

PERT/CPM Management Planning SCHEDULING WORKSHOP

Technical Scheduling Working
JUNE 2015

Copyright 2015 Dennis Starkovich
All Rights Reserved

OUTLINE

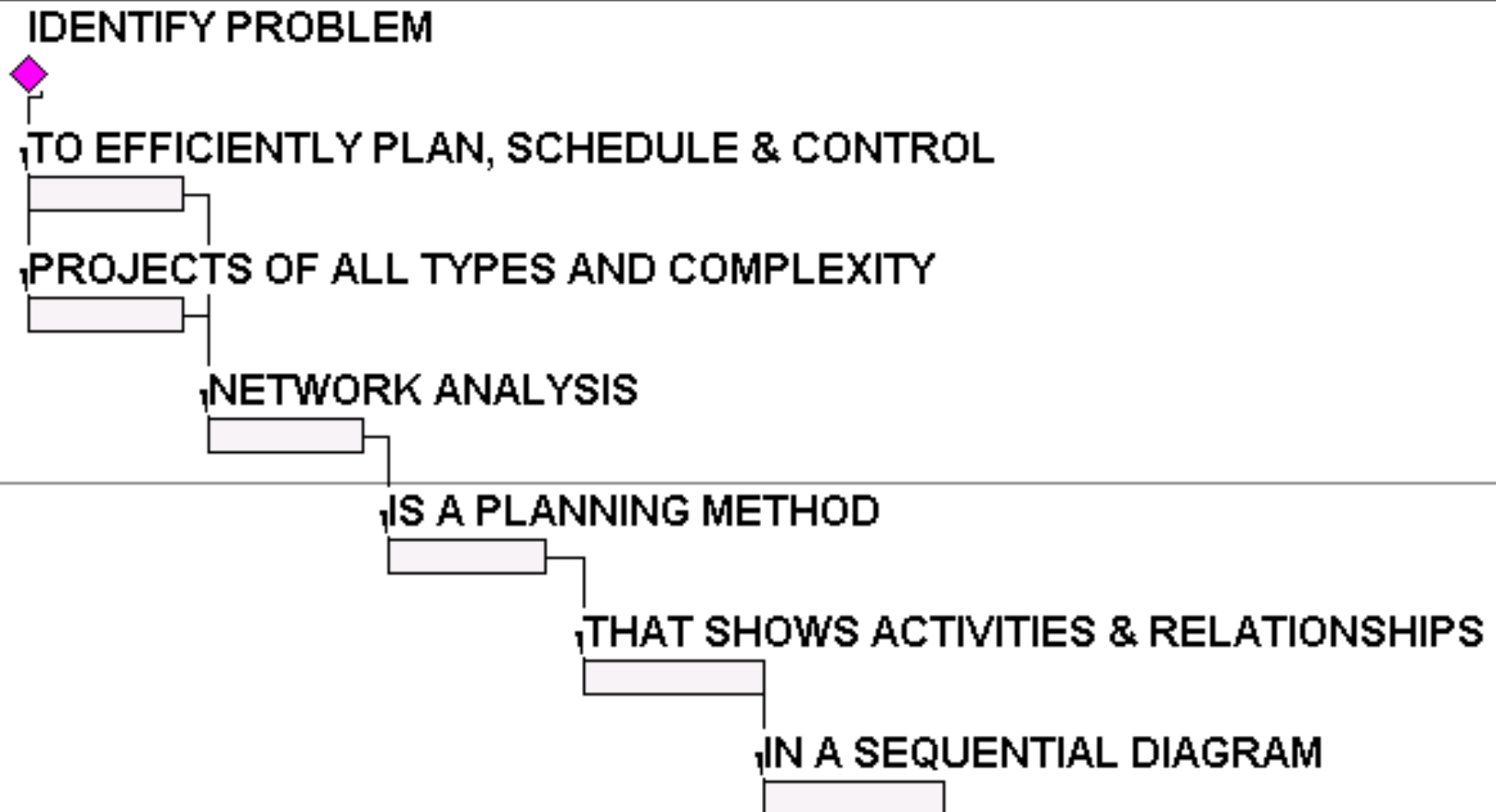
- ⇒ WHAT ARE PERT AND CPM ?
- ⇒ HOW TO MANAGE SCHEDULES
 - Baseline Schedule
 - Updating
 - Lost time Recording
 - Concurrent Delays
- ⇒ HOW TO REVIEW SCHEDULES
 - Specification Compliance
 - Generally Acceptable Practices
 - Review of lost time (Technical vs. Entitlement)

