

Wireless Networking Training Kit Team

Cotonou, Benin
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The Abdus Salam
**International Centre
for Theoretical Physics**

Ermanno Pietrosevoli

<http://www.eslared.org.ve>

- Ermanno is a telecommunications professor at the Universidad de los Andes in Mérida, Venezuela.
- He is also the president of Fundación Escuela Latinoamericana de Redes, EsLaRed, a non profit organization dedicated to training and development activities in ICT.
- Ermanno has been collaborating with ICTP training activities since 1992

Marco Zennaro

<http://wireless.ictp.it>

- Marco is with the Aeronomy and RadioPropagation Laboratory of the ICTP.
- His research interest is in Wireless Sensor Networks.
- He claims he understands French.

Antoine Bagula

<http://wirelessU.org>

- Antoine is with the University of Cape Town in South Africa.
- His interest is in Network Engineering and Wireless Sensor Networks.
- He is from DRC.

Carlo Fonda

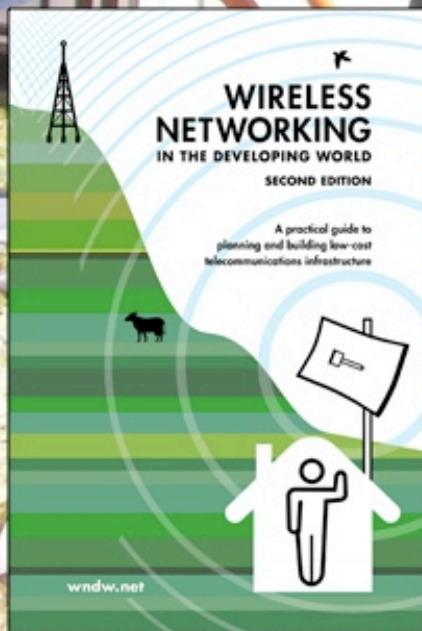
Abdus Salam International Center
for Theoretical Physics

- Wireless trainer at ICTP for 10 years
- Has performed network installations in Nigeria, Ghana, Malawi, Galapagos, Italy, and Venezuela
- Engineered a 279 km Wi-Fi link in the Andes mountains in Venezuela
- Contributor to WNDW and the ICTP Antenna Handbook



Rob Flickenger

Hacker Friendly LLC



- Editor of *Wireless Networking in the Developing World*
- Producer of WirelessU.org
- Teacher at the ICTP since 2004
- Author and editor of several O'Reilly books, including *Linux Server Hacks* and *Wireless Hacks*
- Proud hacker and technology advocate

Pleased to meet you!



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The Wireless Training Kit

Materials for training tomorrow's wireless trainers



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Training kit in-a-box

A black, rugged, open carrying case with a foam interior, containing various electronic equipment and materials. The case is shown from a three-quarter perspective, with the lid open and the contents visible. The background is a dark, gradient blue.

- Includes all equipment and materials needed to hold a wireless training workshop
- Books, access points, training materials, spectrum analyzer, and other gear are configured and ready-to-present
- Ensures compatibility and consistency in teaching methods

Wireless Networking

- Low-cost Access Points
- Nanostation wireless clients
- Inexpensive wireless devices for mesh
- 12 dBi patch antennas
- All connectors and adapters are included



