

ITU Workshop on ICT Innovations

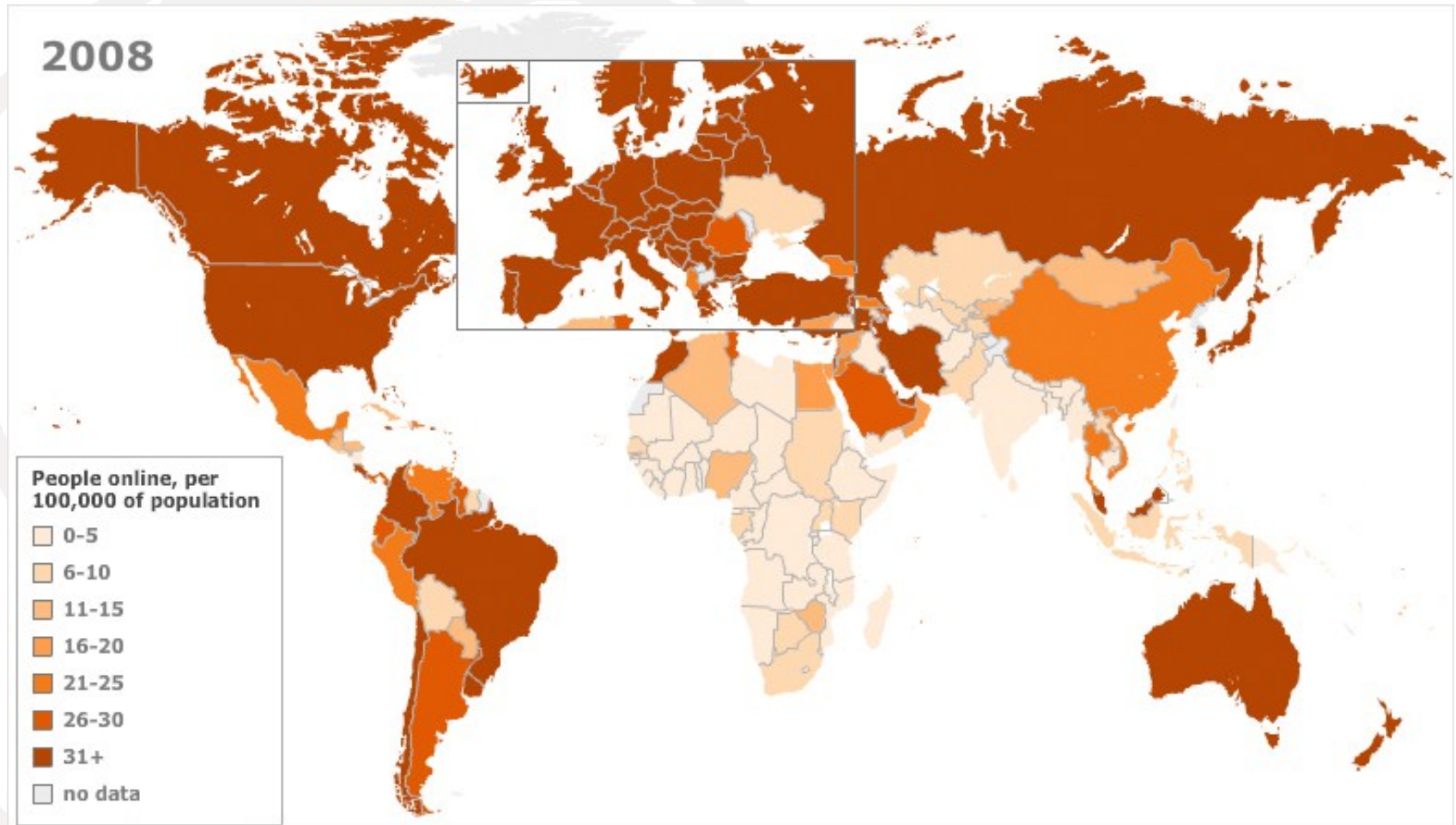
(Geneva, Switzerland, 20-21 March 2012)

**Introducing Technology
to the Developing World:
a sustainable and scalable model
based on continuous and interactive
technological transfer**

