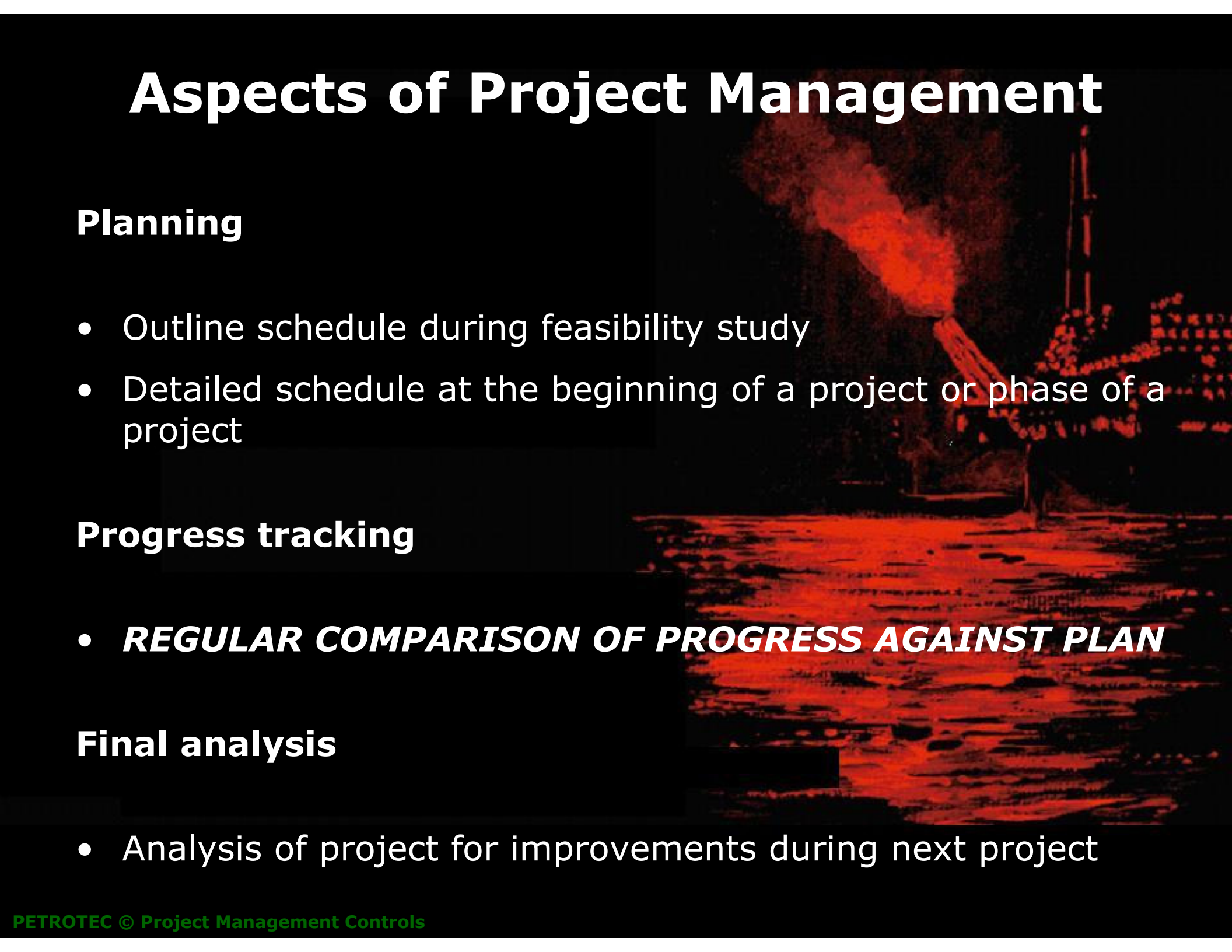
The Aim of Project Management

To complete a project:

- On time
- On budget
- With required functionality
- To the satisfaction of the client
- Without exhausting the team

To provide visibility about the progress of a project

Aspects of Project Management



Planning

- Outline schedule during feasibility study
- Detailed schedule at the beginning of a project or phase of a project

