

Critical Chain Overview

Minimizing
Waste and Variation
in a Knowledge Environment

Gary L Miller
SAS R6s Master Expert
Raytheon Co. Critical Chain Lead
(310)616-8615
GLMiller@raytheon.com

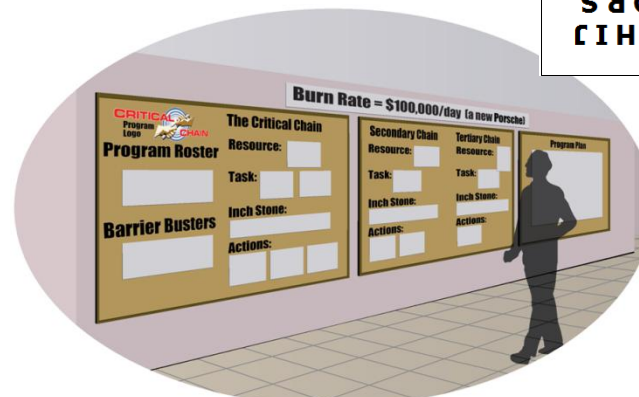
Agenda

- Critical Chain Defined
- Project Planning Considerations
- Behavior Considerations
- The Operating Model

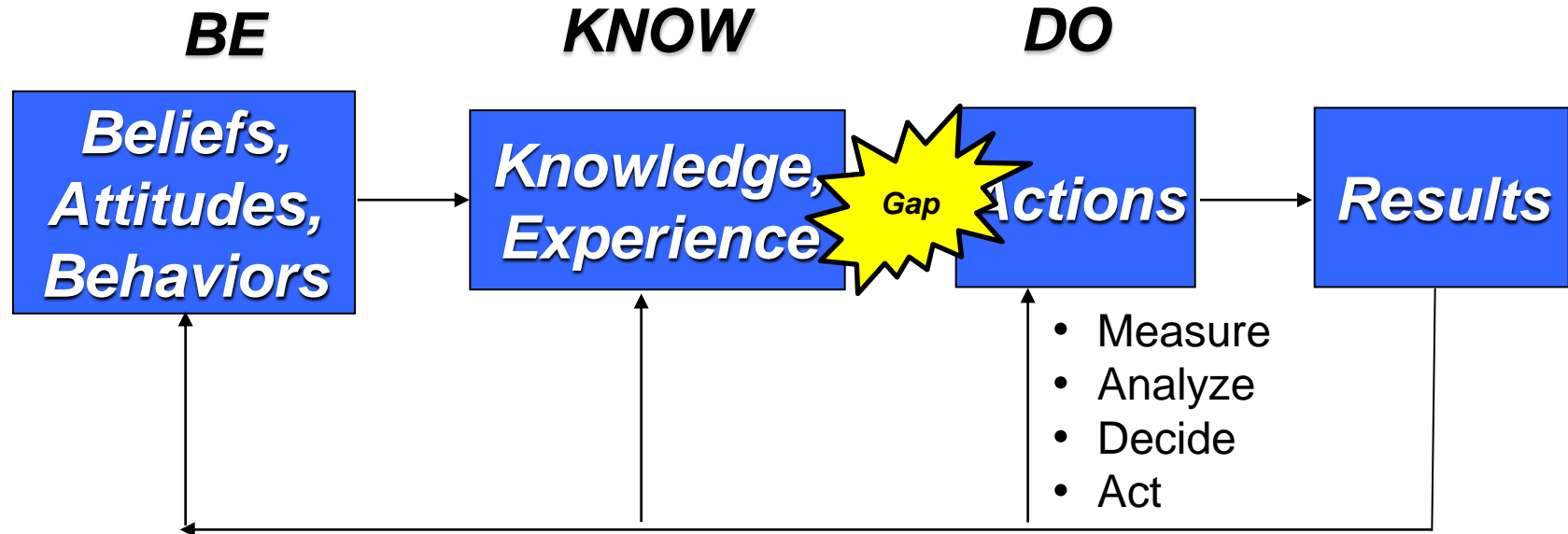


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Leadership Challenges of Project Management



**Leader's quest –
predictable, accelerated project performance**

Critical Chain Defined

- Critical Chain is a **program management** methodology based on the Theory of Constraints
- Critical Chain **discourages multi-tasking** and other behaviors that waste task time
- Critical Chain **identifies which tasks are critical**, and at what time, to achieve the ultimate goal of the project
- Critical Chain provides management the information they need to **FOCUS** on the right tasks at the right time

**Critical Chain Minimizes Waste and Variation
via an Environment that doesn't allow it**

Critical Chain Project Management Techniques

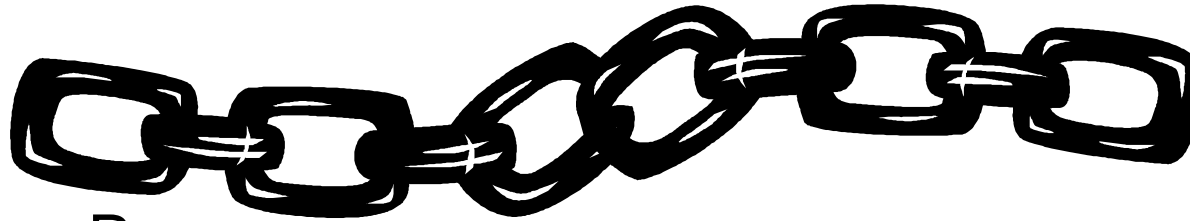
Making Common Sense Common Practice

The Theory of Constraints (TOC) – A Mitigating Strategy

■ Systems Approach to Increased Throughput

- Identify and mitigate constraints to throughput
- Results in increased speed and reduced costs
- Explained in Eli Goldratt's *"The Goal"*

- ***A chain (or system) is only as strong as its weakest link***



■ 5 Step Process:

– Lean Manufacturing

- Identify the Constraining Process
- Exploit
- Subordinate
- Elevate
- Repeat

or Project Management

- ID the constraining Task
- Pamper the resource
- Synchronize the team
- Innovate the task
- Move on to the next task

