

Parallel Computing & Optimization Group

Yearly Team Meeting - 19/11/2015

PhD Candidate: Ana-Maria Simionovici

Supervisor: Prof. Pascal Bouvry



UNIVERSITÉ DU
LUXEMBOURG

Table of contents

- Background
- Current Position
- Project Details
- 1st year outcomes
- 2nd year outcomes
- 3rd year outcomes
- Future Work

Background



- **Bachelor** - Computer Science Faculty, 'Al. Ioan Cuza' University (10/2007 - 07/2010)
- **Socrates-Erasmus exchange** - Computer Science Faculty, 'University of Murcia' (19/09/2011 - 31/01/2012)
- **Computational Optimization Master** - Computer Science Faculty, 'Al. Ioan Cuza' University (10/2010 - 07/2012)
- **Net Developer** - Levi9 Global Sourcing (20/05/2012 -19/10/2012)

Current Position

- PhD Candidate at the University of Luxembourg (since 1 of Nov 2012)
- Thesis Committee:
 - Prof. Pascal Bouvry (Uni Lu) – Supervisor
 - Prof. Steffen Rothkugel (Uni Lu) – Member
 - Prof. Henri Luchian (UAIC) - Member

Project Description (1)

- Funded by FNR and Luxembourg Ministry of Economy - **Dynamic MixVoip (DYMO)**
- Application of learning and anticipation techniques, resource allocation, load balancing methods
- Improvement of the VoIP service via a cloud-based solution

Project Description (2) - Motivation

- Scalability - the biggest drawbacks of the traditional VoIP solutions due the necessity of duplicating the existing infrastructure or replacing the physical hardware;
- Overcapacity - the solution one may consider due the changes in the workload over time;
- Some solutions are executed inside clouds, but in a monolithic approach;
- The nature of the operations carried cannot cope with the highly dynamic evolution of requests, load or other stochastic events

Project Description (3)

- Analysis of Particle Algorithms, Load Prediction (WP1)
 - Load Balancing for Cloud based Environments (WP2)
 - Assessment Models and Validation (WP3)
- 2 years collaboration with **MixVoIP**, a Luxembourg based company specialized in VoIP services

1st year outcomes

- User profiling, call trend
- Configuration of a telephone system
- Development of prediction model for a given time frame
- Publications:
 - “Dynamic MixVoIP”, *EVOLVE* 2013
 - “Predictive modeling in a VoIP system”, *Journal of Telecommunications and Information Technology (JTIT)*, 2013

2nd year outcomes

- Technical specification for building the simulator
- Definition of modules of VoIP environment for load balancing
- Configuration of Telephone System: Asterisk + SIPP
- Development of allocation model for simultaneous calls :
 1. Minimize number of running machines (physical servers)
 2. Maximize throughput(number of simultaneous call) per running machine
 3. CPLEX, linear programming;
 4. Integration with the prediction;

3rd year outcomes (1)

- Extension of the prediction tool - Introduction of two different scenarios for IPS data extraction and comparison of all 3 with Gaussian Mixture Model and Gaussian Processes
- VoIP Load Balancing in Clouds
 - Infrastructure model (telephone system, nodes, servers, processors)
 - Job model (phone calls, utilization)
 - VoIP QoS (utilization of resources, MOS vs packet loss)
 - Optimization Criteria (VoIP provider costs = billing hours for renting VMs, utilization)

3rd year outcomes (2)

- Publications:
 - “VoIP Traffic Modeling using Gaussian Mixture Models, Gaussian Processes and Interactive Particle Algorithms”, *IEEE GLOBECOM 2015*
 - “Distributed Adaptive VoIP Load Balancing in Hybrid Clouds”, *Russian Supercomputing Days (RuSCDays), 2015*
 - “VoIP Service Model for Multi-Objective Scheduling in Cloud Infrastructure”, *International Journal of Metaheuristics(IJMHeur)*

Future Work

- Finish work in progress
- Thesis Writing



☺ *Thank you for your attention!* ☺