DERri
Distributed Energy Resources
Research Infrastructures

TEMPLATE FOR PROPOSAL UNDER DERRI

User-Project Proposal:

User-Project Acronym	ILM
User-Project Title	An Intelligent Load Management Smart Grid Mechanism that maintains the Frequency Stability of the Grid
Main-scientific field	Power and Communication Engineering
Specific-Discipline	Power, Control, Communication and Computer Systems

Lead User of the Proposing Team:

Name	Yiannis Tofis
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Nationality	Cypriot
Organization name, web site and address	University of Cyprys, www.ucy.com.cy 75 Kallipoleos Street, PO Box 20537, P.C. 1678, Nicosia, Cyprus
Activity type and legal status* of Organization	Higher Education Institution
Position in Organization	Researcher – PhD Student

* Higher Education Institution (1) – Public research organization (2) – Private not-for-profit research organization (3) – Small or Medium size private enterprise (4) – Large private enterprise (5) – other (specify)

Additional Users in the Proposing Team:

Name	
Phone	
E-mail	
Nationality	
Organization name, web site and address	
Activity type and legal status* of Organization	
Position in Organization	

* Higher Education Institution (1) – Public research organization (2) – Private not-for-profit research organization (3) – Small or Medium size private enterprise (4) – Large private enterprise (5) – other (specify)

(Repeat for all Users)

Date of submission	31/03/2013
Re-submission	NO
Proposed Host TA Facility	1. VTT, Finland 2. RISOE, Denmark 3. KEMA, Nederland 4. IWES, Germany

	5. AIT, Austria 6. TECNALIA, Spain 7. USTRAT, United Kingdom
Starting date (proposed)	June 1st 2013 or August 23rd 2013

Summary of proposed research (about ½ page)

The evolution of the conventional grid into a smarter one is one of the top priorities of EU and USA governments. Billions of Euros have been invested for the research, development and deployment of smart grid technologies. There is an ever increasing need for enhanced power efficiency, availability, stability and security as well as increased renewable energy penetration to the grid. It is equally essential that the end user will be able to interact with the grid. The customer will be a power consumer and producer at the same time: he/she will take real-time decisions regarding the management of his/her consumption/generation, e.g., based on dynamic pricing schemes and other incentives that the utility will offer. The use of ICT is of central importance for the conversion of the grid into a smarter one. This is exactly where the main contribution of this project lies.
The main objective of the project is to design, develop and test a flexible ICT infrastructure, namely the Hierarchical Control Architecture for electricity distribution networks. This architecture, together with a set of hierarchical grid control algorithms, can achieve improved management of system resources, efficient demand side management as well as effective load shedding.
Our proposed architecture is scalable and it can address the future needs of distribution networks with significant impact on improving the performance of the distribution grid in terms of reliability and quality of service. For example, one of the novelties of our proposal lies primarily in the idea of a load differentiation scheme in cases of emergency; it will be possible to interrupt service to some lower priority loads in a wide area, however, no users will experience total blackout. The selective domestic devices curtailment will be achieved through the installation of a Home Area Network (HAN).
The HAN will be controlled from both the utility, with customer permission based on incentives provided and Service Level Agreements, and the customer sides (utility will be the master). Moreover, it will provide the capability of the optimal management and monitoring of local renewable generation and storage.

State-of-the-Art (about 1 ½ page)

Though Smart Grids are relatively new in the area of electric power systems, they are adopted and increasingly being used in different parts of the world, and receiving increasing attention for power system planners, operators and researchers. A huge research effort is under way on the design of the roadmap towards the Smart Grids [1].
Our research team at the University of Cyprus is active and well known for its work in the field of intelligent networks [3-13]. Smart Grids constitute an intelligent network as an overlay of the already existing conventional electricity network.
The introduction of Smart Grids for enhanced visualization of a power system is suggested in [2].
The gathering and processing of the available information for increased situational awareness as well as the control actions that should be taken need further research.
The aim of introducing the Smart Grid has been addressed by several research groups and consortia that have been formed in order to address these issues. For that purpose there is a number of completed and ongoing projects both in Europe and USA which deal with multiple aspects of the Future Grid; the Denise project was a Spanish R&D initiative (2007-2010); the SmartGrids Technology Platform (supported by the European Commision) aimed to increase the reliability, safety and efficiency European electricity Transmission and Distribution networks as well as the amount of incorporated renewables. Other EU smart grid projects include: ADDRESS,

