

WTS 2021

Wireless Telecommunications Symposium 2021

*Global Wireless Communications: Now and
in the Future*

April 21 - 23, 2021



California State Polytechnic University, Pomona

WELCOME TO WTS 2021

Welcome to the twentieth annual Wireless Telecommunications Symposium, WTS 2021, “Global Wireless Communications: Now and in the Future.” Although the coronavirus pandemic has necessitated our meeting virtually, rather than in San Francisco, California, we hope that WTS 2021 will be a stimulating and rewarding experience for you. During the next three days of invited speakers’ presentations, accepted paper sessions, panel discussions and tutorial, WTS 2021 will explore a wide range of multidisciplinary wireless communications, mobile computing, and related topics in depth.

The WTS 2021 Technical Program Committee received paper submissions from authors around the world, covering a wide area of topics. We thank all the authors who submitted papers and proposals to WTS 2021, the many reviewers who reviewed them, and the co-chairs, track chairs and technical program committee members for coordinating the paper and proposal evaluation and selection process. We also thank the WTS support personnel for their tireless efforts and contributions behind the scene. Producing an event like WTS 2021 is not an easy task, and they did a masterful job. In addition, the WTS Committee is grateful to the IEEE Communications Society, and its Communications & Information Security Technical Committees for their technical support for WTS 2021, and to the distinguished invited speakers representing the global wireless telecommunications industry for having taken time to participate in the conference and help us organize it.

Many organizations have contributed to the conference or lent it financial support. Notable among the contributors and donors are Cal Poly Pomona’s College of Business Administration and College of Engineering, and Cal Poly Pomona’s Computer Information Systems and Electrical & Computer Engineering Departments.

Finally, special thanks go the members of the WTS Committee who spent many hours over the past couple of months converting WTS 2021 to a virtual conference, the second virtual conference in the history of WTS.

On behalf of the WTS 2021 Committee -- Welcome to WTS 2021!

Dr. Steven Powell, WTS General Chair

Dr. Thomas Ketsoglou, WTS Assistant Chair

WTS 2021 Program April 21-23, 2021

Tuesday, April 20	
12:00 pm – 2:00 pm PDT	WTS Organizers' Meeting
Wednesday, April 21	
7:00 am – 7:15 am PDT	Welcoming Remarks
7:15 am – 8:00 am PDT	"5G in the Era of Covid" Dr. William Webb CEO, Webb Search
8:00 am – 8:30 am PDT	Break
8:30 am – 9:15 am PDT	Dr. Markus Hofmann VP, Nokia Bell Labs
9:15 am – 10:00 am PDT	"2021 TMT Regulatory Overview" Andrew D. Lipman Partner, Morgan Lewis
10:00 am – 12:00 pm PDT	Lunch

<p>12:00 pm – 1:15 pm PDT</p>	<p>Panel Discussion: “New Technologies for 6G: A New Wireless Revolution?”</p> <p>Panel Moderator: Dr. Thomas Ketseoglou, Professor, ECE Department, Cal Poly Pomona</p> <p>Panelists include: Dr. Sandip Sarkar, CTO, Sesovera Dr. Pavan Nuggehalli, Google Dr. Alex Bouleogeorgos, Univ. of Pireaus Dr. Yongpeng Wu, Shanghai Jiao Tong Univ</p>
<p>1:15 pm – 1:45 pm PDT</p>	<p>Break</p>
<p>1:45 pm – 2:30 pm PDT</p>	<p>“New Frontiers in Controllable Radio Environment” Dr. Habib Riazi Spectrum, Technology, and Wireless Management Consultant</p>
<p>2:30 pm – 3:15 pm PDT</p>	<p>Doctoral Students’ Session</p> <p><i>Medium Access Strategies for Integrated Access and Backhaul at mmWaves Unlicensed Spectrum</i> Biswapratap Singh Sahoo (National Taiwan University, Taiwan); Satyabrata Swain (VIT Vellore, India); Hung-Yu Wei (National Taiwan University, Taiwan); Mahasweta Sarkar (San Diego State University & Center for Neurotechnology, USA)</p>
<p>3:15 pm – 4:45 pm PDT</p>	<p>Tutorial “Edging Towards an IT-based 5G Future” Dr. Rob van den Dam Former IBM Research Executive</p>
<p>Thursday, April 22</p>	
<p>7:00 am – 8:00 am PDT</p>	<p>Dr. Henning Schulzrinne Julian Clarence Levi Professor of Computer Science at Columbia University</p>
<p>8:00 am – 8:45 am PDT</p>	<p>Prof.dr Milica Pejanović-Djurišić United Nations Ambassador/Permanent Representative from Montenegro</p>
<p>8:45 am –</p>	<p>Break</p>

9:00 am PDT	
9:00 am – 10:00 am PDT	<p align="center">Panel Discussion: “Transformative Effect of Streaming Technology and Analytics”</p> <p align="center">Panel Moderator: Dr. J. P. Shim, Computer Information Systems Faculty Georgia State University</p> <p align="center">Panelists include: Mike Gualtieri, VP & Principal Analyst, Forrester Research Philip Nutsugah, Senior Vice President of Product Development & Management, Cox Ivan Alvarez, Vice President of Big Data and Enterprise Analytics, NCR Corporation Dr. Bipin Singh, VP of Marketing at Nexla</p>
10:00 am - 12:00 pm PDT	Lunch
12:00 pm – 12:45 pm PDT	Jonathan Atkin Managing Director at RBC Capital Markets
12:45 pm – 1:30pm PDT	Dmitry Turbiner Founder and CTO, General Radar Corp.
1:30 pm – 2:00 pm PDT	Break
2:00 pm - 2:45 pm PDT	“The State of 5G -Today and Tomorrow” Chris Pearson CEO, 5G Americas
2:45 pm – 3:30 pm PDT	WTS Organizer Recognition Ceremony
Friday, April 23	
7:00 am –	Paper Presentation Session (I)

