CMSC 401 – Fall 2016

Assignment 2
(due Tuesday 10/11 – 11:59pm)

Dr. Eyuphan Bulut

CMSC 401- Algorithm Analysis with
Advanced Data Structures
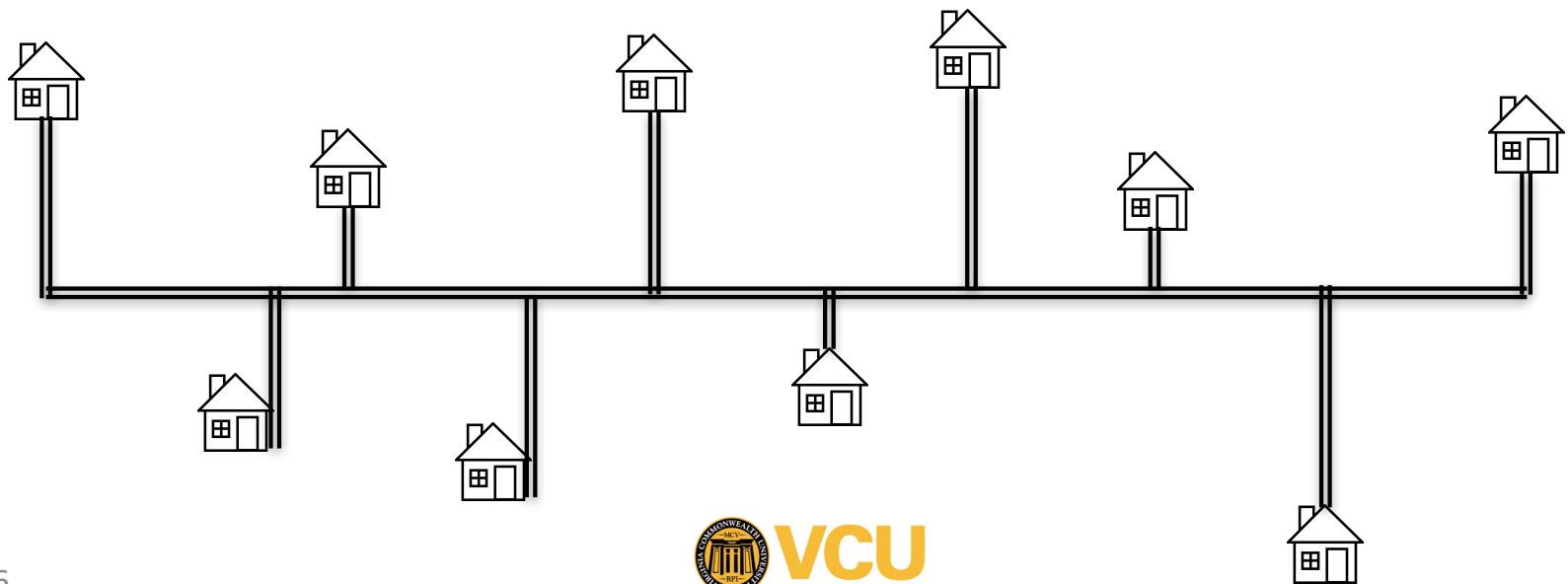
Optimal Power Line Location

- Power distribution company is planning a main power line from east to west (x-axis) across its distribution area
- The area has n houses
- The company wants to connect each house directly to the main power line with smaller power lines in north-south direction (y-axis)
- Your task is to estimate the optimal position (on the y-axis) of the main power line, so that the total length of smaller power lines is the shortest.

Assignment 2

Write a program cmsc401.java that
- takes as input
  - in the first line, the number of houses n, n>=2, n<1,000,000
  - in each consecutive line (from 2nd to (n+1)-th line), the y-coordinate of one house (integers in the range 0 to 1,000,000,000)
- returns as output
  - a single number: the y-coordinate where the main power line should be built
  - only one number, no comments, prompts etc.

- Use standard I/O to read input (System.in, System.out) and write the result
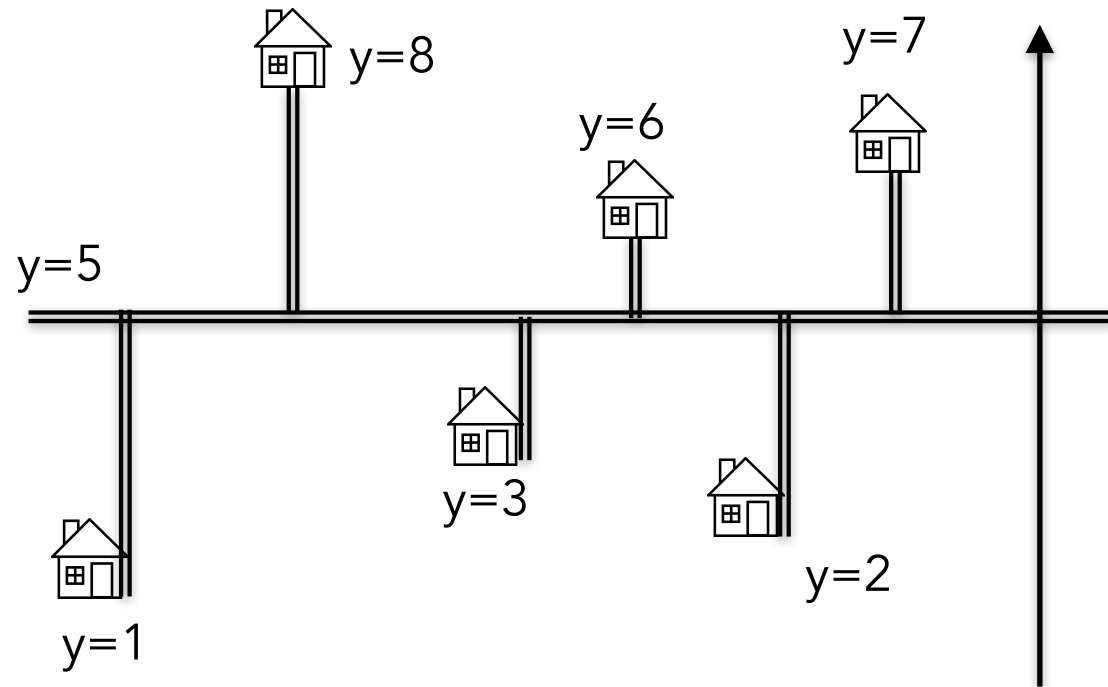- Make sure the program compiles

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Example

Input

6
1
8
3
6
2
7

Output

5

y=8

y=7

y=6

y=5

y=3

y=1

y=2

Total length of smaller power lines: 15
This is the minimum possible length.
There might be other results with the same minimum

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Hints

- Think about the solution over examples
- Consider the y-coordinates of houses as an array of size n
- Design a divide & conquer algorithm like quicksort
  - Use recursive approach with an appropriate *Partition-like* method
- Try to use the asymptotically fastest method
  - Aim at expected linear time O(n)
  - Slower methods will get lower score even it is correct
- There may be several correct solutions, return one of them.

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Submission

- Date due: Tuesday, Oct 11th, 11:59 pm

- Upload through Blackboard
  - Your submission should be a zip archive 2_FamilyName_FirstName.zip containing
    - Java source code in a file cmsc401.java (**all low case letters!**)
      - The file should have your name in a comment in the first line
      - Remember: in Java, class name should match the file name, and is case sensitive

- Please do NOT create your own packages
- Do NOT place the file into a folder – just zip the file

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