WHAT IS NETWORK ANALYSIS ?

- ⇒ Critical Path Method (CPM) definition
- ⇒ Program Evaluation and Review Technique (PERT) definition
- ⇒ Wealth of information in a network analysis
- ⇒ Planning vs. Scheduling
- ⇒ CPM vs. Bar Chart scheduling
- ⇒ CPM vs. PERT

IDENTIFY PROBLEM

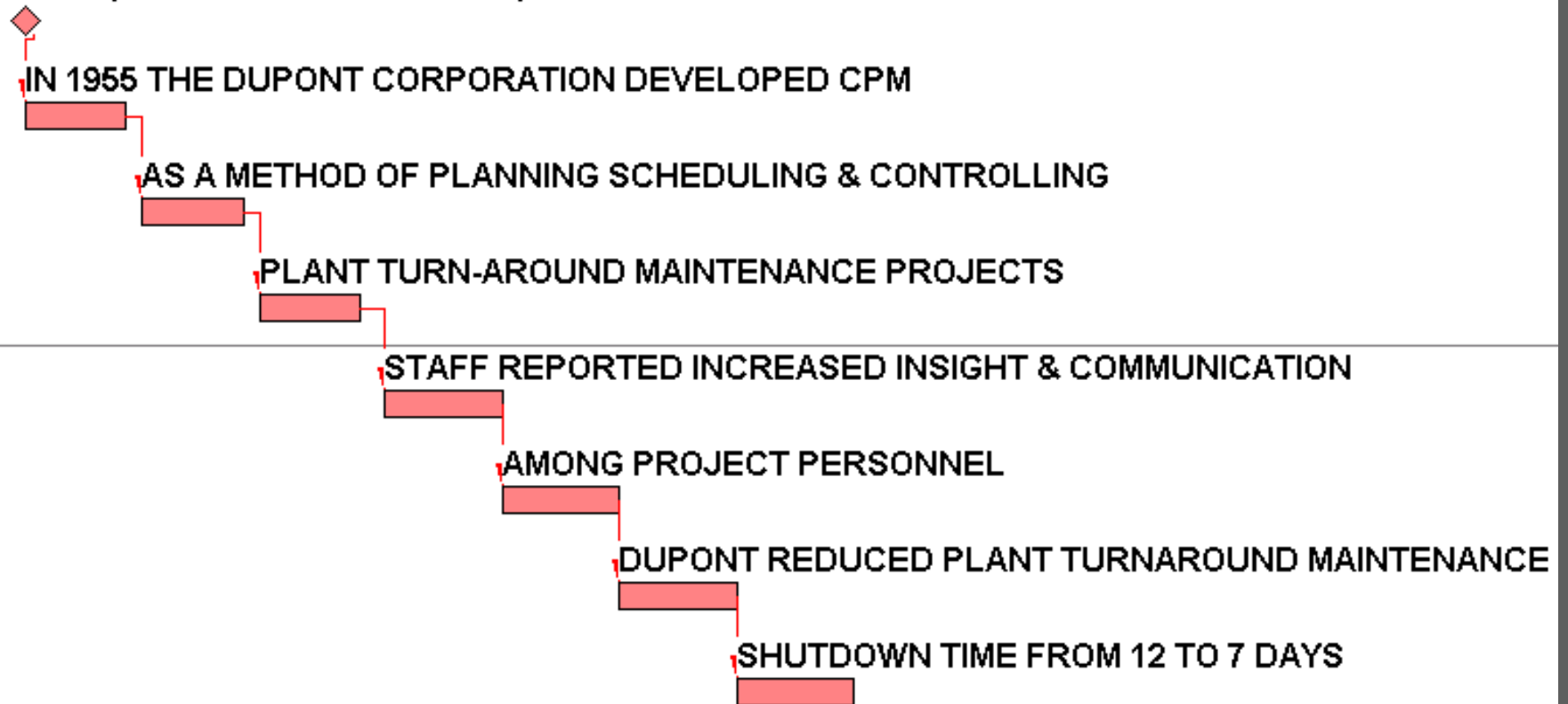
IDENTIFY PROBLEM (PLANNING METHODS)