**Daniele Trincherio,
iXem Labs – Politecnico di Torino**

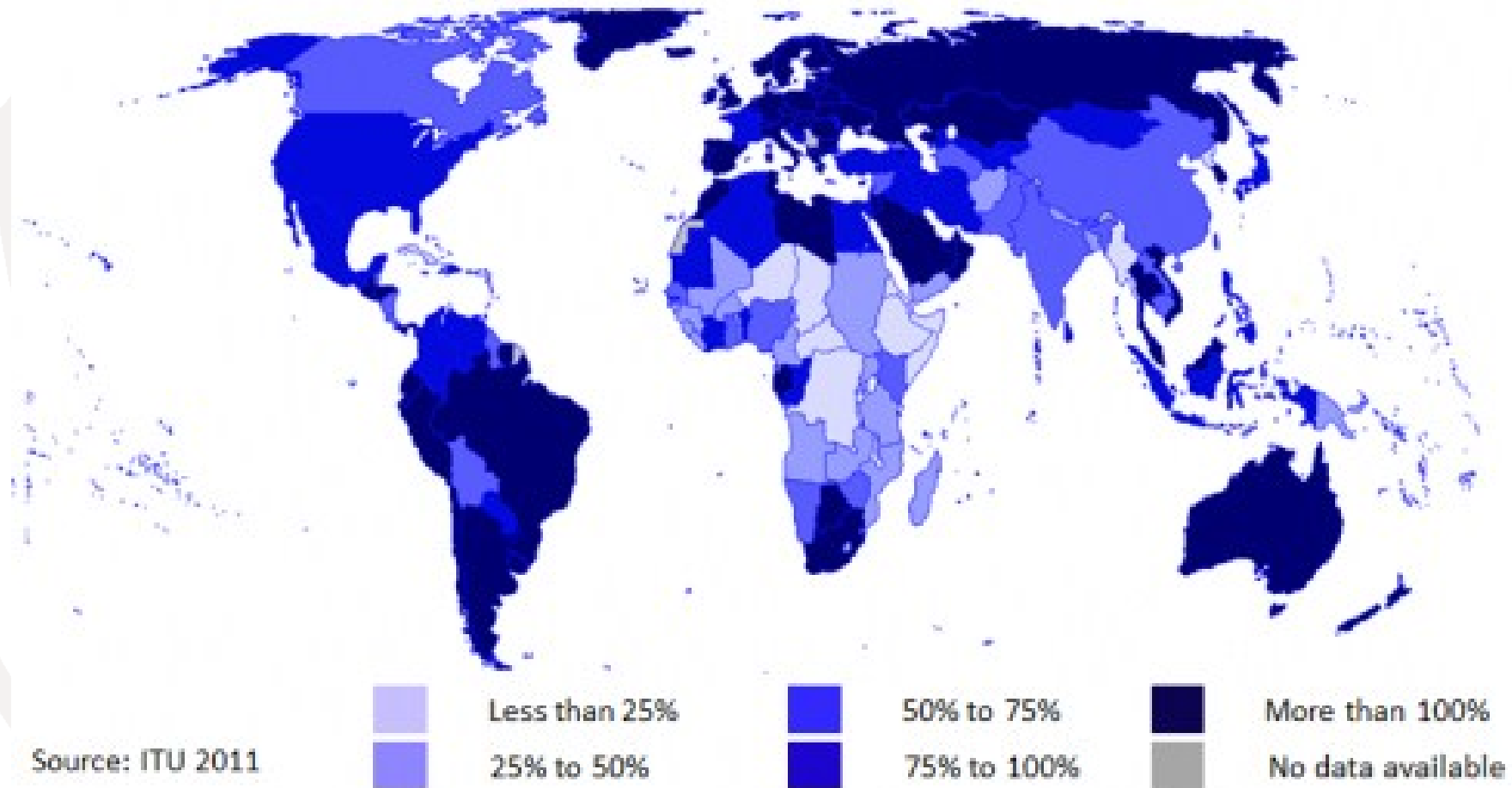
**Daniele.Trincherio@polito.it
#DTrincherio (Twitter)**

Developing World



Developing World

Mobile subscriptions 2010



How to bridge the gap?