**Critical Chain is
Lean Project Management**

Critical Chain –

The Project Management application of Theory of Constraints

■ 5 Step Process

-
- ID the constraining Task
 - Conduct Rolling Wave Reverse Planning
 - Identify the Critical Path / Chain and near-critical paths
 - Evaluate the Accelerated Forecast
 - Identify the Critical Chain Resources
 - Pamper the resource
 - Synchronize the team
 - Innovate the task
 - Move on to the next task
 - **Prioritize the tasks and protect the Critical Chain resource from **Multitasking****
 - **Develop Run Rules for Critical Chain, Barrier Busters, and the Team**
 - **Establish Control Room, Daily Standup Meetings, Visual Controls**
 - **Develop Innovative ways to complete Critical Chain tasks**
 - **Enable early completions and crisp handoffs**

Schedule and Behavior Techniques to achieve predictable, accelerated performance

Reverse Planning – Identify the Constraint

Basic Principle

- “Start with the end in mind”
- Focus on Handoffs
- Capture Linkage, Resources and Durations



Typical Characteristics

- Cross Functional **Team-building** event
- System focused rather than silo'd organizational focus
- **Fosters communication** that often doesn't happen otherwise
- Identifies tasks & dependencies as “**needed**” rather than as they are typically done
- Yields a highly detailed, fully linked, resource loaded schedule in which constraints are easily identified

**Engages the Team in building a Lean Plan and
Identifying Constraints**

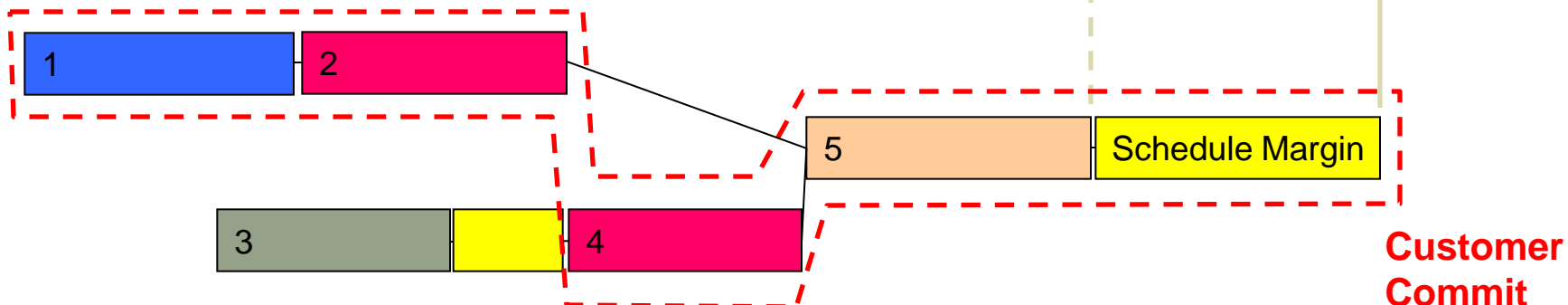
Critical Path vs Critical Chain

Traditional Critical **Path** Planning with Safety Built Into Each Task:



Critical Path: The longest path of dependent tasks

Critical **Chain**:

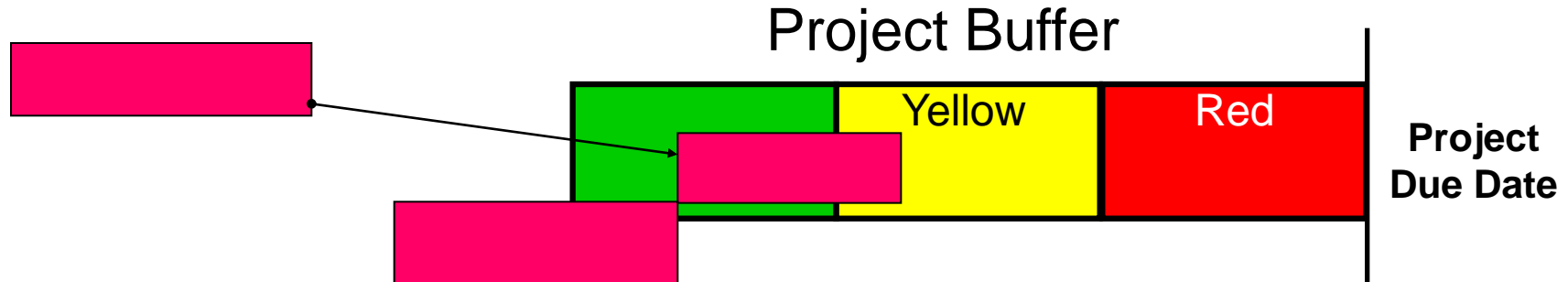


Critical Chain: The longest path of dependent tasks with resources de-conflicted, and individual safeties removed and added back in as buffer

**Aggressive Task Durations • Eliminate Multi-Tasking •
Manage variation using Buffers**

Manage the Buffers

- Depending on the variability realized in each of the tasks, the time remaining in the buffers will DECREASE or INCREASE