CPM

CPM (CRITICAL PATH METHOD)

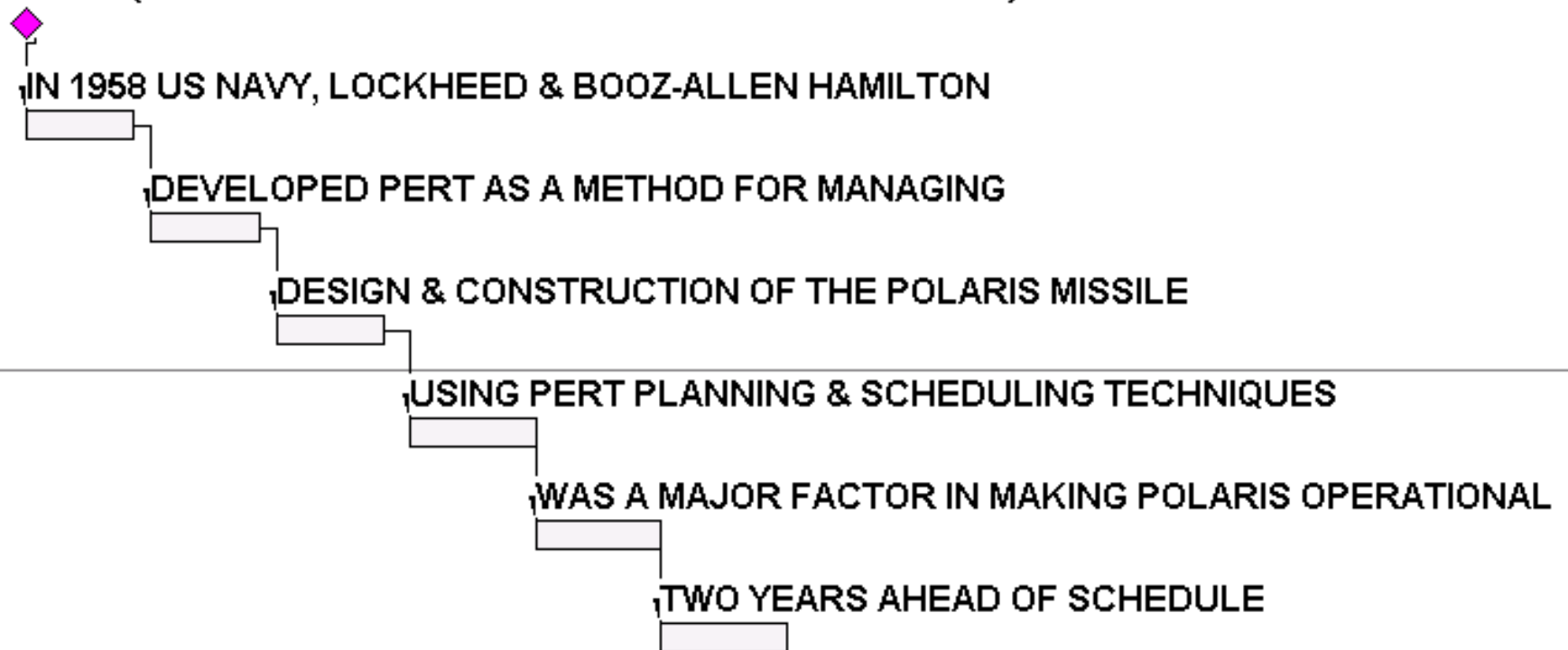
CPM (CRITICAL PATH METHOD)