- Create infrastructures
- Bring cost-effective technology
- Favor technology access & usability
- Trigger business and economical development
- Consolidate job opportunities
- Identify sustainable and durable realizations

What is "remote"?



Geneva, Switzerland, 20-21 March 2012

Bridging the gap in remote scenarios

- ~~Create infrastructures~~
- ~~Bring cost-effective technology~~
- ~~Help usability~~
- ~~Favor business and economical development~~
- ~~Consolidate job opportunities~~
- Identify sustainable and durable realizations

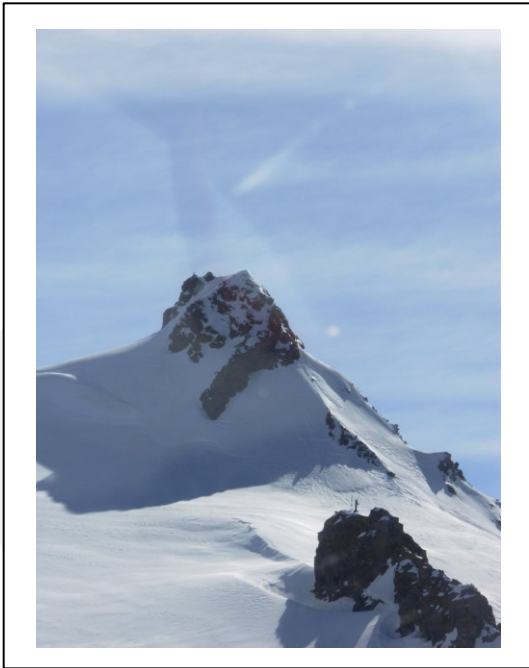
Is broadband coverage present?

- **Landlines:** bad quality, no ADSL
- **3G:** officially present, but expensive, with limited connectivity, due to the complex environment
- **Satellites:** economically unaffordable, non-scalable
- **Wi-Max/LTE/4G/WRAN:** when?
- **Wi-Fi:** maybe, but who is able to set-up such a facility in the jungle?

Is broadband coverage present?



Any idea?



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The idea

- To trigger the use of Internet and/or Communications, TLC Infrastructures should be there
- The local operator has no commercial interest to improve the network
- Foreign Companies/GOs/NGOs/ may set-up an infrastructure, but then?
- The trigger should be born on-site

How to include **VERY** remote places?

- Enrolment of Local Actors
- Technological Transfer
- Continuous Assistance
- Participatory Approach
- Low Cost Platforms
- Transport Information but also Services
- **Open Platforms**

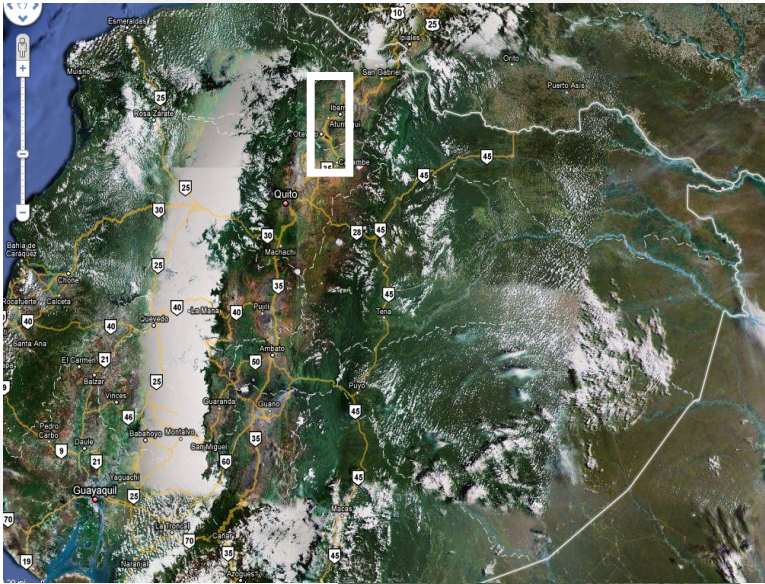
Operatively

- Let's give students a chance to train “on the field”
- Identify low cost and scalable platforms, suitable for application in a harsh (remote) environment
- Involve local stake-holders, to give them the possibility to manage and scale-up the realization
- Look around for funding