CRISP, Flex Power Grid Lab, GRID, E-Energy: ICT-based Energy System of the Future, eTelligence, E-DeMa, MEREGIO, Model City of Mannheim, RegModHarz, Smart W@TTs, FENIX, InovGrid, SmartHouse/SmartGrid and SmartLife. In the USA, projects like EPRI IntelliGrid that deals with integrations of ICT, computing and electronics to meet the energy needs of the future, Modern Grid Initiative that focuses on the future grid from a new perspective as far as the electricity delivery is concerned, EPRI Advanced Distribution Automation that aims to introduce a highly automated distribution system based on an open communications and control architecture, GridWise that envisions to modernize the Grid's infrastructure and operations by the accommodation of two-way telecommunications.
Some studies have suggested the autonomous islanded operation of a power system having Distributed Generation (DG) in case of outage of the link connecting to the grid [14]. How the Smart Grid will facilitate the operation of such a hybrid energy system having renewable energy sources as DG has not yet been well-explored.

References

[1] H. Farhangi, "The path of the smart grid,"Power and Energy Magazine, IEEE, vol. 8, no. 1, pp. 18 – 28, Dec. 2009.
[2] J. Zhu, G. T. Heydt, et al., "Enhanced state estimators," Final report, PSERC, Nov. 2006.
[3] S. Chakrabarti, E. Kyriakides, T. Bi, D. Cai, and V. Terzija, "Measurements get together," IEEE Power and Energy Magazine, vol. 7, no. 1, pp. 41-49, Jan./Feb. 2009.
[4] S. Chakrabarti, E. Kyriakides, and D. G. Eliades, "Placement of synchronized measurements for power system observability," IEEE Transactions on Power Delivery, vol. 24, no.1, pp. 12-19, Jan. 2009.
[5] G. Jiroveanu, R. Boel, and B. Bordbar, "On-line monitoring of large Petri net models under partial observation," Journal of Discrete Event Dynamical Systems, 2008.
[6] G. Jiroveanu and R. K. Boel, "A common architecture for distributed diagnosis and wide-area back-up protection," Proceedings of the Workshop on Developments in Power Systems Protection, Amsterdam, The Netherlands, Apr. 2004.
[7] G. Jiroveanu and R. K. Boel, "Distributed contextual diagnosis for very large systems," Proceedings of the 7th International Workshop on Discrete Event Systems, Reims, France, 2004.
[8] V. Terzija and V. Stanojevic "Two-stage improved recursive Newton type algorithm for power quality indices estimation," IEEE Transactions on Power Delivery, vol. 22, no. 3, pp 1351-1359, July 2007.
[9] V. Terzija, V. Stanojevic, M. Popov, and L. van der Sluis, "Digital metering of power components according to IEEE Standard 1459-2000 using the Newton-type algorithm," IEEE Transactions on Instrumentation and Measurement, vol. 56, no. 6, pp. 2717 – 2724, Dec. 2007.
[10] V. Terzija, "Adaptive underfrequency load shedding based on the magnitude of the disturbance estimation," IEEE Transactions on Power Systems, vol. 21, no. 3, pp. 1260-1266, Aug. 2006.
[11] V. Terzija and H.-J.Koglin, "On the modeling of long arc in still air and arc resistance calculation," IEEE Transactions on Power Delivery, vol. 19, no. 3, pp. 1012- 1017, July 2004.
[12] V. Terzija and D. Markovic, "Symmetrical components estimation through nonrecursive Newton type numerical algorithm," IEEE Transactions on Power Delivery, vol. 18, no. 2, pp. 359-363, April 2003.
[13] V. Terzija, "Improved recursive Newton type algorithm for frequency and spectra estimation in power systems," IEEE Transactions on Instrumentation and Measurement, vol. 52, no. 5, pp. 1654-1659, Oct. 2003.
[14] M. Geidl, "Protection of power systems with distributed generation: state of the art," URL: http://e-collection.ethbib.ethz.ch/ecol-pool/bericht/bericht_424.pdf