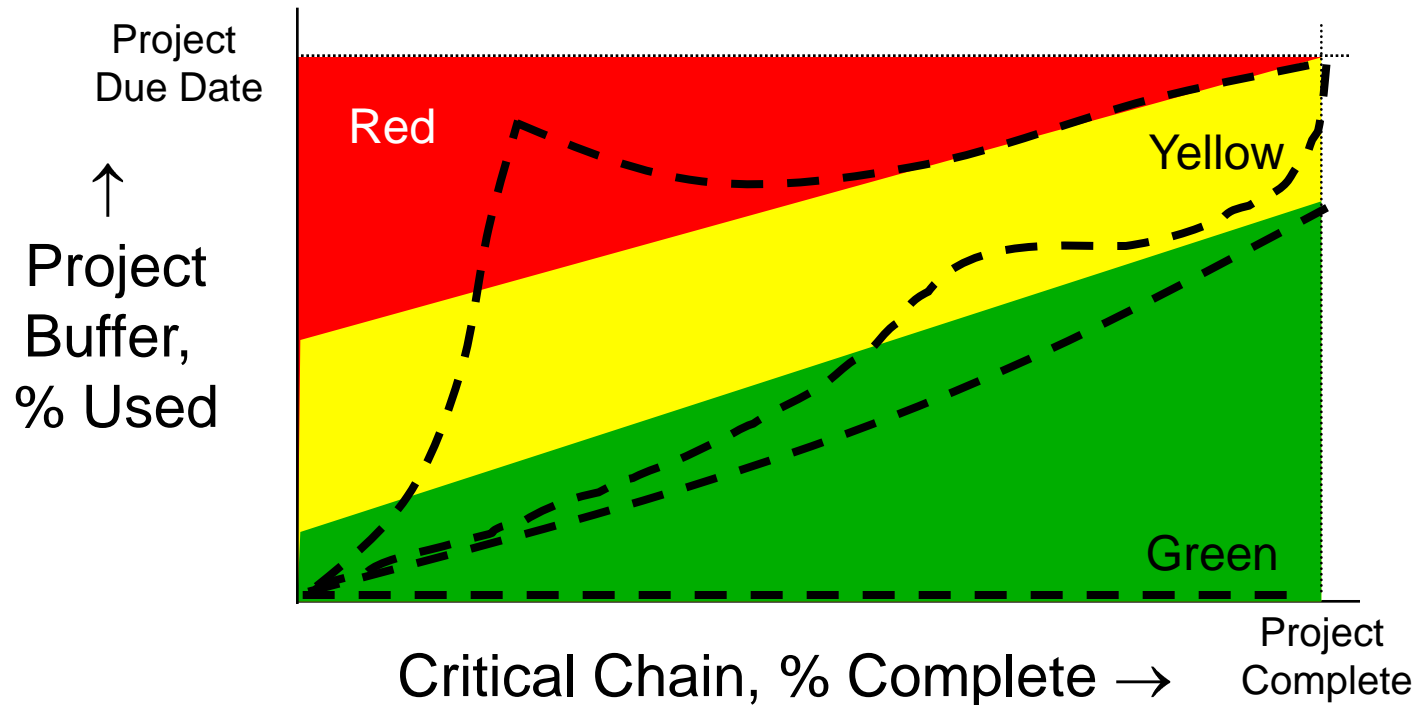


- Assess risk by assessing the health of the buffers

Buffer penetration is a measure of project status

Project Management by the Buffers

- Fever Chart Displays the project status instantly
- It is a visual aid that helps a team understand risk of success



**Much, if not all, of buffer will be consumed
when project is complete**

Eliminate Behaviors That Waste Task Time, Delay Starting Successor Tasks

- **Student Syndrome...** Waiting until the last minute to start a task
- **Unreported early finishes**
- **Parkinson's Law...** Work expands to fill the available time
- **3-minute egg rule...** The belief that quality requires using the entire time
- **Multitasking...** The belief that efficiency is gained by attempting to focus on more than one task at a time

**Eliminate Time Wasting Behaviors to create
Schedule Margin**

Multitasking – The Facts*

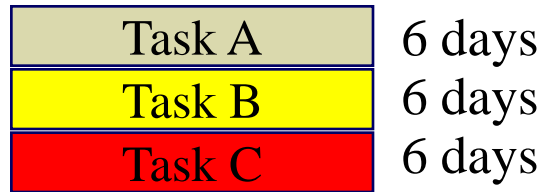
- People can't multitask very well, and when people say they can, **they're deluding themselves**, and the brain is very good at deluding itself.
- Multitasking is a **mythical activity** in which people believe they can perform two or more tasks simultaneously.
- Office workers took an average 25 minutes to **recover from interruptions**
 - Office distractions can eat up **2.1 hours a day** for the average worker
- Multitasking contributes to the **release of stress hormones**, which can cause long-term health problems, and contributes to short-term memory loss.
- Neuroscience is confirming what we all suspect: Multitasking is **dumbing us down** and driving us crazy
- People who multitask are actually **less efficient** than those who focus on one project at a time

Minimizing Multitasking Maximizes Efficiency

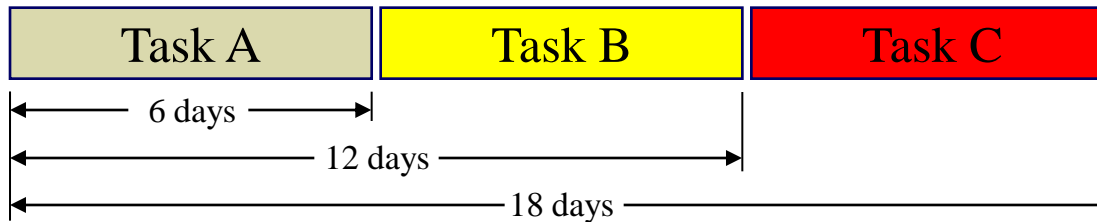
* As quoted by various research papers and articles

What Is The Effect of Multi-tasking On Your Project?

