

The Columbia Institute for Tele-Information

State of Telecom: Online Video as the Disruptor: Winners and Losers



Columbia Institute
for Tele-Information

October 7th 2016

Columbia University
Uris Hall 333
3022 Broadway and 116th St.
New York, NY 10027

9:00am-5:00pm

Background

Over the past 5 years, the use of online video entertainment has exploded. In 2011 the average user spent 39 minutes per day watching online video. By 2015, that number had quadrupled to 1 hour 55 minutes a day. Online video

is quickly becoming the "killer app" of the Internet. As online video becomes a central pillar of the Internet it disrupts traditional players and industries: content producers; distribution networks; aggregators; consumer electronics makers; cloud and data centers; advertisers and marketers; and investors. The conference will analyze how these industries are affected and what the consequences are. It will feature academics, policymakers, and industry trailblazers. Additionally, the conference will hear Wall Street analysts predicting long-term winners and losers.

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Agenda

8:30-9:00am Registration and Breakfast

9:00am Welcome and Introduction to the Conference

- Eli Noam, Columbia University

9:20am Online Video as a Disrupter of Consumer Electronics

Previous generations of video were generally defined by the devices used to view the content (VHS, DVD, Cable/Satellite Set Top Boxes). But online video is not tethered to a single device. This panel will analyze the current and future state of video hardware, and also explore policy on set-top box/device interconnection. Discussion will include financial models for video hardware, and whether the next generation of video will require separate hardware, or be virtualized in the cloud.

Moderator: Darcy Gerbarg

- Henning Schulzrinne, Federal Communications Commission
- John Carey, Fordham University
- Greg Harper, Harpervision
- Bernarda Duarte, Roku

10:35am Online Video as the Disruptor of Distribution Networks

Video transmission is expected to grow to 80% of network traffic by 2020. As video distribution is transformed and more users connect to cloud-based video systems, what will be the demands on network capacity? What kind of upgrades will be needed in the core of the network, in the network architecture, and what are the investment implications? What role will the Backhaul/CDN providers play in this new system, and what will be their industry structure? What will be the impact on DSL, mobile wireless, satellites? What are the opportunities for infrastructure technology vendors. Startups, and software defined networks? What are the implications for vertical integration of CDNs and content? And what are policy implications?

Moderator: Robert Pepper, Facebook

- Brent Olson, AT&T
- Heather Hudson, University of Alaska Anchorage
- Toshiya Jitsuzumi, Kyushu University

11:50am Coffee Break

12:00pm Online Video as a Disruptor of Content Markets

Internet Usage, both wired and wireless, has grown at a high rate. It has been observed that the main driver of this growth has been entertainment, specifically streaming video. The question is what drives this growth. It

has been said that content is king. Others disagree. Several major content acquisitions by distributors have now taken place, most recently Verizon/AOL & Yahoo. Is such vertical integration being oversold? Will the high demand, for premium content raise its cost? What are the implications for media companies of various kinds? What are the policy implications?

Moderator: Jason Buckweitz, Columbia Institute for Tele-Information

- Rick Lane, 21st Century Fox
- Scott McDonald, Nomos Research
- Steve Rosenbaum, Waywire.com
- Hal Vogel, Vogel Capital Management

1:15pm Lunch

2:15pm Disrupting the Disruptors: Video as a Disruptor of Clouds, Platforms, and Data Centers

With video platforms becoming a central element of video distribution, an important question is the emerging industry structure. Vast server farms need to be created and operated, data analytics be performed, and marketing and customer services provided. Are the scale economies such that only a few vast operators will survive? Will this lead to a multi-level industry system? Who will be the major players, and who will be in decline? What is the global nature of such a system? What are the implications?

Moderator: Bruce Lincoln

- Matthias Kurth, Cable Europe
- G. Gooder, Kaltura
- Debasis Mitra, Columbia University

3:30pm Online Video as a Disruptor of Wall Street: Investors Predicting Winners and Losers

This panel will examine what the growth segments and companies are, and which are likely to decline. Projections will be sought for the near term, the more competitive intermediate stage, and a consolidated long run. What are investor implications?

