

David Lucantoni, Ph.D.

Principal Consultant
DLT Consulting, L.L.C.

10 Oak Tree Lane
Ocean, New Jersey 07712-3487

Ph: +1.732.493.0587
Fax: +1.732.493.4465
Email: Lucantoni@DLTconsulting.com
Web: <http://www.DLTconsulting.com>

Professional Summary

Dr. Lucantoni has over twenty-seven years of telecommunications industry experience, as a practitioner, academic and independent consultant. The scope of his experience includes research, product design and technical analysis of high-speed data communications, wireless technology and computer telephony.

Expertise

- Broadband Communications
- Wireless Communications
- Satellite Communications
- Fiber Optic Metropolitan Area Networks
- LAN/WAN Architecture & Protocols
- Digital Switching
- Computer Telephony
- Internet Technology & Infrastructure
- Network Test & Reliability
- Queueing Theory
- Performance Analysis
- Reliability/Availability Analysis

Education

<u>Year</u>	<u>College or University</u>	<u>Degree</u>
1981	University of Delaware Newark, DE	Ph.D., Operations Research <ul style="list-style-type: none">• Dr. Lucantoni's Dissertation analyzed the stop-and-wait retransmission protocol for data integrity where the error environment is highly correlated; The Dissertation was published as a monograph in the "Research Notes in Mathematics" series of <i>Pitman Books Limited</i>, London, 1982. The Dissertation contained the first general proof that the key transform matrix involved in solving stochastic models of the "M/G/1 Type" was the unique minimal solution to a non-linear matrix functional equation• Completed over 80 graduate credits in Mathematics and Operations Research with a GPA of 3.96/4.0
1978	University of Delaware Newark, DE	M.S., Statistics <ul style="list-style-type: none">• Thesis entitled: "Numerical Methods for a Wide Class of Markov Chains Arising in Queueing Theory"
1976	Towson University Towson, MD	B.S., Mathematics

Professional Experience

From:	1998
To:	Present
Organization:	DLT Consulting, L.L.C. , Ocean, NJ
Title:	President

Summary: DLT Consulting provides technical consulting services to client's worldwide. The company's services include the assessment of complex telecommunications networks; reliability, availability and performance analysis of digital and optical networks; traffic engineering; capacity planning; technical due-diligence; patent portfolio analysis and expert witness services. A partial list of clients and projects is outlined below:

<u>Client:</u>	<u>Project Summary:</u>
Various Law Firms Sep 2000 – Present	Served as an expert witness in patent litigations (see section on litigation support experience)
LC Communications Davie, FL Aug 01 – Present	Modeling and analysis of capacity and availability provided to an international circuit reseller in support of an expert witness engagement in Telecom arbitration.
Wong, Cabello, Lutsch, Rutherford & Bruculeri, L.L.P Houston, TX Mar 04 – Jun 04	Review patents involving networking technology for potential licensing value.
TechSearch, L.L.C. Northbrook, IL Jul 03 – Aug 03	Review high-speed networking patents for potential licensing value.
ipValue Management San Jose, CA Jan 03 – Dec 03	Review Telecom patents for potential infringement relating to particular clients.
LNG Holdings SA Hannover, Germany May 02 – Dec 02	Reporting directly to the CEO, conducted a CapEx audit of a potential build-out of a multi-national fiber optic backbone network based on revised traffic forecasts. Participate in redesign of a national fiber optic network to reduce capital expenditures (Madrid). Participate on a Network Management committee to exploit multi-national synergies for potential cost savings (Paris).
SATNAC 2002 Drakensberg, KwaZulu- Natal, South Africa Sep 02	Invited Plenary Speaker at the Southern African Telecommunication Networks and Applications Conference. Talk was on recent results in IP traffic modeling.
17th International Teletraffic Congress Salvador, Bahia, Brazil Dec 01	Participate as an invited panelist on an international panel discussing the lessons learned since the discovery of long-range dependence in Internet traffic measurements.
FIRSTMARK Comm., Europe SA Hannover, Germany Jul 01 – Dec 01	Review architecture, capacity, and potential bottlenecks of a multi-national broadband network, including a fiber optic backbone with wireless local loop (WLL) and digital subscriber line (DSL) access. Reporting directly to the CEO, provide inputs to guide the future direction of the company. Assess the necessity of several deployed fiber optic Metropolitan Area Networks (Madrid and Barcelona) relative to existing capacity requirements. Provide input to a contract negotiation process to settle existing contract disputes.
Chiaro Networks, Ltd. Richardson, TX Apr 01 – Jul 01	Review and refine performance analyses for an optical switching technology. Lead performance discussions with customers.