Detailed Description of proposed project : Objectives – Expected Outcome – Fundamental Scientific and Technical value and interest (2-3 pages)

General Objectives of the Project and Compatibility with the Objectives of the Call
This proposal builds on world-class and innovative research performed at the University of Cyprus, in the introduction and implementation of innovative end to end smart grid architectures. The aim of the project is to develop the components that constitute the smart grid architecture, starting from customer premises and going towards the electric utility. This will contribute to leading research in the critical field of demand management and energy efficiency, which is a top priority of EU and USA governments. The project will also enable an improved integration of renewable energy, enabling Cyprus to fulfill its commitments towards the EU for renewable penetration. The scientific weight of this proposal will be particularly evident to stakeholders in the industry of smart homes, as well as in the power industry. The project facilitates the knowledge transfer between organizations and researchers and between academia, industry and government organizations. The active involvement of TA Infrastructures in DERri will lead to real-life validation. The project will contribute significantly to the Cyprus and EU society and to its economic growth and welfare by producing results and products that have a significant impact on both power systems and green houses.
Specific Scientific and Technical Value Objectives of the Project
• To perform applied research in the Next Generation/Future/Smart Grids and show how the Information and Communication Technology (ICT) can improve the performance of power systems in terms of reliability and quality of service.
• To realize the implementation of a new and innovative end to end Smart Grid platform, open, scalable and market ready that facilitates the incorporation of renewables into the Grid.
• To perform experimental tests on a Home Area Network (HAN) that will enable end users as well as the electricity utility to provide control and management of domestic loads.
• To test in practice the architectural components and basically all the controllers located between the customer and the utility.
• To exploit the enhanced information provided by the incorporation of ICT to the power system in order to take control actions as far as the frequency stability of the system is concerned.
• To emulate the propose architecture and provide performance analysis of the platform.

The proposed project aims at testing an end to end Smart Grid architecture that implements a Demand Side Management mechanism for domestic and industrial load control. The methodologies, algorithms, simulations, emulations and theory developed concern the future Electricity Grid and the appropriate TA Infrastructures in DERri that should be employed. It is directly applicable to the host TA Infrastructure in DERri, but also to any other real power system. The project will focus on the topics described below.
Load Shedding and Peak Leveling/Shaving operational scenarios
The Multipower system of VTT will be employed in order to apply load shedding and peak shaving algorithms developed, exploiting the adjustable loads provided by the VTT infrastructure. After a load event or during peak demand times, load decisions will be made by our intelligent control system mechanism (such as load shifting or shedding) in order to maintain the frequency stability of the islanded portion of the grid, preventing under-frequency operation and leveling the demand curve.
A number of tests for each scenario will be carried out, monitoring the frequency of the grid and taking the appropriate control actions (adjusting the demand of real power through the control of adjustable loads) in order to maintain the frequency of the grid in the desired levels.
The test system to be used is a laboratory network (400 V, 50 Hz) with some generating units and adjustable loads. The integration of renewables as well as energy storage with the distribution network that Multipower is connected with will facilitate the next topic.
Autonomous operation for an isolated power system with renewables