Moderator: Judith O'Neill

- Jonathan Chaplin, New Street Research
- Robert Cohen, Economic Strategy Institute
- Raul Katz, Columbia University
- Craig Moffett, MoffettNathanson
- Tuna Amobi, S&P



4:45pm Conclusion

Bios:

Eli M. Noam

Director, Columbia Institute for Tele-Information

Professor of Finance and Economics

Garrett Professor of Public Policy and Business Responsibility

Columbia University Business School

Professor of Economics and Finance at the Columbia Business School since 1976, and its Garrett Professor of Public Policy and Business Responsibility. Served for three years as a Commissioner for Public Services of New York State. Appointed by the White House to the President's IT Advisory Committee. Director of the Columbia Institute for Tele-Information, a research center focusing on management and policy issues in telecommunications, internet, and electronic mass media. He has also taught at Columbia Law School, Princeton University's Economics Department and Woodrow Wilson School, and the University of St. Gallen, and is active in the development of electronic distance education. Noam has published 29 books and over 350 articles in economics journals, law reviews, and interdisciplinary journals. His recent books include *Broadband Networks and Smart Grids* (Springer, 2013); *Media Ownership and Concentration in America* (Oxford, 2009); *Peer to Peer Video* (Springer, 2008); and *Ultrabroadband* (IDATE, 2008). He is completing a 4-volume

series on *Media Management*, and leads a 30-country team on international media ownership. Chairman of the International Media Management Association (2012-14).



Noam has been a member of advisory boards for the Federal government's telecommunications network, and of the IRS computer system, of the National Computer Systems Laboratory, the National Commission on the Status of Women in Computing, the Governor's Task Force on New Media, and of the Intek Corporation. His academic, advisory, and non-profit board and trustee memberships include the Nexus Mundi Foundation (Chairman), Jones International University (the first accredited online university), the Electronic Privacy Information Center, and several committees of the National Research Council. Noam is a Fellow of the World Economic Forum, a member of the Council on Foreign Relations, and a commercially rated pilot. He served in the Israel Air Force in the 1967 and 1973 wars, and is an active search and rescue pilot with the Civil Air Patrol (1st Lt.). He is married to Nadine Strossen, a law professor and national president of the American Civil Liberties Union for 18 years. He received the degrees of BA, MA, Ph.D (Economics) and JD from Harvard University, and honorary doctorates from the University of Munich (2006) and the University of Marseilles (2008).

Henning Schulzrinne

CTO

Federal Communications Commission

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.

John Carey
Professor of Communications and Media Management
Fordham University

John Carey brings 25 years of experience in media-industry research and product development to his teaching at the Gabelli School of Business. His clients have included Google, American Express, AT&T, NBC Universal, The New York Times, Primedia, A&E Television Networks, Digitas, The Online Publishers Association, PBS, Cablevision, Rainbow Media, Scholastic and XM Satellite Radio, among others. Professor Carey has served on the advisory boards of the Adult Literacy Media Alliance, the Annenberg School For Communications and Fordham's Donald

McGannon Communication Research Center. He was a commissioner on the Annenberg Commission on the Press and Democracy, has been an invited lecturer in more than a dozen countries and has presented his research to the boards of major media companies in the United States. Before coming to Fordham, he taught at Columbia Business School and at New York University.

Greg Harper
Founder and President
Harpervision

Gregory W. Harper is President of Harpervision Associates and co-founder of Gadgetoff, an invitation-only event in New York City that gathers leading science and technology innovators. Mr. Harper is currently focusing on wireless personal information devices, mobile phones, the next generation of ultra high definition (4K) telepresence and collaborative systems, 3D TV, distance learning, digital distribution of media, and rich media. Mr Harper presents cutting edge technology at Gadgetoff events, industry conferences, trade shows and is a frequent contributor on national television talking about the latest in consumer tech.

Mr. Harper has had a long and successful career not only in technology but also in television production. Mr. Harper has served as president of MyPublisher, the leading publisher of custom photo books. In August, 2000, Mr. Harper sold Next Venue, a company he co-founded, to IBeam Broadcasting. Next Venue, a leader in the streaming media industry, was a spin-off of CNBC Dow Jones Business Video, a joint venture of NBC, Dow Jones and Microsoft. Prior to the spin-off, Mr. Harper served as Chief Technologist to the NBC/Microsoft joint venture and was responsible for designing its innovative rich media website. Mr. Harper's prior endeavors include: Executive Vice President of NBC Onsite, a pioneering in-store advertising system; President of Technology for ACTV, a leader in interactive television; President and Founder of Com/Tech Communication Technologies, Inc., a



video production and technology firm, which he sold in 1995; extensive work as a producer of television shows, both in the US and abroad; development and deployment of technology in such areas as interactive cable, data broadcasting, and judicial video arraignment systems; US representative to various ITU standards committees (CCITT and CCIR) as well as various EIA and ISO committees focusing on data broadcasting; active involvement in the creation of the US NABTS teletext standard; assistance in the development of the world's first interactive cable TV system,