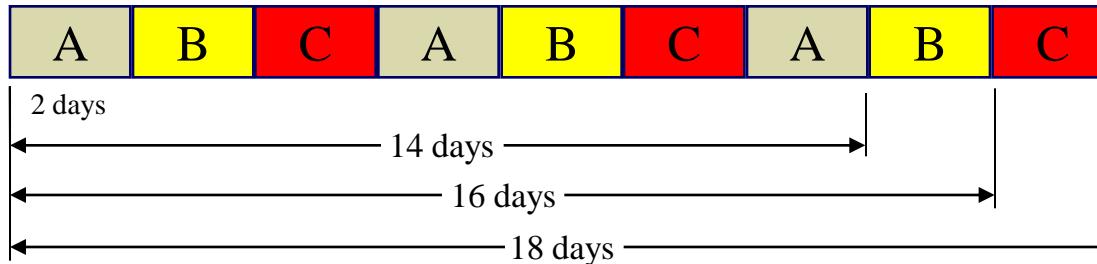
Three tasks
assigned to
a person



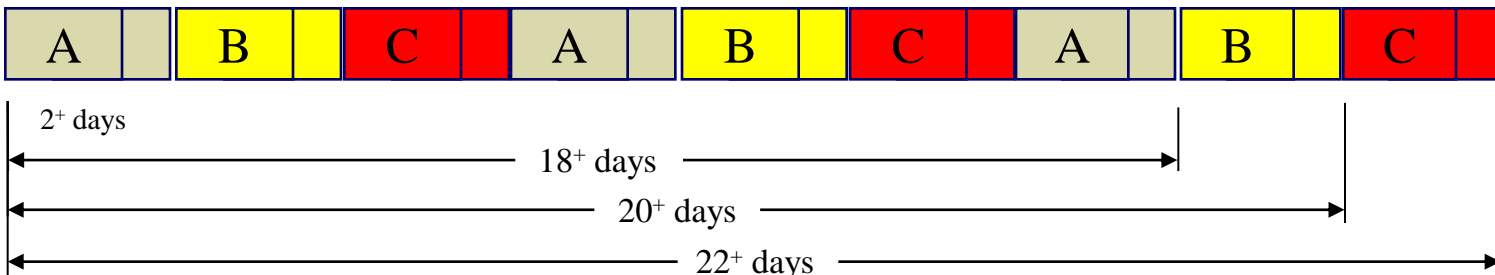
Person
Dedicated To
Task



What Often
Happens
(*assume no loss of
productivity from
start-stop-resume*)



Tragic Cost of
Multi-tasking



30+% Lost

**Multitasking causes us to be late.
Being late causes cost overruns.**

Multitasking – A Demonstration

■ The Alpha-Numeric Simulation

– Materials

- Two writing instruments
- One sheet of paper
- Writing Surface
- Timer

Round 1:

Three entries at a time
(3) Numerical
(3) Alphabetical
Repeat

0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5

Z Y X W V U T
K L M N O P Q R S
A B C D E F G H I J

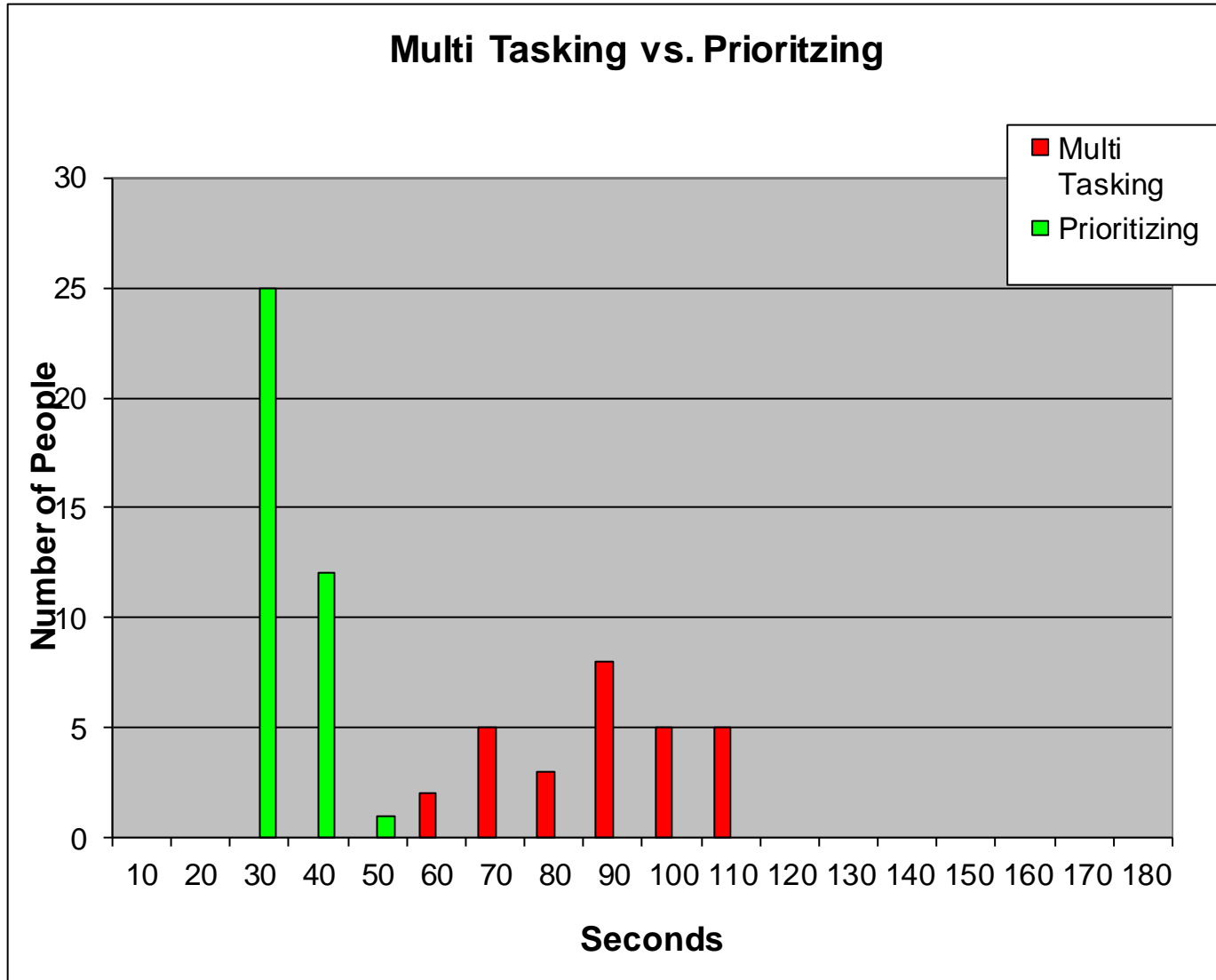
■ Objective

- Demonstrate the effects of multitasking when performing two simple tasks

■ Execution

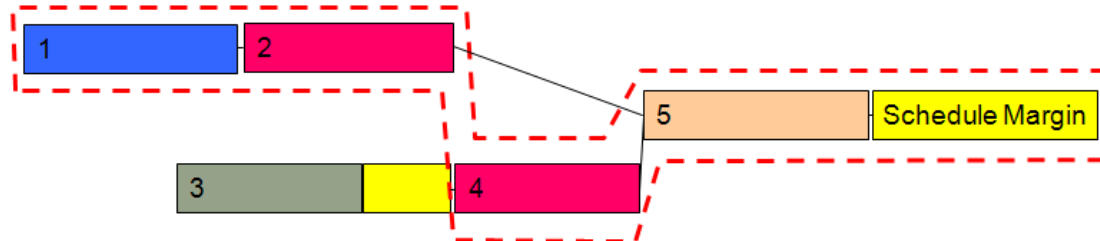
- Round 1: Perform the tasks while multitasking
- Round 2: Perform the tasks one after the other