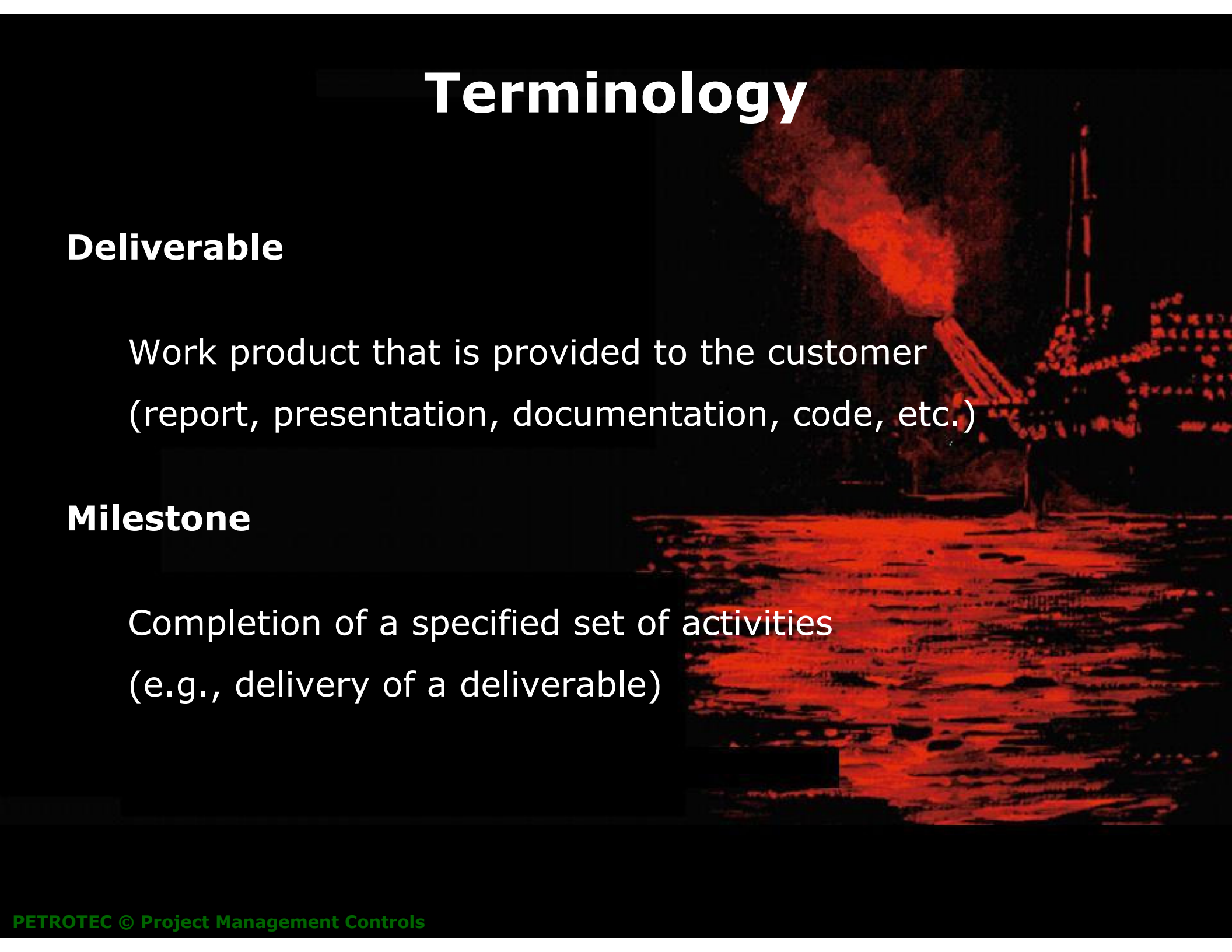
Progress tracking

- ***REGULAR COMPARISON OF PROGRESS AGAINST PLAN***

Final analysis

- Analysis of project for improvements during next project

Terminology



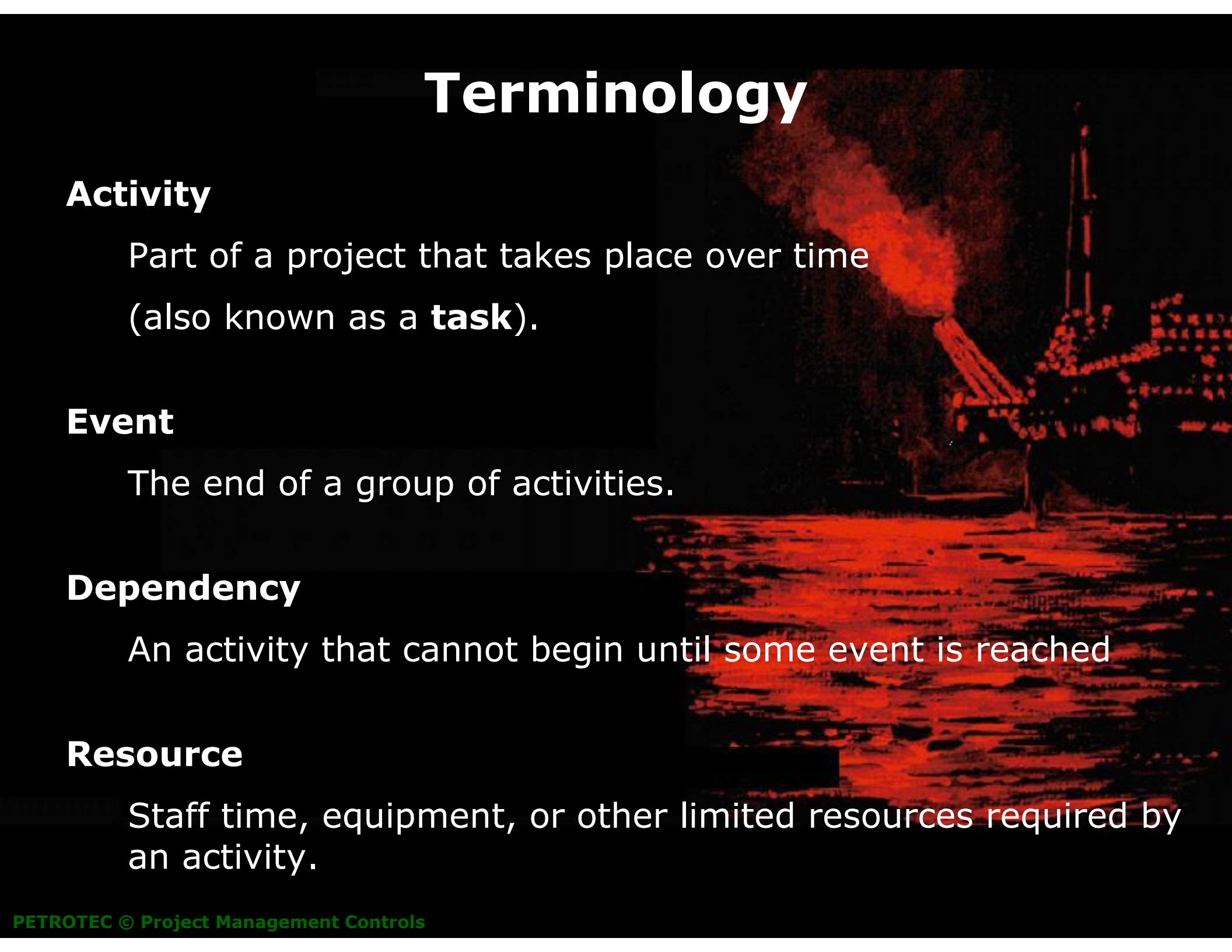
Deliverable

Work product that is provided to the customer
(report, presentation, documentation, code, etc.)

Milestone

Completion of a specified set of activities
