LASSU
Sustainability on ICT
Research Laboratory

Department of Computing and Digital System Engineering

University of São Paulo

- **11** campi (4 – city of São Paulo).
- **89** Unities.
- **92.064** students (undergrad, grad and extension).
- **5.860** professors.
- **16.837** administrative staff.
- **249** undergratuation programs.
- **239** graduation Programs

Public University, founded in 1934

Source: Anuário Estatistico 2013

LASSU-PCS-EPUSP

- LASSU – Laboratory on Sustainability
  - **Created in 2010**
  - **3 professors (Engineering School, Architecture & Urbanism, EACH)**
  - **10** collaborators - Doctorate, Master and Undergrad students and employees.
  - **Strong Partnership with CEDIR (Center For Discard and Reuse of E-Waste)**

- Main fields of interest
  - **ITC Governance**
  - **Network Management oriented to Sustainability Policies**
  - **Energy Efficiency** applied to:
    - SDN (Software Defined Network)
    - Cloud Computing
    - Data Centers
  - **Electronic Waste**
  - **Sustainability in Productive Chain**
  - Life Cycle Assessment

Main Partnerships

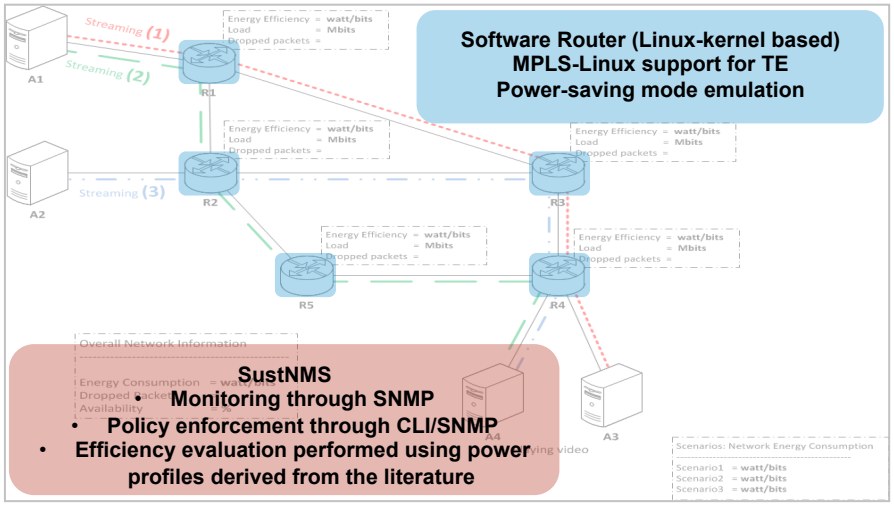
- RNP (National Network for Research and Education)
- ANSP (Academic Network of São Paulo State)
- I2Cat – Living Laboratories
- University of Illinois – Chicago
- FIU – Florida International University

- **Ericsson Research Sweden, Canada, Finland**
- Center for Innovation - Ericsson Brazil
- PETROBRAS
- **IBM Research – T.J. Watson**
- MIT CISR (Center For Information System Research)
- MIT D-Lab
- MIT L-Lab (Leadership on Sustainability)

SUStainability oriented Network Management System (SustNMS)