From:	1994
To:	1998
Organization:	IsoQuantic Technologies L.L.C. (IQ Tech) , Ocean, NJ
Title	VP & Chief Technical Officer (Co-Founder)

Summary: Provides a family of wireless telecommunications and analytical products, plus a comprehensive range of engineering consulting services, including technology training. The company is positioned to support telecommunications network architecture, design, and analysis needs in the areas of modern telecommunications systems (e.g., cellular, satellite, GSM, PCS) to the public with dramatic cycle time reductions. A partial list of clients and projects includes:

<u>Client:</u>	<u>Project Summary:</u>
Motorola Satellite Comm. Chandler, AZ Jun 98 – Jul 98	Began performance assessment of access schemes for data services for a next generation mobile satellite system.
A.T. Kearney London England Jan 98 – Mar 98	Participate on a technical due diligence team assessing the performance of the satellite and ground systems for the ICO global mobile satellite system. Interview major subcontractors, e.g., NEC London, NEC Tokyo, NEC Melbourne, Hughes Space and ComSat. Assess cost models used in the Satellite System Business Plan. Perform probabilistic assessment of launch failure scenarios.
Bell Comm. Research Morristown, NJ Sep 97 – Dec 97	Provide algorithms and custom software for approximating long-range dependent data traffic (e.g., IP or broadband) with a Markovian Arrival Process. Provide algorithms and custom software for computing appropriate performance measures to be used for engineering such a network.
Lockheed Martin Telecommunications Sunnyvale, CA Sep 96 – Aug 97	General performance analysis for the Astrolink broadband satellite system. Assessed loss of efficiency of imposing various constraints on the Demand Assignment Multiple Access (DAMA) algorithms. Performed buffer sizing studies for aspects of the Astrolink system.
AT&T Laboratories Holmdel, NJ Sep 96 – Apr 97	Began assessment of Internet telephony as both a threat and an opportunity to AT&T long distance revenues. Prepared an internal management presentation on Choices in Packet Telephony.
AirNet Comm., Inc. Melbourne, FL Jun 95 – Jun 96	Provided continuing consulting services for performance analysis and architecture for a start-up wireless company building a PCS1900 Base Station Controller (BSC) and a Base Transceiver System (BTS) using smart-radio technology. Supervised in-house development of a system-level simulation. Designed the resource allocation algorithm for a PCS1900 Base Station Subsystem (BSS). Presented the paper “Supporting ATM on Low-Earth Orbit Satellite Systems” at the ITC Specialists Seminar in Amsterdam.
Motorola, Inc. Chandler, AZ Sep 94 – Jun 95	General performance analysis for the Iridium™ Low-Earth Orbit (LEO) satellite system. Consulting through GORCA in Moorestown, NJ, continued development of a crucial resource allocation algorithm operating in real time on-board the satellite vehicle. Created risk models to determine insurance strategies for coping with potentially unreliable launch vehicles in the initial deployment of the Iridium™ system. Recruited and established a Network Integrity Support Team to focus on performance aspects of the Iridium™ system.

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From:	April 1994
To:	September 1994
Organization:	Motorola, Inc. , Chandler AZ
Title:	Member of Technical Staff (GS-13)

Summary: General performance analysis for the Iridium™ Low-Earth Orbit satellite system. In response to a discovery that the switching fabric in production was not “non-blocking” as originally believed, Dr. Lucantoni designed a real-time resource allocation algorithm to operate on-board the satellite vehicle that could recover the potential capacity loss. This algorithm avoided a costly hardware redesign **saving more than \$50M** and is currently implemented on board the Iridium™ satellites.

