision co-ordination and alignment throughout the organisation, and into the supply chain
- *Transferable Knowledge package* to ensure that your people can do it for themselves
- *Structured Implementation process* to bring results – FAST!

Executives' Benefits – CCPM

- Improve business performance
  - Deliver more bottom-line (sales and productivity) with the same resources
- Improve strategic decisions - strong what-if capability
  - Accepting new business
  - Prioritizing investment decisions
- Fast and up to date view of all projects' status
- Focus management - identifying the few areas where attention is needed

CCPM - Project Managers benefits

- Schedules projects leveraging the constraining resources/activities
- Synchronizes all company activities
- Provides forward-looking forecast of project's completion date
- Gives dynamic visibility to project status and recommended actions
- Provide on going communication to customers
- Quickly identifies project plans

CCPM Programme Portfolio Benefits

Prioritizing multiple projects

- Unique mechanism for Due Date Quotation enable proper new project delivery date
- Simple and fast interface to financial and business systems
- Strong users privileges' management addresses the different users' needs for updates and reports control
- Extensive reports (including report generator)
- Buffer diagnostics the base for on going improvement

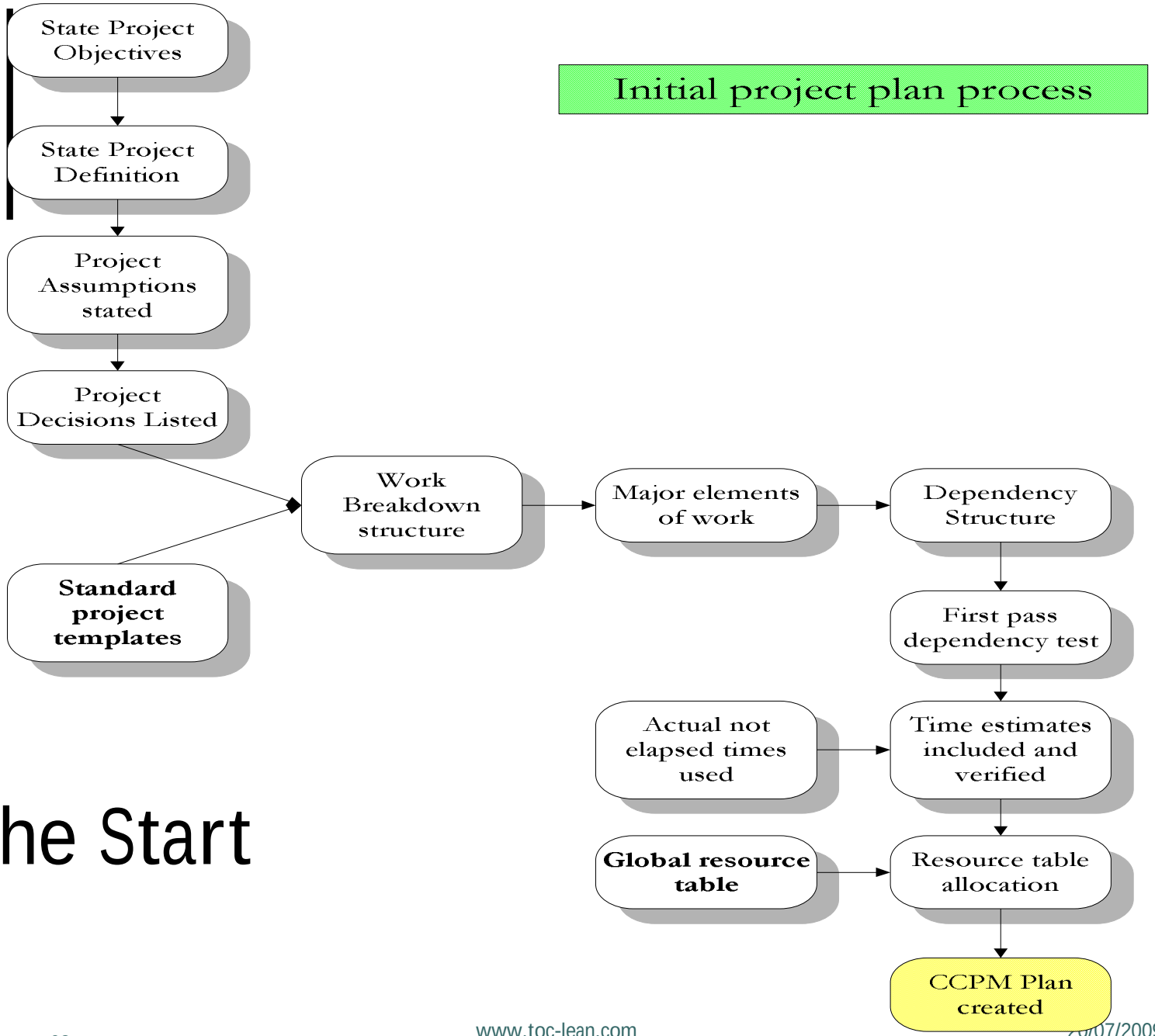
Best Practice Procedures

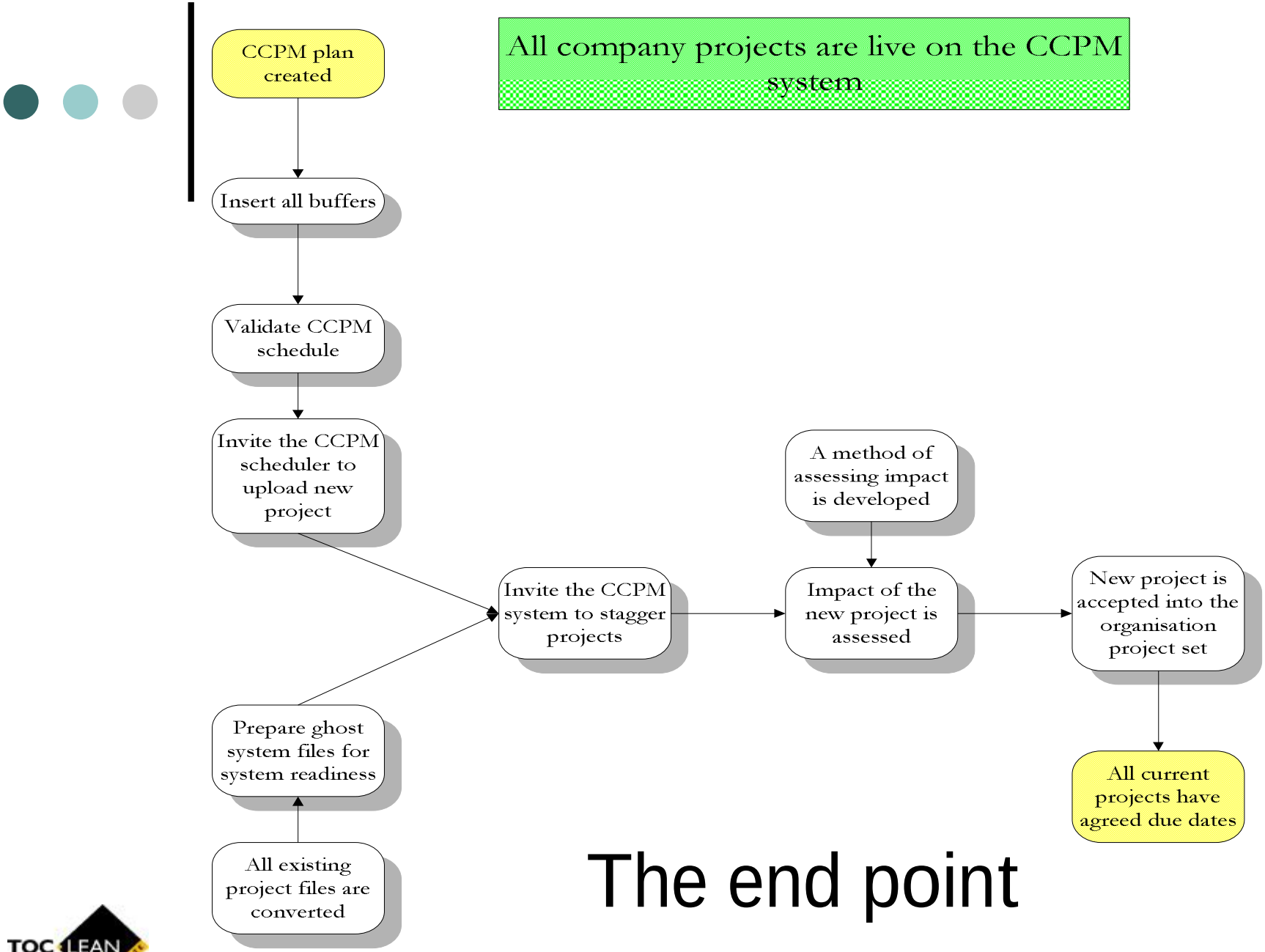
- Business Objectives and planning
- Single project scheduling
- Resource table - Hierarchy, responsibilities, calendar
- Projects updating- responsibilities, privileges, frequency
- Strategic Resource identification and scheduling
- Task manager- resource allocation and priorities
- What-if simulation- due date quotation
- Resource planning
- Managerial control all levels