8:00 am PDT	
8:00 am – 9:00 am PDT	Dr. Gee Rittenhouse SVP and GM, Security Cisco
9:00 am – 9:20 am PDT	Break
9:20 am – 10:00 am PDT	Paper Presentation Session (II)
10:00 am – 11:10 am PDT	Lunch Best Paper Awards Ceremony
11:10 am – 1:10 pm PDT	Paper Presentation Session (III)
1:10 pm – 1:30 pm PDT	Break
1:30 pm – 4:00 pm PDT	Paper Presentation Session (IV)

Panel Discussions, Workshops & Tutorials

WTS 2021 Panel Discussion

“New Technologies for 6G: A New Wireless Revolution?”

The development of new technologies toward 6G has already taken central stage within academia and industry on a global scale. The design of 6G already seems more revolutionary than evolutionary, especially due to the extremely high standards and requirements already set for it. This has resulted in many breakthrough technologies already proposed for 6G, encompassing a wide spectrum of applications. This panel will shed light on advanced new core technologies with high potential impact in 6G. More explicitly, the panel will be tackling some of the most envisaged as high-impact disruptive technologies for 6G, including: Reconfigurable Intelligent Surfaces (RIS), Modulation and Channel Coding for 6G, Massive Random Access (MRA) for IoT, and Radio Protocol Design for 6G.

Panel Moderator:

Dr. Thomas Ketseoglou received the B.S. degree from the University of Patras, the M.S. degree from the University of Maryland, College Park, and the Ph.D. degree from the University of Southern California, Los Angeles, all in Electrical Engineering. He worked in the wireless communications industry, including senior level positions with Siemens, Ericsson, Rockwell, and Omnipoint. He has been inventor and co-inventor in several essential patents in wireless communications. Since September 2003 he has been with the Electrical and Computer Engineering department of the California State Polytechnic University, Pomona, California, where he is a professor. He is a part-time lecturer at the University of California, Irvine. His research focuses on wireless communications with emphasis on MIMO, OFDM, and Iterative Processing.

Panelists:

Dr. Alexandros-Apostolos A. Boulogeorgos received the Electrical and Computer Engineering (ECE) diploma degree and Ph.D. degree in Wireless Communications from the Aristotle University of Thessaloniki (AUTH) in 2012 and 2016, respectively, and he is working as a researcher at University of Piraeus, Greece. From November 2012, he has worked as a researcher in various national and European projects. He has authored and co-authored more than 65 technical papers published in scientific journals and presented at prestigious international conferences. He serves as an Editor for IEEE Communications Letters, and the Frontier In Communications And Networks. His current research interests span wireless communications and networks with emphasis in high frequency communications, optical wireless communications, and signal processing for biomedical applications.

Dr. Pavan Nuggehalli received the B.Tech. degree in electronics and communication engineering from the Regional Engineering College at Kurukshetra, the M.Sc. degree in electrical sciences from the Indian Institute of Science, Bangalore, and the Ph.D. degree in electrical and computer engineering from the University of California at San Diego. He was an assistant professor in the Indian Institute of Science and a visiting researcher at the University of California, San Diego. In the wireless industry, he has been employed at several companies including Vanu, Beceem, Samsung, Broadcom, MediaTek, and Google, and has extensive experience in wireless industry. He has authored over 30 papers in peer-reviewed journals and conferences, holds 30 patents, and served on the Committees of several conferences. He is currently a wireless systems engineer in Mountain View, California, representing Google in 3GPP's RAN2 working group.

Dr. Sandip Sarkar graduated from the Indian Institute of Technology in Kanpur, India with a bachelor's degree in technology. He earned his Ph.D. in Electrical Engineering from Princeton University, and is currently the CTO of Sesovera, Before that, Dr..Sarkar was a Sr Director at Qualcomm the worldwide lead for 5G/LTE. He also worked on Globalstar, cdma2000, UMB and LTE standards. Sandip holds more that 300+ worldwide patents.

Dr. Yongpeng Wu is currently a Tenure-Track Associate Professor with the Department of Electronic Engineering, Shanghai Jiao Tong University, China. Previously, he was senior research fellow with Institute for Communications Engineering, Technical University of Munich, Germany and the Humboldt research fellow and the senior research fellow with Institute for Digital Communications, University Erlangen-Nurnberg, Germany. During his doctoral studies, he conducted cooperative research at the Department of Electrical Engineering, Missouri University of

Science and Technology, USA. His research interests include massive MIMO/MIMO systems, massive machine type communication, physical layer security, and signal processing for wireless communications.