The Alpha-Numeric Demonstration



Timer.exe

Protecting Schedule Margin



■ Implementing the Critical Chain Operating Model

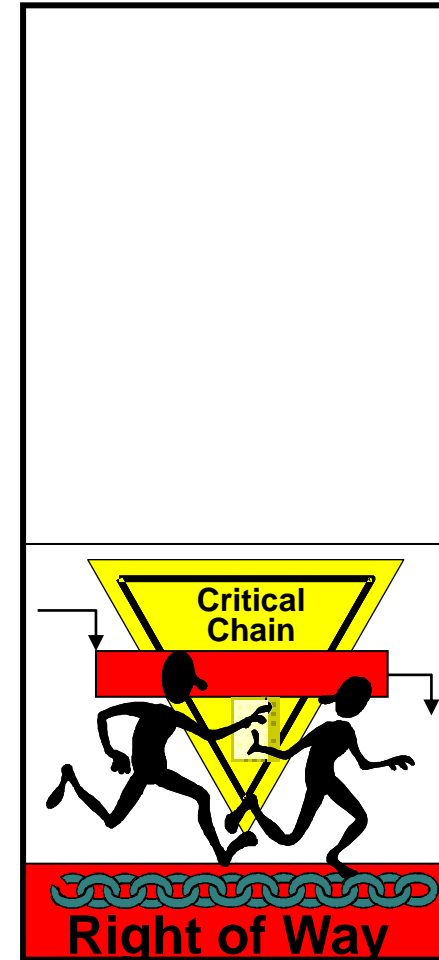
- Establish Run Rules to Pamper and Synchronize the Team
 - Critical Chain Resource
 - Barrier Busters
 - Execution Team
- Establish a Control Room
 - Critical Chain Battle Rhythm
- **Quarterly** or twice Annually
 - Conduct Rolling Wave Reverse Planning
 - **Weekly** Monitoring
 - Establish Priorities
 - **Daily** Stand-Up Meeting
 - Identify and Bust Barriers Proactively

Establish Roles and Responsibilities:

The Critical Chain resource is the most important person on the program

Run Rules to pamper people/team on the critical chain

- **“Right of Way”** – Critical Chain has priority
 - May interrupt anyone, as necessary
 - May not be interrupted (except during posted “office hour”)
- No multi-tasking on the critical chain
 - Begin task immediately upon receipt
 - Pass task to next step immediately upon completion
 - Focus on the critical task at hand until “DONE” and handed off
- **Exempt from meetings**
 - Attend the Daily Stand-up meetings
 - Send designee, if feasible, to low priority meetings
 - If required at meeting, first on agenda
- Post office hours and establish and create Time Guard Perks
 - Hold all calls and Email
 - Assign support for:
 - Issues and Information gathering, when feasible
 - Assistance with clerical activities
- Raise issues – IMMEDIATELY
- Do not use passive communication (e.g. e-mail)

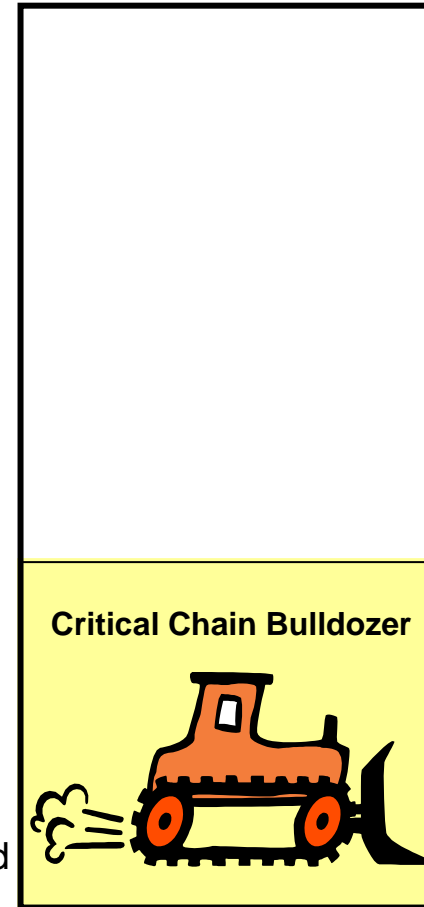


Establish Roles and Responsibilities:

Management Models Behavior

Management “Pampers and “Synchronizes” the team

- **Establish clear priorities** and stick to them (at least weekly)
- Establish performance expectations (Performance Screens/PD Process)
- Establish a culture of helping each other (reward the behavior desired)
- Reward being up-front and addressing issues head-on
- **Remove barriers (Don’t create them)**
- Management takes on a much more active role
 - Resolve the high priority issues
 - Do not try to understand every problem (get your head out of the weeds)
- Systems thinking – optimize the system (not the IPT, Group, or task)
 - Subordinate decisions to the needs of the Critical Chain
 - Look downstream to tasks with inherent risk, mitigate the risk beforehand
- Create and sustain a “sense of urgency”
- Attend CC Stand-ups
- Wear the “CC Bulldozer” Badge