Access Point

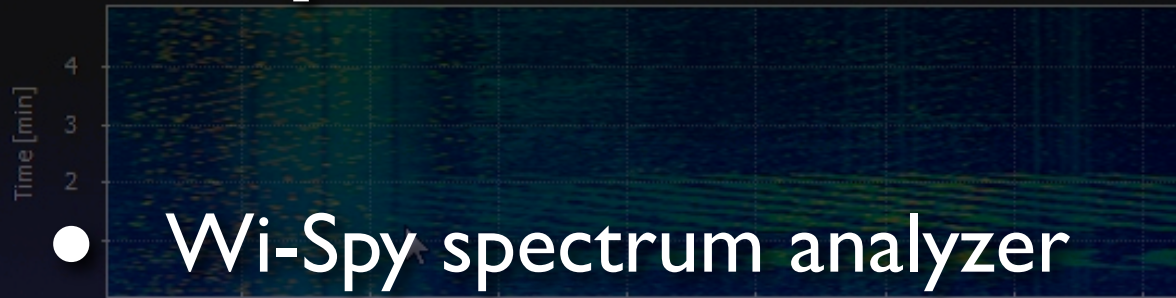


Wireless Client

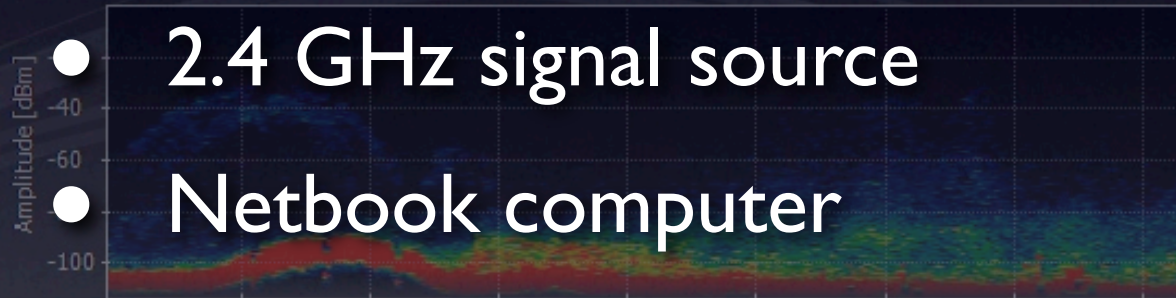


Mesh Node

Spectrum Analysis



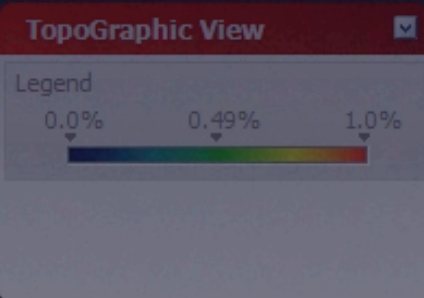
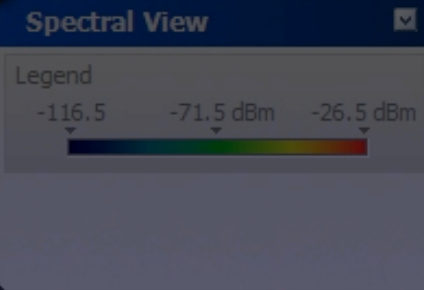
- Wi-Spy spectrum analyzer



- 2.4 GHz signal source
- Netbook computer



- Reference 2.4 GHz antenna
- Useful for demonstrating interference and long distance antenna alignment



Planar View

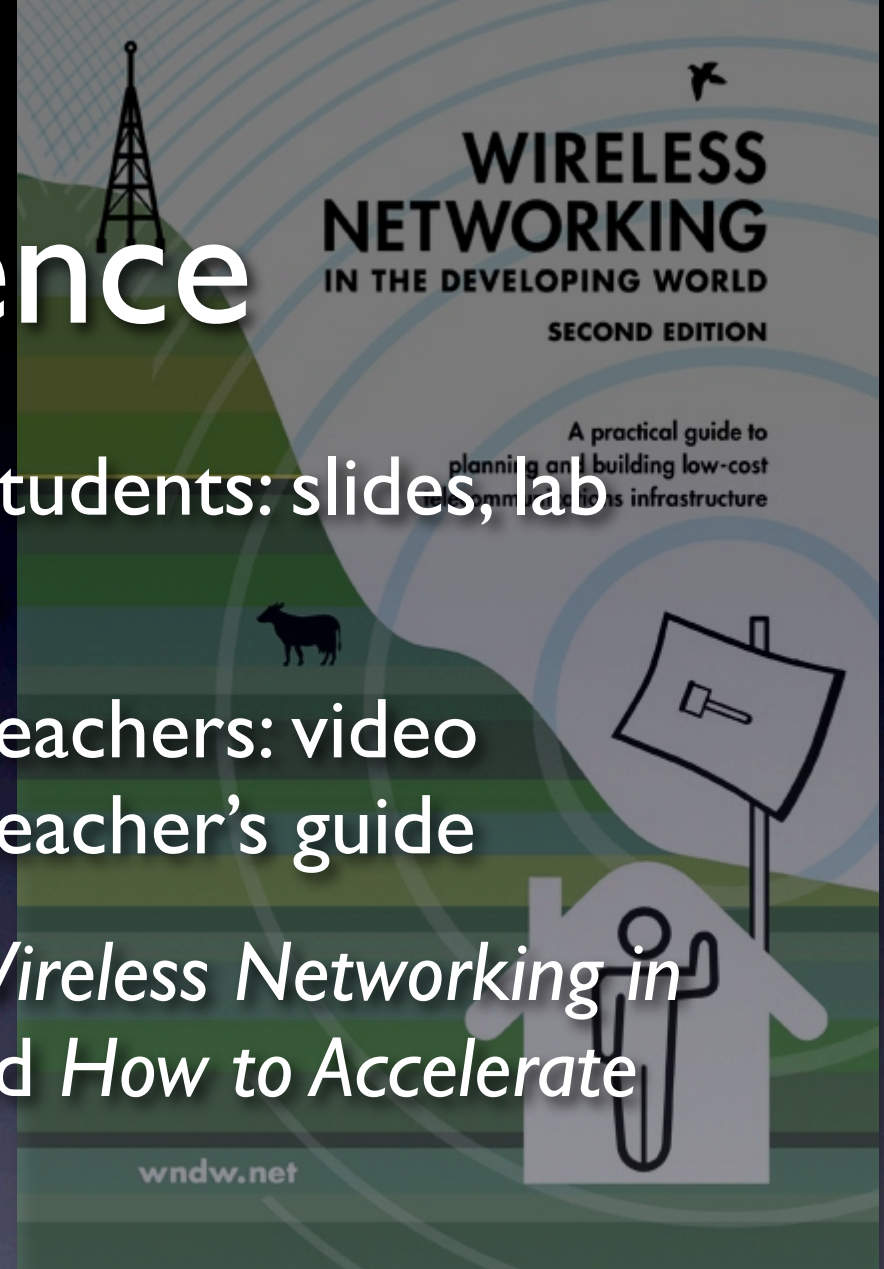
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■	2416.3	-95.5	-94.2	-35.0