WTS 2021 Panel Discussion

“Transformative Effect of Streaming Technology and Analytics”

Our businesses and society have become increasingly impacted by way of being immersed in an era of phenomenal changes which include communication amongst digital devices that have had a transformative effect from traditional methods of doing business to interconnected digital methods within an über-connected ecosystem. The business landscape has experienced an incredibly rapid growth in such a short span of time, with businesses having to handle substantial amounts of real-time data streaming, from handling day-to-day operations that involve applications, social media, IoT, sensors, devices, and websites while expanding the bottom-line and top-line growth of the business. Real-time streaming technology and analytics are growing so rapidly that a great number of firms and organizations have already or have begun to implement these tools to meet increasing consumer demands. There are numerous use cases of real-time streaming in various industries, such as the manufacturing and supply chain industry, the retail and customer service industry, the IT and cybersecurity industry, and the finance industry, along with other industries.

The panel will address the questions and issues to the audience members. Specifically, the panelists will be allotted time to share their views and to provide an opposing or supporting view on the issues. The panelists will be asked to draw on their expertise to address the initial questions, which is as follows: 1) what issues exist within the world of streaming technology and analytics? 2) what about the future and challenging issues in streaming technology and analytics?

Panel Moderator: Dr. J. P. Shim, Computer Information Systems Faculty, Georgia State University

Panelists include:

Mike Gualtieri, VP & Principal Analyst, Forrester Research

Philip Nutsugah, Senior Vice President of Product Development & Management, Cox

Ivan Alvarez, Vice President of Big Data and Enterprise Analytics, NCR Corporation

Dr. Bipin Singh, VP of Marketing at Nexla

Speakers' Biographies

Dr. J. P. Shim, Computer Information Systems Faculty, Georgia State University

Before joining at GSU in 2011, he was a tenured Professor, Notable Scholar, and John Grisham Professor at MSU. He received PhD from University of Nebraska-Lincoln and completed Harvard Business School's Executive Education. His research areas are IoT, IIoT Cybersecurity, Streaming Analytics, AR/VR, 5G, and AI. He worked as a consultant for Booz Allen, EPA, and Kia Motors.

Panelists:

Mike Gualtieri, VP & Principal Analyst, Forrester Research

Mike's research focuses on AI technologies, platforms, and practices that enable technology professionals to deliver digital transformations that lead to prescient digital experiences and breakthrough operational efficiency. His key technology coverage areas are AI and emerging technologies that make software faster, smarter, and transformative for global enterprises and organizations.

Philip Nutsugah, Senior Vice President of Product Development & Management, Cox.

Philip Nutsugah is the Senior Vice President of Product Development & Management for Cox Communications, overseeing the company's entire portfolio of residential, business and carrier products and services. He also serves on the board of directors for Camp Twin Lakes, Inc., an Atlanta-based non-profit organization.

Ivan Alvarez, Vice President of Big Data and Enterprise Analytics, NCR Corporation

Prior to joining NCR, Ivan was VP of Products and Process Development for SunGard Availability Services. He represents NCR on the Master of Advanced Analytics at Georgia Tech and holds a board seat at their advisory organization. Advanced Analytics programs he has led include

Pricing Prescriptive implementation, prediction of Failure for Hardware and Software, Service Dispatch avoidance – prediction.

Dr. Bipin Singh, VP of Marketing at Nexla.

Prior to Nexla, Bipin led product marketing for TIBCO's analytics and data management product portfolio. He held various managerial positions in Intel, ZEISS Group, and Aspen Technology. He holds an MBA from Babson College, PhD from Iowa State University, and BS in Chemical Engineering from Indian Institute of Technology Kanpur.

WTS 2021 Tutorial

“Edging Towards an AI-based 5G Future”

Presenter: Rob van den Dam (Former IBM Research Executive)

Abstract

The telecommunications industry is at an inflection point as it postures itself for future growth . . . or survival. To optimally benefit from the 5G revolution, communications service providers (CSPs) need to alter their mindsets and reinvent themselves. They may follow several successful paths to growth, but it is important they define and execute a strategy – and remain agile to measure and shift. It is crucial that they are part of the digital fabric, provide open platforms to play on, and deliver solutions in partnership with their ecosystems. The key forces driving this need to change include:

- 5G will accelerate the rise of digital market making platforms
- 5G is poised to shift the dynamics of – even reinvent entire – industries
- More data and decision-making will shift to the network edge
- Value is shifting to digital ecosystems as end users want market-leading products
- Most value goes to those who control pivotal parts of the digital value chain
- Hybrid cloud is crucial to accelerate economic benefits from 5G and edge

The presentation will address options for CSPs on how to respond to these forces to create high margin opportunities and to return to strong growth again.

Speaker's Biography

Rob van den Dam is recognized as a thought leader, lateral thinker and a strategic visionary in the field of telecommunications. Just retired from IBM, where he was the Global Industry Leader, Telecommunications, Media and Entertainment (TME) of IBM's Institute for Business Value (the business think tank of IBM). In his role, he was responsible for developing strategic TME Thought Leadership and Eminence. As such he contributed to IBM's global TME strategy. He has over 25 years of experience in the industry and is a member of the Global Business Services (GBS) Senior Leadership team.

He graduated from the Delft University in Aerospace Engineering (with honours) and got a Phd. Before joining IBM he was Senior Principal at Data Sciences and one of the founders of the Telecommunications practice. He received the highest (Platinum) Acclaim Award for achieved global recognition as a Telecommunications Thought Leader within and outside IBM. He is also a WTS Fellow at the California State Polytechnic University, Pomona.

Rob is a recognized speaker/presenter – often being invited as keynote speaker - at almost all major industry conferences, such as TMForum, ITU, GSMA, IBC, CommunicAsia, Total Telecom, DigiWorld, Broadband World Forum, World Telecoms Council and the European Commission i2010 Industry roundtable.

