The Abdus Salam
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for Theoretical Physics
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Exploring IoT Opportunities in Developing Countries

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Most of the pictures used in this presentation have been taken from the Internet.

Agenda

- Introduction
- PhD research
- IoT in developing countries

Introduction

About Me

- Associate Professor
  - Quaid-e-Awam Univeristy, Nawabshah, Pakistan
- PhD from Free University of Berlin, Germany in 2012
- Research Assistant (TU Berlin, Germany) from 2006 – 2008
- System Engineer at MACH Communications, Wurzburg, Germany
- Part of European Union Projects
  - WISEBED
  - The DES-Testbed
  - FeuerWhere
  - Building Commissioning (ZESAN project)
- Currently supervising
  - 3 PhDs, 6+ Master, Several Undergraduate projects
- 35+ Publications

Freie Universität Berlin

WISEBED

About PhD research

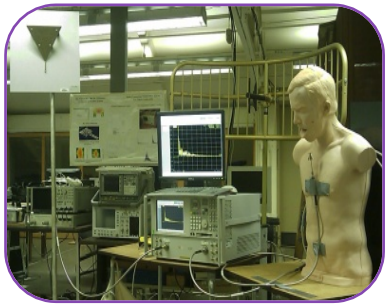
WSN Challenges & Objectives

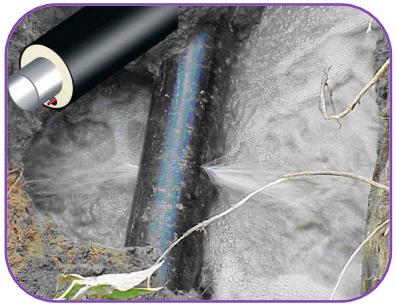
- However, WSNs inherent several challenges

Traditionally the main design objective has been to prolong system lifetime

Research Issues

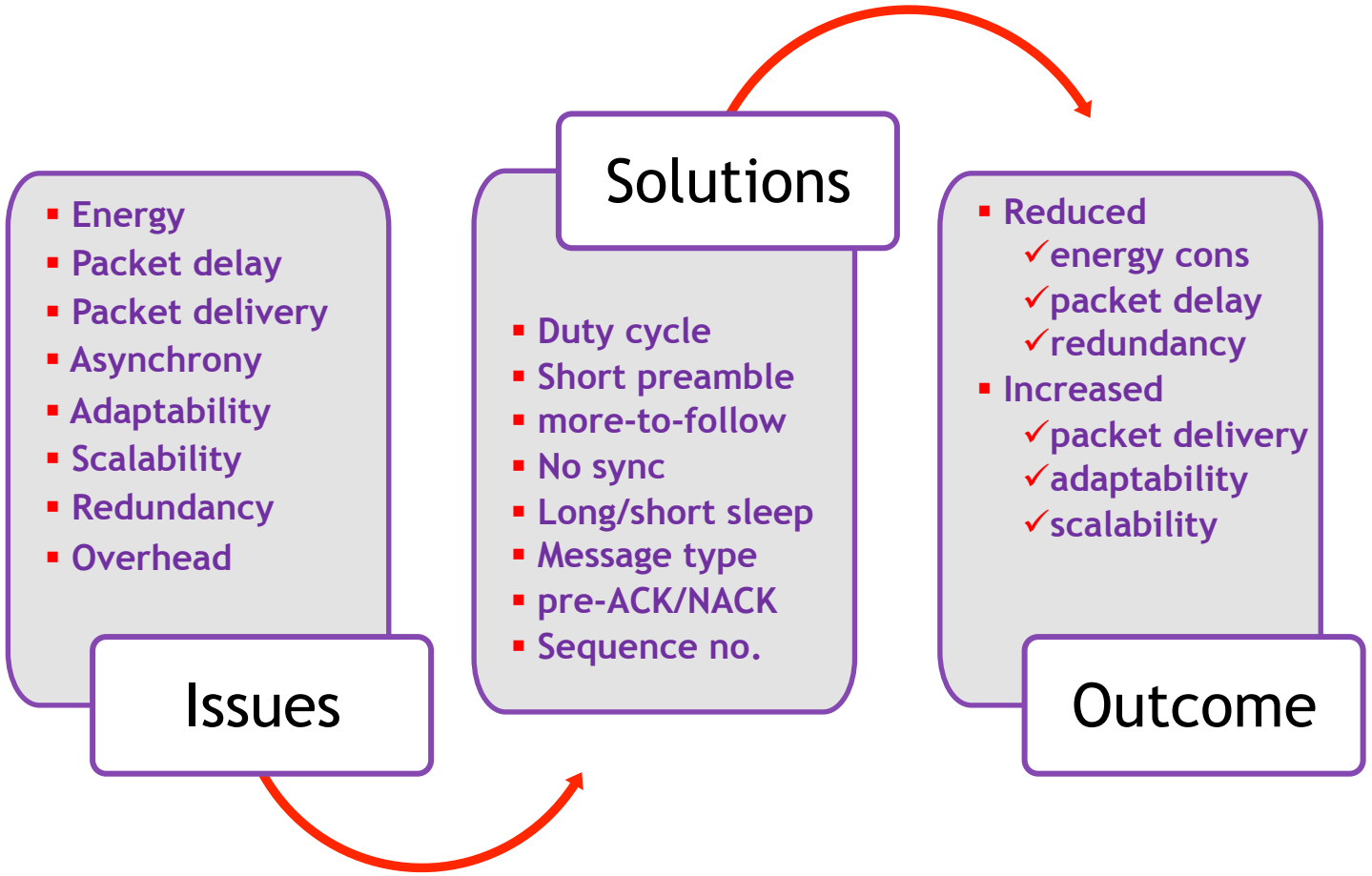
- *Why only Energy?*
  - continuous advent of novel low-power and energy harvesting technologies
    - Koomey's law
  - varying application requirements
- Other metrics need to be considered
  - packet delay
  - packet delivery
  - adaptability
  - redundancy
  - asynchrony
  - scalability
- *PhD focus*
  - ***AREA-MAC*** a novel MAC protocol that, along with energy, deals with other factors