Warner's Qube System; work for various television networks and stations including WGBY TV, Springfield, CBS (news division and technology), PBS (technology and program production), France Telecom – TDF (President of its US subsidiary, Antiope

and Telematics) and NBC (long range planning and data broadcasting). Mr. Harper is a graduate of Amherst College.

Bernarda Duarte
Director of Content Acquisition
Roku

Robert Pepper
Global Connectivity and Technology Policy
Facebook

Robert Pepper helps lead Facebook's connectivity and technology policy activities focusing on new technology development, deployment and adoption. Pepper previously was Cisco's Vice President for Global Technology Policy for more than a decade working with governments across the world helping them develop their digital strategies and address areas such as ICT and development, broadband plans, IP enabled services, wireless and spectrum policy, the Internet of Things, security, privacy and Internet governance.

Pepper was Chief of the Office of Plans and Policy and Chief of Policy Development at the FCC for 16 years beginning in 1989 where he led teams designing and implementing the first U.S. spectrum auctions, developing policies promoting the development of the Internet, implementing telecommunications legislation, and planning for the transition to digital television.

Before joining the FCC, Pepper was Director of the Annenberg Washington Program in Communications Policy. His government service also included Acting Associate Administrator at the National Telecommunications and Information Administration (NTIA) and initiating a program on Computers, Communications and Information Policy at the National Science Foundation.

His academic appointments included faculty positions at the Universities of Iowa, Indiana, and Pennsylvania, and as a research affiliate at Harvard University. He chairs the U.S. Department of State's Advisory Committee on International Communications and Information Policy and has served on the board of the U.S. Telecommunications Training Institute, the U.S. Department of Commerce's Spectrum Management Advisory Committee and the UK's OFCOM Spectrum Advisory Board.



Pepper received his BA. and Ph.D. from the University of Wisconsin-Madison.



Brent Olson
Vice President Global Public Policy
AT&T

Brent Olson serves as Vice President – Global Public Policy at AT&T. Mr. Olson oversees a team responsible for developing and coordinating at the international, federal and state levels AT&T's public policy positions on issues covering next generation broadband services, IP interconnection, VoIP, Internet content and intermediary responsibility, video programming, and other Internet user community initiatives. Mr. Olson has 20+ years of telecommunications law and policy experience. Prior to joining AT&T, Mr. Olson worked for a total of nine years as an attorney at the Federal Communications Commission, including serving as the Deputy Chief of the Competition Policy Division of the Wireline Competition Bureau from 2000 - 2004.

He is a graduate of Northwestern University and holds a JD from the UCLA School of Law.

Heather Hudson
Affiliate Professor of Communications Policy
University of Alaska Anchorage



Dr. Heather E. Hudson is Affiliate Professor of Communications Policy and former Director of the Institute of Social and Economic Research (ISER), University of Alaska Anchorage, and Professor Emerita of the University of San Francisco. Her research focuses on applications of information and communication technologies for socio-economic development, regulatory issues, and policies and strategies to extend affordable access to communications, particularly in rural and developing regions. She has planned and evaluated communication projects in Alaska and northern Canada and more than 50 developing countries and emerging economies. Dr. Hudson is the author of numerous articles and several books. Her latest book is *Connecting Alaskans: Telecommunications in Alaska from Telegraph to Broadband*.

Her recent activities include research on Internet and broadband usage in indigenous communities in Alaska and northern Canada, testimony on behalf of First Nations communications organizations on broadband as a basic service in Canada, and research on the role of radio plus mobile phones and innovative mobile applications in improving food security in sub-Saharan Africa.

Professor Hudson is a CITI Fellow at Columbia University and a Sproul Fellow at the University of California, Berkeley, and has held a Fulbright Research Chair in Canada and Fulbright Distinguished Lectureship in the Asia/Pacific. She is a Board Member of Farm Radio International and the Global Telecommunications Women's Network (GTWN). She is also a member of the FirstNet Public Safety Advisory Committee, the Advisory Council of the Pacific Telecommunications Council, and the University of Hawaii's ICTD Advisory Board.