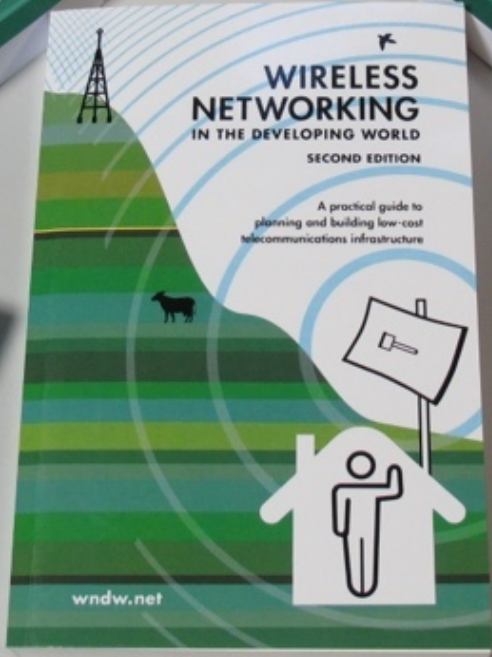
Antenna Construction

- Microwave connectors
- Pigtail cables for supplied wireless devices
- Construction guide
- Example pre-drilled “cantenna”

Reference

- Training materials for students: slides, lab activities, and exercises
- Training materials for teachers: video lecture examples and teacher's guide
- Copies of the books *Wireless Networking in the Developing World* and *How to Accelerate Your Internet*
- Books are available in English, Spanish, French, Portuguese, Arabic, and Indonesian







Example video lectures on DVD

Programme - day 1

MONDAY - Topic: *Radio physics and antennas*

morning:

LECTURE: Radio physics (C) (30 minutes)

LECTURE: dB math (M) (30 minutes)

LECTURE: Antennas and transmission lines fundamentals (E) (60 minutes)

lunch break

afternoon:

LECTURE: Comparative Use of Unlicensed Spectrum (VIDEO, 20 minutes)

EXERCISES:

- Working with AirView and video sender (C)

Programme - day 2

TUESDAY - Topic: *Wireless networking*

morning:

LECTURE: Introduction to WiFi (A) (120 minutes)

LECTURE: APs and clients (C) (145 minutes)

lunch break

afternoon:

EXERCISES:

- **Exercise: DIY WiFi antenna (E,C)**
- **AP configuration (M,C)**

Programme - day 3

WEDNESDAY - Topic: *Outdoor wireless*

morning:

LECTURE: How to choose wireless networking equipment (E) <1 hour

**LECTURE: Power over Ethernet, grounding, and lightning protection (E)
1 hour**

LECTURE: Link budget (M) 1/2 hour

lunch break

afternoon:

EXERCISES:

- **Exercise: Link budget calculation and Radio Mobile (M) (1 hour)**
- **Setting up a Wireless ISP (M,C) (up to the end)**

Programme - day 4

THURSDAY - Topic: *Network management and security*

morning:

LECTURE: Site survey, outdoor installation, long distance links (E) 60min

LECTURE: Wireless Security, Wireless Tools (C) (60 minutes)

LECTURE: Network management (Alain) (60 minutes)

afternoon:

EXERCISES:

- finish the WISP exercise
- Network management and wireless tools (Alain, C) (60 minutes)
- Example of site survey and outdoor link (E, C) (90 minutes)

Programme - day 5

FRIDAY - Topic: *Advanced topics and final review*

morning:

LECTURE: Off-Grid Power for wireless networks (E) (60 minutes)

LECTURE: Introduction to Wireless Sensor Networks (M) (30 minutes)

LECTURE: Mesh networking basics (A,M) (30 minutes)

LECTURE: Advanced network management (Alain) ???

lunch break

afternoon:

EXERCISES:

- Dimensioning a solar electrical power system (E)

CASE STUDIES (1 hour)

FINAL REVIEW, Questions and Answers