WORKSHOP ON "NETWORKING RESEARCH TOPICS: PAST, PRESENT AND FUTURE INSPIRED BY MARIO GERLA"
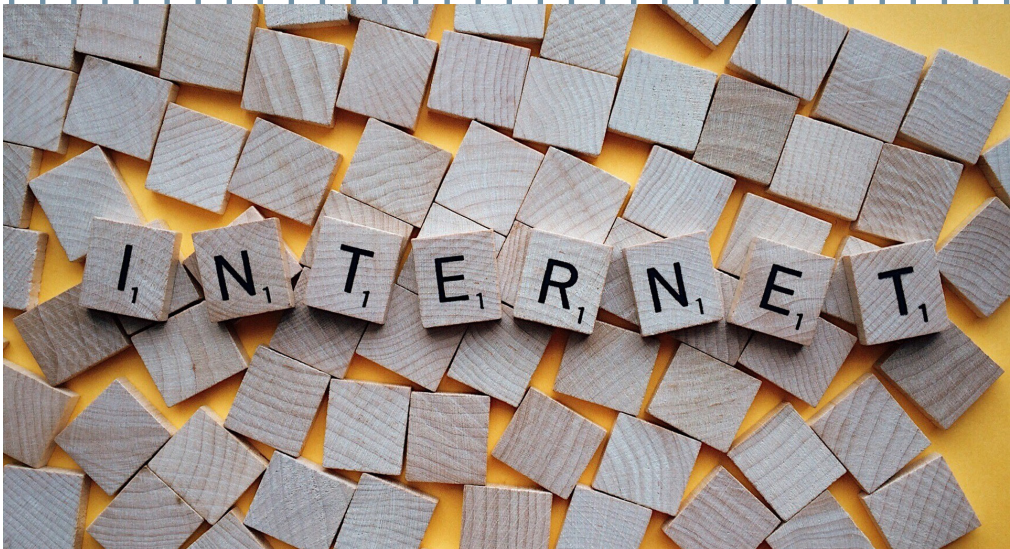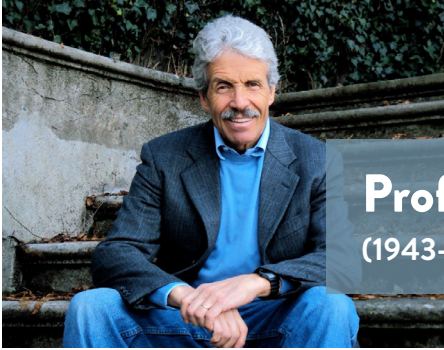

Aula De Donato - Politecnico di Milano, Milano Italy
Monday June 3, 2019 from 13.30 to 18.30

The Mario Gerla Scholarship in Computer Science

An endowed scholarship is being established in Mario's name to enhance the diversity of scholars in the field of computer science at UCLA.

Contributions can be made at giving.ucla.edu/Gerla

Professor Mario Gerla
(1943-2019)

Professor Mario Gerla passed away on February 9, 2019 after a prolonged battle with pancreatic cancer. He was 75 years old.

Mario was born in Arona, Italy in 1943 and grew up in Milan. He received an EE degree from the Politecnico di Milano in 1966 and completed service in the Italian navy before moving to the United States in 1969 to join the team at UCLA working on the ARPANET led by his advisor Leonard Kleinrock. He received his MS and PhD degrees from UCLA in 1970 and 1973, respectively. From 1973 to 1976, he was a manager in Network Analysis Corporation in Glen Cove, NY, where he was involved in several computer network design projects for both government and industry.

Since 1977, Mario has been on the Faculty of the Computer Science Department of UCLA, where he held the Jonathan B. Postel Chair and served as Department Chair from 2015 to 2018. He was the Director of the Center for Autonomous Intelligent Networks and the Network Research Lab.

Mario's research focused on the design, performance evaluation, and control of distributed computer communication systems and networks. As a pioneer in computer networking, his early work optimized that which we now know as the Internet. Over the course of his career at UCLA he graduated more than 100 PhD students from all over the world and published more than 1.000 papers. For his work in the field of mobile ad hoc networks he was made a Fellow of IEEE and ACM, received the SIGMOBILE Outstanding Contribution Award, and was recognized for lifetime achievement awards by INFOCOM and MILCOM. Although he left Italy nearly 50 years ago, he always maintained a close connection with research colleagues in his homeland.