The use of renewable energy sources as distributed generation (DG) is increasing in many parts of the world. Here it is proposed to develop a methodology to ensure reliable and secure operation of a hybrid energy system using the proposed architectural model. The major use of the proposed model in this regard is anticipated to be in the detection of islanding of a part of the network containing DG and the appropriate "personalized" load curtailment at each home in order to prevent abnormal frequency operation. When a part of the utility network containing DG is islanded due to some fault (referred to as the loss of mains (LOM) or loss of grid (LOG)), neither the voltage, nor the frequency is controlled by the utility conventional grid. The current solution is disconnecting the DG (and this if and only if LOM is detected quickly in real-time by special measurers called Phasor Measurement Units (PMUs)). In our Smart Grid proposed case, the DG won't be disconnected but their generation would be used for feeding special and emergency loads of the islanded microgrid. The amount of demand will be matched with DG and the important loads will be served even in the case of a total general blackout.

We expect that this research work will lead into original results that will be applied to the electric utility industry. This involves Intellectual Property Rights (IPR) protection, as well as further evaluation of the potential for commercialization of the outcomes. While academic partners might want to publish as quickly as possible, prudent exploitation dictates that some information may be withheld from the public domain until protected appropriately by patenting.

Apart from the general safety measures and rules that someone should comply with in a laboratory environment, there are not any special requirements for safety measures, equipment, and standards. Any shortcomings, uncertainties and risks for the fulfillment of the project objectives will be discussed in detail with the TA infrastructure, specified in the Agreement to be signed between the TA infrastructure and our side. For safety reasons, VTT personnel is always participating in the laboratory tests, offering at the same time help and guidance where needed, as indicated in the call.

Originality and Innovation of proposed research – Broader Impact (1-2 pages)

The major innovation of the proposed project is the testing of the proposed Smart Grid architecture that will provide an end to end Demand Side Management Mechanism for distributed load shedding, stability control of the Grid, massive incorporation of renewables into the grid as well as home energy efficiency from the user perspective.
Some of the specific innovations expected from this project are listed below.
• Distributed control: The proposed architecture will provide distributed control, the control decisions will be taken centrally but the actions will be implemented locally at a neighborhood level throughout a conversational procedure that will take place between the Differentiated Local Controller (DLC) located at the customer's premises and the Local Area Controller (LAC), located at the Utility substation – at a neighborhood level.
• Real-time dynamic pricing: The architecture under consideration will facilitate the testing of a real-time dynamic pricing schemes as an incentive for the end users to curtail domestic loads and reduce their consumption. This will serve as an implicit peak shaving (leveling) mechanism that will reduce the need for excessive spinning reserves.
• Contingency scenarios/case studies: Contingency scenarios and case studies will be examined and the robustness of the proposed scheme will be examined and evaluated in these extreme cases.
• Comparison of the performance of the proposed architecture to the conventional one taken at the same bus and effect of possible differences between these two architectures in control operations.
• Implementation of the cited technologies towards massive penetration of renewable resource generation.
The proposed project is a critical contribution to the enhancement of the operational capability of

the power system, as well as in the rest of the societal infrastructures that these ideas can be applied to. It is envisioned that the innovations in the project, through ICT technologies, will act as very useful tools to the utilities in ensuring stable, reliable, and better performance of the electricity Grid as well as reduced bills for their customers.

Proposed Host TA Infrastructure/Installation – Justification (about one page)

The TA infrastructure needed consists of a laboratory power network with generating units and adjustable loads with control and measurement systems. The frequency of the islanded portion of the grid will be monitored and control actions such load switching/adjusting actions will be taken. Integrated renewables and energy storages can be employed depending on their availability. Further, selective load shedding can be applied to distribution network that Multipower is connected with.
The test set-up will implement in a real environment an intelligent control algorithm which maintains the frequency of the grid based on selective load shedding in an islanded power network.
If there is no objection from the host TA infrastructure, it is intended to deliver to the premises of the host TA infrastructure (at our expense and responsibility) a number of ZigBee Wireless modules that provide consumption and switching capabilities of the loads/devices that are connected with. This will allow us to establish a wireless mesh plug and play Home Area Network (HAN) in a pilot smart grid-interfaced home/customer premise. In this manner both the utility and customer side will interact through either a dedicated communication network (if it is provided by the host TA infrastructure) or the WEB.
Finally, the TA Infrastructures in DERri which may better serve the scope of the proposed research are the following, in order of preference:

1. VTT, Finland
2. RISOE, Denmark
3. KEMA, Nederland
4. IWES, Germany
5. AIT, Austria
6. TECNALIA, Spain
7. USTRAT, United Kingdom

Synergy with ongoing research (about ½ page)

Provide information on any concurrent research project with the same or similar subject with the one proposed. Describe the synergy (if any) that will be sought between the existing and the proposed project.

A huge research effort is currently under way on the design of the roadmap towards the Smart Grids at the university of Cyprus. As indicated before and stated by the references, our research team at the University of Cyprus is active and well known for its work in the field of intelligent networks.
In the context of this effort, multiple control algorithms have been proposed in the direction of maintaining the frequency stability of the grid while the components of the grid have been simulated and simulation results have been extracted. TA Infrastructures in DERri will provide us the opportunity to test these algorithms on a real system in islanded operation. The laboratory network with adjustable loads will allow us to test the implementation of selective load shedding with contribution from the customers and compare the results with the simulated ones.

Dissemination – Exploitation of results (about ½ page)

One of the most important aspects of scientific research is the dissemination of the knowledge generated within a project. Appropriate dissemination activities can strengthen excellence, promote the advancement of knowledge, discover industrial applications, and increase the impact of the project. It is proposed to organize dissemination, exploitation and training activities of the project in a series of major tasks which include publication of the results in scientific journals, presentations at international conferences and fora, raising public awareness and significant contributions to pre-standardization knowledge aiming at the adoption of universally accepted hardware and software solutions for the underlying ICT infrastructure to monitor and control the electricity distribution grid.

To strengthen excellence, promote the advancement of knowledge, discover industrial applications, and increase the impact of the project, it is proposed to organize the dissemination, exploitation and training activities around the following major areas:

Area 1 – Exploitation of the Project Results/Intellectual Property Rights Protection

An essential aim of any research project of this magnitude involves exploitation of the project results. We expect that this research work will lead into original results that will be applied to the electric utility industry. This involves Intellectual Property Rights (IPR) protection, as well as further evaluation of the potential for commercialization of the outcomes. While academic partners might want to publish as quickly as possible, prudent exploitation dictates that some information may be withheld from the public domain until protected appropriately by patenting.

Area 2 – Dissemination of results

Dissemination of the knowledge generated by the project to the scientific community will be achieved by presentations of project members at international conferences, or for other research groups and interested parties in the field and publications in high-ranked peer-reviewed scientific journals. A series of esteemed journals will be targeted, such as the IEEE Transactions on Power Systems, IEEE Transactions on Power Delivery, IEEE Transactions on Instrumentation and Measurement, IEEE Transactions on Smart Grid, and IET Proceedings on Generation, Transmission and Distribution.

Area 3 – Raising public awareness

Raising public participation and awareness will be accomplished by a number of outreach activities as described below:

Project Seminars/Workshop: *A number of seminars and a workshop (all open to the public) will be organized during the project. Announcements will be sent via email and through mail to government and private entities as well as individuals who are interested in this research area.*

Newsletter Articles: *The KIOS Center publishes a biannual newsletter ("Intelligent Times") which is distributed to a wide audience including local and international industrial companies, government bodies, students, and international research organizations. The research team will publish project related articles and announcements regularly in the KIOS newsletter.*

Presentations at the KIOS Annual Workshop: *The KIOS Research Center organizes annual workshops open to the public. These events include lectures related to the topics covered by the Center, poster sessions for the research activities of the Center and interesting demos. The research team will present their project results during these events. Posters: Posters will be printed and displayed at the premises and research laboratories of the University of Cyprus and of the partners to raise public awareness about the project.*