PERT

PERT (PROGRAM EVALUATION AND REVIEW TECHNIQUE)

PERT (PROGRAM EVALUATION AND REVIEW TECHNIQUE)



NETWORK ANALYSIS

PERT/CPM (METHODS OF NETWORK ANALYSIS)

PERT/CPM



PERT & CPM ARE NETWORK ANALYSIS TECHNIQUES

APPLIED TO PHYSICAL OR INTELLECTUAL PROJECTS

VALUE OF NETWORK ANALYSIS

DERIVES FROM DEGREE OF IMMERSION INTO PLANS

PERT/CPM NETWORK ANALYSIS FORCES DISCOVERY

OF HOW JOB MUST BE PUT TOGETHER

PERT/CPM ENABLE DISCOVERY OF PROBLEM AREAS

BY METHODOICAL ANALYSIS OF PROJECT RELATIONSHIPS

PERT/CPM PROVIDE SOPHISTICATED & SIMPLE MEANS

OF ASSESSING CHANGES IN PROGRAM SCOPE

DUE TO UNANTICIPATED DELAYS TO PROGRESS

NETWORK TECHNIQUE

NETWORK TECHNIQUE (METHODOLOGY)

NETWORK ANALYSIS TECHNIQUE

CONSTRUCT A DIAGRAM / MODEL THAT REPRESENTS

PROJECT ACTIVITIES IN A LOGICAL SEQUENCE

EVALUATE & REVISE ACTIVITY LOGIC & SEQUENCE

MAKE INITIAL ACTIVITY TIME ESTIMATES

BASED ON ANALYSIS OF AVAILABLE RESOURCES