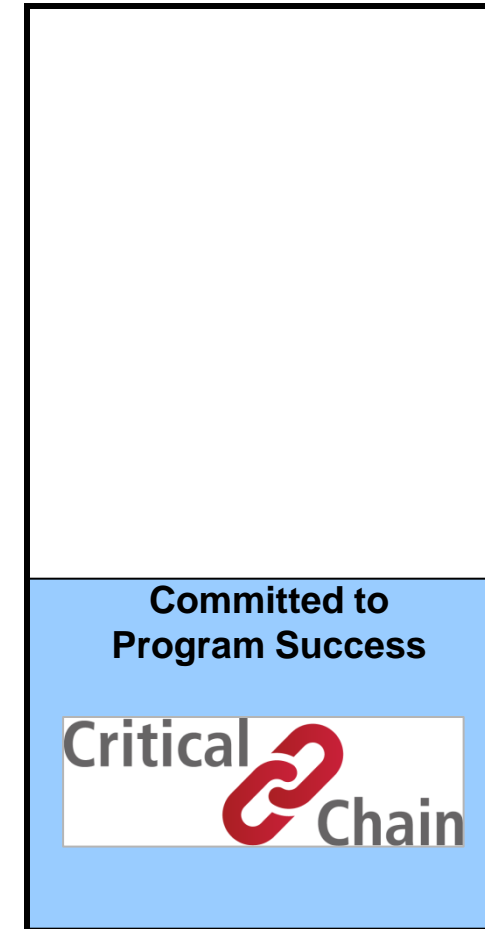


Establish Roles and Responsibilities:

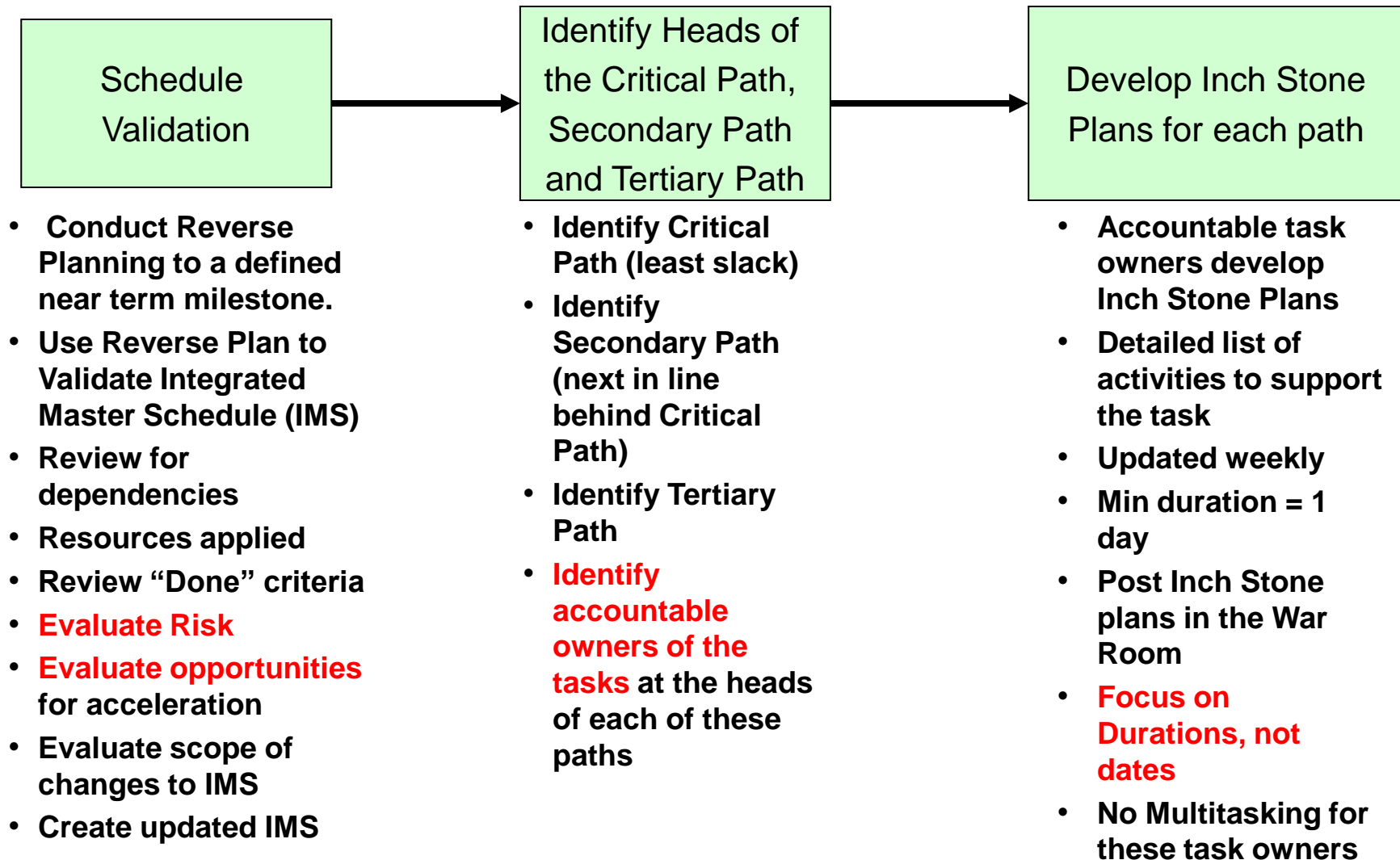
Execution Teams help each other succeed

Execution Teams

- Estimate Tasks in terms of variability (50% and 90%)
- **Define what it means to be “DONE”** (establish completion criteria)
- Be active in plan management (change it if it is wrong)
- Be “Forward Looking” by providing status in terms of remaining work (“Remaining Duration to achieve DONE”)
- Assess the 50/50 and 90/10 durations – Change them if incorrect
- Complete Tasks as soon as possible
- **Pick up for people who get pulled onto the Critical Chain**
- Understand the Run Rules and abide by them
- Be ready to support the Critical Chain when needed

