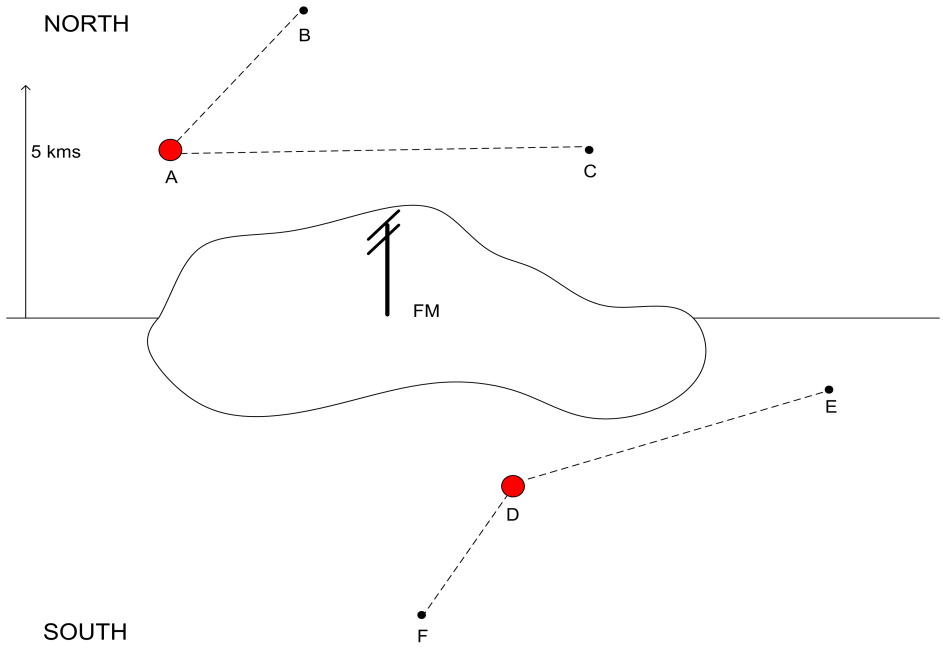
Re-Quiz 3
Connectivity Challenges
ICT4D 2005

Part 1 (40%)

Consider the following very common scenario in a developing region.

- Villages B and C are connected to A (capital of the North Region) by means of an IEEE 802.11b outdoor link
- Village E and F are connected to D (capital of the South Region) by means of an IEEE 802.11b outdoor link
- The capital A, acts as a gateway for the North Region and routes all traffic of B and C to the Internet via a VSAT gateway. The VSAT gateway in the North Region has a total capacity (down/up) of 512/128 Kbps at the price of 1000 USD/month
- Similarly, the capital D acts as a gateway for the South Region and routes all traffic of E and F. VSAT traffic prices in South Region are 50% cheaper. The VSAT gateway in the South Region has also a total capacity (down/up) of 512/128 Kbps at the price of 500 USD/month
- The North and South Regions are separated by a mountain. At the top of the mountain there is a mast used by a commercial FM radio station.



Your goal is to enable voice and data services between the villages of the North and South Region and the global Internet. You should aim for the lowest possible cost.

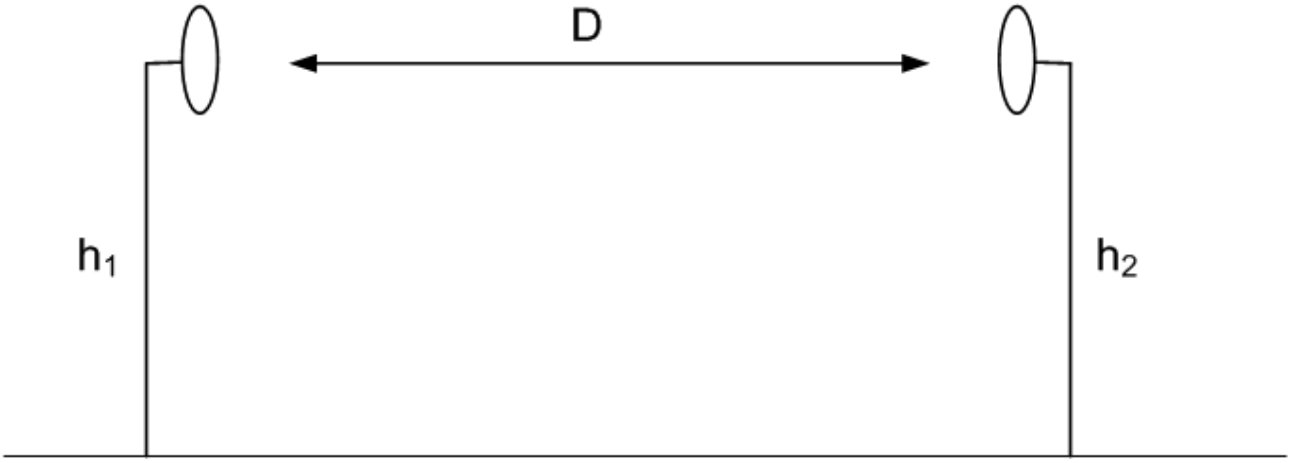
List at least two possible alternatives and justify your answer. Which solution do you consider the best one?

Part 2 (20%)

Describe all the permissions that are necessary to implement your design.

Part 3 (40%)

We want to connect two villages by means of a IEEE 802.11b outdoor radio link.



The transceivers have a transmission power of 15 dBm and a sensitivity of -95 dBm for 1 Mbps. The villages are separated D=4 kms from each other; the FSPL for that distance is known to be -112.4 dB.

In order to build the radio we have two antennas of 8 dBi available and LMR400 low-loss cable. LMR400 cable has a loss of 0.22 dB/meter

Assuming that:

- The transceivers are placed at the bottom of each of the radio towers. (i.e. The cable length is equal to the radio tower's height)
- Both radio towers have the same height (h1=h2). (i.e. Symmetrical radio link budget)
- The losses in connectors are 0 dB.
- The maximum transmitted power (in the air) due to legal regulations is 100 mW/20 dBm.

With the help of the link budget tool

1. What is the minimum length of cable needed to comply with the max. power legal requirements?
2. What is the maximum length of cable or height of tower possible to have the link working properly? Allow a 6 dB margin.

You can include screen shoots of the calculations. Justify your answers with your own words.