Two Examples (more are coming)

- Puerto Francisco de Orellana (Eastern Ecuador, Amazonian Jungle)
in Partnership with InterAmerican Development Bank
- Comoros Islands
(Africa, Mozambique Channel)
in Partnership with **Qatar University**
and Qatari Ministry of Foreign Affairs

The Amazonian Region of Puerto Francisco de Orellana



The Amazonian Region of Puerto Francisco de Orellana

Massive emigration from rural areas

Lack of basic services

Remote villages isolation

Inadequacy of transport and communication facilities and infrastructures

Basic social services

Generally insufficient

Telecommunication facilities

Generally unsatisfactory

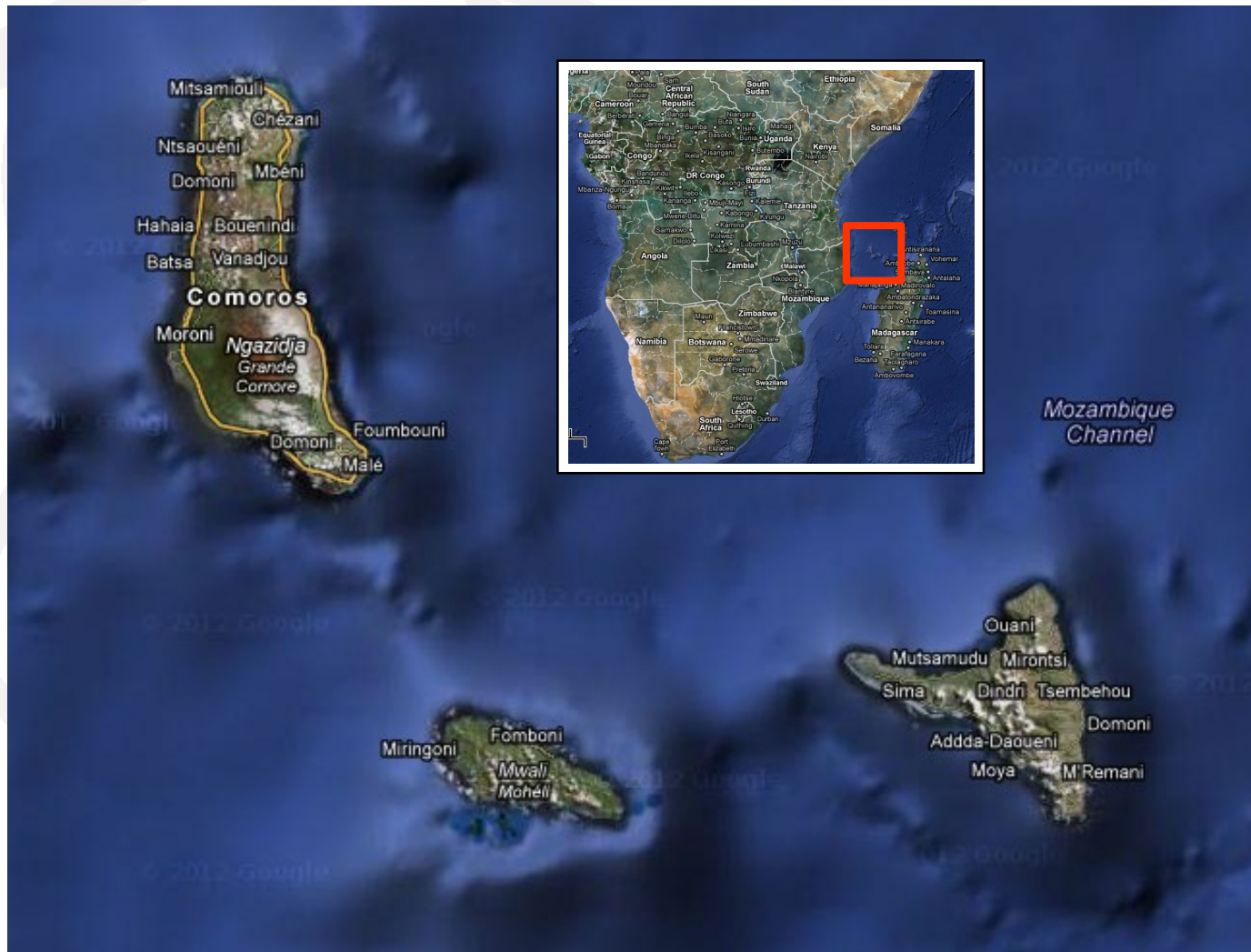
Strategy for a sustainable implementation

