

Lecture Proposal

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Title: **New Green Networking and Computing Approaches:**
Energy-oriented Infrastructures in a Carbon Constrained World

Energy consumption and the concomitant Green House Gas (GHG) emissions are becoming major issues in modern industrial society. In this scenario, current high performance network infrastructures (routers, switches, line cards, signal regenerators, optical amplifiers, etc.) have reached huge bandwidth capacity but their development has not been compensated at the same rate as for their energy consumption. It is estimated that such infrastructures alone consume 22 GW of electrical power corresponding to more than 1% of the worldwide electrical energy consumption, with a power consumption growth rate of 12% per year, further stressing the need for energy-efficient network devices and energy aware routing protocols and control planes. Analogously, the ever-increasing data volumes to be processed, stored, and accessed every day in modern data centers result in an energy demand growing a faster and faster pace. Data center power and cooling infrastructure worldwide waste more than 60 million MW hours per year of electricity that does no useful work powering IT equipment. This represents an enormous financial burden on industry and is a significant public policy environmental issue. Renewable energy sources are emerging as promising solution both to drastically reduce GHG emissions and to cope with the growing power requirements of these infrastructures, due to their lower energy costs. In particular, the dynamic distribution of computing and storage load in multiple data centers scattered throughout the world can be investigated in order to exploit the availability of renewable energy sources and lower their ecological footprint and contain the energy-related bills. Therefore, new energy-aware paradigms relying on smart grid infrastructure are emerging, able to either divert the network traffic on energy-efficient equipment or, analogously, to direct computing tasks or the data towards a site which is currently green powered (thus, in a *follow-the-renewable* energy manner), or to request to the smart grid a quantity and quality of energy (e.g., from an available renewable energy production site) for the facility (in a *follow-the-data* manner). Such energy-aware paradigms unveil new potentials for the ICT that have not been explored before. The main objective of this lecture is presenting the current challenges and research trends for eco-sustainable ICT infrastructures and the new energy-aware networking and computing models, protocols, architectures, techniques and paradigms that, considering power usage as a new constraint, optimize the use of energy and reduce the GHG emissions for achieving a more sustainable society that will be a basis for growth and prosperity.

Short Bio

Aniello Castiglione (S'04–M'08) received the Ph.D. degree in Computer Science from the University of Salerno, Italy. He received the Italian National Habilitation as Associate Professor in Computer Science. He is Adjunct Professor at the Department of Educational Science and at the Department of Computer Science of University of Salerno, and at the University of Naples. He has published more than 120 papers in international journals and conferences. His current research interests include Information Forensics, Digital Forensics, Security and Privacy on Cloud, Communication Networks, and Applied Cryptography. He is a member of several associations, including ACM and IEEE. He served as Program Chair and TPC Member in around 120 international conferences. One of his papers has been selected as “Featured Article” in the IEEE Cybersecurity Initiative. He serves as a Reviewer for several international journals and is the Managing Editor of two international journals. He also acts as a Reviewer for around 50 international journals. He acted as a Guest Editor in several journals and serves as an Editor for several editorial boards of international journals. He has been involved in forensic investigations, collaborating with several Law Enforcement Agencies, as a consultant.