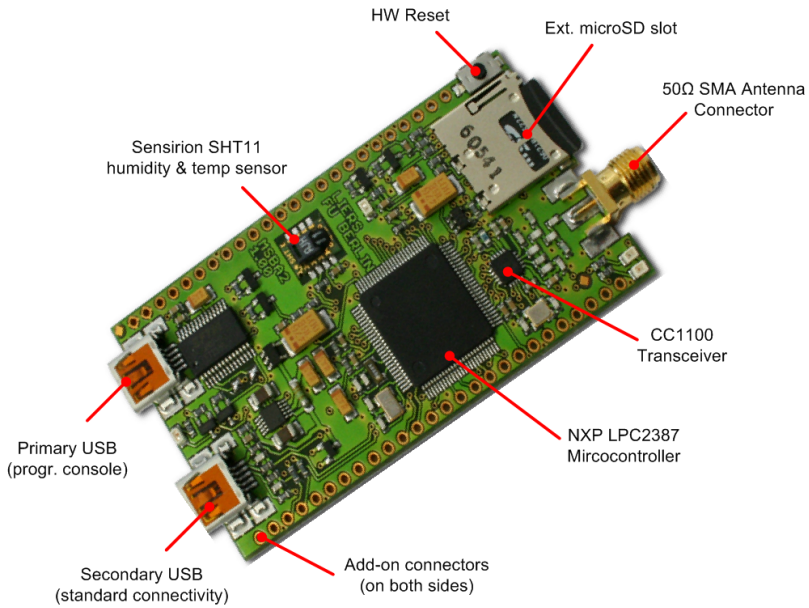

AREA-MAC Protocol

- Asynchronous Real-time Energy-efficient & Adaptive MAC



Evaluation Methods

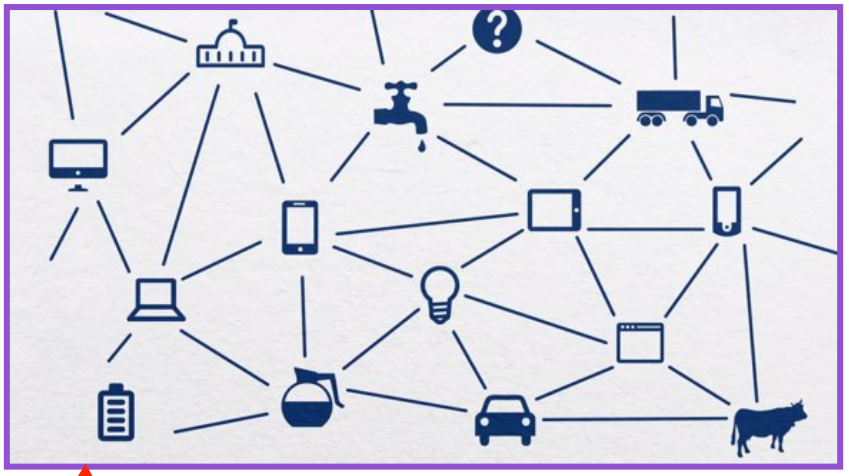
- Analytical
  - Through mathematical analysis
  - Optimization methods
- Simulation
  - OMNeT++
    - A discrete event based modular simulation tool
    - like LEGO blocks, models can be combined and reused
- Real testbed implementation
  - DES Testbed
    - Around 200 MSB-A2 sensor nodes deployed across several campuses at FU Berlin