From:	1981
To:	1994
Organization:	Bell Telephone Laboratories , Holmdel, NJ
Title:	Distinguished Member of Technical Staff

Summary: During his thirteen year tenure, Dr. Lucantoni was involved in several projects dealing with leading edge technology, including:

Broadband ISDN/ATM

- Defined overall control architecture, incorporating end-to-end flow control, traffic shaping capabilities and higher layer control functions; portions have been incorporated into international standards.
- Using exact and approximate models quantified the multiplexing gain for a large number of bursty sources and the impact on engineering of ATM networks.
- Using exact models demonstrated that predictions based on the popular notions of “effective bandwidth” could be arbitrarily poor; proposed more accurate approximations.
- Derived and solved analytically tractable models for quantifying the effectiveness of the “throughput-burstiness filter.”
- Performed analytic modeling to assess the effectiveness of several selective cell discard mechanisms for congestion control in broadband networks using models and analysis, formulated specific recommendations for switched virtual circuit call acceptance/denial algorithms and for bandwidth-on-demand negotiation algorithms.

Algorithmic Solutions to Stochastic Models, Queueing Theory, and Applied Probability

- Developed algorithms for numerically computing an arbitrary number of moments as well as the exact asymptotic behavior of a distribution function from its transform.
- Contributed to the development of algorithms for numerically inverting multidimensional Laplace-Stieltjes transforms and/or probability generating functions (with an important application of allowing numerical computations to be performed for various transient queueing models).
- Drastically simplified analysis and algorithms for a large class of complex queueing models (BMAP/G/1 queue), which also include multiplexed, highly correlated arrival streams.
- Derived exact solutions and numerical algorithms for computing the transient performance measures of the above class of models; this framework allows new insights into the problems of overload control and call acceptance algorithms for broadband networks.
- Combined transform/eigen-analysis approach with the matrix-geometric method to solve important class of voice and data queueing models.
- Introduced the, now popular, Markovian Arrival Process (MAP) as a versatile and tractable class which includes both renewal and non-renewal point processes.
- Solved the queue with vacations using above model; generalized known factorization results to the non-renewal case and obtained new factorization results.
- Derived an enormously improved approach for solving the nonlinear matrix functional equation arising in the matrix analytic solution to phase-type queues.
- Provided the first general proof that the key transform matrix involved in solving stochastic models of the “M/G/1 Type” was the unique minimal solution to a non-linear, matrix functional equation.

Variable-Bit-Rate Video

- Developed Markov renewal model for sizing leaky bucket parameters for call setup algorithms.
- Defined two novel measures of goodness-of-fit of a model to data.

Packetized Voice and Data

Teaching Experience

From: 1991
To: 1993
Organization: **Stevens Institute of Technology**, Hoboken, NJ
Title: Adjunct Professor of Computer Science
Summary: Dr. Lucantoni taught graduate level courses in *Probability* and *Stochastic Processes*

Litigation Support Experience

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Citizens Communications
Services Provided: Mar 2008 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Citizens Communications; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Teligence
Services Provided: Mar 2008 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Teligence; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Citizens Financial
Services Provided: Mar 2008 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Citizens Financial; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Cincinnati Bell
Services Provided: Mar 2008 – Sep 2008 (engaged on behalf of RAKTL) Wrote an expert report on

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Disposition: infringement by Cincinnati Bell; was deposed
Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Macy's
Services Provided: Mar 2008 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Macy's; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Echostar Satellite LLC
Services Provided: Mar 2008 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Echostar; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. U. S. Bancorp, et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by U. S. Bank; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Humana, Inc., et al.
Services Provided: Nov 2007 – June 2008 (engaged on behalf of RAKTL) Wrote expert reports on infringement by Humana and Humana Military Health Systems; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. General Motors Corp., et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by General Motors; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Earthlink, Inc., et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Earthlink; was deposed
Disposition: Ongoing

Expert Engagement:

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Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. DirecTV Group, et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by DirecTV; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Cox Communications, Inc., et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by Cox Communications; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Whirlpool, Inc., et al.
Services Provided: Nov 2007 – Jun 2008 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Whirlpool
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Aetna, Inc., et al.
Services Provided: Nov 2007 – July 2008 (engaged on behalf of RAKTL) Wrote an expert reports on infringement by Aetna, Caremark & Kroger
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Amtrak, Inc., et al.
Services Provided: Nov 2007 – Jun 2008 (engaged on behalf of RAKTL) Wrote expert report on infringement by Amtrak
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Federal Express, Inc., et al.
Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by FedEx; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. American Airlines, Inc., et al.