(e.g., delivery of a deliverable)

Terminology



Activity

Part of a project that takes place over time

(also known as a **task**).

Event

The end of a group of activities.

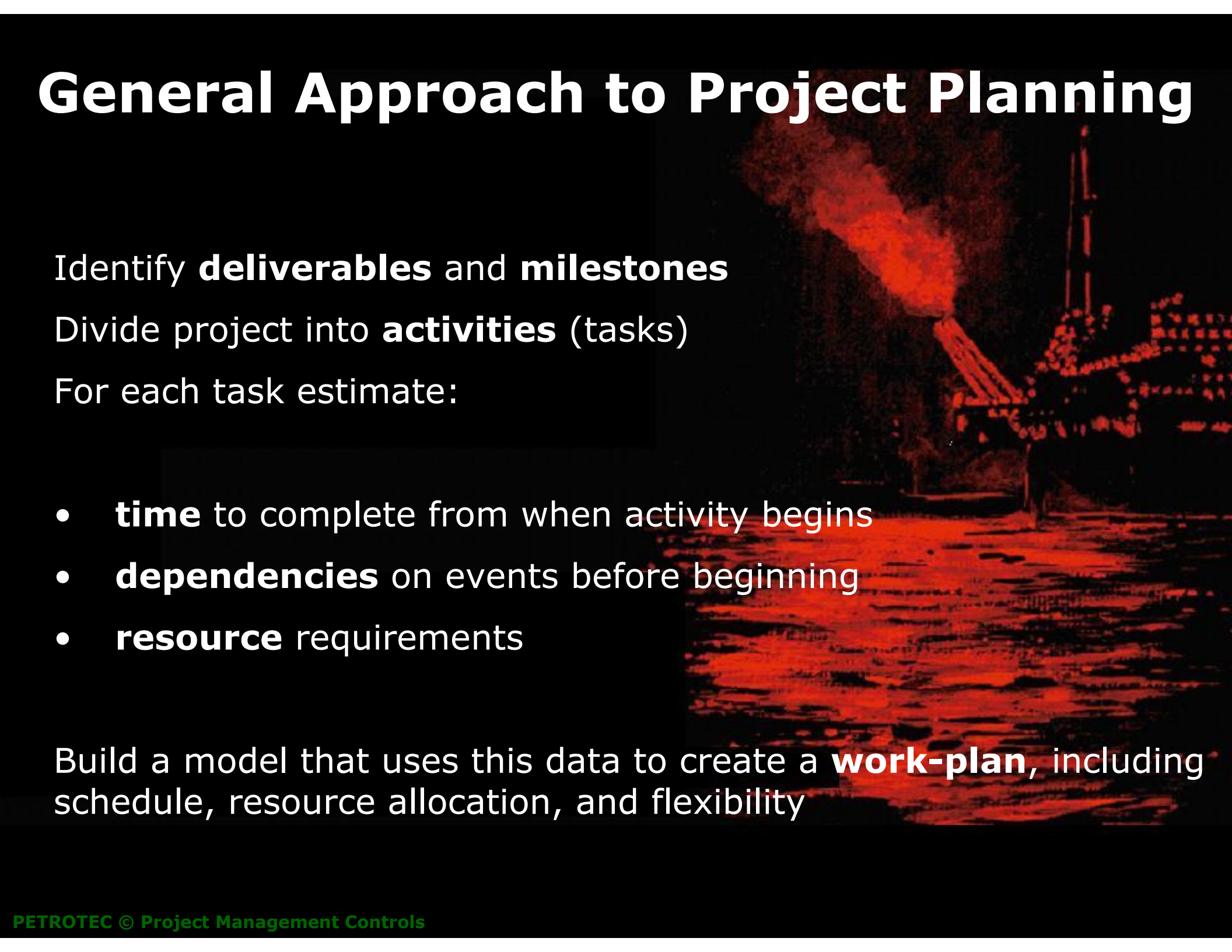
Dependency

An activity that cannot begin until some event is reached

Resource

Staff time, equipment, or other limited resources required by an activity.