He helped to found the Italian Scientists and Scholars of North America Foundation (ISSNAF) and was awarded a knighthood by the President of Italy in 2002, the Cavaliere Ufficiale in the Order of Merit of the Republic of Italy (OMRI). Mario was a marathoner, triathlete and member of the UCLA Masters Swim Club. He was also an ardent traveler who was proud to have visited all 7 continents and swum in 6 of 7 seas during his lifetime.

Mario is survived by his wife, his two daughters, his three siblings, many beloved nieces and nephews, and the global community of friends, colleagues, and students whom he touched with his intellect, kindness, *gioia di vivere*, and warm smile.

PROGRAM

13.30   Registrations

13.45   Initial Remarks
Chairman: **Luigi Fratta**
Executive Vice Rector of Politecnico: **Donatella Sciuto**
Dean of Engineering School: **Antonio Capone**

14.00   Remembering Mario: A path 50 years long from Politecnico to UCLA
Luigi Fratta & Leonard Kleinrock

14.30   "Internet congestion control using the power metric: Keep the pipe just full, but no fuller"
Leonard Kleinrock, *Distinguished Professor of Computer Science, UCLA, USA*

15.00   "Intelligent Environments to Realize Communication in 6G Wireless Systems"
Ian Akyildiz, *Professor at Georgia Institute of Technology, Atlanta, USA*

15.30   "Ethical and privacy issues in autonomic vehicular networks"
Gérard Le Lann, *Research Director Emeritus, INRIA, Paris/Rocquencourt, France*

16.00   "Vehicular Cloud Concepts for Mobile Edge Computing"
Falko Dressler, *Professor at Paderborn University, Germany*

16.30   "Network Measurements: Learning from the Edge"
Edmundo de Souza e Silva, *Professor at COPPE Federal University of Rio de Janeiro, Brasil*

17.00   " Back to the Future: Hardware-specialized Cloud Networking"
Giuseppe Bianchi, *Professor at Università di Roma, Tor Vergata, Rome, Italy*

17.30   Concluding Remarks

17.45   Cocktail

Internet congestion control using the power metric: Keep the pipe just full, but no fuller

Professor Leonard Kleinrock

Abstract

We identify a system operating point that maximizes a universal performance metric called Power for an arbitrary function. This optimization is proven mathematically and graphically. We then apply this metric to congestion control in networks which allows us to extract exact and surprising results that support the insight that one should "Keep the pipe just full, but no fuller". In the process, we introduce a very general plot that we call the Universal Power Profile which has broad application.

Short bio

Professor Leonard Kleinrock is Distinguished Professor of Computer Science at UCLA. He is considered a father of the Internet, having developed the mathematical theory of packet networks, the technology underpinning the Internet as an MIT graduate student in 1962. His UCLA Host computer became the first node of the Internet in September 1969 from which he directed the transmission of the first Internet message. Kleinrock received the 2007 National Medal of Science, the highest honor for achievement in science bestowed by the President of the United States.

Leonard Kleinrock received his Ph.D. from MIT in 1963. He has served as Professor of Computer Science at UCLA since then, and was department Chairman from 1991-1995. He received a BEE degree from CCNY in 1957 (Evening Session) and an MS degree from MIT in 1959. He has received eight honorary degrees, has published over 250 papers, authored six books, and has supervised the research for 50 Ph.D. students.

Dr. Kleinrock is a member of the National Academy of Engineering, the American Academy of Arts and Sciences, is an IEEE fellow, an ACM fellow, an INFORMS fellow, an IEC fellow, an inaugural member of the Internet Hall of Fame, a Guggenheim fellow, an Eminent member of Eta Kappa Nu, and a founding member of the Computer Science and Telecommunications Board of the National Research Council. Among his many honors,

he is the recipient of the National Medal of Science, the Ericsson Prize, the NAE Draper Prize, the Marconi Prize, the Dan David Prize, the Okawa Prize, the 2015 BBVA Frontiers of Knowledge Award, the IEEE Internet Millennium Award, the ORSA Lanchester Prize, the ACM SIGCOMM Award, the NEC Computer and Communications Award, the BBVA Foundation Frontiers of Knowledge Award, the Sigma Xi Monie A. Ferst Award, the CCNY Townsend Harris Medal, the CCNY Electrical Engineering Award, the UCLA Outstanding Faculty Member Award, the UCLA Distinguished Teaching Award, the INFORMS President's Award, the ICC Prize Paper Award, the IEEE Leonard G. Abraham Prize Paper Award, the IEEE Alexander Graham Bell Medal, the SIGMOBILE 2014 Outstanding Contributions Award, the SIGMOBILE Inaugural Test of Time Award, CCNY President's Leadership Award, and the IEEE Harry M. Goode Award.