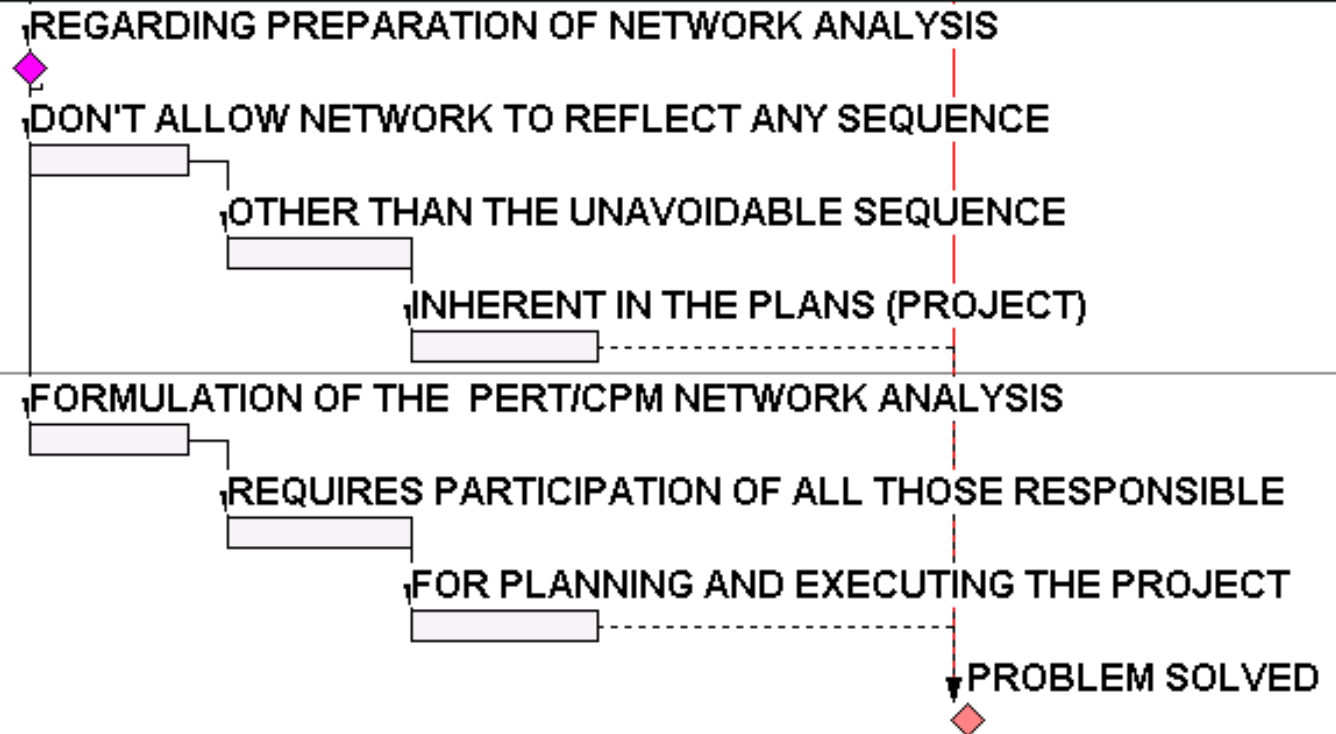
AND APPLICATION OF COMPANY'S EXPERIENCE

ALLOCATE RESOURCES & CHOOSE SCHEDULE

MONITOR & CONTROL PROJECT

BE ADVISED

BE ADVISED



NETWORK DIAGRAM

NETWORK DIAGRAM

PERT/CPM NETWORK ANALYSIS

GRAPHIC TOOL TO PLAN AND SCHEDULE ACTIVITIES

DIAGRAM SHOWS ACTIVITY RELATIONSHIPS

DIAGRAM SHOWS INTERDEPENDENCIES OF ACTIVITIES

REFLECTS THE PROGRESS OF THE PROJECT

USEFUL FOR ANALYSIS OF DELAY IMPACT CLAIMS

SUBSTANTIATE CONTRACT CLAIMS BEFORE COURTS

REVIEW CONCURRENT DELAYS ON / OFF CRITICAL PATH

RESOLVE QUESTIONS OF CAUSE, EFFECT & LIABILITY

NETWORK PREPARATION

NETWORK PREPARATION

PREPARATION OF PERT/CPM NETWORK:

DETERMINE ACTIVITIES NECESSARY TO PERFORM WORK
IN ACCORDANCE WITH PLANS AND SPECIFICATIONS

DETERMINE RELATIONSHIPS BETWEEN ACTIVITIES

ANALYSIS CAN BE AN ARROW DIAGRAM

ANALYSIS CAN BE A PRECEDENCE DIAGRAM

DETERMINE TIME DURATIONS FOR VARIOUS ACTIVITIES

CARE MUST BE USED TO ADEQUATELY CONSIDER:

CREW-LOADING

MATERIAL AND EQUIPMENT REQUIREMENTS

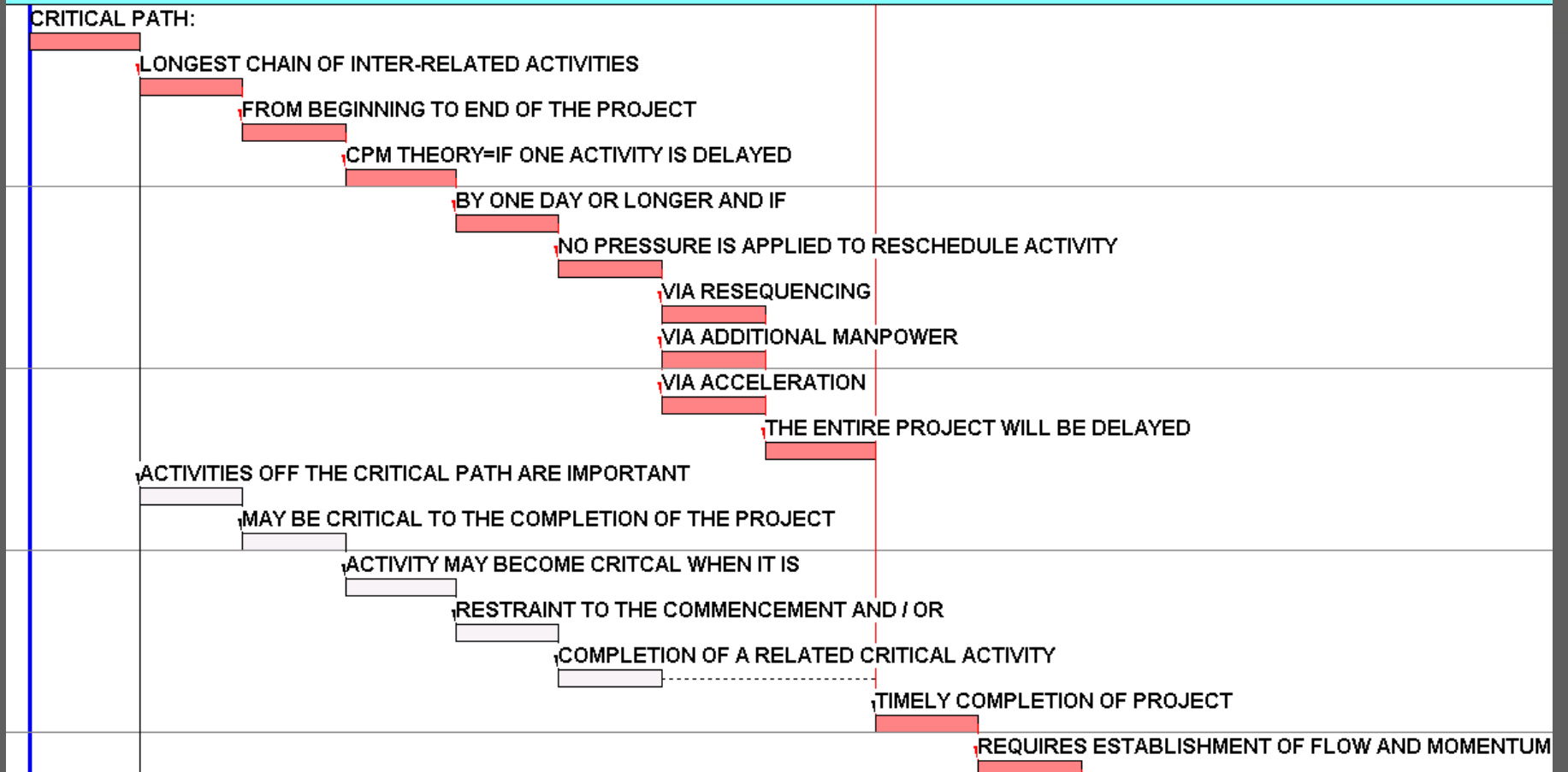
AVAILABILITY OF RESOURCES

REFLECTS ACTIVITIES / RELATIONSHIPS / DURATIONS

PLACED IN CALENDAR FRAMEWORK (CONTRACT SCHEDULE)