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Services Provided: Nov 2007 – Present (engaged on behalf of RAKTL) Wrote an expert report on infringement by American Airlines; was deposed
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Cooley Godward Kronish LLP**, Reston, VA
Case Name: Ronald A. Katz Technology Licensing L.P. v. Citibank, N.A., et al.
Services Provided: May 2005 – Nov 2007 (engaged on behalf of RAKTL) Wrote an expert report on infringement by T-Mobile
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **King & Spalding LLP**, New York, NY
Case Name: QPSX Developments 5 Pty Ltd. v. Juniper Networks, Inc., et al.
Services Provided: January 2006 – April 2007 (engaged on behalf of Alcatel) Wrote an expert report on non-infringement
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Maher, Guiley & Maher, P.A.**, Winter Park, FL & **Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.**, Orlando, FL
Case Name: 800 Adept, Inc. v. Murex Securities, LTD., et al.
Services Provided: October 2005 – October 2006 (Engaged on behalf of 800 Adept) Wrote expert reports on infringement for patents involving geographic routing of 800 calls. Testified at deposition and as a direct and rebuttal witness at the (jury) trial.
Disposition: Jury verdict in favor of plaintiff (800 Adept); found all 800 Adept asserted claims infringed; found willful infringement on the part of Murex Securities, LTD.; found all Murex asserted claims non-infringed.

Read the Jury Verdict:

<http://www.dltconsulting.com/documents/documents/JuryVerdict.pdf>

This verdict was listed as number 76 in the Top 100 Verdicts of 2006. See:

http://www.verdictsearch.com/jv3_news/top100_2006/index.jsp

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **McKool Smith, P.C.**, Austin, TX
Case Name: Ciena Corporation v. Nortel Networks Limited
Services Provided: September 2005 – July 2006 (Engaged on behalf of Nortel) Wrote expert reports on non-infringement and validity and was deposed on patents involving inverse multiplexing over ATM (IMA).
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **McDonnell Boehnen Hulbert & Berghoff LLP**, Chicago, IL
Case Name: SmartCall Licensing Inc. v. Sprint Spectrum LP.
Services Provided: August 2005 – September 2005 (Engaged on behalf of Sprint) Participated in claim construction activities involving paging network patents.

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Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Oblon, Spivak, McClelland, Maier & Neustadt P.C.**, Alexandria, VA
Case Name: Toshiba Corporation v. Juniper Networks, Inc. and Riverstone Networks, Inc.
Services Provided: Participated in claim construction activities involving a Multiprotocol Label Switching (MPLS) patent
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Gibbons, Del Deo, Dolan, Griffinger & Vecchione**, Newark, NJ
Case Name: Acceris Communications Technologies, Inc. v. ITXC Corp.
Services Provided: October 2004 – June 2005 (Engaged on behalf of Acceris) Participated in claim construction activities involving a voice-over-IP patent
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Kirkland & Ellis**, New York, NY
Case Name: Lucent Technologies v. Extreme Networks, Inc.
Services Provided: Deposed as a fact witness for his Lucent patents involving telecommunications congestion control technologies that have since been incorporated into the ATM standards.
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Kirkland & Ellis**, New York, NY
Case Name: Lucent Technologies v. Foundry Networks, Inc.
Services Provided: Deposed as a fact witness for his Lucent patents involving telecommunications congestion control technologies that have since been incorporated into the ATM standards.
Disposition: Ongoing

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Fish & Neave**, New York, NY
Case Name: Verizon v. Katz
Services Provided: November 2002 – July 2004. (Engaged on behalf of Katz.) Serving as an expert witness involving telecommunications call center technology; Completed expert reports related to patent infringement, enablement and written description. Testified at several depositions.
Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: **Kenyon & Kenyon**, New York, NY
Case Name: Alcatel Internetworking, Inc. v. Cisco Systems, Inc.

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Services Provided: September 2000 – March 2004. (Engaged on behalf of Alcatel.) Serving as an expert witness involving telecommunications networking technology; Testified at Federal District Court at the Markman claim construction hearing in the Central District of California at Los Angeles, CA. Completed expert reports related to patent infringement and patent invalidity and the subsequent depositions.

Disposition: Settled

Expert Engagement

Type of Matter: Telecom Arbitration (Breach of Contract)

Law Firm: **Law Offices of Francis X. Markey**, Washington, DC

Case Name: Confidential

Services Provided: From August 2001 to Present. (On behalf of International Telecom, Inc.) Provide consulting (as an expert witness) and modeling in a telecommunications arbitration case. Was deposed and testified for over four days at trial at the American Arbitration Association.

