



David Lucantoni, Ph.D.  
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DLT Consulting, L.L.C.

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## Professional Summary

Dr. Lucantoni has over thirty-five 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

- Voice over IP (VoIP)
- Computer Networking
- Digital Switching
- Call Center Technology
- Broadband, Wireless, Satellite Communications
- LAN/WAN Architecture & Protocols
- Internet Technology & Infrastructure
- Traffic engineering
- Capacity Planning
- Network Test & Reliability
- Queueing Theory
- Performance Analysis
- Reliability/Availability Analysis

## Education

<u>Year</u>	<u>College or University</u>	<u>Degree</u>
1981	<b>University of Delaware</b> Newark, DE	Ph.D., Operations Research <ul style="list-style-type: none"><li>• 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</li><li>• Completed over 80 graduate credits in Mathematics and Operations Research with a GPA of 3.96/4.0</li></ul>

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- 1978      **University of Delaware**    M.S., Statistics  
                                 Newark, DE      • Thesis entitled: “Numerical Methods for a Wide Class of Markov Chains Arising in Queuing Theory”
- 1976      **Towson University**    B.S., Mathematics  
                                 Towson, MD

## Professional Experience

From:	1998
To:	Present
Organization:	<b>DLT Consulting, L.L.C.</b> , Ocean, NJ
Title:	Principal Consultant

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:

Client:    Project Summary:

- Various Law Firms**    Serves as an expert witness in patent litigations (see section on litigation support experience)  
Sep 2000 – Present
- LC Communications**    Modeling and analysis of capacity and availability provided to an international circuit reseller in support of an expert witness engagement in Telecom arbitration.  
Davie, FL  
Aug 01 – Nov 09
- Wong, Cabello, Lutsch, Rutherford & Brucculeri, L.L.P**    Review patents involving networking technology for potential licensing value.  
Houston, TX  
Mar 04 – Jun 04
- TechSearch, L.L.C.**    Review high-speed networking patents for potential licensing value.  
Northbrook, IL  
Jul 03 – Aug 03
- ipValue Management**    Review Telecom patents for potential infringement relating to particular clients.  
San Jose, CA  
Jan 03 – Dec 03
- LNG Holdings SA**    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. Participated in redesign of a national fiber optic network to reduce capital expenditures (Madrid). Participated on a Network Management committee to exploit multi-national synergies for potential cost savings (Paris).  
Hannover, Germany  
May 02 – Dec 02
- SATNAC 2002**    Invited Plenary Speaker at the Southern African Telecommunication Networks and Applications Conference. Talk was on recent results in IP traffic  
Drakensberg, KwaZulu-Natal, South Africa

- Sep 02 modeling.
- 17th International Teletraffic Congress**  
Salvador, Bahia, Brazil  
Dec 01  
Participated 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  
Reviewed 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. Provided input to a contract negotiation process to settle existing contract disputes.
- Chiaro Networks, Ltd.**  
Richardson, TX  
Apr 01 – Jul 01  
Reviewed and refined performance analyses for an optical switching technology. Lead performance discussions with customers.
- Intel Corporation**  
Chandler, AZ  
Feb 01– Mar 01  
Taught a two-day training seminar on *Performance Analysis* and *Queueing Theory*. Developed performance models to identify potential bottlenecks on a “system-on-a-chip”.
- Vayusphere**  
Mountain Lakes, NJ  
Jan 01 – Feb 01  
Developed traffic load models for a multi-platform Instant Messaging service.
- AT&T Laboratories**  
Middletown, NJ  
Apr 99 – Dec 00  
End-to-end performance, reliability and availability analysis of AT&T’s Common Open IP Platform. Six Sigma and Defects per Million (DPM) analysis of several IP applications. Prescribed and analyzed end-to-end load testing to assess the capacity for IP services. Participated on the Signaling Transport Working Group of the Internet Engineering Task Force (IETF). Compared the performance of competing proposals for transporting packet-based PSTN signaling over IP networks.
- Prominence Networks**  
Holmdel, NJ  
Jul 00 – Nov 00  
Provided algorithms and computer programs for network sizing for a Voice over IP application.
- Fairfield Resources Int’l**  
Stamford, CT  
Feb 00 – Jun 00  
Reviewed ATM and wireless patents for potential infringement relating to particular clients.
- Allied Riser Comm., Inc.**  
Richardson, TX  
Oct 99 – Feb 00  
Provided capacity planning methodologies and IP traffic modeling for high-speed, optical transport to the desktop.
- InterCall, Inc.**  
West Point, GA  
Provided capacity planning methodologies and service reliability modeling for an audio-conferencing service

Sep 99 – Dec 99 provider and call center. Analyzed various architectural alternatives.

