NPTEL MOOC,JAN-FEB 2015
Week 1, Module 3

DESIGN AND ANALYSIS OF ALGORITHMS

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Example 2: Xerox Shop

- Campus Xerox has several photocopiers
- Tomorrow is the deadline for BTech projects and there is a rush of reports to be printed
- How to schedule the pending jobs most effectively?

Xerox Shop …

- The number of pages for each job is known
- Each customer has been promised delivery by a deadline
  - Campus Xerox offers discount if deadline is not met
- How to sequentially allocate the jobs to photocopiers to maximize revenue?

Xerox Shop …

- Brute force
  - Try all possible allocations
    - Choose one that is optimum
- Number of possibilities is exponential!
- Even with 30 jobs, it would take hours to compute an optimal schedule

Xerox Shop …

- Decompose the problem
- Choose a job to schedule first, and the machine on which it will run, according to some strategy
- Now, recursively solve the problem for N-1 jobs

Xerox Shop …

- **Greedy approach**
  - Fix the choice of next job once and for all
  - Never go back and try another sequence
- How to choose the next job?
  - Shortest processing time?
  - Earliest deadline?
- How to show that this strategy is optimal?

Variations

- Some photocopiers are old and slow, some are new and fast
  - Time for a job depends on choice of machine
- Cost of ink and paper varies across machines
  - Net revenue for a job depends on choice of machine

Variations

- Account for set up time between jobs
  - Need to reserve time slots to reload paper
- Is there a valid greedy strategy?