In the last 15 years, Rob has authored more than 100 reports, articles and blogs. He has published articles in, among others, Annual Review of Communications, Jnl. of Telecommunications Management, European Communications, Forbes, Total Telecom Magazine, Broadcast Engineering, Telecom Asia, IBC365, Mobile Europe, Admap and Wireless Asia. He regularly writes blogs for TM Forum, ITU, Insights on Business and other social media.

WTS 2021 Paper Presentation Program

Wednesday, April 21

2:30
pm –

Doctoral Students' Session

1570706279 *Medium Access Strategies for Integrated Access and*

3:15
pm

Backhaul at mmWaves Unlicensed Spectrum Biswapratap Singh Sahoo (National Taiwan University, Taiwan); Satyabrata Swain (VIT Vellore, India); Hung-Yu Wei (National Taiwan University, Taiwan); Mahasweta Sarkar (San Diego State University & Center for Neurotechnology, USA)

Friday, April 23

I-A
IEEE Xplore Papers

1570698701 *Adaptive Downlink Beamforming based on SRS for Channel Estimation using Coherence Bandwidth Characteristic in sub-6GHz 5G NR System*

Kyungyong Lee, Yeonju Song and Jaeseon Jang (Korea Telecom, Korea (South))

7:00
am –
8:00
am

1570703591 *Energy Efficient Resource Allocation and Mode Selection for Content Fetching in Cellular D2D Networks*

Elhadj Moustapha Diallo and Rong Chai (Chongqing University of Posts and Telecommunications, China); Tazeem Ahmad (Chongqing University of Post and Telecommunication, China)

1570705814 *Cooperation-Assisted Spectrum Handover Mechanism in Vehicular Ad Hoc Networks*

Ming-Chin Chuang (China University of Technology, Taiwan)

1570706336 *Analysis of RSSI Feasibility for Sensor Positioning in Exterior Environment*

Qian Dong (Jinan University, China); Feng Zhu (Sun Yat-Sen University, China); Yanning Cai and Liangda Fang (Jinan University, China); Mi Lu (Texas A&M, USA)

I-B
IJITN Papers

7:00
am –
8:00
am

1570704188 *Small-Footprint Keyword Spotting for Controlling Smart Home Appliances using TCN and CRNN Models*

Alapati Hemalatha (National Institute of Technology Rourkela, India); Mahasweta Sarkar (San Diego State University & Center for Neurotechnology, USA); Suchismita Chinara (National Institute of Technology Rourkela, India); Christopher Paolini (San Diego State University, USA)

8:00 am – 9:00 am	Dr. Gee Rittenhouse SVP and GM, Security Cisco
9:00 am – 9:20 am	Break
9:20 am – 10:00 am	<p>II-A IEEE Xplore Papers</p> <p>1570705088 <i>Efficient Data Gathering from Passive Wireless Sensor Networks</i> Zohar Naor (University of Haifa, Israel)</p> <p>1570703439 <i>AptBLE: Adaptive PHY Mode based on K-means Algorithm in Bluetooth5</i> Xuan Luo, Mingyuan Zang, Ying Yan and Lars Dittmann (Technical University of Denmark, Denmark)</p>
9:20 am – 10:00 am	<p>II-B IJITN Papers</p> <p>1570706572 <i>Reformed QoE Based Approach In Bitrate-Adaptation for Dynamic Adaptive Streaming Systems</i> Nada Abdelhafez, Mohamed S. Hassan and Taha Landolsi (American University of Sharjah, United Arab Emirates)</p> <p>1570699261 <i>Secure Protocol for Resource Constrained IoT Devices Authentication</i> Vincent O. Nyangaresi (Tom Mboya University College, Kenya)</p>
10:00 am – 11:10 am	Lunch Best Paper Awards Ceremony
11:10 am –	III-A IEEE Xplore Papers

1:10
pm

1570694716 *Considering Sync Word and Header Error Rates for Performance Assessment in LoRa System*
Vincent Savaux (B-COM, France); Christophe Delacourt (Bcom, France); Patrick Savelli (B-com, France)

1570704378 *Simple Asymptotic BER Expressions for LoRaSystem over Rice and Rayleigh Channels*
Vincent Savaux (B-COM, France); Guillaume Ferré (University of Bordeaux, France)

1570699260 *A Multimode FPGA-based Modem with Embedded Sigma Delta Analog-to-Digital Converter for Software Defined Radio*
Francisco de Assis Brito-Filho (Federal University of Semi-arid Region - UFERSA, Brazil); Jose Garibaldi Duarte, Jr. (Federal University of Rio Grande do Norte, Brazil)

1570704679 *Phase-Only Pattern Nulling of Planar Antenna Arrays in mmWave Communications*
Sahar Molla Aghajanzadeh (Huawei Canada, Canada); Ming Jian (Huawei Technologies Co. LTD., Canada)

1570706536 *Low Complexity PIC-MMSE Detector for LDS Systems over Frequency-Selective Channels*
Mitchell Fantuz (University of Ottawa, Canada); Michel Kulhandjian (University of Ottawa & Carleton University, Canada); Claude D'Amours (University of Ottawa, Canada)

1570706598 *Novel Unsupervised Feature Extraction Protocol using Autoencoders for Connected Speech: Application in Parkinson's Disease Classification*
Sai Bharadwaj Appakaya (iCONS Lab, University of South Florida, USA); Ravi Sankar and Ehsan Sheybani (University of South Florida, USA)