Toshiya Jitsuzumi

**Professor of Economics
Kyushu University**

Toshiya Jitsuzumi is a professor in the Faculty of Economics, Kyushu University. He obtained an LLB from the University of Tokyo, an MBA from the Stern School of Business, New York University, and a DSc from the Graduate School of Global Information and Telecommunication Studies, Waseda University. His research focuses on telecom/Internet policy and the economics of the telecom industry. His current interests include net neutrality, OTT, municipal Wi-Fi, and economic value of personal information.

Rick Lane
Senior Vice President of Government Affairs
21st Century Fox

Rick Lane is the Senior Vice President of Government Affairs of 21st Century Fox. 21st Century Fox is the world's premier portfolio of cable, broadcast, film, pay TV and satellite assets spanning six continents across the globe. Reaching nearly 1.5 billion subscribers in 100 local languages every day, 21st Century Fox is home to a global portfolio of cable and broadcasting networks and properties, including FOX, FX, FXX, FS1, Fox News Channel, Fox Business Network, Fox Sports, Fox Sports Network, National Geographic Channels, Fox Pan American Sports, MundoFox, STAR and 28 local television stations; film studio Twentieth Century Fox Film; and television production studios Twentieth Century Fox Television and Shine Group.



As Senior Vice President of Government Affairs, Rick is responsible for coordinating the development and implementation of the Company's public policy activities. Before joining 21st Century Fox (formally known as "News Corporation"), Rick was the Director of Congressional Affairs focusing on E-Commerce and Internet

public policy issues for the United States Chamber of Commerce, the world's largest business organization. Prior to working at the Chamber, Rick was employed by the international law firm of Weil, Gotshal & Manges LLP (WG&M) as the Director of Legislative Affairs. While at Weil, he advised and represented clients before Congress on a variety of legislative matters affecting the technology and telecommunications industries. From 1988 to 1993, he worked for U.S. Representative Joseph D. Early (D-MA) as an Associate Staff member to the House Appropriations Committee. While working for Representative Early, his primary responsibilities involved technology, telecommunications, tax, education, and labor and related issues.



Rick's background includes creating the Modern Educational Technology Center (METEC) in 1993 and CyberSports, Inc. in 1994. METEC was an educational technology private-public partnership. CyberSports is a for-profit corporation which created the leading college and university sports recruiting software in the nation.

Rick has served in leadership positions on a variety of federal, state, local commissions and committees, including his participation as a member of the United States Trade Representative's Joint Government-Private Sector Committee on Experts on Electronic Commerce (Joint E-Commerce Committee). He also served on the Federal Trade Commission's Advisory Committee on Online Access and Security and the Virginia Attorney General's Online Safety Task Force. At the local level Rick served as chairman of the Montgomery County, MD Cable & Communications Advisory Committee (CCAC) working to develop the County's cable and communications policy. He currently serves on the Board of Directors of Horton's Kids, a community-based 501(c)3 whose goal is to empower at-risk children in Washington, DC and prepare them for college, career, and life through educational opportunities and comprehensive programs tailored to their needs.

Scott McDonald
President
Nomos Research

Scott McDonald is the President of Nomos Research, a media research consultancy based in New York City. For nearly 15 years, he was Senior Vice President, Market Research at Condé Nast, responsible for cross-platform research on and for all of the Condé Nast portfolio of media brands-- including such well-known properties as Vogue, Vanity Fair, Wired, GQ and The New Yorker. Prior to joining Condé Nast, he

held similar research positions at Time Warner Inc.

From 1998 to 2015 Scott taught a popular course on media measurement and economics at the Columbia Business School. He currently is working on research initiatives at the Social Science Matrix at UC Berkeley, where he has also lectured and given seminars. He also is Program Chair of the London-based PDRF (Publisher Data Research Forum) and is on the board of the i-COM, a digital media and analytics consortium based in Geneva. He also has served as the Chairman of the New York-based Advertising Research Foundation.

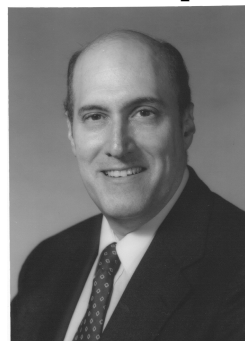


He holds an A.B. in Sociology from the University of California at Berkeley and a Ph.D. in Sociology from Harvard University.