Disposition: Ongoing

Expert Engagement:

Type of Matter: Telecom Arbitration (Breach of Contract)

Law Firm: **Law Offices of Francis X. Markey**, Washington, DC

Case Name: International Telecom, Inc. d/b/a LC Communications v. Generadora Electrica del Oriente, S.A., et al., 00-CIV 8695 WHP

Services Provided: From August 2001 to December 2001. (On behalf of International Telecom, Inc.) Provide consulting as an expert witness and modeling in a telecommunications arbitration case.

Disposition: Judgment in favor of International Telecom, Inc.

Expert Engagement:

Type of Matter: Patent Infringement

Law Firm: **Reed Smith, LLP**, New York, NY

Case Name: Acterna (Telecommunications Techniques Corporation) v. Adtech

Services Provided: From August 2001 to October 2001, served as an expert witness involving telecommunications networking monitoring technology.

Disposition: Settled

Expert Engagement:

Type of Matter: Patent Infringement

Law Firm: **Kirkland & Ellis**, New York, NY

Case Name: Lucent Technologies v. Newbridge Networks

Services Provided: From October 1998 to November 1999, served as a fact witness for his Lucent patents involving telecommunications congestion control technologies that have since been incorporated into the ATM standards.

Disposition: Decided in favor of Lucent

Awards and Honors

- Received the 2008 Dean's Recognition Award in the Jess and Mildred Fisher College of Science and Mathematics, Towson University, May 2008, See, <http://www.towson.edu/fcsm/alumni/noteable.asp>
- Acknowledged by Thomson Scientific as a Highly Cited Researcher, June 2006, See, <http://isihighlycited.com/>. Acknowledged individuals comprise less than one-half of one percent of all publishing researchers
- Elected to Fellow grade, Institute of Electrical and Electronic Engineers (IEEE), January 2006; See, <http://www.ieee.org/web/aboutus/fellows/fellows.html> The citation reads, "for contributions to stochastic modeling of communication systems." Each year, only one-tenth of one percent of the (400,000+) voting members of the IEEE are allowed to be elected to the grade of Fellow
- Received the *2000 Lucent Patent Recognition Award* for patents that were "of Significant Importance to Lucent Technologies' Commercial Success." Only 120 patents have received this recognition out of over 30,000 active patents. See Dr. Lucantoni's Lucent patent award presentation and patent animation: http://www.dltconsulting.com/documents/documents/PatentPresentationVCD2_000.mov
- Elected to Senior Member, Institute for Electrical and Electronic Engineers (IEEE), June 1999
- Co-recipient of an Honorable Mention for the 1998 INFORMS Frederick W. Lanchester Prize for the best-published work in Operations Research and the Management Sciences, 1998. See, <http://www.informs.org/Prizes/LanchesterDetails.html#1997lanc> & <http://www.columbia.edu/~ww2040/nominated.html>
- Promoted to *Distinguished Member of Technical Staff*, AT&T Bell Laboratories, 1987
- Co-recipient of the *IEEE Communications Society Stephen O. Rice Prize Paper Award* in the field of Communication Theory, 1987, for the paper:
Heffes, H and Lucantoni, D. M., "A Markov modulated characterization of packetized voice and data traffic and related statistical multiplexer performance", *IEEE J. on Selected Areas in Communications, Special Issue on Network Performance Evaluation, Vol. SAC-4*, No. 6, 856-68, 1986
See, <http://www.comsoc.org/~awards/rice.html>
- Subject of biographical record in *Who's Who in Frontier Science and Technology*, and *American Men and Women in Science*, since 1984,
- Allan P. Colburn Prize for the best dissertation in the Engineering and Mathematical Sciences, University of Delaware, 1982
- Mary Hudson Scarborough Award for Excellence in Mathematics, Towson University, 1976

Professional Affiliations

- Fellow of Institute of Electrical and Electronic Engineers (IEEE)
 - Member of the IEEE Communications Society
 - Member of the IEEE Vehicular Technology Society
- Member of Institute for Operations Research and Management Science (INFORMS)

- Member of Association for Computing Machinery (ACM)
- Member of Independent Computer Consultants Association (ICCA)
- Member of the International Teletraffic Congress (ITC)

Patents

<u>Patent</u>	<u>Issue Date:</u>	<u>Description</u>
4,769,810	Sept. 6, 1988	Packet switching system arranged for congestion control through bandwidth management
4,769,811	Sept. 6, 1988	Packet switching system arranged for congestion control

The ideas and techniques embodied in the above-referenced patents are now part of the international standards for high-speed networks, for example the discard eligibility, or DE, bit in Frame Relay technology; the cell-loss priority (CLP) bit in ATM (Asynchronous Transfer Mode) switching and various methods of *DiffServ* in the IETF Internet standards.