- 1. low costs:** the hardware platform is applied in different ways, even recycled technology;
- 2. technological transfer:** local technicians were trained by iXem engineers to build up, control and maintain the network;
- 3. social services:** apart from “Telecentros”, the infrastructure is primarily used for telemedicine and distance learning applications;
- 4. sustainability:** the infrastructure does not need significant or compromising actions for the environment;
- 5. scalability:** the project is designed in order to be scaled up with smooth cost coefficients

Project outcomes

- Extension of the broadband connectivity already available in the capital over a 1600 sqkm area (full coverage), by an IEEE 802.11h infrastructure
- A Telecentro and Public Internet Access in the village
- Local Hot Spot facilities in Dayuma, will be extended to other five villages by the local Municipalities
- Connection between Infirmaries and the central Hospital in the Capital, through the net
- Connection between Elementary Schools and the Central one in the Capital, again through the net

The Project in Comoro Islands



The Comoro Project

- Comoros
- Countries
- per capi
- Islands
- Lack of
- Services
- Unafford
- Services

163	 Zambia	1,600	2011 est.
165	 Burkina Faso	1,500	2011 est.
165	 Tanzania	1,500	2011 est.
165	 Benin	1,500	2011 est.
168	 Lesotho	1,400	2011 est.
169	 Burma	1,300	2011 est.
169	 Uganda	1,300	2011 est.
169	 Rwanda	1,300	2011 est.
169	 Mali	1,300	2011 est.
169	 Nepal	1,300	2011 est.
174	 Haiti	1,200	2011 est.
174	 Comoros	1,200	2011 est.
176	 Ethiopia	1,100	2011 est.
176	 Guinea-Bissau	1,100	2011 est.
176	 Guinea	1,100	2011 est.
176	 Mozambique	1,100	2011 est.
180	 Afghanistan	1,000	2011 est.
—	 Tokelau	1,000	1993 est.
181	 Malawi	900	2011 est.
181	 Togo	900	2011 est.
181	 Madagascar	900	2011 est.
184	 Sierra Leone	800	2011 est.
184	 Central African Republic	800	2011 est.
184	 Niger	800	2011 est.