Hal Vogel
Founder
Vogel Capital Management

Harold L. Vogel is the author of *Entertainment Industry Economics: A Guide for Financial Analysis* (Fifth Edition) and of the companion volume, *Travel Industry Economics: A Guide for Financial Analysis*, both published by Cambridge University Press in 2001. He was ranked as top entertainment industry analyst for a record ten years by Institutional Investor magazine and was the senior entertainment industry analyst at Merrill Lynch for seventeen years. A chartered financial analyst (C.F.A.), Mr. Vogel served on the New York State Governor's Motion Picture and Television Advisory Board and as an adjunct professor of media economics at Columbia University's Graduate School of Business. He is currently a venture capitalist and fund manager specializing in early stage investments in media and entertainment and aviation and is based in New York. He is also a corporate director of NearWare Networks and Cavalcade Media and is on the advisory board of Rightsline, Inc. and several other companies.

Matthias Kurth
Executive Chairman
Cable Europe



Matthias Kurth joined Cable Europe in October 2012 as Executive Chairman. Mr. Kurth sits on Cable Europe's Executive Committee which has oversight of the cable industry's main representational duties in Europe. Matthias lastly held the position of President of the German Federal Network Agency, Bundesnetzagentur



(BNetzA), the authority for telecommunications, postal, energy and railway markets in Germany, including frequency management and digital signature. He played an instrumental role in the liberalization of the German energy market and left behind notable achievements with respect to competition in the telecommunications market. Matthias also served as Chairman of the European Regulators Group (ERG) in 2009 to increase regulatory cooperation at the EU level.

G. Gooder
SVP, Global Sales, Media & Telecom
Kaltura

G. leads the the Media & Telco sales team at Kaltura, managing all revenues and bookings. Prior to this position, G. was Kaltura's Vice President & GM of North America– leading the Education, Enterprise and Media teams across the region. Prior to this G. led Kaltura's Education practice.

G. has worked in online video sales for almost 20 years. Prior to Kaltura he was VP Strategic Account for Brightcove, and prior to that he worked for online video pioneer The FeedRoom.

G. graduated from Brown University in 1994, and began his career in broadcast television, working for ABC News, CBS News and the Fox News Channel.

Debasis Mitra
Professor of Electrical Engineering
Columbia University



Debasis Mitra joined Columbia University as Professor of Electrical Engineering in 2013. Prior to joining Columbia he worked at Bell Labs for 44 years. His current research interests are in the scientific foundations of policy that impact engineers and engineering systems, especially in models, analyses and syntheses of organizational and individual interactions. Instances are network neutrality, network economics, and the science and management of innovations and knowledge-creation. In the recent past his research has been in traffic engineering of communication networks, cooperative inter-networking, planning for network infrastructure and network resource sharing.

Debasis Mitra served as Vice President of the Mathematical and Algorithmic Sciences Research Center in Bell Labs during 1999-2007. He directed work in fundamental mathematics, algorithms, complex systems analysis and optimization, statistics, information & communication sciences and operations research. During

2008-2013 he served as Vice President, Chief Scientist's Office, Bell Labs, and had responsibility for global research partnerships, academic relations and technical excellence.

Debasis Mitra is a member of the National Academy of Engineering, a Bell Labs Fellow and a Life Fellow of the IEEE. He is a recipient of the 2012 ACM SIGMETRICS Lifetime Achievement Award, the 2012 Arne Jensen Lifetime Achievement Award from the International Teletraffic Congress, 1998 IEEE Eric E. Sumner Award, the 1993 Steven O. Rice Prize Paper Award and the 1982 Guillemin-Cauer Prize Paper Award of the IEEE, among other awards.



Debasis Mitra has been on the editorial boards of the IEEE/ACM Transactions on Networking, the IEEE Transactions of Communications, the IEEE Transactions on Circuits and Systems, Queueing Systems (QUESTA) and Operations Research. He is author of over 100 journal publications and holds over 20 patents.