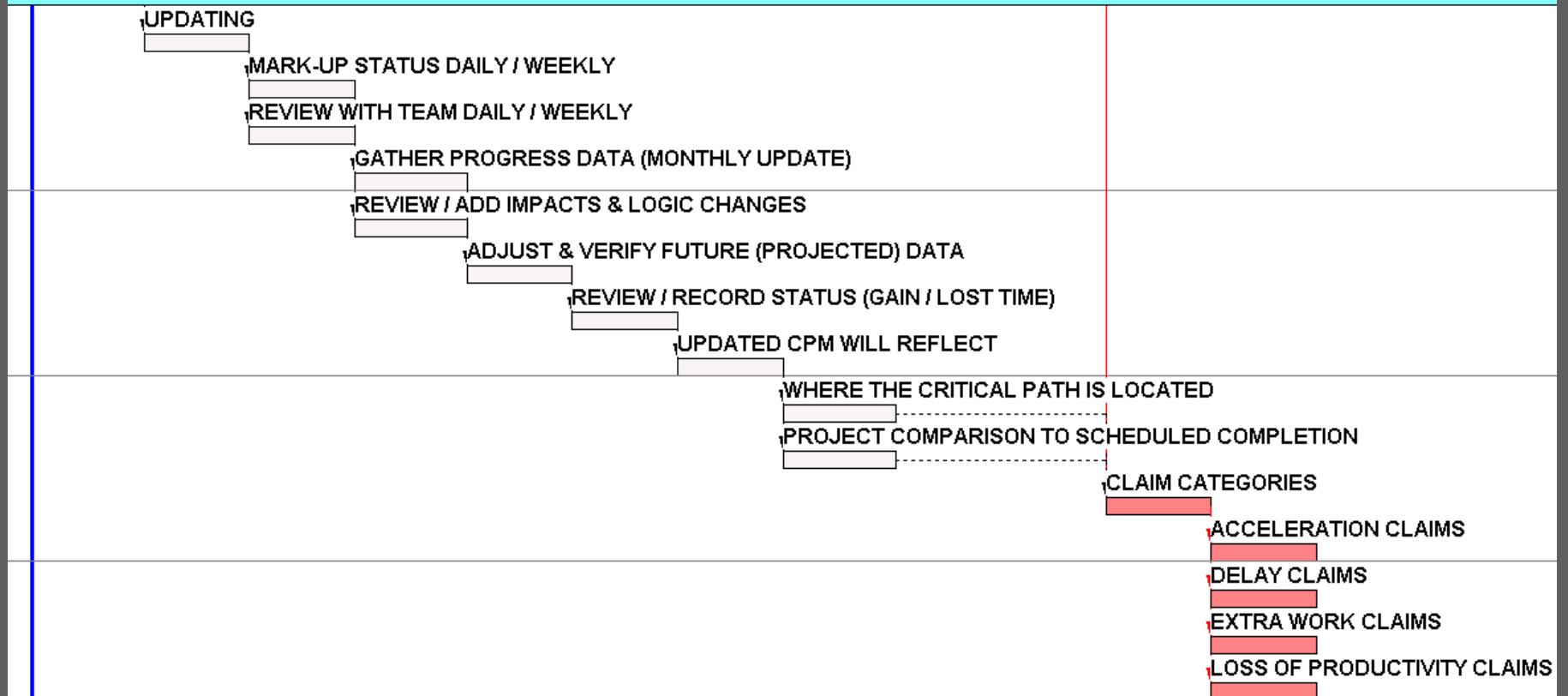
CRITICAL PATH

CRITICAL PATH



UPDATING

UPDATING



HOW TO MANAGE SCHEDULES

- ⇒ Baseline schedule acceptability
- ⇒ Regardless of specification requirements, the schedule has to:
 - represent the entire project scope
 - represent an accurate and constructible way of executing the project
 - be conveyed to subcontractors to provide them an opportunity to review/comment (whether they do or not)
- ⇒ The actual execution can vary from the initial plan; when that happens revisions have to be tracked through updating and adjustment of logic