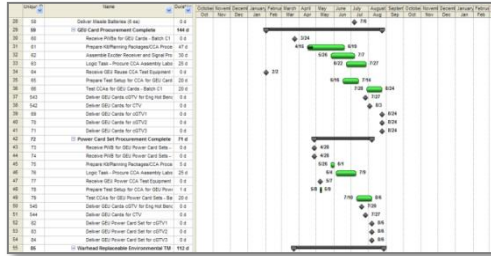


Reverse Planning

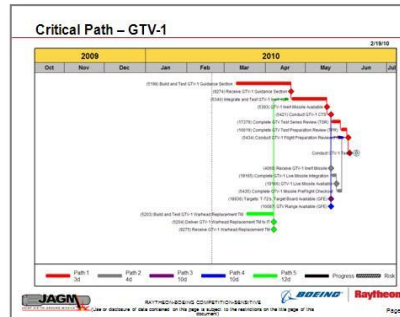


A Weekly Critical Chain Battle Rhythm to Set Priorities

Raytheon
Behavior



Project Plan

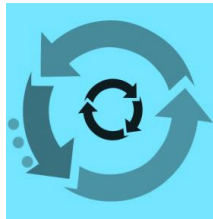


Critical Path Charts



Monday Morning Huddle

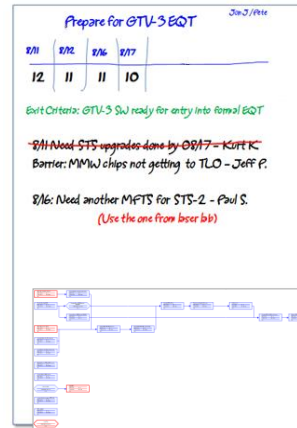
Attack barriers!



Task Work



4:00PM Stand-up



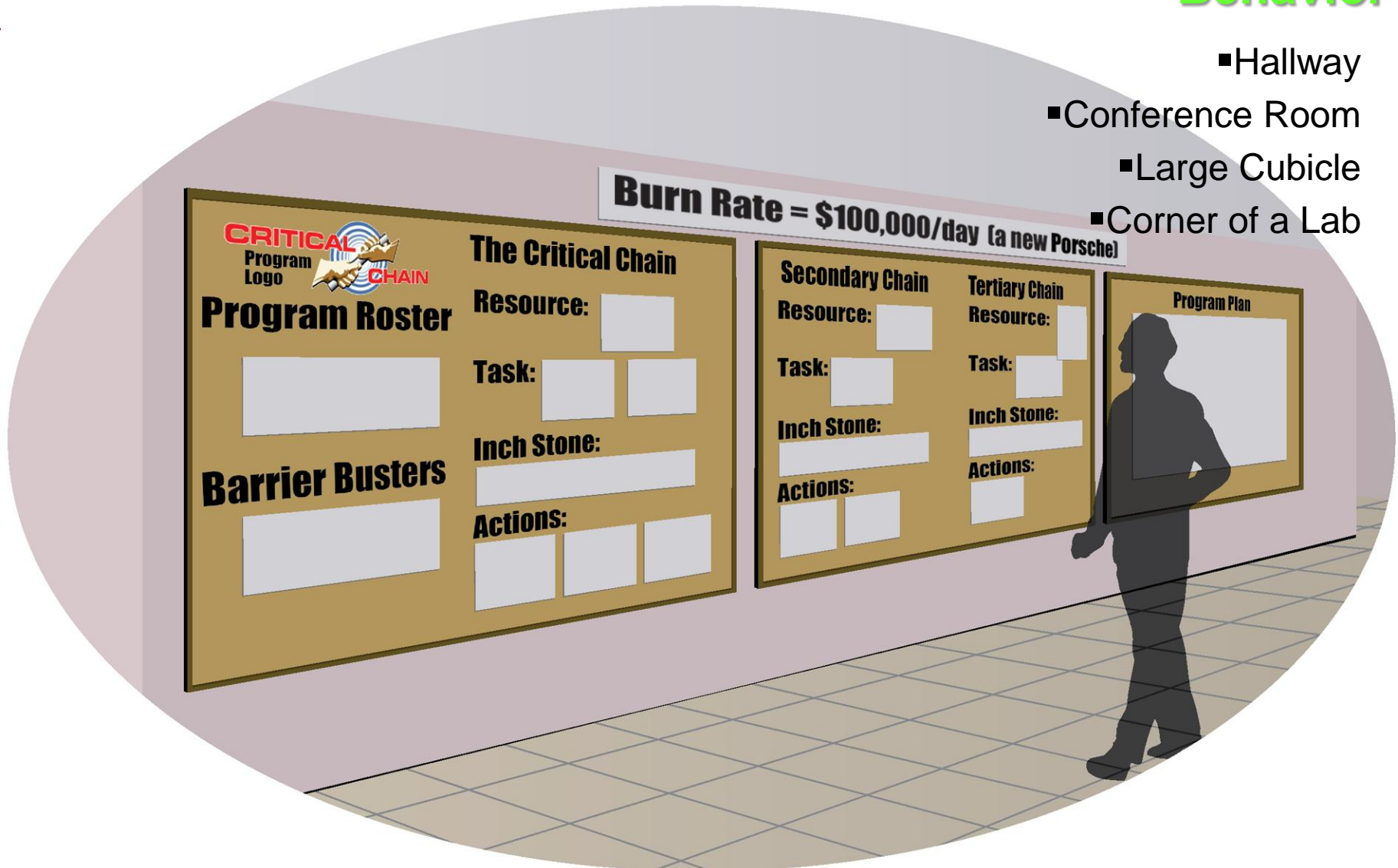
Critical Chain Task

| Action List | | | |
|--|---------------|----------|---------------------------------------|
| Item | Owner | Priority | Comments |
| EDT Flight Test Requirements | Danny Carillo | 1 | simultaneous tri-mode data collection |
| Lab Conference Room Rehabilitation | Dan Woodward | 2 | AIS1125 LAN drop |
| Computer Availability for SW Team (Qty 12) | Dan Woodward | 3 | AIS1125 LAN drop |
| DAS 807 MMW Bandwidth (CFT-2) for Range Greater Than 7km | Mike Stanley | 4 | Eldon to determine requirements |
| Build Engine for SW Team | Mike Stevens | 5 | |
| Windows Low Level Memory Real Time Control HW API Issue | Jerry Cichon | 6 | Related to 807 DASs |