His home page may be found at:

https://www.lk.cs.ucla.edu/index.html

Intelligent Environments to Realize Communication in 6G Wireless Systems

Professor Ian Akyildiz

Abstract

Electromagnetic waves undergo multiple uncontrollable alterations as they propagate with- in a wireless environment. Free space path loss, signal absorption, as well as reflections, refractions, and diffractions caused by physical objects within the environment highly affect the performance of wireless communications. Currently, such effects are intractable to account for and are treated as probabilistic factors. This talk proposes a radically different approach, enabling deterministic, programmable control over the behavior of wireless environments. The key enabler is the so-called HyperSurface tile, a novel class of planar meta-materials that can interact with impinging electromagnetic waves in a controlled manner. The HyperSurface tiles can effectively re-engineer electromagnetic waves, including steering toward any desired direction, full absorption, polarization manipulation, and more. Multiple tiles are employed to coat objects such as walls, furniture, and overall, any objects in indoor and outdoor environments. An external software service calculates and deploys the optimal interaction types per tile to best fit the needs of communicating devices. Evaluation via simulations highlights the potential of the new concept.

Talk is based on the following papers and on the VISORSURF project:
- C. Liaskos, S. Nie, A. Tsioliaridou, A. Pitsillides, S. Ioannidis, I. F. Akyildiz. "A New Wireless Communication Paradigm through Software-controlled Metasurfaces" IEEE Communication Magazine, Sept. 2018.
- C. Liaskos, A. Tsioliaridou, A. Pitsillides, S. Ioannidis, I. F. Akyildiz. "Using any Surface to Realize a New Paradigm for Wireless Communications"
- Communications of the ACM, Nov. 2018.

Short bio

I.F. AKYILDIZ is the Ken Byers Chair Professor with the School of Electrical and Computer Engineering, Georgia Institute of Technology, Director of the Broadband Wireless Networking Laboratory and Chair of the Tel-

ecommunications Group. Dr. Akyildiz is also Megagrant winner in Russia. He is Megagrant lead researcher at the Institute for Information Transmission Problems, Kharckevich Institute, Russian Academy of Sciences in Moscow, Russia since January 2018. He is the Editor-in-Chief of Computer Networks (Elsevier) Journal since 2000 and the founding Editor-in-Chief of the Ad Hoc Networks Journal (2003) both published by Elsevier. Dr. Akyildiz is an IEEE FELLOW (1996) and an ACM FELLOW (1997). He received numerous awards from IEEE and ACM. Due to Google scholar, his papers received over 103.5+K citations and his h-index is 115K as of March 2019. His current research interests are in 5GB Wireless Systems, TeraHertz Band Communication, Internet of xThings.
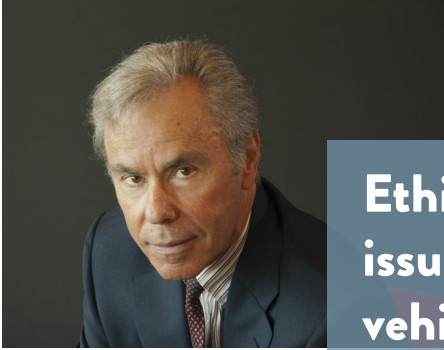
Ethical and privacy issues in autonomic vehicular networks

Dr. Gérard Le Lann

Abstract

The Trolley Problem (TP) serves as an introduction to ethical issues that arise with partially and fully automated vehicles: when there is no alternative, how to "choose" a victim? Since human injuries and fatalities are the most appropriate "yardstick" of safety, it makes sense to examine the (wifi-based) V2X and the (cellular radio-based) C-V2X solutions currently promoted by the Cooperative Intelligent Transportation Systems community. A worrisome conclusion is that safety can be compromised by remote cyberattackers. Moreover, these solutions favor privacy threats, via path tracking as well as by collecting data carried in broadcast V2X messages. Pseudonym schemes do not help, owing to mandatory periodic beaconing. Fortunately, there are solutions (with proofs) to the overall problem of safety and privacy and efficiency and cybersecurity in autonomic vehicular networks. Hints will be given in the course of this presentation.