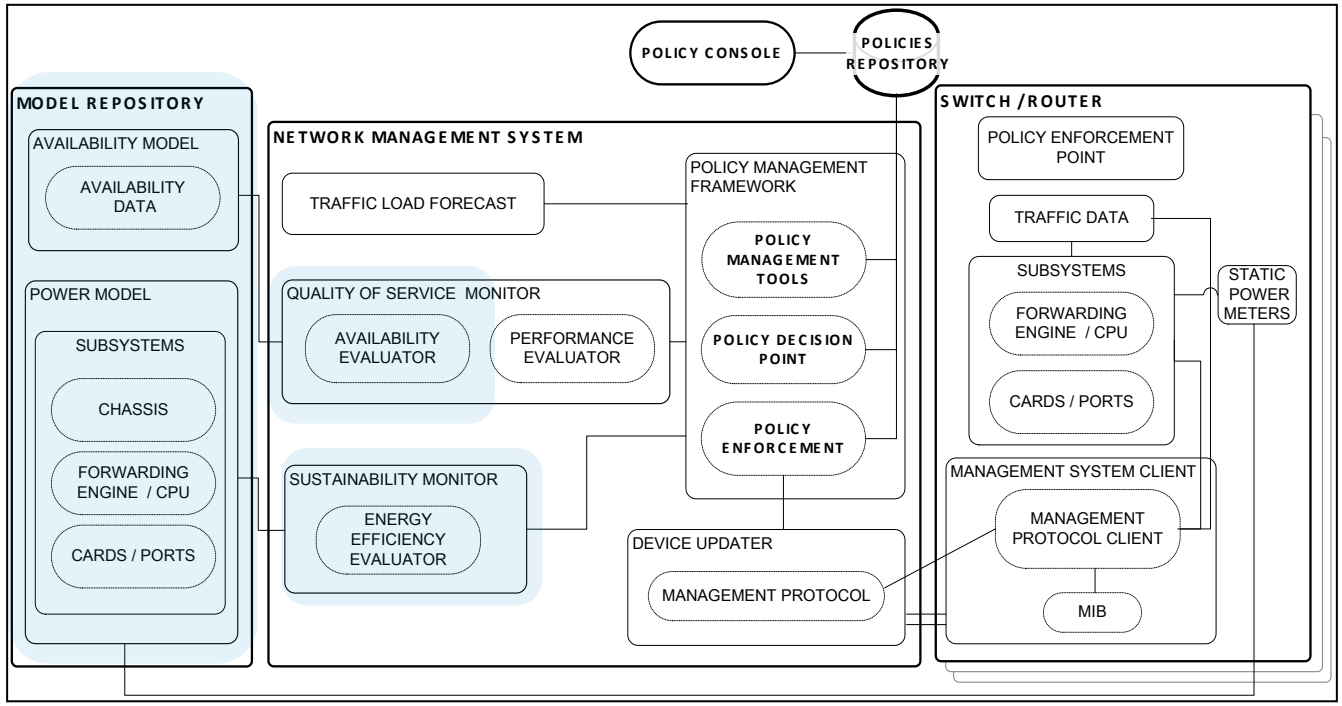
Introduction

- **Trade-off between performance and energy consumption → challenge**
- How to correlate quality of service and actions targeting efficiency improvement?
- Is a broader sustainability view possible at network management level?
- How to compare device efficiency and prioritize more efficient device for multiple network paths?
- How to coordinate power-saving features in a heterogeneous network?



Results

- **Savings of 43% when prioritizing energy efficiency**
- **Savings of 30% when no performance degradation is allowed**
- **Savings of 27% when a seven-nines reliability constraint is imposed**
- **Patent application**
- **3 papers**
- **2 Master's Thesis**



Sustainability Oriented System based on Dynamic Policies with Automated Policy Refinement (SOS)

Introduction

- **ICT energy spending is growing**
  - **2% of worldwide emissions** [1]
- **Networks represent a significant part of this amount**
  - Voice and Data Networks ~**23%** in 2020 [1]
- **And they are usually overprovisioned**
- **There are some research works aiming at saving energy in the network**
  - Sleeping
  - Link Rating

- **How to bring business together?**
- **How to coordinate the different green functionalities?**

Current Research

- Energy efficiency features to save energy in the network → but there is no automated way to "bring" a sustainability high level policy to these features
- **There is no automated policy refinement method able to handle all the refinement requirements of sustainability-oriented policies**

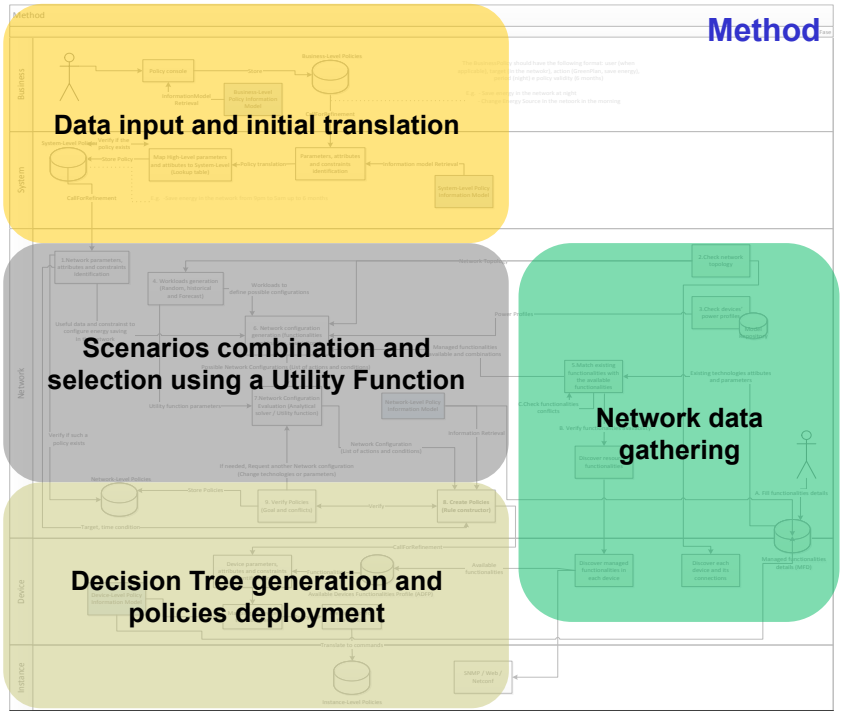
Utility Function (our proposal)

$$UF = pl * \frac{1}{\frac{\sum_{k=0}^{n} EnergyAfterSavings_{Router\ k}}{\sum_{k=0}^{n} EnergyBaseline_{Router\ k}}}$$

Expected Results

- **Comprise a method to support the selection of green functionalities using an utility function;**
- **Use Table Lookup for policies translation;**
- **Determine different information models to standardize the definition of policies and comply with the Policy Continuum;**
- **Use parameterized policies to enable dynamicity, besides incorporating time conditions in the description of policies, and having a type of policy to change policies in case of change in scenario.**