**Astrolink Int'l, Ltd.** Performed quantitative comparisons of various buffer management strategies for the Astrolink global broadband satellite system.  
Bethesda, MD  
Jul 99 – Aug 99

**Exigent International, Software Tech., Inc.** Performed scalability analyses of system design for a ground station satellite controller designed for 70 satellites (Iridium™) to assess performance in controlling 300 satellites (Teledesic). Suggested design changes that increased system scalability.  
Melbourne, FL  
Jun 98 – May 99

**A.T. Kearney** Participated on the second phase of 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 Melbourne, Australia, Hughes Space and ComSat. Perform probabilistic assessment of launch failure scenarios and analyzed the effects of potential launch failures on the project management schedule. Analyze the technical aspects of the business cost models.  
London, England  
Jan 99 – Mar 99

**AT&T Laboratories** Defined Internet and Intranet measurement methodologies to assess end-user perceived performance.  
Holmdel, NJ  
Oct 98 – Dec 98

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

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

Client:    Project Summary:

**Motorola Satellite Comm.** Began performance assessment of access schemes for data services for a next generation mobile satellite system.  
Chandler, AZ  
Jun 98 – Jul 98

**A.T. Kearney** Participate on a technical due diligence team assessing the performance of the satellite, ground systems, handsets, etc., for the ICO global mobile satellite system. Interview major subcontractors, e.g., NEC London, NEC Tokyo, NEC Melbourne, Australia, Hughes Space  
London England  
Jan 98 – Mar 98

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. 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.

From:	April 1994
To:	September 1994
Organization:	<b>Motorola, Inc.</b> , 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:	<b>Bell Telephone Laboratories</b> , 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 the 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.

#### Variable-Bit-Rate Video

- Developed a 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

- Derived powerful, and widely used, methodology for approximating superposition's of complicated arrival streams (such as packetized voice) by simpler, tractable processes (e.g., Markov modulated Poisson processes)
- Derived analytic model of bit-dropping in packetized voice which demonstrated (and explained why) a Poisson process was an accurate model for predicting performance.

#### Wideband Packet Technology

- Derived and solved (using state-of-the-art solution techniques) an analytic model of the LAPD protocol incorporating timers, retransmissions, polls, etc., in conjunction with a variety of end-terminal window adaptation procedures and network throughput enforcement controls.

#### LAPD Frame Relay

- Assisted in design of terminal adapters for frame-relay networks by identifying performance degradations resulting from interactions of pipelining and protocol windowing.

#### Packet Switching

- Derived matrix-analytic performance assessment methodology for a synchronous, self-routing packet switching fabric, which quantified the impact of traffic burstiness and the effects of switch parameters.

#### Digital Switch Performance

- Responsible for performance of new modules required to support ISDN on existing digital switches (e.g., the 5ESS).
- Provided developers with a variety of performance inputs which affected microprocessor selections, buffer sizing, capacity planning, etc.

#### Cellular Phone Technology (AMPS)

- Designed and analyzed a system level overload control; potential system throughput degradation under overload was identified; proposed a simple fix which was implemented in the system.

## 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

Dr. Lucantoni has served as an expert witness and consultant for over 30 patent infringement and arbitration cases in the Telecom industry. He has been deposed over 25 times, has testified in Federal District Court at a Markman claim construction hearing, at a trial before jury and for 4 days to a 3-judge panel at the American Arbitration Association. Dr. Lucantoni has written expert reports on patent infringement, validity, written description and enablement.

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Pepper Hamilton LLP**, Boston, MA  
Case Name: BroadSoft Inc. v. Callwave Communications Inc, et al.  
Services Provided: Aug 2014 – Present (engaged on behalf of CallWave Communications) Participated in claim construction, wrote infringement and validity reports on a case involving VoIP; was deposed  
Disposition: Ongoing

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Pepper Hamilton LLP**, Boston, MA  
Case Name: Callwave Communications v. AT&T, AT&T Mobility and Google Inc, et al.  
Services Provided: Aug 2014 – Present (engaged on behalf of CallWave Communications) Participated in claim construction, wrote infringement and validity reports on a case involving VoIP; was deposed  
Disposition: Ongoing

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Mishcon de Reya LLP**, New York, NY  
Case Name: TLI Communications, LLC v. Facebook, Inc., et al.  
Services Provided: Oct 2014 – Feb 2015 (engaged on behalf of TLI Communications) Participated in claim construction and preliminary infringement analysis  
Disposition: Case dismissed