HOW TO MANAGE SCHEDULES

- ⇒ Concept of buying and selling durations
- ⇒ You buy a 10 day duration for work (e.g. millwork) from subcontractor + risk that it will take longer
- ⇒ You sell a 10 day duration for work to owner: What happens to the risk?
 - a) Have explicit contingency at the end of the project
 - b) Build buffer into owner schedule, i.e. sell 12 day duration?
(not recommended)
 - c) Structure the schedule in such a way to allow implementation of relatively easy re-sequencing to generate float if needed

HOW TO MANAGE SCHEDULES

- ⇒ Schedule updating
- ⇒ Regardless of specification requirements, the schedule needs to be updated with as-built information. This involves:
 - a) Gathering of actual data (can be done by project team) to establish the project status. Recording should be performed daily / weekly.
 - b) Updating of schedule (by scheduler)
 - c) Verification of projected (future) data (by project team / scheduler) to insure that the future schedule dates are still accurate.
 - d) Adjustments to schedule network activities and/or sequences if needed to achieve (c) above (scheduler / project team)
 - e) Review / recording of lost time (in CPM and / or text form)
- ⇒ Contemporaneous updating vs. after-the-fact updating

HOW TO MANAGE SCHEDULES

- ⇒ How to evaluate lost time and act accordingly
- ⇒ Comparison of plan vs. actual
- ⇒ Critical path delay vs. consumption of float.
- ⇒ Cumulative delay (death by a thousand cuts)
- ⇒ Time Management is similar to Accounting
- ⇒ Contingency as discrete activity at end of schedule = savings / monitoring account (especially important for weather)

HOW TO MANAGE SCHEDULES

- ⇒ How to deal with concurrent delay
- ⇒ Define concurrency
- ⇒ Concurrent delays on the same path vs. two independent paths
- ⇒ The "but-for" test: But for one delay, would the critical path shift to the other delay?
- ⇒ "Pacing": But for one delay, would one have acted differently on the other delay?
- ⇒ What if one delay is yourself and second delay is another party?
- ⇒ What if both delays are by other parties?

HOW TO REVIEW SCHEDULES

⇒ Specification Compliance

- Key requirements must be met
- Identify requirements that are not applicable or conflicting
- Identify and document acceptable variances

HOW TO REVIEW SCHEDULES

⇒ Generally Accepted Principles


- Schedule must not contain
 - Loose ends
 - Constrained dates (or held to a minimum)
 - Float Sequestering logic ties
- Schedule must contain
 - Submittals for each specification section (often not done by many contractors)

HOW TO REVIEW SCHEDULES

⇒ Review of Lost Time

- “Technical” review of lost time
 - Analysis identifies when, where, and how much time is lost
 - Based on information shown on CPM
- “Responsibility” and “Entitlement” review of lost time
 - Requires development of fragnet information
 - Requires off-CPM analysis of contract requirements
- At a minimum, the technical analysis needs to be performed contemporaneously

HOW TO REVIEW SCHEDULES

- ⇒ Delay Chronology
 - Month 1: Owner delay
 - Month 2: Recovery
 - Month 3: Contractor delay
 - ⇒ Who is responsible for delay?
 - ⇒ Windows Method of Analysis
 - ⇒ Best methodology if accurate schedules are available
 - ⇒ Treat each delay / recovery period in a separate window
 - Month 1: Issue time extension
 - Month 2: Project has positive float
 - Month 3: Project on schedule (float used by contractor)
- 

HOW TO REVIEW SCHEDULES

⇒ Compensation for Delays

- When to negotiate “technical” review of lost time?
 - How much time was lost when?
- When to negotiate “responsibility” review of lost time?
 - Who was responsible for delay?
- When to negotiate “entitlement” review of lost time?
 - Has the contractor entered the “extended project duration” and began spending “extended” general conditions?
 - Have any of the earlier delays been mitigated by re-sequencing or acceleration?
 - Better to negotiate mitigations as the project proceeds!

PERT/CPM Management Planning SCHEDULING WORKSHOP

Questions & Answers

Copyright 2015 Dennis Starkovich
All Rights Reserved