the poorest
est GDP

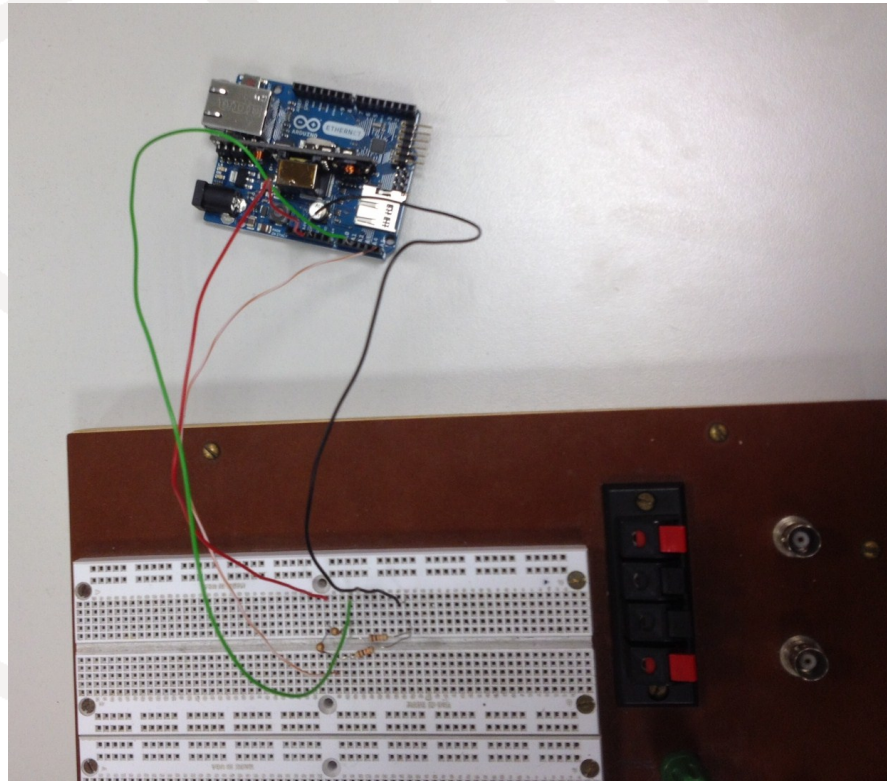
struction
and
unication

Project outcomes

- Creation of broadband connectivity to interconnect the three Islands (dedicated low cost solution)
- Connection between Infirmaries and the central Hospital in the Capital, through an hybrid ad hoc / IEEE 802.11h network
- Local Hot Spot facilities in 16 remote villages, to provide Internet access to the village community

Further than Internet

- Open source hardware platforms



The iXemWiki Project

Introduction to the Course of RadioPlanning (Main.NewPage) - XWiki - Mozilla Firefox

File Modifica Visualizza Cronologia Segnalibri Strumenti Aiuto

Introduction to the Course of RadioPlanning ... +

wiki.ixem.polito.it:8080/xwiki/bin/view/Main/NewPage

Google

$[\rho_m] = \left[\frac{W}{m^3} \right]$

In this case, the first and the second Maxwell equations are independent and the current densities are separated in two contributions: the current (the generator creates the flux of the current along any kind of place) and the conductive current (in the medium). This formula you study the propagation:

$$\nabla \times \vec{H}(\vec{r}, t) = \frac{\partial \vec{D}(\vec{r}, t)}{\partial t} + \vec{J}_{es}(\vec{r}, t) + \vec{J}_{ec}(\vec{r}, t)$$
$$\nabla \times \vec{E}(\vec{r}, t) = -\frac{\partial \vec{B}(\vec{r}, t)}{\partial t} - \vec{J}_{ms}(\vec{r}, t) - \vec{J}_{mc}(\vec{r}, t)$$

Where \vec{J}_{ms} and \vec{J}_{mc} not exists, but they are useful to develop the concept of the dual theorem.

For the completion, we can rewrite the equations:

$$\vec{\nabla} \cdot \vec{D}(\vec{r}, t) = \rho_{es} + \rho_{ec}$$
$$\vec{\nabla} \cdot \vec{B}(\vec{r}, t) = \rho_{ms} + \rho_{mc}$$

For the same reason, the magnetic densities ρ_{ms} and ρ_{mc} are zero (not exist). This notation is important because we can introduce the dual theorem.