General Approach to Project Planning



Identify **deliverables** and **milestones**

Divide project into **activities** (tasks)

For each task estimate:

- **time** to complete from when activity begins
- **dependencies** on events before beginning
- **resource** requirements

Build a model that uses this data to create a **work-plan**, including schedule, resource allocation, and flexibility

Project Planning Methods

Critical Path Method, **Gantt charts**, **Activity bar charts, etc.**

- Build a work-plan from activity data.
- Display work-plan in graphical form.

Project planning software (e.g., Microsoft Project)

- Maintain a database of activity data with input tools
- Calculate and display schedules
- Provide progress reports

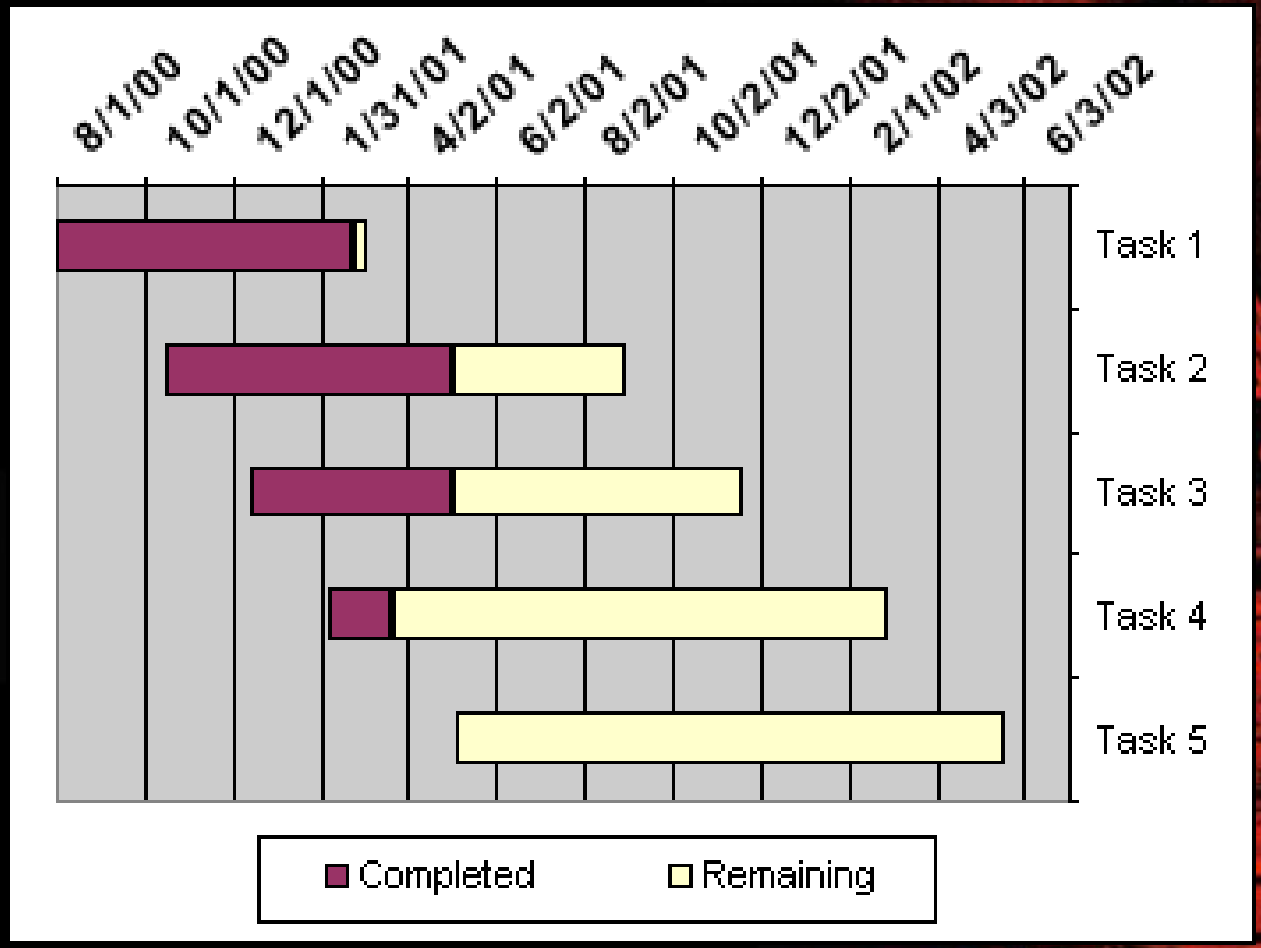
Project Planning Methods

All project planning methods are best when:

1. Plan is updated regularly (e.g., weekly or monthly)
2. The structure of the project is well understood
3. The time estimates are reliable
4. Activities do not share resources

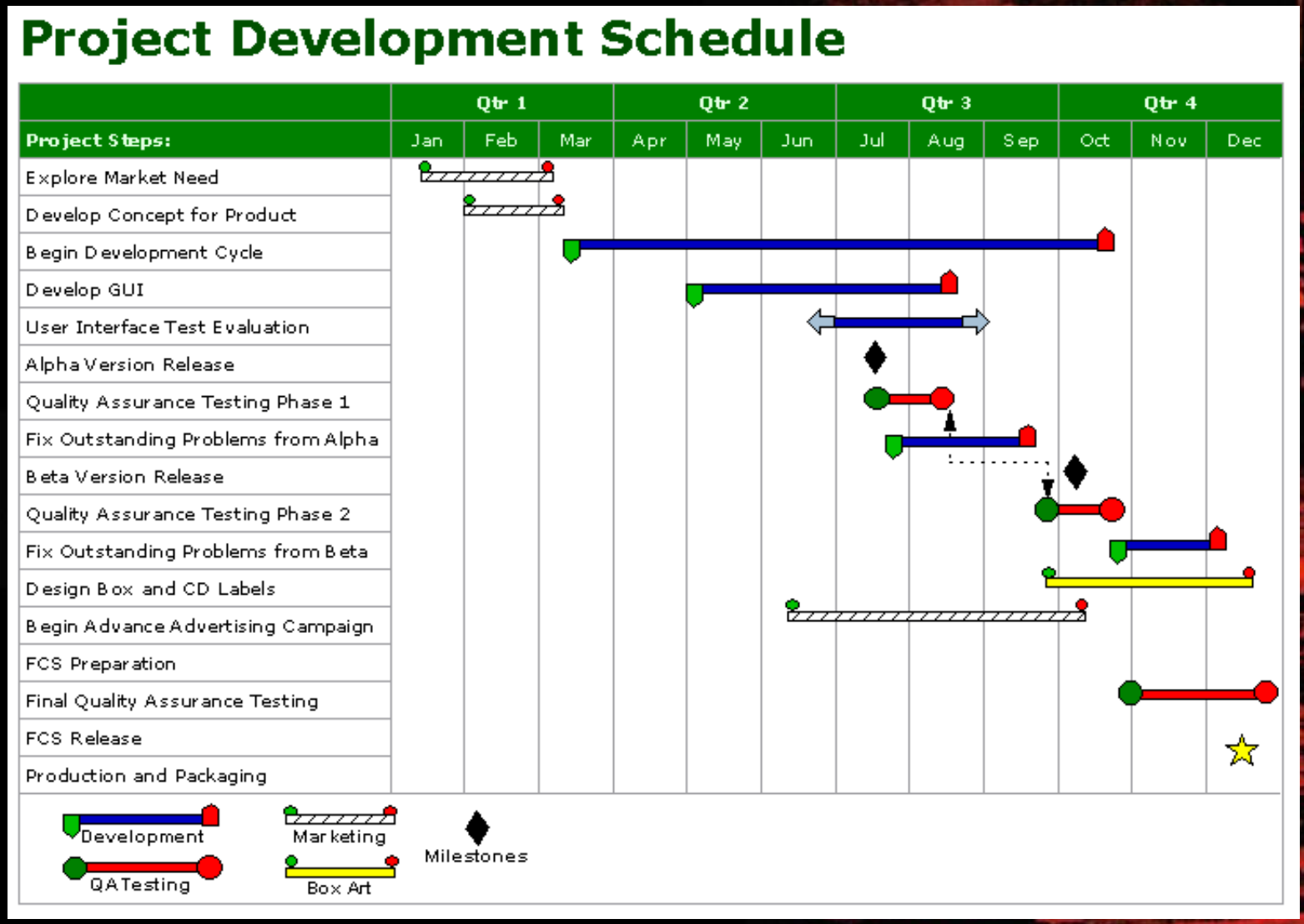
Unfortunately, #2, #3, #4 rarely apply to software development