Structured Implementation - Deliverables

- Implementation planned and controlled with CCPM
- Project management of implementation
- Assistance in building projects plans
- Assistance in customizing best practice procedures
- Accompanying top management
- Assistance in building company know-how

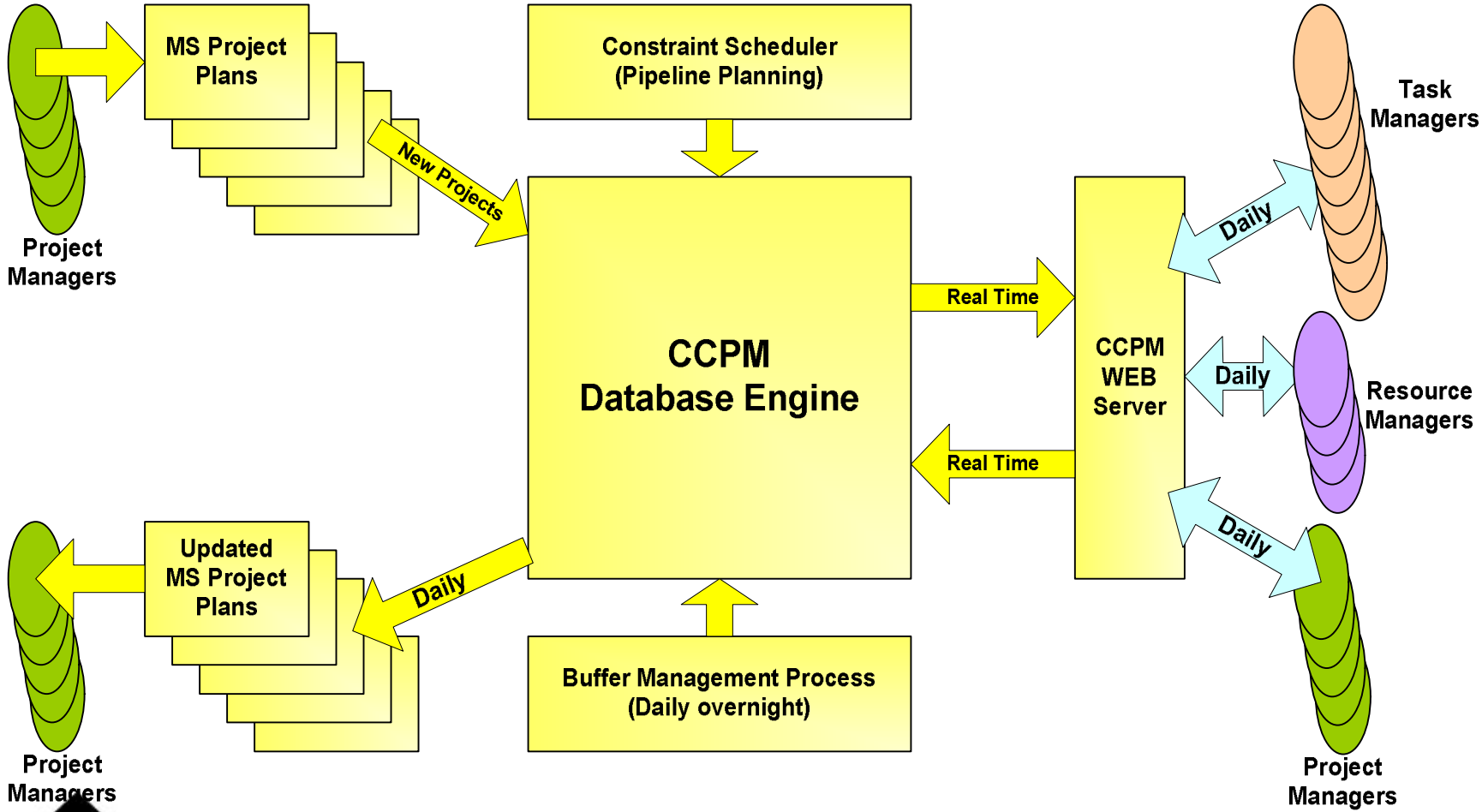
The Start


Initial project plan process
State Project Objectives
State Project Definition
Project Assumptions stated
Project Decisions Listed
Work Breakdown structure
Standard project templates
Major elements of work
Dependency Structure
First pass dependency test
Actual not elapsed times used
Time estimates included and verified
Global resource table
Resource table allocation
CCPM Plan created



The end point

How the system works



If you want to know more

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