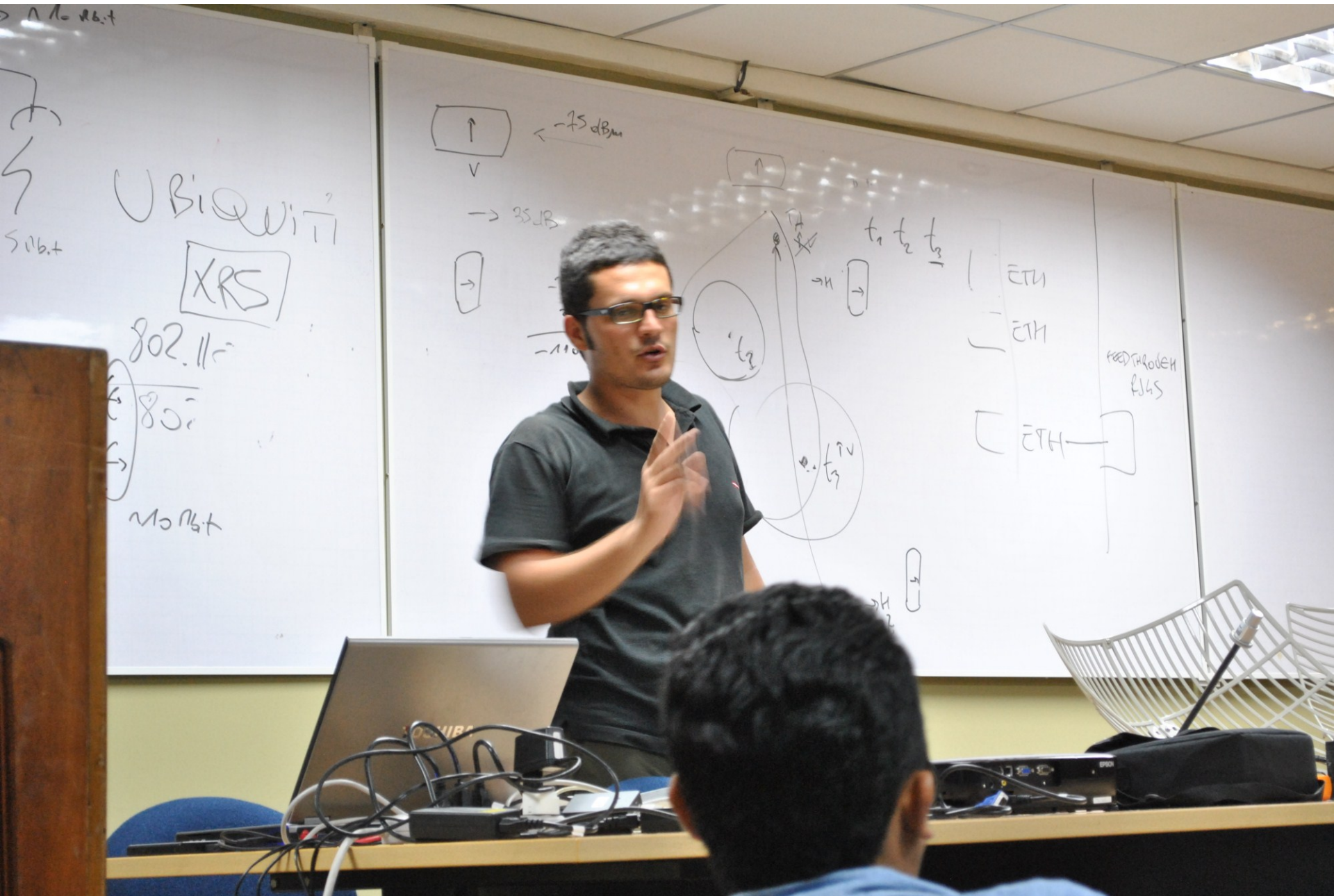
Dual Theorem

The two main equations are:

$$[\vec{E}] = \left[\frac{V}{m} \right]$$
$$[\vec{H}] = \left[\frac{A}{m} \right]$$

If I do a substitution operation:

Antonella Marti
16/03/2012
Elisa, you're right. I'll correct it tomorrow!