*Expert Engagement:*

Type of Matter: Patent Infringement

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Law Firm: **Bingham McCutchen LLP**, Washington, DC  
Case Name: Straight Path IP Group, Inc. v. Bandwidth.com Inc., et al.  
Services Provided: Dec 2013 – Mar 2014 (engaged on behalf of Vocalocity) Wrote infringement and invalidity reports for SIP VoIP; was deposed.  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Class Action Suit  
Law Firm: **Mathews Law Group**, Arcadia, CA  
Case Name: Brian Connelly, Mary Alicia Sikes, and Keith Merritt, on behalf of themselves and all others similarly situated, v. Hilton Grand Vacations Company, LLC  
Services Provided: Jun 2013 – Dec 2013 (engaged on behalf of Plaintiffs) Wrote declaration describing practices in violation of the Telephone Consumer Protection Act (TCPA); was deposed.  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **DiNovo, Price, Ellwanger & Hardy**, Austin, TX  
Case Name: LivePerson, Inc. v. Pragmatus Telecom, Inc.  
Services Provided: Jan 2013 – Jun 2013 (engaged on behalf of Pragmatus Telecom, Inc.) Wrote declaration in support of claim construction  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Thompson Knight**, Dallas, TX  
Case Name: QPSX Developments 5 Pty LTD. v. Ciena Corporation, et al.  
Services Provided: Nov 2010 – May 2011 (engaged on behalf of Ericsson) Helped with claim construction issues  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Hogan Lovells**, New York, NY  
Case Name: Automated Transactions, LLC v. IYG Holding Co., 7-Eleven, Inc., Vcom Financial, Inc., and Cardtronics USA, Inc.  
Services Provided: Feb 2010 – Nov 2010 (engaged on behalf of IYG Holding, Co., et. al.) Wrote non-infringement and invalidity expert reports and two declarations  
Disposition: Settled in favor of IYG Holdings, Co. et al. by Summary Judgment

*Expert Engagement:*

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

*Expert Engagement:*

Type of Matter: Patent Infringement

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Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Teligence  
Services Provided: Mar 2008 – May 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Teligence; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Citizens Financial  
Services Provided: Mar 2008 – May 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Citizens Financial; was deposed  
Disposition: Settled

*Expert Engagement:*

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

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Macy's  
Services Provided: Mar 2008 – Jan 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Macy's; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Echostar Satellite LLC  
Services Provided: Mar 2008 – Nov 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Echostar; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. U. S. Bancorp, et al.  
Services Provided: Nov 2007 – Apr 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by U. S. Bank; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Humana, Inc., et al.  
Services Provided: Nov 2007 – Mar 2009 (engaged on behalf of RAKTL) Wrote expert reports on infringement by Humana and Humana Military Health Systems; was deposed

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Disposition: Settled

*Expert Engagement:*

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

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Earthlink, Inc., et al.  
Services Provided: Nov 2007 – Jan 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Earthlink; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. DirecTV Group, et al.  
Services Provided: Nov 2007 – Jan 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by DirecTV; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Cox Communications, Inc., et al.  
Services Provided: Nov 2007 – Jan 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by Cox Communications; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley 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 LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Aetna, Inc., et al.  
Services Provided: Nov 2007 – Aug 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

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Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Amtrak, Inc., et al.  
Services Provided: Nov 2007 – May 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 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 LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. UPS  
Services Provided: Nov 2007 – Sept 2009 (engaged on behalf of RAKTL) Wrote an expert report on infringement by UPS; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. American Airlines, Inc., et al.  
Services Provided: Nov 2007 – Feb 2014 (engaged on behalf of RAKTL) Wrote an expert report on infringement by American Airlines; was deposed  
Disposition: Settled

*Expert Engagement:*

Type of Matter: Patent Infringement  
Law Firm: **Cooley LLP**, Reston, VA  
Case Name: Ronald A. Katz Technology Licensing L.P. v. Citibank, N.A., et al.  
Services Provided: May 2005 – July 2008 (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 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](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.  
Disposition: Settled

*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

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### *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.  
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: All America Cables & Radio v. International Telecom, Inc. d/b/a LC Communications  
Services Provided: From August 2001 to 2006. (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: Settled

### *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 at trial

## 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](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

## David Lucantoni, Ph.D.

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- Industry Advisory Board Member at Auburn University's Wireless Engineering Program
- Towson University Alumni Board of Directors
- 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)
  - Applied Probability Society
  - Telecommunications Section
- 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. “Matrix Analytic Methods – Some Real Life Applications,” Invited Plenary Speaker, 6<sup>th</sup> Annual Conference on Queueing Theory and Network Applications, Korea University, Seoul, Korea, 2011
2. “Modeling multiple IP traffic streams with rate limits,” *IEEE/ACM Transactions on Networking*, Vol. 11, No. 6, 948-958, 2003. (with D. Heyman)
3. “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.
4. “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).
5. “Modeling multiple IP traffic streams with rate limits,” *Teletraffic Engineering in the Internet Era*, Proceedings of the 17<sup>th</sup> 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).