11:10
am –
1:10
pm

III-B
IJITN Papers

1570706591 *V2X Wireless Communication: Simulation Platform for CA (Connected & Automated) Vehicles*
Muhammad Naeem Tahir (Finnish Meteorological Institute (FMI) & University of Oulu, Center of Wireless Communication, Finland); Marcos Katz (University of Oulu, Finland); Sahar Fatima (Bahauddin Zakariya University, Multan, Finland); Pekka Leviakangas (University of Oulu,

	<p>Finland)</p> <p>1570706594 <i>Heterogeneous Data for Enhanced Traffic Services for Smart Traffic</i> Muhammad Naeem Tahir (Finnish Meteorological Institute (FMI) & University of Oulu, Center of Wireless Communication, Finland); Marcos Katz (University of Oulu, Finland)</p> <p>1570706435 <i>Analysis of ADC Quantization and Clipping Effects on CDMA-OQAM-OFDM Based WSA</i> Hamad Aldoseri (University of Duisburg - Essen, Germany); Lars Haering (University Duisburg-Essen, Germany); Andreas Czulwik (Universität Duisburg-Essen, Germany)</p> <p>1570703485 <i>Lapa Card - A Smart Membership Card for Authentication, Payments and Directional Marketing</i> Joao Oliveira, Luis Certo, Pedro Minatel and Danton Silva (Beyond Emotions, Lda, Portugal)</p> <p>1570701119 <i>An FPGA-based Reconfigurable FIR Filter for SDR Applications</i> Lincoln Alexandre Paz Silva and Francisco de Assis Brito-Filho (Federal University of Semi-arid Region - UFERSA, Brazil)</p> <p>1570703648 <i>Single Frozen Bit Polar Code Synchronization</i> Janak Sodha (University of the West Indies, Barbados)</p>
1:10 pm – 1:30 pm	Break
1:30 pm – 4:00 pm	IV-A IEEE Xplore Papers <p>1570705607 <i>A Novel Blockchain-Based Trust Management Scheme for Vehicular Networks</i> Cong Pu (Marshall University, USA)</p> <p>1570698403 <i>Wireless Cybersecurity Education: A Focus on Curriculum</i> Edward J. Glantz (The Pennsylvania State University & College of Information Sciences and Technology, USA); Michael Bartolacci (Penn State University - Berks, USA); Mahdi Nasereddin (Penn State University, USA); David Fusco, Joanne C. Peca and Devin Kachmar (The Pennsylvania State University, USA)</p>

1570705761 *Exact File Delivery Time of Bundle Protocol in Delay/disruption-Tolerant Networks*

Lei Cao (The University of Mississippi, USA); Ramanarayanan Viswanathan (University of Mississippi, USA)

1570700706 *On Caching with Finite Blocklength Coding for Secrecy over the Binary Erasure Wiretap Channel*

Willie K Harrison and Morteza Shoushtari (Brigham Young University, USA)

1570707489 *Study of Aeronautical Broadband Service Protecting Co-Frequency Terrestrial Services in Ka-band*

Sunil Panthi (Thales Avionics, USA); Pasquale Amodio (& Thales Avionics, Inc., USA)

1570706304 *Application of 915 MHz Band LoRa for Agro-Informatic*

Aarti Gehani, Sri Harsha Shatagopam and Rahul Raghav (San Diego State University, USA); Mahasweta Sarkar (San Diego State University & Center for Neurotechnology, USA); Christopher Paolini (San Diego State University, USA)

IV-B

IJITN Papers & Extended Abstracts

1570706233 *Designing a Mobile Intervention for Alzheimer's & Other Dementias*

Upkar Varshney (Georgia State University, USA); Smita Varshney (Alzhacare, USA); Shanta Dube (Wingate University, USA); Neetu Singh (University of Illinois Springfield, USA); Vaughn McCall (Augusta University, USA)

1:30
pm –
4:00
pm

1570705743 *Cyclotomic Construction of Sparse Code Multiple Access with Improved Diversity*

Hussein Al-Hamdani (University of Arkansas at Little Rock, USA & University of Kerbala, Iraq); Aqiel Almamori (University of Baghdad, Iraq); Seshadri Mohan (University of Arkansas at Little Rock, USA)

1570703148 *An Integral Emergency Alert System for Mexico*

Elizabet De Armas Sardiñas (Universidad Nacional Autónoma de México, Mexico)

1570703906 *BER Performance of Pre-coded Space-Time Conjugate Two-Path OFDM Systems*

Hen-Geul Yeh (California State University Long Beach, USA); Jun Zhou (California State University, Long Beach, USA)

1570703907 *Design Switchable Precoded Space-Time Parallel Two-Path OFDM Systems*

Hen-Geul Yeh (California State University Long Beach, USA); Jun Zhou (California State University, Long Beach, USA)

An Efficient Implementation of Huffman Coding Algorithm

Salam N. Salloum (Cal Poly Pomona)

The Impact of the Twitter Social Media Platform in the Emergency Response to the 2016 Fort McMurray Fires in Alberta, Canada

Alex Diener, Michael Bartolacci (Penn State Berks), Stanko Dimitrov (University of Waterloo)

Speaker Biographies

Jonathan Atkin, a Managing Director in the Equity Research Division, has been with RBC Capital Markets since 2000. Previously, he held equity research positions with Alex Brown, Toronto Dominion, and Ferris Baker Watts, covering wireless, wireline, and Internet service providers. Previously, Jonathan was a senior consultant at BIA Companies, worked in corporate strategy at Daimler-Benz AG, and was a policy analyst with the United States Congress. Jonathan has BS and MS degrees in mechanical engineering from Stanford University and an MBA from Columbia University.

