Wireless Network Planning

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Objectives

Understanding that:

- A good plan needs a good budget
- A good budget demonstrates that you have a good plan
The objectives are NOT

- To provide the **plan** for its implementation
- To provide **the budget** for its implementation
Table of contents

- Viability study
- Implementation plan
- Budget
- Licenses and permissions
- Import and acquisition of equipment
- Implementation phase
- Contracts and quality assurance
Viability study

- Where is the nearest Internet access point located?
- Weather and terrain conditions
- Transport accessibility
- Legislation (radio/towers)
Implementation plan

1) Network topology
2) Radio simulations
3) Equipment selection
Implementation plan

- Network Topology
  - Central tower/mast
  - Wireless repeaters
  - Clients
Implementation plan

- Radio simulations
  - Radio Mobile
  - GPS coordinates
- Radio link budget calculation
- Available line of sight
Equipment selection

- Functionality (Quality of service, traffic conformation)
- Price range
- Availability
- Indoors or outdoors?
Budget

- Hardware budget
- Human resources
Hardware budget

- Radio and network equipment
  - Electric grounding, lightning protection
- Hand tools
- Climbing gear, walkie-talkies, aluminum ladder, backpack to carry equipment, GPS, maps, binoculars, flashlights, ropes, tape, standard tool box.
Hardware budget

- Power
  - UPS, solar panels and charge regulator, storage battery
- Infrastructure (tower / masts)
Equipment kits

- Central hub
- Wireless repeater
- Outdoor CPE
- Indoor CPE
Central hub

- Radio: outdoor access point(s)
- Power: Solar or grid
- Antenna: Depends on expected area coverage
- Mounting: To be mounted in central tower
Central hub

• Electric power fluctuation: Surge protection
• Power backup: Generator, storage battery, solar panel and charge regulator
Wireless repeater

- Radio: Two outdoor units
- Power: Solar or grid
- Antenna: Depends on expected area coverage
- Mounting: Pole and wall mount brackets (typically)
Wireless repeater

- Electric power fluctuations and Lightning protection
- Power backup: generator, backup battery, solar panel and regulator, etc.
Wireless outdoor CPE

- Radio: One outdoor unit
- Power: Grid
- Antenna: Internal or external directional antenna type depending on gain and distance
Wireless outdoor CPE

- Mounting: Pole and wall mount brackets
- Electric power fluctuations and lightning: Surge protection
- Power backup: UPS
Wireless indoor CPE

- Power: regular power cord
- Antenna: Internal or external directional antenna with RF cable.
- Mounting: Pole and wall mount brackets
Radio: One indoor unit

Electric power fluctuations and lightning:
Surge protection

Power backup: UPS
Practical installation
Human resources

- Estimated work load
- Local transportation
- Accommodation and permits
- Communications
- Administrative expenses
Licences and permits

- Permission to build a tower (see “Communication Tower”)

- Owner of the premises / tower / plot

- Authorities that regulate the airspace in the country
Licences and permits

- Requirements to operate IEEE 802.11 equipment
  - Unlicenced (free licence with limitations)
  - Licence required
Licences and Permits

- “Unlicenced” implies that a license is not required
- “Unlicenced” does not mean unregulated
- Maximum power output is regulated
Licences and Permits

- Regulations vary from country to country
- Normally, licenses are handled by the “Ministry of Communications”
Licences and Permits

- Brasil, Honduras, Nicaragua, Anguila, Jamaica, Colombia, México, Perú(*) and Venezuela
  - Free use of 2.4 and 5.8 GHz with some constraints: maximum power, antenna gain, open spaces.
  - (*) rural areas
Licences and Permits

- Argentina, Ecuador, Costa Rica, El Salvador
  - 2.4 and 5.8 GHZ require registration, with constraints
- Paraguay
  - 2.4 requires concession, licence or autorizacion
Equipment acquisition

- Local acquisition
  - Heavy and bulky equipment
  - Locally manufactured
- Imports
  - Equipment not available in local markets
Imports

・ Rules and regulations
  ✔ Revenue Authority
  ✔ Chamber of Commerce
  ✔ Trade Council
Most common import documents

- Pre-shipment inspection
- Proof of origin
- Trading invoice
- Transport insurance
Import tax and VAT

- Based on **cost** of equipment
- Based on **type** of equipment
- Ranges from 0% to 20-30%
- Make sure that your imported goods are correctly classified
Import tax and VAT

- VAT adds to import tax
- VAT varies from 10 to 20%
Implementation phase

- Before starting up:
  - Acquisition and shipment of equipment
  - Licences and permissions obtained and payed

- Implementation time (weather conditions)

- Team project (expertise)
General advice about contracts

- Delivery time
- Transportation
- Installation
- Guarantee
- Exchange rate
Public tenders

- Prepare in advance a good specification
- Specify what you want and what you do not want
- Let someone with more experience revise your specification. Involve external experts
Public tenders

- Do not forget: tests and evaluation
- Expect quality, demand quality!
Quality assurance

- Test the equipment and compare labels
- Revise specifications
- ¿What do you want? ¿How can it be measured?
- ¿What can be guaranteed?
- ¿Who's to be blamed? :-)

Conclusions

- You do not need to be a genius to plan and budget a wireless network implementation. Be realistic and a bit “pessimistic”

- A good implementation plan from the beginning will save you lots of trouble (and money) at the end of the project
Conclusions

• Budget must include bringing internet and electricity to the site, obtaining licences, ensure lightning protection, transportation, tools

• A budget *per se* is not a good plan. But a good plan has a good and detailed budget