



Institute of Technology

Ciência sem Fronteiras / Science Without Borders

Postgraduate Project Template

Institution:	Waterford Institute of Technology
Title of Postgraduate Opportunity: (include level of study)	PhD
PI Name & Contact Details:	<p>Dr. Lei Shi Emerging Networks Laboratory, Arc Labs, Carriganore, Waterford Institute of Technology, Waterford, Ireland</p> <p>lshi@tssg.org +353 51 842988</p>
Department/School:	Department of Maths and Computing
Research Centre /Group:	TSSG
Research Centre/Group website:	www.tssg.org
<p>Brief Summary of PI research / research group /centre activity</p> <p>The PI has expertise in the design, development and evaluation of algorithms and tools in cloud computing, router architectures, network processors, peer-to-peer networks, network monitoring and fault management.</p> <p>TSSG is an internationally recognized centre of excellence for ICT research and innovation. We carry out a wide spectrum of industry-informed research in Information and Communications Technologies (ICT).</p> <p>The Emerging Networks Lab (ENL) at the TSSG is a research group investigating emerging networks for the Future Internet. In particular, the research group investigates New Generation communication networks that are immersed and surrounds all users, ranging from large-scale infrastructure to micro and nano devices. One particular research of the group is in Bio-inspired networking, which aims to use inspirations from biological systems to drive the adaptive behaviour of communications networks.</p>	

Brief Description of Masters or PhD Project

Fostered by innovations in virtualization and distributed computing, and the increased availability of high-speed Internet connectivity, cloud computing is becoming a general utility providing on-demand resource leases as transparent services to users. The continuing growth in the number and scale of data centers, user demands and network services has resulted in new requirements for resource management in data center. These requirements are in terms of energy efficiency, revenue maximization, fault tolerance, service elasticity, scalability and availability. To meet them, different resource allocation strategies are proposed and implemented for cloud data centers.

The objective of the research is to investigate the resource allocation issues and develop a novel resource management system for applications and services in the cloud data centers. A series of novel designs are proposed to aim at the following objectives:

- * Combinatorial auction based dynamic pricing scheme for cloud resources
- * Online and offline resource allocation for cloud services with different placement constraints in heterogeneous cloud infrastructure for multiple objectives such as energy efficiency, server load balancing, fault tolerance and revenue maximization.
- * Efficient VM migration schemes for service elasticity, service consolidation and traffic engineering in data center.
- * Scalability and robustness of the resource management strategies considering network and node failures in large-scale data centers.
- * Resource management for deployment of large scale virtual networks in data centers

The system utilizes combinatorial auction-based pricing strategy, VM live migration, optimization technology and approximation algorithms for high-performance and scalable implementation of optimized resource allocation strategies to meet different objectives of data centers. Through leveraging economies of scale and the capacity to manage resources more efficiently for ever increasing services and applications, cloud computing consumes far less energy and other resources to be environmentally and economically sustainable.

Key Attributes of Project for Brazilian Postgraduate Students

TSSG has engaged with over 425 partners across 35 countries worldwide, on collaborative research projects. Their partners include IBM, Cisco, Nokia, Ericsson, Nokia Siemens Networks and Alcatel-Lucent – as well as Tier 1 operators including Telefónica/O2, T-Mobile, T-Systems (a division of Deutsche Telekom), Telecom Italia, Vodafone, Telenor Group and Portugal Telecom and many more.

TSSG is also part of the Telecommunication Graduate Initiative (www.tgi.ie), a program designed to enhance the experience and development of PhD candidates in the field of telecommunications. The programme consists of leading Irish Universities and Institutes of Technology, where the aim is to deliver high quality, relevant course material in both telecommunications topics and transferrable skills. These courses are delivered by leading telecommunications experts from around the world, ensuring a high quality student learning experience and enabling high quality graduates. Potential candidate will have the opportunity to avail of these courses as part of the study programme.

Name and contact details for project queries, if different from PI named above:

Please indicate graduate disciplines which are eligible for application: Computer Science, Telecommunications, Math, Electronic Engineering and related disciplines	
Alignment with Science Without Borders Priority Areas: Please indicate the specific programme priority area under which the proposed postgraduate project fits – choose only one (tick box)	
Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	X
Aerospace	
Pharmaceuticals	
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	
Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	