A Simple Gantt Chart



Source: Microsoft using Excel

A More Complex Gantt Chart

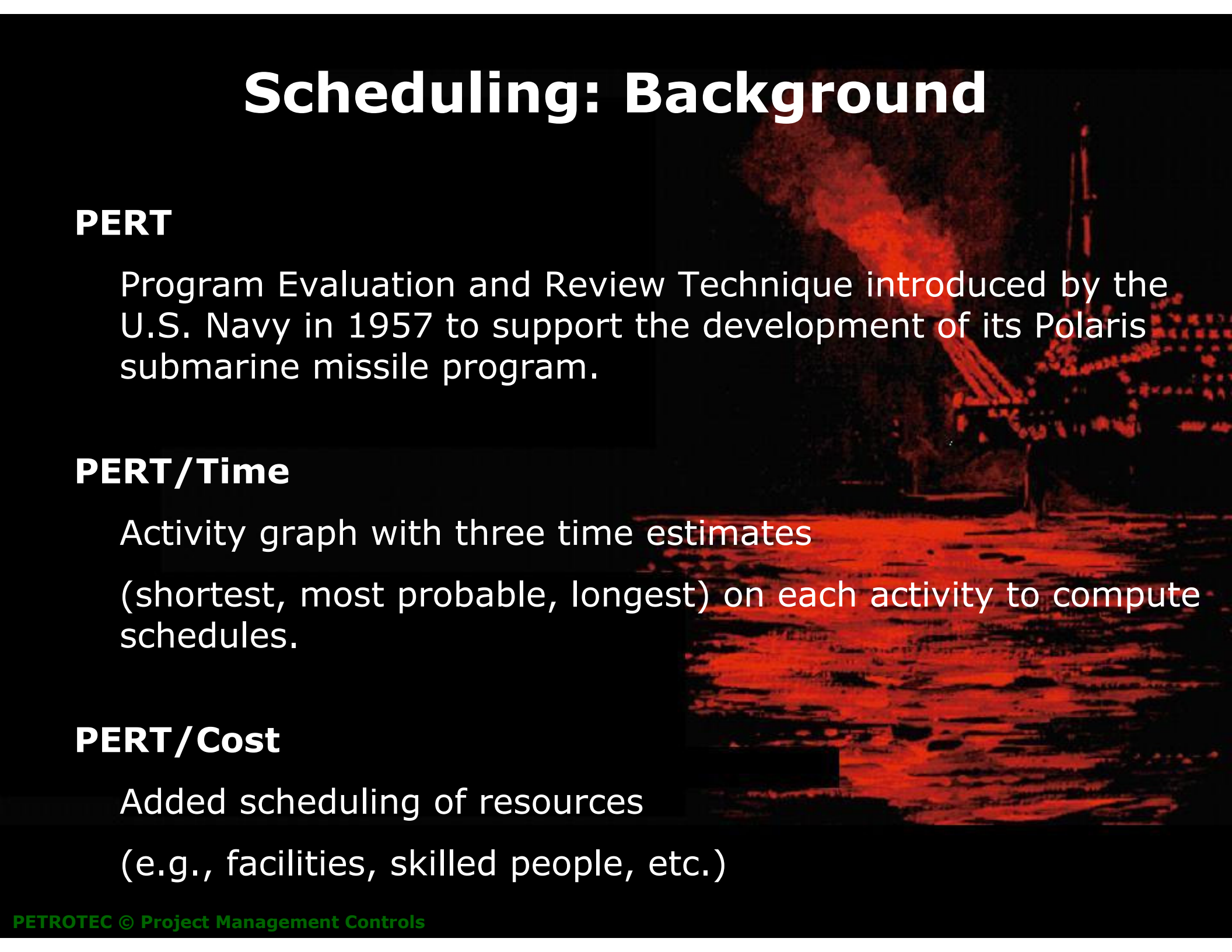


Smart Draw, MS Project, Primavera 3, Winpcs,
Petrotec MCCS

Gantt Charts

- Dates run along the top (days, weeks or months).
- Each row represents an activity. Activities may be scheduled sequentially, in parallel or overlapping.
- The scheduled for an activity is a horizontal bar. The left end marks the planned beginning of the task. The right end marks the expected end date.
- The chart may be updated by filling in each activity to a length proportional to the work accomplished.
- Progress to date can be compared with the plan by drawing a vertical line through the chart at the current date.

Scheduling: Background



PERT

Program Evaluation and Review Technique introduced by the U.S. Navy in 1957 to support the development of its Polaris submarine missile program.

PERT/Time

Activity graph with three time estimates

(shortest, most probable, longest) on each activity to compute schedules.

PERT/Cost

Added scheduling of resources

(e.g., facilities, skilled people, etc.)

Critical Path Method

Uses **Activity Graph** with single time estimate for each activity to estimate:

earliest start date -- every activity begins at first possible time

latest start date -- every activity begins at the last possible time

slack -- difference between the latest and earliest start dates

A standard method for managing large construction projects.

On big projects, activity graphs with more than 10,000 activities are common.

Estimating the Time for an Activity

With experienced staff, estimating the actual time to carry out a single task is usually fairly accurate, but ...

The little bits and pieces are underestimated ?

- The time from almost "done" to completely "done" is much longer than anticipated.

  (There's just one thing to tidy up. I need to put the comments into better shape. I really should get rid of that patch.)

- The distractions are not planned for.

  (My system crashed and I decided to upgrade the software. My child's school was closed because of snow. I spent the day showing visitors around.)

- Some things just have to be done twice.

Start-up Time

On a normal project, the start-up time is typically three to six Months (Or Much Longer!!!!!):

- Personnel have to complete previous projects (fatigue) or be recruited.
- Hardware and software has to be acquired and installed.
- Staff have to learn new domain areas and software (slow while learning).
- Clients may not be ready.