Time schedule (about ½ page)

In order to perform the described experiments and tests, a period of 6 to 7 weeks is required, depending on the availability of the infrastructure under consideration. The target starting date can be:

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1. June 1st 2013 or
2. August 23rd 2013

Description of the proposing team (as long as needed)

Yiannis Tofis

Personal Information

Date of Birth : 04-08-1984
Place of Birth : Larnaca, Cyprus
Gender : Male

Contact Information

Address : 22 Panidos Street
Larnaca
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Cyprus

Phone : +357-99306137
E- mail : yiannistofis@hotmail.com

Education

November-January 2012: Internship at the **University of Cambridge**: Dealing with the development of a sensor and lighting control platform over a low bandwidth wired communication network based on prototype hardware. The project is supervised by the Professor Ian Leslie.

July-August 2012: Internship at **CERN** (European Laboratory for Particle Physics): Dealing with the monitoring of the electricity grid (both transmission and distribution) and performing real time load flows and state estimation, exploding available data from PVSS SCADA Framework. These data (from PVSS) are imported to DigSilent PowerFactory Simulator via OPC Interoperability Standard for Industrial Automation.

October-December 2011: He has achieved excellent performance and he was ranked among the top 15% at the courses of Machine Learning, Database Systems and Artificial Intelligence offered online from Stanford University Professors.

2010-Present: PhD student at the Electrical and Computer Engineering Department of the University of Cyprus dealing with the Smart Electricity Grids and Demand Side Management.

2009-2010: Msc Telecommunications, School of Electrical and Electronic Engineering, University College of London (UCL), United Kingdom

Qualification: **Distinction (74% - Ranked among the top 8%)**

May-September 2010: Dissertation Research project dealing with Content Centric Networks (CCN) and caching performance analysis.

2004-2009: Five years Diploma Degree in Electrical and Computer Engineering, School of Electrical and Computer Engineering (ECE), National Technical University of Athens (NTUA), Greece.

Graduation GPA: 8.02 /10 ('Very Good')

Major Area: Communications engineering

March-July 2009: final diploma thesis entitled "Performance of multi-hop Free Space Optical (FSO) systems". These relay assisted systems increase the order of diversity of the whole system and can be reduced to a powerful mitigation tool for FSO systems operating under atmospheric turbulence channels.

2002: Certificate of studies, St. George Lyceum of Larnaca

Graduated with honors GPA 19.64/20.00

Internships:

1 July – 31 August 2011: Internship at the Smarterphone AS: Dealing with the development and testing of software for mobile phones. In particular we considered the development and evaluation of user interfaces and documentation of the Smarterphone 3.0 platform. This refers to a software application suite for mobile handsets that provides all of the layers from the hardware up to the end-user applications and what is needed for the interaction between them.

15 July –14 August 2009: Internship at the Public Power Corporation S.A. in the department of the Islands Power Supply Direction concerning the design and implementation of an algorithm destined for the economical incorporation and operation of Electricity Production Units of the Lesvos island whilst being an apprentice at the Autonomous Electricity Production Station as well as at the Direction of Transportation and Distribution of Lesvos. The project was highly distinguished in a panhellenic student contest for the promotion of competent research programmes, such as the above.

18 November-end of June 2009: Internship at the Network Management Center (NMC) of the National Technical University of Athens (NTUA).

Duties: a) Management and maintenance of the Advanced Telematics Network of NTUA.
b) Trouble ticket and use of the integrated information system developed to support the trouble ticket mechanism.
c) Application offered to new connections to the data networks.
d) Accounting (personal statements) and user's requests and complains of users of the NTUA's Network.

July –August 2008: University of Tokyo (**IAESTE exchange program**): Dealing with the research theme "Measurements of Environmental Microwave Power" supervised by Professor Tohru Asami. The task concerned the estimation of the amount of power

scavenged from RF signals in the real environment.