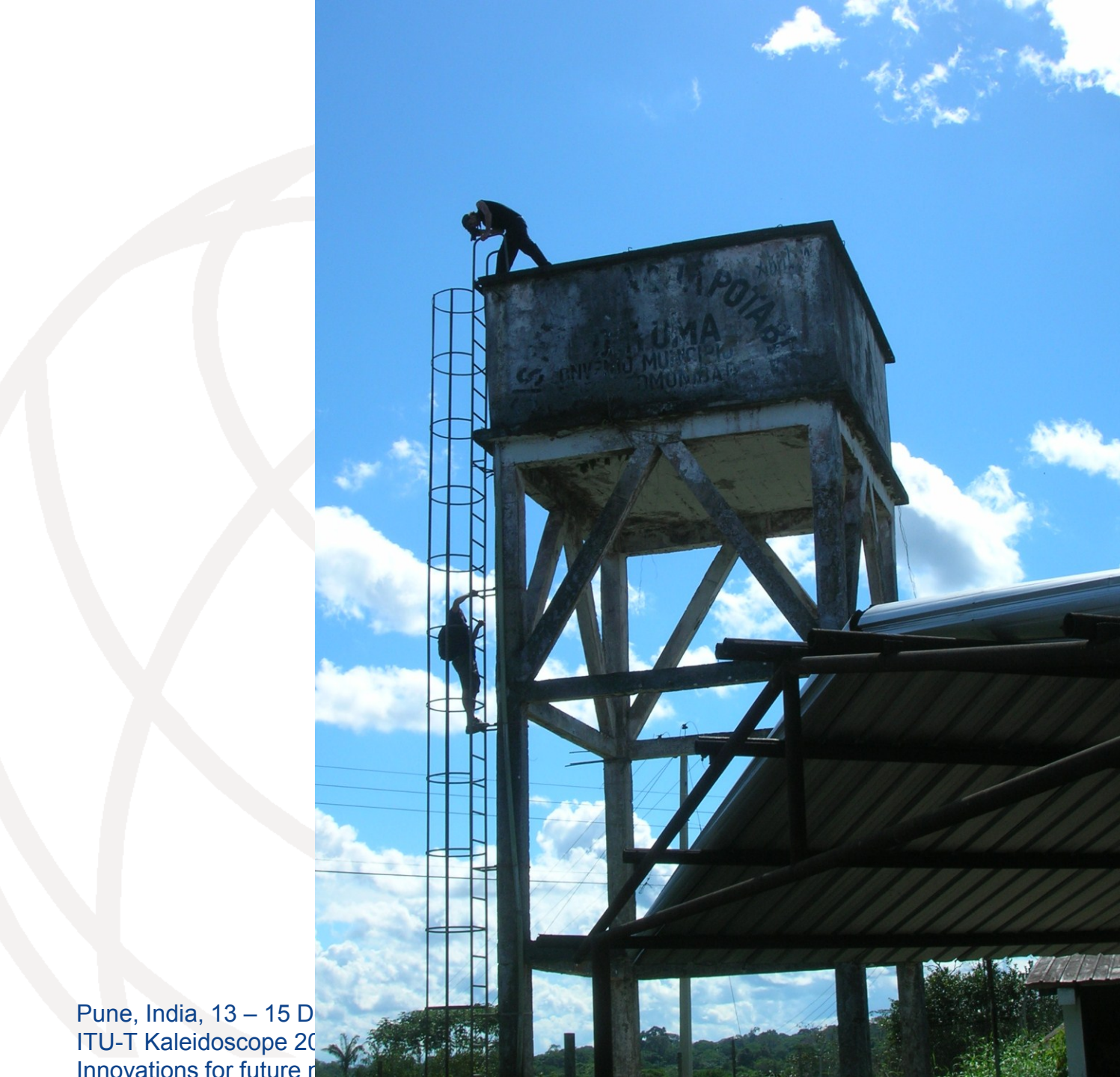






Pune, India, 13 – 15 Dec 2010:
ITU-T Kaleidoscope 2010 – Beyond the Internet?
Innovations for future networks and services







Comoros Islands





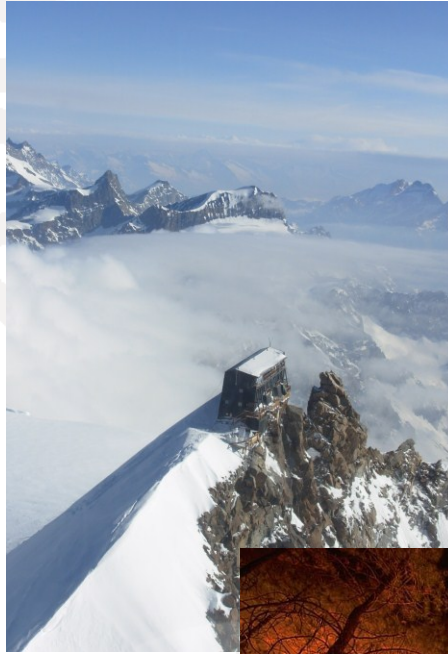
Why this Tech Transfer is important?

- In Ecuador: after one month few cows ate cables
- In Ecuador: lightning compromised network functionality
- In Comoros: students of local University are attending International courses and training

Conclusions and Recommendations

- Tech Transfer is best action to trigger new network developments
- It guarantees participation, sustainability, and requires much lower costs
- Shall we standardize the approach?
- Shall we recommend use of open hardware?
- Shall we promote open learning?

Very nice to be with you!!!



Where you can't imagine to place an antenna, we (try to) DO

<http://www.iXem.polito.it/>