Dr. Markus Hofmann joined Bell Labs in 1998, transitioning from researcher, to project manager, to Head of Bell Labs Research - Alcatel-Lucent's research organization that is globally recognized for inventions that shaped the world of telecommunications and technology including the transistor, the laser, DSL, UNIX, C and C++, Solar Cells and MIMO. Seven Nobel Prizes have been awarded for work completed at Bell Laboratories. Dr. Hofmann has overseen research in multimedia communications, optics, wireless, cloud, Internet, content networking and more. Not to mention he is renowned for his pioneering work on reliable multicasting over the Internet and for defining and shaping fundamental

principles of content networking. In his current role as Executive Vice President, IP Platforms Research, he created a new global team of diverse researchers to develop disruptive solutions for the most persistent software, systems, and data analytics problems. Under his leadership he is inventing, building, and delivering innovative software components into the market.

Dr. Hofmann has published over 60 journal and conference papers and given invited talks as well as courses all over the world. He has been granted 14 U.S. patents, with many more patent applications pending.

Dr. Hofmann has been very active in several professional organizations, and the IEEE Communications Society (ComSoc), in particular. He has served as Chair of the Internet Technical Committee (ITC), a joint committee of the Internet Society and the IEEE Communications Society. He has also served as the Chair of the Open Pluggable Edge Services (OPES) Working Group in the Internet Engineering Task Force (IETF), on the Editorial Board of the Computer Communications Journal and on the Editorial Board of the IEEE/ACM Transactions on Networking. He has been involved in organizing a number of major international conferences and events. These include serving as the Technical Program Chair of the IEEE Globecom Symposium on Global Internet, the Network Group Communication (NGC), and the 1999 GI Multicast Workshop. He has been on the Advisory Board of the 2001 Content Distribution Networking (CDN) conference and served as guest editor of a issue of the Computer Networks Journal. Dr. Hofmann has been on the program committees of various IEEE and ACM-sponsored conferences and is an alumnus of the 2004 Frontiers of Engineering, National Academy of Engineers (NAE). Between 1998 and 2002, he was a national representative of Germany on the Cost 264 Management Committee, a project within the European research framework.

He received his Ph.D. with honors in Computer Engineering from University of Karlsruhe, Germany, in 1998 and joined Bell Labs Research the same year. For the spring 2005, spring 2006, and spring 2007 semesters, Dr. Hofmann also accepted a position as adjunct professor at Columbia University in New York, USA, teaching a graduate course on Content Networking. Before joining Bell Labs in May 1998, he worked as a Senior Researcher in the High Performance Networking Group at University of Karlsruhe, Germany, where he initiated and led several projects with industry partners in multiple European countries.

Dr. Hofmann has been awarded several prestigious awards. His Ph.D.

thesis won the 1998 GI/KuVS Doctoral Dissertation Award for the best Ph.D. thesis in Germany in the area of Distributed Systems and Telecommunications, and the 1998 FZI Doctoral Dissertation Award for best Ph.D. thesis in Computer Science at University of Karlsruhe. He received the Bell Labs Teamwork Award several times and was a key leader of the team that won the 2006 Lucent Chairman award. In 2013, Dr. Hofmann and his colleagues were awarded the Thomas Edison Patent Award. For more information, see <http://www.mhof.com/>.

Andrew D. Lipman is a partner at Morgan Lewis and the leader of the firm's Telecommunications, Media and Technology Practice. He practices in most aspects of communications law and related fields, including regulatory, transactional, litigation, legislative, and land use. Andy's clients in the private and public sectors include those in the areas of local, long distance, and international telephone common carriage; Internet services and technologies; conventional and emerging wireless services; satellite services; broadcasting; competitive video services; telecommunications equipment manufacturing; and other high-technology applications. Additionally, he manages privatizations of telecommunications carriers in Europe, Asia, and Latin America.

To open the US local telephone market to competition, Andy has been involved in most new legal and regulatory policies at the Federal Communications Commission, at state public service commissions, in Congress, and before courts. He helped shape crucial provisions of the Telecommunications Act of 1996 and used similar approaches to promote the opening of foreign markets. He also obtained one of the first competitive local service and interconnection agreements in continental Europe and the first competitive fiber network application in Japan. Andy's practice includes strategic analysis of companies' telecom user agreements, renegotiating existing agreements, and negotiating new, more favorable telecom user agreements.

For nearly a decade, Andy served as senior vice president, legal and regulatory affairs, for MFS Communications, the nation's largest competitive local services provider. One of the founders of MFS, Andy helped guide the company from startup to its eventual sale for \$14.4 billion to WorldCom.

Frequently writing and speaking on telecommunications, Andy's work encompasses more than 170 articles and five books, including two Dow Jones books on telecommunications. He occasionally appears on National Public Radio, C-SPAN, Bloomberg News Network, and ABC News, and

he served on the editorial advisory boards of Phillips Publishing Company, Internet Law and Regulation, Telecommunications Alert, Telecommunications Reports, Telecommunications Regulatory Monitor, and The Satellite Compendium.