IoT Opportunities in Developing Countries

3A -> 4A

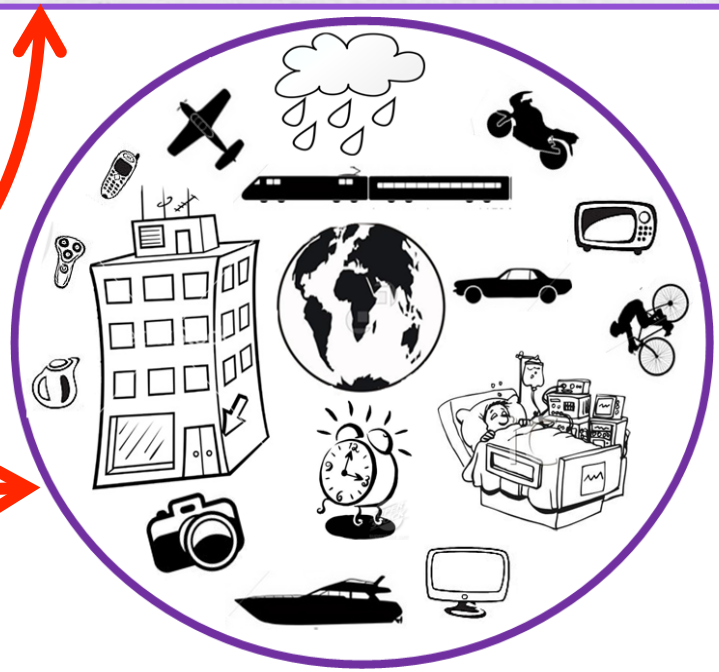
- Ubiquitous/distributed systems
  - Anytime, Anywhere & Anyone
- IoT
  - Anytime, Anywhere, Anyone & Anything
  - Cyberspace → physical and biological systems



Internet of Computers

Internet of People

Internet of Things



Are 3rd World Countries On Board?