Short bio

Dr. Gerard Le Lann holds French degrees, a M.S. in Applied Mathematics (University of Toulouse), an Engineering Degree in Computer Science (ENSEEIHT, Toulouse), and a Ph.D in Computer Science (University of Rennes). He started his career at CERN, Geneva (Switzerland), and joined IRIA (now INRIA) in 1972. His main areas of research are distributed dependable computing and networking, real-time computing and networking, proof-based system engineering and, more recently, mobile wireless safety-critical cyber-physical systems, including ad hoc vehicular networks. At Stanford University (1973-74), working with Professor Vint Cerf, he was involved in the design of what became known as the Internet TCP/IP protocol.

In 1977, he published one of the founding papers on distributed fault-tolerant computing. In the early 80's, he published innovative results on non-blocking concurrency control in distributed databases, which work was eventually transferred to Digital Equipment Corp. In

the mid 80's, he co-patented a deterministic version of the Ethernet protocol, which became a French Navy standard. More recently, he has been conducting research on safety and privacy issues as they arise with fully automated driving. He has published on time-bounded wireless communications, distributed agreements and distributed real-time transactions in ad hoc vehicular networks, based on radio or optics. In 2012, G. Le Lann has received the Willis Lamb Prize from the French Academy of Sciences for his work applicable to defense systems.

Besides its current affiliation with INRIA as Research Director Emeritus, G. Le Lann is an international consultant. He has conducted a number of audits and managed more than 60 contracts in his research areas, for US, European, and French organizations or companies.

Vehicular Cloud Concepts for Mobile Edge Computing

Professor Falko Dressler

Abstract

We will primarily discuss the challenges and opportunities of the connected cars vision in relation to the need for distributed data management solutions ranging from the vehicle to the mobile edge and to the data centers. As a novel concept, vehicle micro clouds have been proposed that bridge the gap between fully distributed vehicular networks based on short range vehicle to vehicle communication and cellular based infrastructure for centralized solutions. We will discuss the need for vehicular micro clouds, followed by the architecture, formation of micro clouds, and feasibility of micro clouds. Furthermore, we will cover aspects of efficient data upload and download between cars and a data center facilitated by our micro cloud concept.

Short bio

Falko Dressler is full professor of computer science and chair for Distributed Embedded Systems at the Heinz Nixdorf Institute and the Dept. of Computer Science, Paderborn University. Before moving to Paderborn, he was a full professor at the Institute of Computer Science, University of Innsbruck and an assistant professor at the Dept. of Computer Science, University of Erlangen. He received his M.Sc. and Ph.D. degrees from the Dept. of Computer Science, University of Erlangen in 1998 and 2003, respectively.

Dr. Dressler is associate editor-in-chief for Elsevier Computer Communications as well as an editor for journals such as IEEE Trans. on Mobile Computing, IEEE Trans. on Network Science and Engineering, Elsevier Ad Hoc Networks, and Elsevier Nano Communication Networks. He has been guest editor of special issues in IEEE Journal on Selected Areas in Communications, IEEE Communications Magazine, Elsevier Ad Hoc Networks, and many others. He has been chairing conferences such as IEEE INFOCOM, ACM MobiSys, ACM MobiHoc, IEEE VNC, IEEE GLOBECOM, and many others. He authored the textbooks Self-Organization in Sensor and Actor Networks published by

Wiley & Sons and Vehicular Networking published by Cambridge University Press. He has been an IEEE Distinguished Lecturer as well as an ACM Distinguished Speaker.

Dr. Dressler is an IEEE Fellow as well as an ACM Distinguished Member, and member of the German computer science society (GI). He also serves on the IEEE COMSOC Conference Council and the ACM SIGMOBILE Executive Committee. His research objectives include adaptive wireless networking, self-organization techniques, and embedded system design with applications in ad hoc and sensor networks, vehicular networks, industrial wireless networks, and nano-networking.

Network Measurements: Learning from the Edge
Professor Edmundo de Souza e Silva

Abstract

Measurement, modeling and analysis have been essential areas of research sincethe dawn of the Internet. UCLA led the first measurement and analysis efforts for many years through its ARPANET Measurement Center. Since then, the Internet has experienced an enormous growth and has been playing an increasingly critical role in our daily lives.

