

Unit 20



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



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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



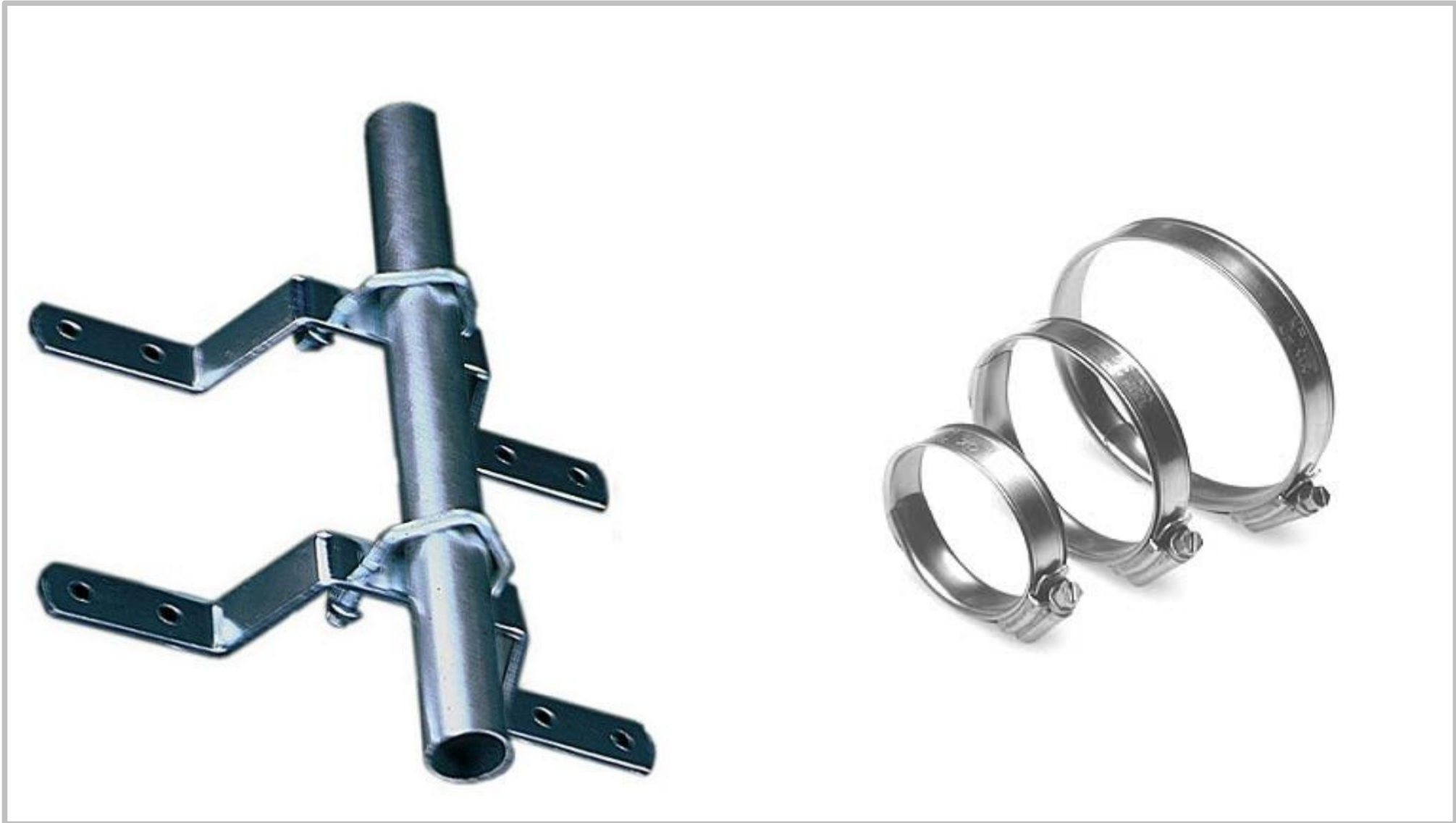
- ◆ Power: regular power cord
- ◆ Antenna: Internal or external directional antenna with RF cable.
- ◆ Mounting: Pole and wall mount brackets

Wireless indoor CPE



- ◆ Radio: One indoor unit
- ◆ Electric power fluctuations and lightning:
Surge protection
- ◆ Power backup: UPS

Practical installation





Human resources

- ◆ Estimated work load
- ◆ Local transportation
- ◆ Accomodation 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
 - ✓ Unlicensed (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



- ♦ Brazil, 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 authorization

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