Method



Sustainability Oriented Telecom Clouds with Automated Policy Refinement (SustClouds)

Introduction

- **Energy consumption demand**
  - Datacenters
  - Operators
- **New paradigm: Distributed Telecom Clouds**

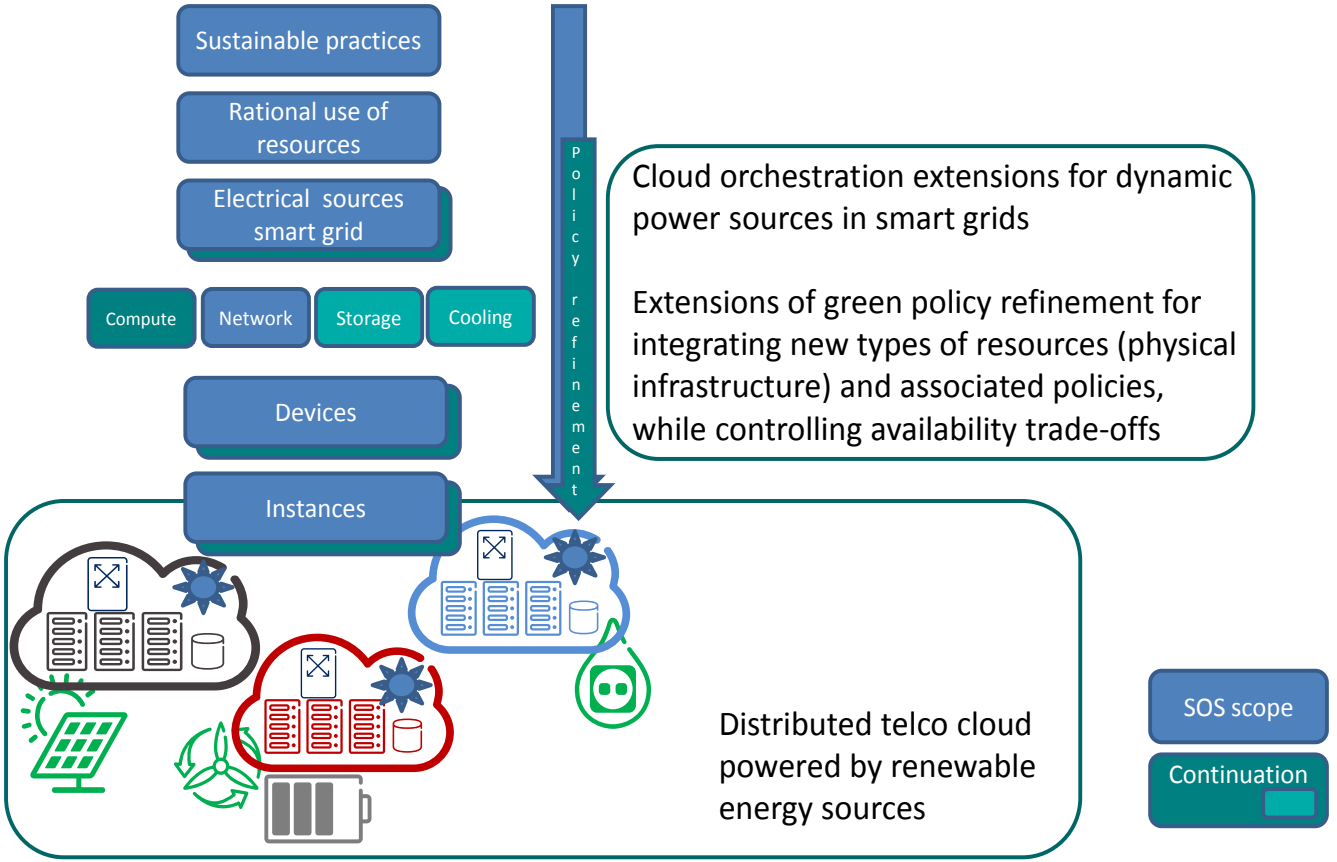
- **Objective: Expand SOS to consider automated policies in the context of Distributed Telecom Clouds and Smart Grids**

Current Research

- **Sustainability-oriented policies** refinement and energy efficiency functionalities management → SOS
- **Cloud platforms and virtualization**
- Smart Grids and renewable sources

Deliverables

- **Green service levels differentiation**
- **Sustainability oriented policies specific to the Distributed Telecom Cloud Environment**
- **Analysis of how Smart Grids can support**
- **Expansion of SOS to the distributed telecom cloud environment**
- **Specification and implementation of SustClouds**



LASSU Main Research Areas

- **Energy Efficiency** applied to:
  - SDN (Software Defined Network)
  - Cloud Computing
  - Data Centers
- **Sustainability Policies for ICT System**
- **Digital technologies as Driver for Sustainability**.
- **Smart Grids.**
- ICT Governance
- Life Cycle Assessment
- Sustainable Productive Chain

Thanks