He has served as member, National Academies Panel on Information Sciences (and its predecessors) at the Army Research Laboratory during 2009-2015. In 2011-2012 he chaired the panel and served on the Army Research Laboratory Technical Assessment Board. In 2009-2010 he served on the panel to assess the National Institute of Standards and Technology's Information Technology Laboratory. During 2006-2010 he served on the Air Force Studies Board of the National Academies. In 2003 he served as Chair of the Telecom review panel of the N.J. Commission on Jobs Growth and Economic Development. He has served on the Review Panel of the Institute of Infocomm Research in Singapore, the Advisory Committee to CEET in the University of Melbourne, the IEEE COMSOC Awards Committee and chaired the IEEE Eric Sumner Award Committee during 2004-2005.

Jonathan Chaplin
Managing Partner
New Street Research

Jonathan Chaplin is Managing Partner of New Street Research, an equity research boutique focused on the Communications Services industries with offices in New York, London and Singapore. Jonathan partnered with former colleagues from Credit Suisse and JPMorgan to launch New Street's US practice in 2012. Prior to New Street he led the Telecom Research team at Credit Suisse and the Telecom & Cable Research teams at JPMorgan. Jonathan started his career in finance in the M&A group at JPMorgan, focused on the Telecommunications Sector.

Jonathan has twice been recognized as "Best on The Street" among Telecom analysts by the Wall Street Journal, second for stock picking among Telecom analysts by Forbes Magazine and as a leading stock picker among analysts covering all industries by Institutional Investor Magazine.

Jonathan is an avid alpinist, climbing technical peaks all over the world whenever he can tear himself away the worlds of finance and communications. He has also launched two restaurants and magazine in Cape Town, South Africa.

Robert Cohen
Senior Fellow
Economic Strategy Institute



Robert Cohen is an economist and senior fellow at the Economic Strategy Institute. He analyzes the economic impact of new telecommunications and computing technologies. His current work explores the emergence of software as the fundamental building block for networks, data centers and computing. It does this by forecasting the growth of cloud services and the Internet of Things. Dr. Cohen employs input/output analysis to forecast US investment and productivity changes and employment impacts. The Ewing Marion Kauffman Foundation, Brocade Communications and the OECD are sponsoring this effort.

Dr. Cohen's studies of the impact of grid computing on North Carolina and the US used a similar approach, with support from the NC Rural Internet Access Authority, IBM, AT&T, Intel, Juniper Networks, MCI, Corning, Applied Materials, and Cadence. With support from Japan's AIST, IBM, Cisco, NTT Data, and Intel, Dr. Cohen repeated this analysis for Japan. Dr. Cohen has been Associate Professor of International Business and Finance at New York University Business School, Associate Professor of Finance and Economics at York College of the City University of New York, and Senior International Economist at the Futures Group. He was on the Open Grid Forum's steering committee and COMNET's planning committee. He is a past president of the Forecasters Club of New York. He holds an MA and Ph.D. in economics from the New School for Social Research and a BA from Swarthmore College. He is an author, co-author or editor of five books.

Raul Katz
Adjunct Professor
Columbia University

As an international telecom industry consulting executive, Dr. Raul Katz has provided direction to CEOs and other top management of major

telecommunications, software and information services companies in the areas of business strategy, consumer/industrial marketing and general management approaches. He managed projects in the areas of demand forecasting, scenario planning, competitive analysis, market entry strategy, churn management and new product development. Dr. Katz conducted assignments in the United States, Europe, Asia, the Middle East and Latin America. In addition, Dr. Katz has worked extensively in the design of organizations, management processes and best practices of telecommunications enterprises.

In addition, Dr. Katz has worked with governments and international organizations in the development of regulatory frameworks and policies, National Broadband Plans and National Technology Strategies. In particular, he has supported the governments of Colombia, Costa Rica, and Brazil.

He is currently President of Telecom Advisory Services, a boutique firm that advises clients in the interrelated fields of strategy and regulation. He was previously CEO of Adventis, a telecommunications consulting company with offices in New York, Boston, London, Berlin and Shanghai. Before joining Adventis, he was a Lead Partner at Booz Allen Hamilton, where he was a member of the firm's Leadership Team and Head of the US and Latin America telecommunication practices.

Dr. Katz received his Ph.D. in Management Science and Political Science and an M.S. in Communications Technology and Policy from the Massachusetts Institute of Technology. In addition, he holds a Licence in History and a Maîtrise in Political Science from the University of Paris-Sorbonne, as well as a Licence and a Maîtrise (with honors) in Communication Sciences from the University of Paris.