Power Shortage/Mismanagement

Gas Pipeline Leakages/Blasts/Shortages

Fire Inside Buildings/Industries

Water Issues

Waste Management

Traffic Management

Health Related Issues

Agriculture Related Issues

Food Preservation

Corruption & Rigging

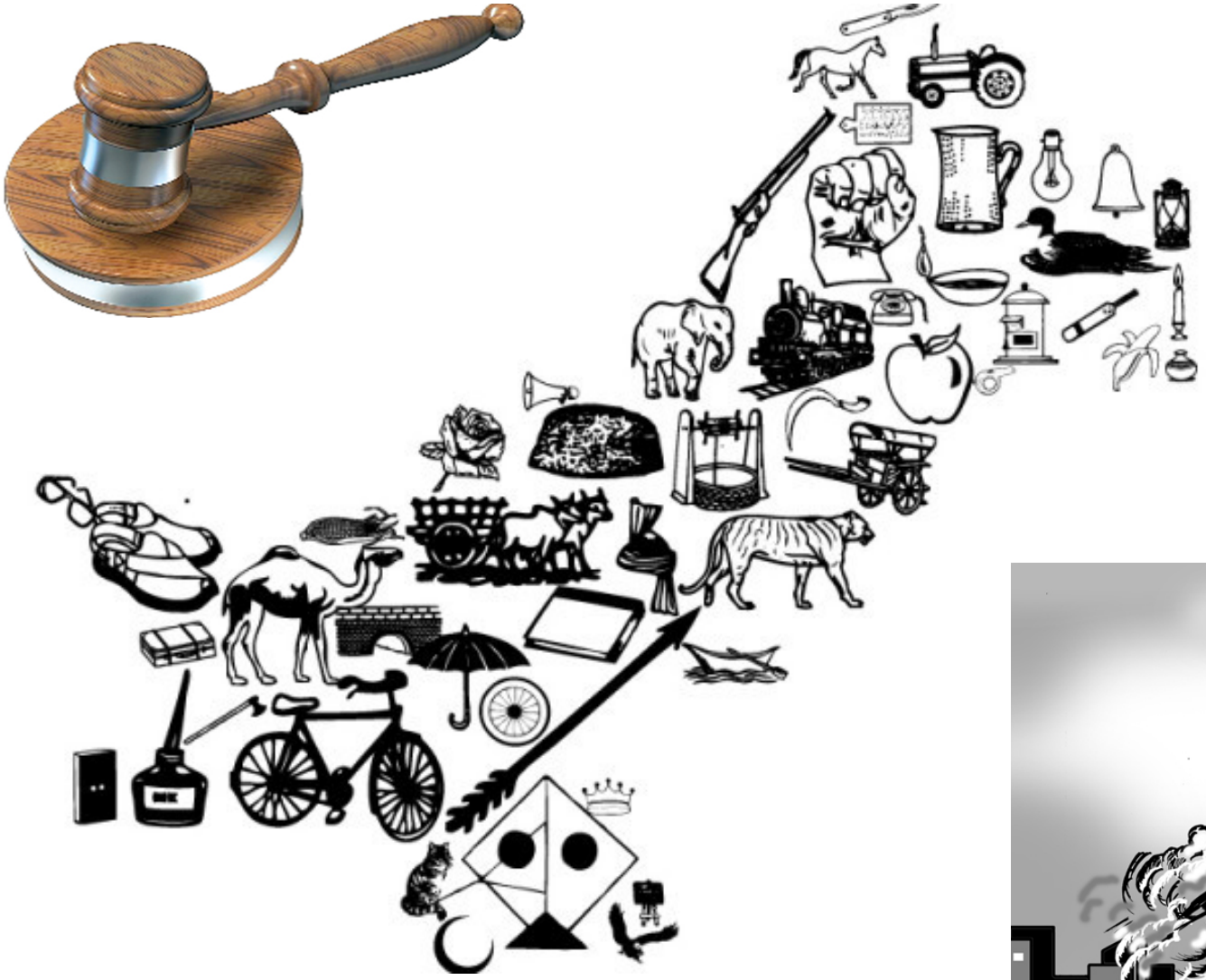
Road Conditions

Schooling/Education System

Drug & Weapon Tracking

Human & Animal Trafficking

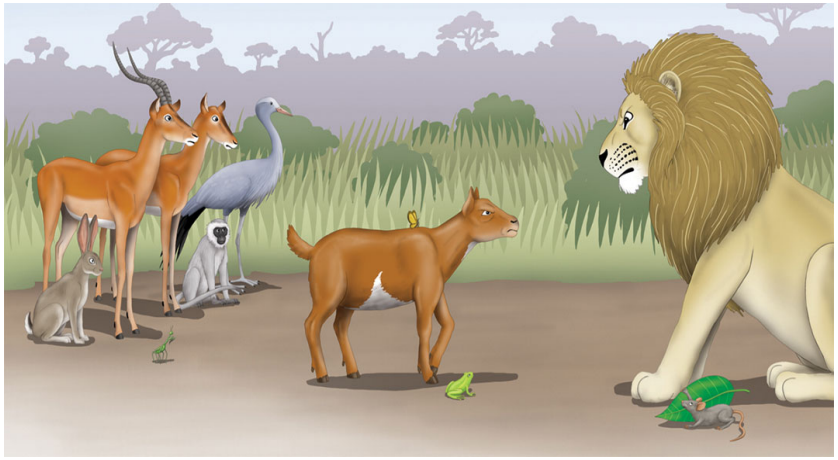
Governance & Policy Making



But …..

Our IoT Objectives

- Integration with existing networks
  - such as WSN, WMN, WPAN, MANET, RFID, Bluetooth, 6LoWPAN, etc.
- Communication protocols
- Technological Standardization
- Privacy and security
- Big data analysis and management
- Energy and QoS trades-off
- Experimenting IoT
- Social, governance & legal issues
- Bridging the gap
  - Academia, Business, Industry & Public



Peaceful Co-existence

Bridging the Gap

A Big Thank to

ICTP, Dr. Marco & Co.

Participants