Andy served as general counsel to the International Teleconferencing Association and as legislative/regulatory counsel to the International Satellite Users Association. He sits on the board of directors of five public companies trading on the NYSE, NASDAQ, and Toronto Stock Exchange. Additionally, he co-founded the Association of Local Telecommunication Services (ALTS)—the national trade association for competitive telecommunications carriers—and served as its first chairman.

Prior to joining Morgan Lewis, Andy was a partner in the corporate practice of another international law firm, where he was also a member of the executive board and leader of the telecommunications, media and technology practice. Before entering private practice, he participated in the legal honors program at the US Department of Transportation and served in the Office of the Secretary of Transportation. He also served as an extern law clerk to Judge Raymond Sullivan of the California Supreme Court.

Andy was awarded a Bachelor of Arts, Summa Cum Laude from the University of Rochester in 1974 and Juris Doctor for Stanford Law School in 1977.

In 2017 he was named to The Legal 500 Hall of Fame and in 2018 its Leading Lawyer Media, technology and telecoms: Telecoms and broadcast: transactional.

Andy is admitted to practice in the District of Columbia.

Chris Pearson is the President of 5G Americas. In his executive role, he is responsible for the overall planning of the organization and providing management for the integration of strategy and operations in the areas of technology, marketing, public relations and regulatory affairs. As President of 5G Americas (formerly called 4G Americas), Mr. Pearson represents the organization's Market Representation interests within the 3rd Generation Partnership Program (3GPP) organization.

Mr. Pearson led the organization from its inception in 2001 as the 3GPP family of technologies market share grew from 10 percent in 2001 to more than 90 percent in North, Central and South America. Mr. Pearson came to the organization from the Universal Wireless Communications Consortium

(UWCC) where he served as Executive Vice President in charge of the strategic executive management of the global TDMA wireless technology consortium. Prior to joining the UWCC, Mr. Pearson held several senior technical and marketing positions at AT&T Wireless and GTE.

With more than 28 years of experience in the telecommunications industry, Mr. Pearson is a recognized spokesperson in mobile wireless and 5G technology trends and has spoken at technology conferences throughout the world including CES, Mobile World Congress, CTIA, LTE World, 5G World North America, and 5G Forum USA.

Mr. Pearson earned a Master of Business Administration degree from The Albers School of Business and Economics at Seattle University and a Bachelor of Arts degree with emphasis in Marketing and Finance from the University of Washington.

Prof.dr Milica Pejanović-Djurišić is currently Ambassador/Permanent Representative of Montenegro to UN. She served as Minister of Defence in the Government of Montenegro from March 2012 to November 2016. Previously, she had various diplomatic and political engagements working at strengthening the stability and security in the Western Balkan Region. With the PhD in Telecommunication Engineering, Milica Pejanović-Djurišić continuously pursued her academic carrier, being full professor in Telecommunications and Wireless Communications at the Faculty of Electrical Engineering, University of Montenegro. Prof. Pejanović-Djurišić's role in fostering digital transformation of Montenegro and the region has been widely recognized, through a number of initiatives focusing on development and deployment of info-communication infrastructures and applications. She has also achieved significant research results that have been published in over 200 scientific papers in international journals and at international conferences, as well as in three books, and she has been leading and coordinating many international and national research projects. She also has considerable industry experience being President of the Board of „Telekom Montenegro“ (1999-2002), as well as President of the Board of the first Montenegrin Internet provider (2001-2002). She has been working as a consultant in the field of telecommunications, being engaged as an expert for European Commission, ITU and participating in a number of global professional associations and initiatives in the field of info-communication technologies.

Dr. Habib Riazi has been a contributor to the telecom industry for more than 30 years. He has been the RF and Systems Engineering Director at Corning Optical Communications Wireless Ltd, a major manufacturer of

active Distributed Antenna System (DAS). His previous tenure includes positions at both wireless service providers and equipment manufacturers. Prior to Corning, Habib was the Technology Strategist at Nextel, Sprint, and Clearwire, where he was responsible for assessing and recommending Radio Access Technology and products for network deployment. Prior to Nextel, he led the team for system design and simulation of the Satellite Digital Audio Receiver, now a commercially available product, at Bell Labs Advanced Technologies. Prior to Bell Labs, Habib served as the Radio Access Network Manager for Verizon for one of the first CDMA commercial network deployments. Habib did doctoral studies in Electrical Engineering at the George Washington University in Washington DC. He is a life senior member of IEEE ComSoc, a registered Professional Engineer in the state of Virginia, has served on Virginia State University Industrial Advisory Board, and holds a number of US and EU patents.

Gee Rittenhouse is the senior vice president and general manager of Cisco's Security Business Group (SBG). With strong executive management skills and deep technical experience, he is responsible for the company's global security business including strategy, portfolio, and architecture. Previously, he was the senior vice president of engineering for SBG, where he was responsible for development efforts across the business.

In 2014, Gee was named one of Cisco's Rising Stars by CRN after he was recruited by John Chambers to help the company shape its cloud and virtualization strategy. As vice president and general manager of Cisco's Cloud and Virtualization Group, he accelerated development of the company's software stack, NFV and SaaS consumption model. Prior to joining Cisco, Gee served as president of Bell Labs where he led the extensive transformation of the organization that followed the merger of Bell Labs and Alcatel's Research group.

