Applications offloading in Mobile Cloud Computing environment
1. Motivation and Objectives

2. Mobile Applications Offloading (MAO) Algorithm for LTE Environment

3. Application Servers Placement in Digital Radio Over Fiber (DRoF)-Based Infrastructure

4. Experimental Setup of MAO and Results (done in a collaboration with IMPACT Lab in Arizona, US)

5. Conclusion
CHAPTER 1

Motivation and Objectives
**Problem Statement**

SMART PHONE

Y U NO HAVE LONG BATTERY LIFE?

**Solution:**

- Remote execution
  - Extend Battery autonomy;
  - Enrich user’s Quality of Experience (QoE).

**Two key Objectives:**

- An offloading algorithm for mobile applications (MAO);
  - Reduce power consumption on mobile terminals by executing jobs remotely;
  - An admissible QoE.

- Where to place the remote applications servers in the mobile backhaul?
CHAPTER 2

MAO for LTE Environment
2.1 Design Goals and Architecture

**Figure: Schematic block diagram of the MAO algorithm**
Main contributions:
- QoE Satisfaction;
- Network conditions considered;
- User Position within the Cell Considered
- CPU considered;
- State of Charge of the battery considered;
Range of applications:
► Chess game: processing inherent to the execution of one move on the chess-board;
► Speech recognition: conversion of an analog speech to a text and vice versa;
► Virus scanning: a program able to detect the presence of virus, and if possible, to kill it;

<table>
<thead>
<tr>
<th>Application</th>
<th>CPU</th>
<th>Interactivity</th>
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<tbody>
<tr>
<td>Chess game</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Speech recognition</td>
<td>Low</td>
<td>High</td>
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<tr>
<td>Virus scanning</td>
<td>High</td>
<td>Low</td>
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At high loads, applications with both high interactivity and CPU computation are prone to be offloaded. (Chess game case).

At low loads, applications with high CPU demanding and low interactivity are those to be migrated. (Virus Scanning case)
Fitting formulas could be potentially exploited by Cloud providers whenever they decide to deploy applications servers.
CHAPTER 3

Application Servers Placement in Digital Radio Over Fiber (DRoF)-Based Infrastructure
CHAPTER 3: Servers Placement in DROF-Based WDM-PONs

3.1 Network Architecture and Servers Placement

The diagram illustrates the network architecture for servers placement in DROF-based WDM-PONs. The architecture includes mobile applications offloading, with servers managed by mobile operators in the lower part of the mobile backhaul and fixed operators in the upper part. The network components such as BBU farm, RRHs, ONU-CRAN, and OLT are depicted with data flow paths indicating the offloading and standard data transmission.
CHAPTER 4
Experimental Set-up and Results
Experiments done in a collaboration with the IMPACT Lab in Arizona, US

- Nexus-5,32 GB, Quad core 2.3 GHz
- “Quiet Gaming” PC Z77 to host our Cloud server, dual core i5/i7 at 3.5-3.9 GHz
- Sample Application: Speech recognition
- PocketSphinx Free source code
- MAO Java code integration into the mobile application
4.2 Results

- Runtime enhancement;
- Energy savings.
CHAPTER 5
Conclusion
► Designed offloading algorithm (MAO) tweaking on energy efficiency and QoE;
► Used realistic applications to simulate;
► Evaluated model through numerical and experimental results;
► Applications servers placement over a real network infrastructure configuration.


Thank you