Additionally, these patents are assigned to Lucent Technologies and USP 4,769,810 was recognized in the 2000 Lucent Patent Recognition Award for patents that were “. . .of Significant Importance to Lucent Technologies' Commercial Success.”

Publications

1. “Modeling multiple IP traffic streams with rate limits,” *IEEE/ACM Transactions on Networking*, Vol. 11, No. 6, 948-958, 2003. (with D. Heyman)
2. “After Long Range Dependency (LRD) discoveries, what are the lessons learned so far to provide QoS for Internet advanced applications” in *International Teletraffic Congress*, Panel Discussion. Salvador da Bahia, Brazil. 2001.
3. “Internet application performance: A signature-based empirical approach,” submitted for publication (with Avritzer, Farel, Futamura, Hosseini-Nasab, Huebner, Karasaridis, Mainkar, Meier-Hellstern, Reeser and Wirth).
4. “Modeling multiple IP traffic streams with rate limits,” *Teletraffic Engineering in the Internet Era*, Proceedings of the 17th International Teletraffic Congress - ITC17, Salvador da Bahia, Brazil, 2001, Editors: Jorge Moreira de Souza, Nelson L.S. da Fonseca, Edmundo de Souza e Silva, Elsevier. (with D. Heyman).
5. “Approximating the effect of limiting the peak of highly bursty traffic,” in preparation.
6. “Further transient analysis of the *BMAP/G/1* queue,” *Stoch. Mod.*, 14, No. 1&2, 461-478, 1998.
7. “Demand Assignment Multiple Access (DAMA) for Multimedia Services - Performance Results,” MILCOM '97, Monterey, CA, Nov. 1997 (with S. Kota, J. Kallaus and H. Huey)

8. "Numerical solution of piecewise-stationary $M_i/G_i/1$ queues," *Oper. Res.*, 45, No. 3, May-June, 451-463, 1997 (with G.L. Choudhury and W. Whitt).
9. "Squeezing the most out of ATM," *IEEE Trans. on Comm*, 44, No. 2, 203-217, 1996 (with G.L. Choudhury and W. Whitt).
10. "Asymptotic analysis of tail probabilities based on the computation of moments," *Ann. Appl. Prob.*, 5, No. 4, 983-1007, 1995 (with J. Abate, G.L. Choudhury and W. Whitt).
11. "Supporting ATM on low-earth orbit satellites," *Proc. of ITC Seminar on Teletraffic Modelling and Measurement*, Leidschendam, The Netherlands, 1995 (with P.L. Reilly).
12. "The BMAP/G/1 queue: A tutorial," *Models and techniques for Performance Evaluation of Computer and Communications Systems*, Editors: L. Donatiello and R. Nelson, Springer Verlag, 330-58, 1993.
13. "Computing the transient distributions in general single-server queues", *Proc. of IEEE Globecom '93*, No. 29.1, 1045-50, Houston, Nov. 29-Dec. 2, 1993 (with G.L. Choudhury and W. Whitt).
14. "Tail probabilities in a queue with many independent sources," in preparation (with G.L. Choudhury and W. Whitt).
15. "Multidimensional transform inversion with applications to the transient $M/G/1$ queue," *Ann. Appl. Prob.*, 4, No. 3, 719-740, 1994 (with G.L. Choudhury and W. Whitt).
16. "The distribution of the duration and number served during a busy period in the BMAP/G/1 queue," in preparation (with G.L. Choudhury and W. Whitt).
17. "Refined approximations for probability distributions in queues," in preparation (with G.L. Choudhury and W. Whitt).
18. "The transient $BMAP/G/1$ queue," *Stoch. Mod.*, 10, No. 1, 145-82, 1994 (with G.L. Choudhury and W. Whitt).
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