Research Funded Projects:

- ICT-FP7 COntent Mediator architecture for content-aware nETworks (COMET) project, ICT-93757, from May to September 2010
- NEDO Grant (in Japan) for Industrial Technology Research Power scavenging solutions for the development of environmentally friendly wireless sensing systems, from July to August 2008

Seminars:

- Eestec Workshop on Nanoelectronics held in the Technical University of Munich (TUM) from the 8th to the 17th of May 2009
- 8th School in Nuclear Fusion, organised by the department of Mechanical Engineering of the University of Thessaly, in Volos from the 6th to 11th of April 2009
- 2nd and 3rd International Conference of the Hellenic Telecommunications and Post commission on Broadband Internet (Athens - Grand Resort Lagonissi).
- 2nd Pan-Hellenic conference of electrical and computer engineering students (18-19 April 2008 at the theatre of Cultural Center "Hellenic World").
- September-December 2002: Military school for young officers in Herculean-Crete, Greece

Honors and Awards

May 2010: Accepted to Summer Academy of "Wireless Communication-New Technologies and Research Challenges" funded by the German Academic Exchange Service (DAAD) that has taken place from July 26 to August 08 at TU Ilmenau in Germany.

2002-now: Awarded 5 annual scholarships by the Greek Foundation of National Scholarships (IKY) for maintaining the academic excellence prerequisites.

2002: Scholarship from the Greek Foundation of National Scholarships (IKY) for achieving the 4th Pan-Cypriot highest grade in university entrance exams.

Computer/ Technical Skills

Programming: Pascal, C, Java, HTML, XML, MySQL

Operating Systems: Windows
Tools: Matlab, PSpice, Agilent, Advanced Design System (ADS)

Technical experience in android application development. A location based application that provides seamless positioning between GPS and Cellular Base Station (BS) Location retrieved through BS Cell ID and an unti-stoling mechanism (plug in) has been developed, submitted to Ericsson Application Awards and was highly distinguished, exhibited now to the Ericsson's application showroom.

Professional Activities

IEEE Student Member (2009-Present)
IEEE Power and Energy Society (PES) Cyprus Student Branch Vice President (2012-Present)
Cyprus Technical Chamber Member (2009-Present)

Musical education and Awards

2003: Exhibition Award of the Trinity College London for achieving the highest degree in Middle East/Mediterranean for the performance certificate diploma in violin.

1991-2003: Violin courses resulting in obtaining the Performer's Certificate violin diploma from Trinity College of London, awarded with Distinction

Languages

Greek : Native Speaker
English : Fluent: GCE O' Level English Language – Grade B (January 1997)
French : Beginner

Other Qualifications

GCE Edexcel A' Level	Pure Mathematics – Grade A (June 2001)
GCE Edexcel AS' Level	Mechanics – Grade A (June 2001)
GCE Edexcel AS' Level	Statistics – Grade A (January 2001)
GCE Edexcel O' Level	Computing – Grade A (June 2000)
Trinity College London	Performance Certificate violin – Grade 88/100

Military service

2002-2004: Infantry Officer at the National Guard of Cyprus.

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Publications

Yiannis Tofis, Ioannis Psaras and George Pavlou, “Modelling Queuing Delays in Content-Centric Networks”, London Communications Symposium (LCS), September, 2010

Andreas Kamilaris, Yiannis Tofis, Chakib Bekaraz, Andreas Pitsillides and Elias Kyriakides, “Integrating Web-Enabled Energy-Aware Smart Homes to the Smart Grid”, Journal On Advances in Intelligent Systems 5 (1), 15-31, 2012

Yiannis Tofis, Lenos Hadjidemetriou, and Elias Kyriakides, “An intelligent load shedding mechanism for maintaining frequency stability”, Accepted to IEEE PowerTech 2013 Conference.