Final Analysis with Critical Path Method

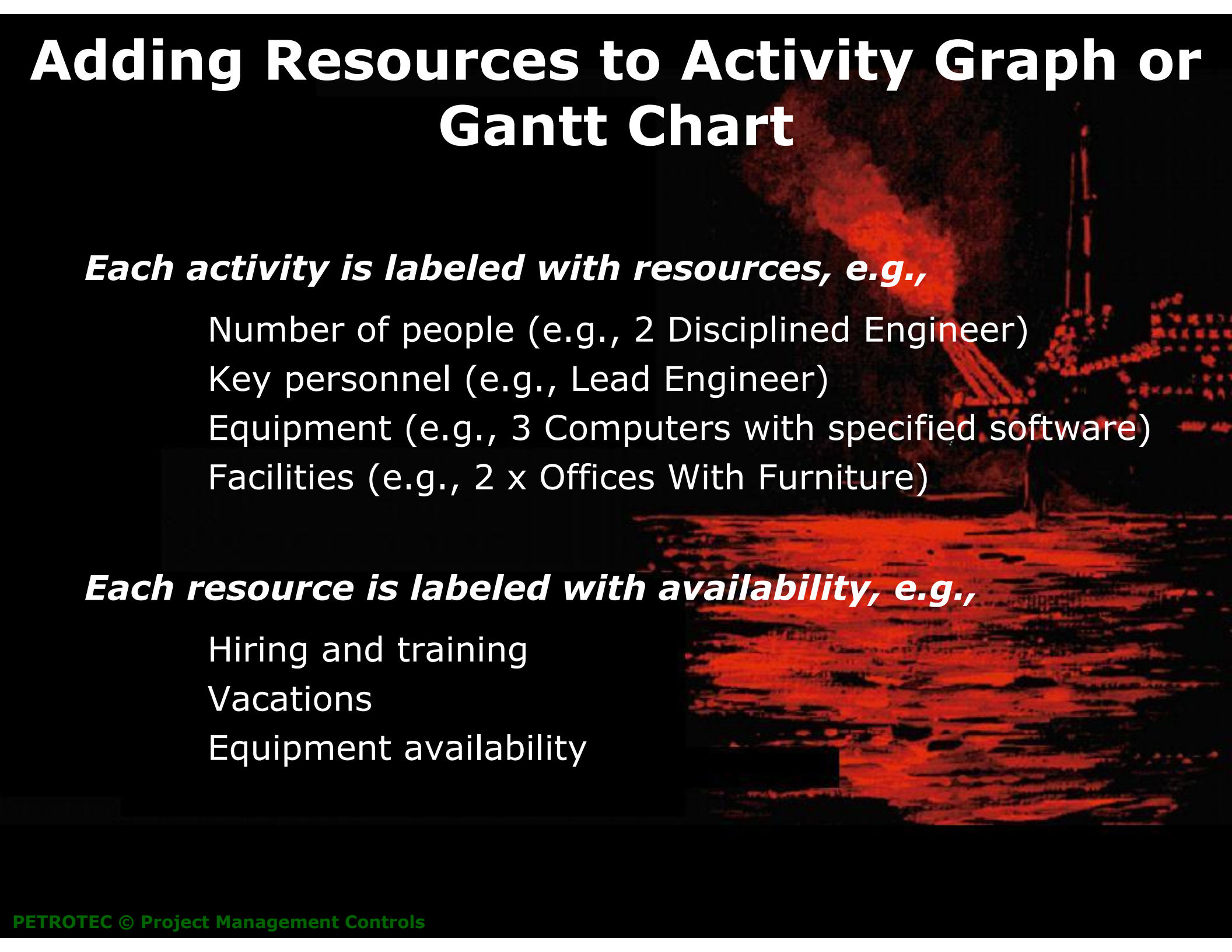
Administrative computing department used the Critical Path Method for implementation phase of major projects (plan developed after project was well-understood).

Experience: Elapsed time to complete projects was consistently 30% to 40% longer than predicted by model.

Analysis:

- Some tasks not anticipated (incomplete understanding)
- Some tasks had to be redone (change of requirements, technical changes)
- Key personnel on many activities (schedule conflicts)
- System ZZZ (non-billable hours)

Adding Resources to Activity Graph or Gantt Chart



Each activity is labeled with resources, e.g.,

Number of people (e.g., 2 Disciplined Engineer)
Key personnel (e.g., Lead Engineer)
Equipment (e.g., 3 Computers with specified software)
Facilities (e.g., 2 x Offices With Furniture)

Each resource is labeled with availability, e.g.,

Hiring and training
Vacations
Equipment availability

Using Critical Path Method for Resources

Assume every activity begins at earliest start date:

In each time period, calculate:

- resources required
- resources available

Identify shortage / surplus resources

Adjust schedule

- acquire extra staff (e.g., consultants)
- rearrange schedule (e.g., change vacations)
- change order of carrying out activities

The earlier that a problem is known, the easier it is to fix.