Ranked Action List

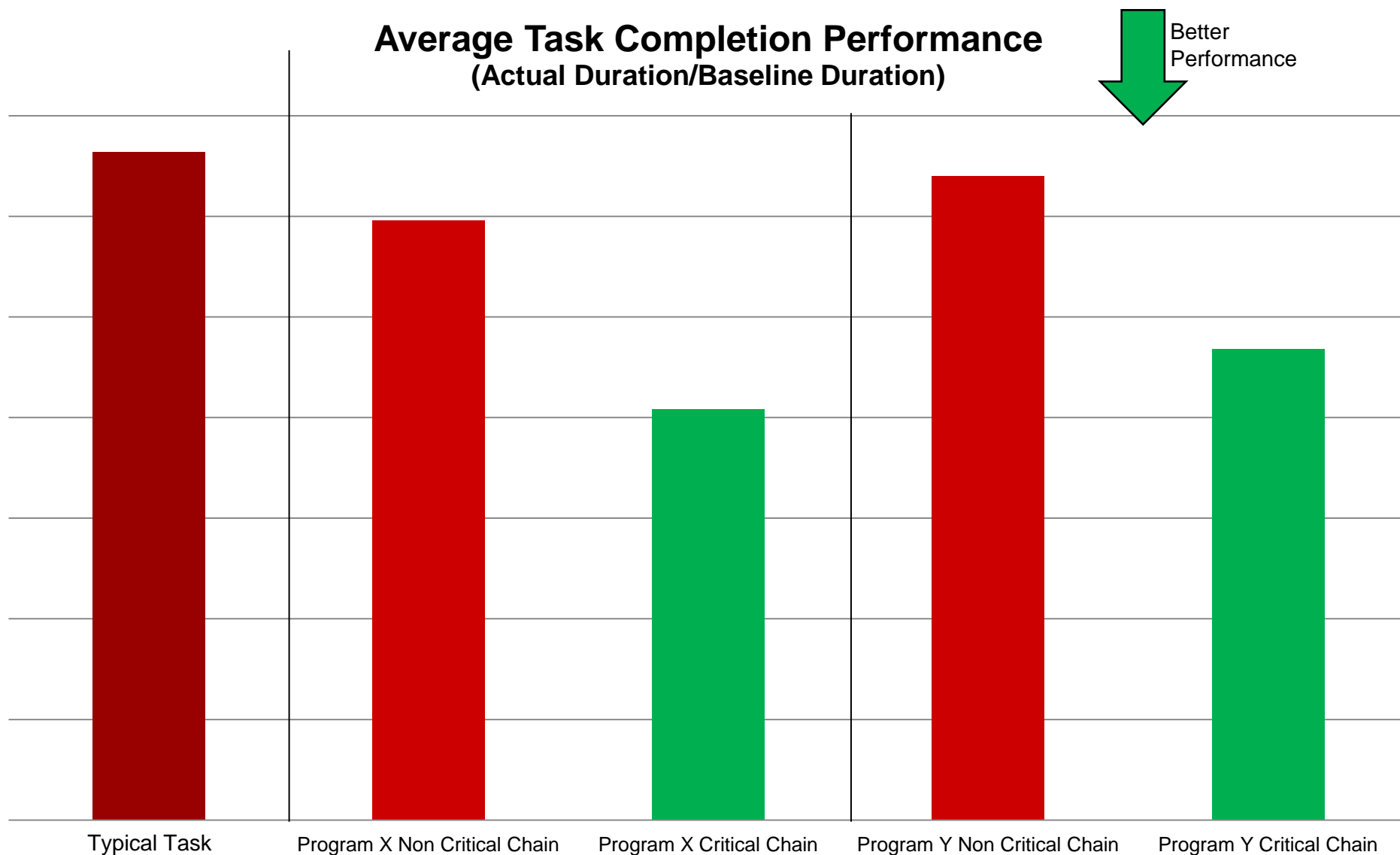
Daily Standups in the Control Room

- Hallway
- Conference Room
- Large Cubicle
- Corner of a Lab



Be creative in your use of program space

Does this Really Work?



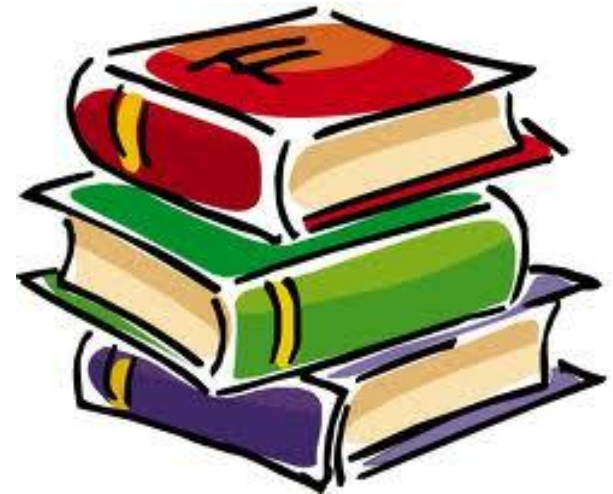
What to look for in Proactive Performance

- ***Deliverables:*** Are you delivering commitments on or ahead of plan
- ***Project Performance trends:*** are you seeing an upswing in schedule and cost performance or a stabilization in performance
- ***Total Float/Slack/Buffer:*** Is this growing through acceleration of tasks
- ***Rework:*** Is the team secure in the priorities and acting accordingly, thus reducing swirl, confusion, rework
- ***Risk Retirement:*** Are you catching risk early, lowering anticipated cost of mitigation
- ***Team Meeting Efficiency:*** Is the Daily Standup trumping or causing the cancellation of other meetings or causing other meetings to be more efficient
- ***Team morale/urgency:*** Is the team focused, energized. Is there minimized debate regarding priority decisions; are team members helping folks on the critical chain.
- ***Functional / Program Collaboration:*** is there a better perception of teamwork among the leadership community regarding resource management

Critical Chain Benefits are both Quantitative and Qualitative

Critical Chain Resources

- "Critical Chain" - Eli Goldratt
- "Project Management in the Fast Lane: Applying the Theory of Constraints" - Robert C. Newbold
- "Critical Chain Project Management" - Larry P. Leach



Passing the Baton – A Critical Chain Story



Critical  Chain

Critical Chain Helps Make Common Sense Common Practice