As a highly respected IT industry leader with more than 20 years of experience in the telecommunications industry, Gee is often a featured speaker on advances in mobile communications and wireless networking technology, management, policy, applications and security. He has appeared before the U.S. Congress, U.S. FCC, European Presidential Commission, and World Economic Forum. He has twice been elected to the Global Telecoms Business Power 100, published numerous articles, and holds more than a dozen patents.

Previously, Gee served as a member of the advisory board for the University of California, Santa Barbara Computer Engineering

Department, chairman of the board of Green Touch, and board member at the ALU Foundation, which has the goal of educating disadvantaged women worldwide. Currently, he is a senior member of IEEE and was the previous recipient of the IEEE Communication Quality and Reliability (CQR) Chairman's Award.

Gee has a Ph.D. degree in electrical engineering and computer science from the Massachusetts Institute of Technology (MIT).

Prof. Henning Schulzrinne is Julian Clarence Levi Professor of Computer Science at Columbia University. He received his undergraduate degree in economics and electrical engineering from the Darmstadt University of Technology, Germany, his MSEE degree as a Fulbright scholar from the University of Cincinnati, Ohio and his Ph.D. from the University of Massachusetts in Amherst, Massachusetts. He was a member of technical staff at AT&T Bell Laboratories, Murray Hill and an associate department head at GMD-Fokus (Berlin), before joining the Computer Science and Electrical Engineering departments at Columbia University, New York. From 2004 to 2009, he served as chair of the Department of Computer Science. From 2010 to 2011, he was an Engineering Fellow at the Federal Communications Commission (FCC); he is currently the CTO of the FCC.

He is editor of the "Computer Communications Journal", the "ACM Transactions on Multimedia Computing", the "ComSoc Surveys & Tutorials" and a former editor of the "IEEE Transactions on Image Processing", "Journal of Communications and Networks", "IEEE/ACM Transactions on Networking" and the "IEEE Internet Computing Magazine".

He has been a member of the Board of Governors of the IEEE Communications Society and is vice chair of ACM SIGCOMM, former chair of the IEEE Communications Society Technical Committees on Computer Communications and the Internet and has been technical program chair of Global Internet, IEEE Infocom 2000, ACM NOSSDAV, IEEE IM, IPTComm 2008, IFIP Networking 2009 and IPtel and general co-Chair of ACM Multimedia 2004 and ICNP 2009. He serves on the Internet2 Applications, Middleware and Services Advisory Council and have led a working in the NSF GENI project. He also has been a member of the IAB (Internet Architecture Board). He serves on a number of conference and journal steering committees, including for the IEEE/ACM Transactions on Networking.

He has published more than 250 journal and conference papers, and more than 70 Internet RFCs. Protocols co-developed by him are now Internet standards, used by almost all Internet telephony and multimedia applications. His research interests include Internet multimedia systems, quality of service, and performance evaluation.

He served as Chief Scientist for FirstHand Technologies and Chief Scientific Advisor for Ubiquity Software Corporation. He is a Fellow of the IEEE, has received the New York City Mayor's Award for Excellence in Science and Technology, the VON Pioneer Award, TCCC service award and the IEEE Region 1 William Terry Award for Lifetime Distinguished Service to IEEE.

Dmitry Turbiner is a founder, inventor of multiple foundational technologies and a hardware engineer with a BS in Electrical Engineering from MIT and an MS from Stanford University. He dropped out of Stanford in 2016 to found General Radar to revolutionize AI based radar technology for use in autonomous systems and long-range perception. An expert in high-speed electronics, RF, computing and sensing devices, Dmitry invented and developed the original prototype, secured over \$8M in seed funding from Kleiner Perkins, and some of the most reputable angel investors in the field. Over the last couple years, Dmitry assembled a team of over fifteen extremely talented and broad-skilled engineers and executives from MIT and Stanford. Together, the team has developed four generations of radar and one lidar system and is delivering solutions to a variety of problems in both the commercial and defense space, including the United States Air Force.

Prior to Genrad, Dmitry was a Microwave Engineer at NASA/JPL where he served as the Chief Engineer for the COSMIC-2/FORMOSAT-7 Mission's Radio Occultation Antenna Array. Currently, twelve of Dmitry's Antennas are orbiting on a constellation of six LEO satellites, launched by a SpaceX Falcon Heavy from LC-39A at Kennedy Space Center. Dmitry also holds two issued patents in the field of Antenna design and three patents pending in Radar, as well as a groundbreaking invention of a Petascale chip in partnership with Professor Danny Bankman at Carnegie Mellon University.

Dmitry is passionate about solving complex, mission critical engineering problems at cost and scale.

William Webb is one of the world's leading wireless communications experts. William is CEO at Webb Search, an independent consultancy. He

was one of the founding directors of Neul, a company developing machine-to-machine technologies and networks, which was formed at the start of 2011 and subsequently sold to Huawei and became CEO of the Weightless SIG, a body standardizing IoT technology. Prior to this William was a Director at Ofcom where he managed a team providing technical advice and performing research. He has worked for a range of communications consultancies and spent three years providing strategic management across Motorola's entire communications portfolio, based in Chicago. He was IET President 2014-2015.

William has published 17 books, 100 papers, and 18 patents. He is a Visiting Professor at Southampton University, a Fellow of the Royal Academy of Engineering, the IEEE and the IET. He has been awarded multiple honorary doctorates by the UK's leading universities and in 2018 was awarded the IET's prestigious Mountbatten Medal for technology entrepreneurship. William has a first class honours degree in electronics, a PhD and an MBA.

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