As the core network expands, home networks (hosting PCs,tablets, mobile devices, Internet TVs, etc.) have also undergone tremendousgrowth incomplexity. However, little is known about this recent environment.

Most measurements have been collected at routers that aggregate a hugenumber of network flows from thousands of homes. A detailed analysis of dataat these measurements points is extremely costly and, in addition, privacyissues must be considered complicating the measurement efforts.

In this talk we focus on lightweight measurements performed at home gateway routers and subsequent data analysis. The home router plays an important role as the conduit to home devices, making it an ideal place to implementmeasurement functionalities. However, they have limited capacity. We leverageon an ongoing collaboration among Brazil and the USA (UFRJ and UMass), amid-size ISP in Brazil and a startup company incubated at UFRJ for data gathering and analysis.

Short bio

Edmundo de Souza e Silva received the B.Sc. and M.Sc. degrees in electrical engineering, both from Pontifical Catholic University of Rio de Janeiro (PUC/RJ), and the Ph.D. degree in computer science from the University of California, Los Angeles in 1984.

Edmundo was a visiting professor/researcher at renowned universities and research centers including the IBM T.J. Watson research Center, IBM Tokyo Research Laboratory, UCLA Department of Computer Science, Computer Science Department at USC, Politecnico di Torino, Chinese University of Hong Kong, IRISA/INRIA-Rennes, Univer-

sity of Massachusetts at Amherst. He has been involved with international cooperative research programs sponsored by NSF (USA) and CNPq (Brazil) and also with INRIA (France). He has served as Technical Program Committee co-Chair of major international conferences including IEEE/Globecom'1999, ITC'2001, ACM/Sigmetrics'2002, IEEE/Infocom 2009. Edmundo was elected for the ACM/SIGMETRICS Board of Directors for 2 terms (2001-2005), and was Chair of the IFIP WG 7.3 for the 2008-2014 terms. He serves on the Editorial Board of the Journal of Internet Services and Applications (Springer) and the ACM Transactions on Modeling and Performance Evaluation of Computing Systems. Currently he is a professor at the Federal University of Rio de Janeiro, COPPE, Systems Engineering and Computer Science Department. In 2008, he received the medal of the National Order of Scientific Merit from the President of Brazil. In 2012 he received the first "Highlight Award" for his scientific contributions in the area of Computer Networks and many services to the Computer Network community in Brazil, Brazilian Computer Society. In 2017 he was recipient of the title "Builders of the Internet.br", granted by the National Education and Research Network, in recognition of its essential role and important contribution in the construction and development of the Brazilian Academic Network and the Internet Brazil. He is a member of the Brazilian Academy of Sciences and the National Academy of Engineering (Brazil).

His areas of interest include the modeling and analysis of computer systems andcommunication multimedia networks, Machine Learning and network monitoring/measurements.

Back to the Future: Hardware-specialized Cloud Networking

Professor Giuseppe Bianchi

Abstract

Since its inception, Cloud Networking (and the relevant Network Function Virtualization trend) has been based on the assumption that network processing tasks originally performed by dedicated hardware appliances should be converted into software running on commodity hardware. However, emerging media-rich and network-intensive applications come along with, at the same time, throughput requirements which are challenging for software functions, as well as latency requirements which mandate for decentralization towards the edge. In this talk we posit that recent trends in fully programmable hardware platforms specialized for high-speed packet processing, and their relevant leap of orders of magnitude with respect to the same processing on commodity CPUs, appears not only a way to address the emerging applications' requirements, but also appear to be a compelling way to address horizontal caling limitations deemed to affect edge cloud deployments.

Short bio

Giuseppe Bianchi is Full Professor of Networking at the University of Roma Tor Vergata since 2007. His research activity includes wireless networks (his pioneering research work on WLAN modeling and assessment has received the ACM SigMobile 2017 Test-Of-Time award), programmable network systems, privacy and security, traffic modeling and control, and is documented in about 230 peer-reviewed international journal and conference papers, accounting for more than 16.000 citations (source: Google Scholar). He has coordinated six large scale EU projects, and has been (or still is) editor for several journals in his field, including IEEE/ACM Trans. on Networking, IEEE Trans. on Wireless Communications, IEEE Trans. on Network and Service Management, and Elsevier Computer Communications.