He is a Director of Business Strategy Research at Columbia University's Center for Tele-Information, an Adjunct Professor in Columbia Business School Division of Finance and Economics, and a Visiting Professor at the Universidad de San Andres in Argentina. He currently teaches courses on Competitive Strategy for High Technology Companies, and Consulting in the Telecommunications and Media Industries.

Dr. Katz has published articles in journals such as Telecommunications Policy, Telephony, Strategy and Business, Communications and Strategies, Interconomics, America's Network and The Information Society. His book The Information Society: an International Perspective, focusing on the deregulation trends in the worldwide telecommunications industry was published in 1988. His book Creative Destruction: Business Survival Strategies in the Global Internet Economy, addressing recent discontinuities in the telecommunications industry, was published in 2000, and translated into Japanese. His book The Role of ICT in Development was published in

2010.

He is fluent in English, French and Spanish. He currently lives in New York and has lived in France, in addition to his native country of Argentina.

Craig Moffett
Senior Research Analyst
MoffettNathanson

Craig Moffett has been elected to Institutional Investor Magazine's All-American Research Team in the U.S. Telecom and/or Cable & Satellite sectors on fifteen separate occasions, including nine separate appearance as the #1 analyst in America in either U.S. Telecom and/or Cable & Satellite. He has also been rated the #1 analyst in the U.S. Telecommunications sector by Bloomberg Markets, and he has consistently ranked #1 in Research Quality in Greenwich Research's annual survey in both Telecommunications and U.S. Cable and Satellite sectors.



Prior to founding MoffettNathanson, Mr. Moffett spent more than ten years at Sanford Bernstein & Co., LLC as a senior research analyst. In 2011 he became the first analyst in the firm's history to be ranked #1 in two sectors simultaneously by Institutional Investor.



He was previously the President and founder of the e-commerce business at Sotheby's Holdings, the venerable auction house. In 1999, he led Sothebys.com to what was then the highest first year sales of any consumer website ever launched.

Mr. Moffett spent more than eleven years at The Boston Consulting Group, where he was a Partner and Vice President specializing in telecommunications. He was the leader of BCG's global Telecommunications practice from 1996 to 1999. While at BCG, he led client initiatives in the U.S. local, long distance, and wireless sectors, in both consumer and commercial services, and advised companies outside the U.S. in Europe, Latin America, and Asia. His relationship with a U.S. RBOC spanned more than a decade, and he was the author of more than 20 articles about the telecommunications industry during the 1990s. He published analyses and forecasts of the overcapacity and pending collapse of the U.S. long distance business as early as 1998. Mr. Moffett graduated from Harvard Business School with Honors in 1989. He received a BA from Brown University phi beta kappa in 1984.

Tuna Amobi

Senior Media and Entertainment Analyst Standards and Poor's

Tuna N. Amobi is the senior media and entertainment analyst in Standard & Poor's U.S. Equity Research Services. In this capacity, he provides analysis and investment recommendations on a range of stocks in the broadcast, cable, satellite, movies and entertainment sectors. He also writes periodic industry research reports and makes regular appearances and has been interviewed and widely quoted in the financial press, including Barron's, BBC, Bloomberg, Business Week, CNBC, Dow Jones, Financial Times, BBN and Reuters.

Tuna is a member of the Standard & Poor's Analytical Policy Board, which reviews and directs major policy decisions and analytical criteria consistent with the mission of Standard & Poor's Investment Services. As an accounting analyst, he is also a member of the Standard & Poor's Core Earnings Committee, which creates and refines a proprietary analytical framework used to measure the performance of a company's core business.

Prior to joining Standard & Poor's, Tuna worked as an equity research coverage analyst at Lehman Brothers, New York, where he also used his expertise to offer best investment ideas with the firm's Investment Policy Committee. Earlier in his career, Tuna was a manager in the assurance and strategy consulting groups in the New York offices of Arthur Andersen & Co., and subsequently, KPMG Peat Marwick, LLP.

Tuna holds the Chartered Financial Analyst (CFA) designation. He is a member of the American Institute of Certified Public Accountants, the New York State Society of CPAs, and the New York Society of Security Analysts. Tuna earned a JD (LL.B.) degree, and a B.Sc. (Accounting), summa cum laude, and received an MBA from the premier University of Strathclyde, Glasgow, Scotland. He also holds the Series 7 and Series 63 securities licenses.