Key Personnel:
The Mythical Man Month

In computing, not all people are equal

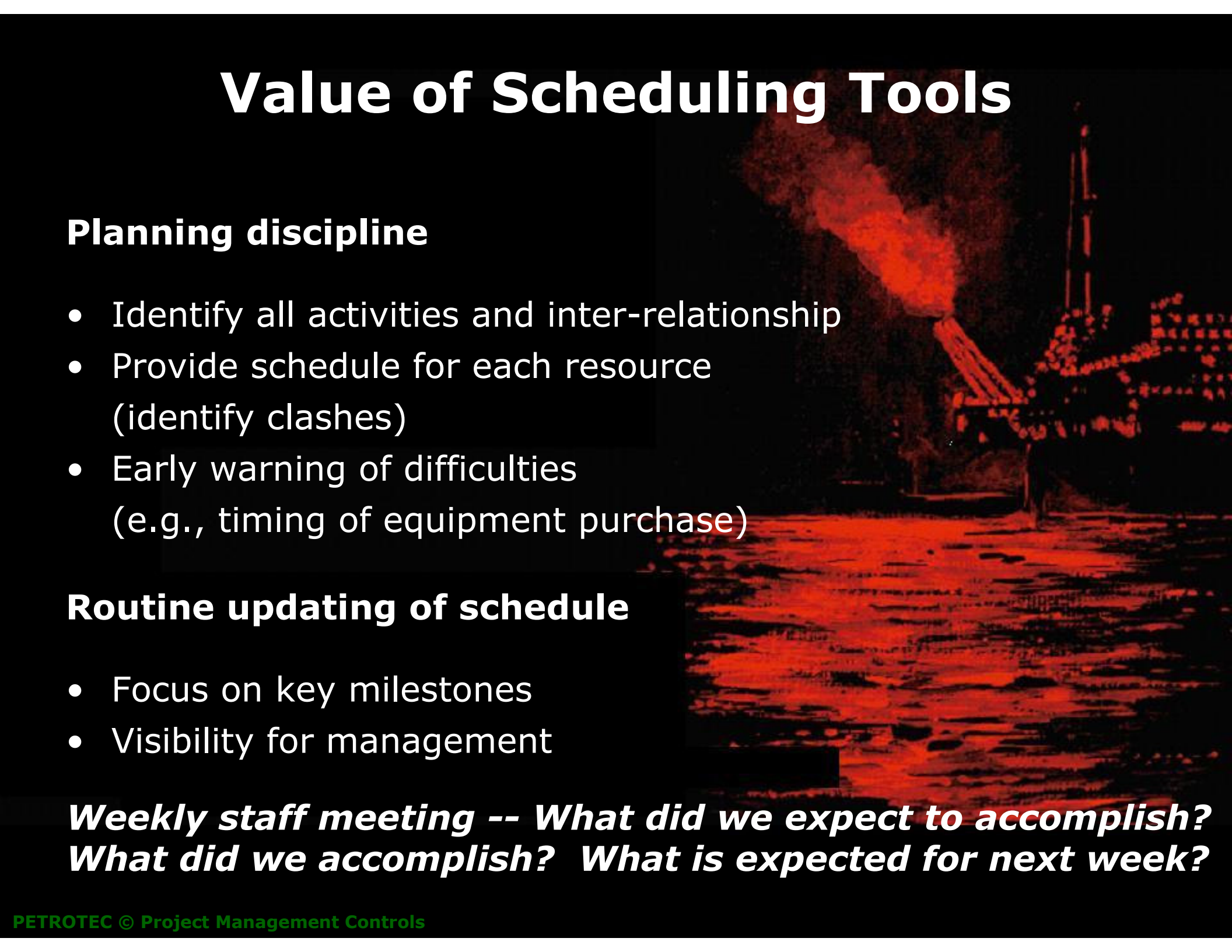
- The best are at least 5 times more productive.
- Some tasks are too difficult for everybody.

Adding more people adds communications complexity

- Some activities need a single mind.
- Sometimes, the elapsed time for an activity can not be shortened.

What happens to the project if a key person is sick or quits?

Value of Scheduling Tools



Planning discipline

- Identify all activities and inter-relationship
- Provide schedule for each resource (identify clashes)
- Early warning of difficulties (e.g., timing of equipment purchase)

Routine updating of schedule

- Focus on key milestones
- Visibility for management

Weekly staff meeting -- What did we expect to accomplish? What did we accomplish? What is expected for next week?

The Project Manager

- Create and maintain the schedule.
- Track progress against schedule.
- Keep some slack in the schedule (minimize ***risk***).
- Continually make adjustments:

  Start activities before previous activity complete
  Sub-contract activities
  Renegotiate deliverables

- Keep senior management informed (***visibility***).

Updating the Plan

A PROJECT PLAN IS USELESS IS IT IS NOT UPDATED:

- Whenever changes occur
- On a regular schedule (weekly or monthly)

The project manager needs the support of the head of the development team and the confidence of the team members.

A realistic, current project plan is an essential part of **visibility**.