6. "Approximating the effect of limiting the peak of highly bursty traffic," in preparation.
7. "Further transient analysis of the  $BMAP/G/1$  queue," *Stoch. Mod.*, 14, No. 1&2, 461-478, 1998.
8. "Demand Assignment Multiple Access (DAMA) for Multimedia Services - Performance Results," MILCOM '97, Monterey, CA, Nov. 1997 (with S. Kota, J. Kallaus and H. Huey)
9. "Numerical solution of piecewise-stationary  $M_t/G_t/1$  queues," *Oper. Res.*, 45, No. 3, May-June, 451-463, 1997 (with G.L. Choudhury and W. Whitt).
10. "Squeezing the most out of ATM," *IEEE Trans. on Comm.*, 44, No. 2, 203-217, 1996 (with G.L. Choudhury and W. Whitt).
11. "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).
12. "Supporting ATM on low-earth orbit satellites," *Proc. of ITC Seminar on Teletraffic Modeling and Measurement*, Leidschendam, The Netherlands, 1995 (with P.L. Reilly).
13. "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.
14. "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).
15. "Tail probabilities in a queue with many independent sources," in preparation (with G.L. Choudhury and W. Whitt).
16. "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).
17. "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).
18. "Refined approximations for probability distributions in queues," in preparation (with G.L. Choudhury and W. Whitt).
19. "The transient  $BMAP/G/1$  queue," *Stoch. Mod.*, 10, No. 1, 145-82, 1994 (with G.L. Choudhury and W. Whitt).
20. "Some steady-state distributions for the  $MAP/SM/1$  queue," *Stoch. Mod.*, 10, 575-598, 1994 (with M.F. Neuts).
21. "Numerical transform inversion to analyze teletraffic models," *The Fundamental Role of Teletraffic in the Evolution of Telecommunications Networks, Vol. 1B*, Editors: J. Labetoulle and J.W. Roberts, Elsevier Science, 1043-52, 1994 (with G.L. Choudhury and W. Whitt).
22. "On the effectiveness of effective bandwidths for admission control in ATM networks," *The Fundamental Role of Teletraffic in the Evolution of Telecommunications Networks, Vol. 1A*, Editors: J. Labetoulle and J.W. Roberts, Elsevier Science, 411-20, 1994 (with G.L. Choudhury and W. Whitt).
23. "Two vacation models for token-ring networks where service is controlled by timers," *Perf. Eval.*, 20, 165-184, 1994 (with K.K. Leung).
24. "The customer delay in a single server queue with a batch Markovian arrival process," submitted for publication (with M.F. Neuts).
25. "Simpler proofs of some properties of the  $MAP/G/1$  queue," *J. Appl. Prob.*, 31, 235-243, 1994 (with M.F. Neuts).
26. "Numerical computation of the moments of a probability distribution from its transform," *Oper. Res.*, 44, No. 2, March-April, 368-381, 1996 (with G.L. Choudhury).

27. "Methods for performance evaluation of VBR video traffic models," *IEEE/ACM Transactions on Networking*, 22, 176-80, April 1994 (with M.F. Neuts and A.R. Reibman).
28. "Numerical computation of a large number of moments with application to asymptotic analysis," *Proc. of ITC Seminar on Teletraffic Analysis Methods for Current and Future Telecom Networks*, Bangalore, India, 1993 (with G.L. Choudhury).
29. "Traffic modeling for broadband services," *Worldwide Advances in Communication Networks*, 1993 (with M.F. Neuts and A.R. Reibman).
30. "Build out delay in the receiver buffer of a video system with image compression," *Proc. of the First International Conference on Computer Communications and Networks*, San Diego, 211-15, June, 1992 (with M. Sarraf and F.A. Faryar).
31. "Congestion control issues and strategies associated with B-ISDN/ATM access and network transport," *Telecommunication Access Networks Technology and Service Trends*, Editor: W. Lemstra, Elsevier Science Publishers B. V. (North-Holland), 196-202, and 1991 (with A.E. Eckberg and P.K. Prasana).
32. "Selective cell discard mechanisms for a B-ISDN congestion control architecture," *Proc. of the 7<sup>th</sup> International Teletraffic Congress Specialists' Seminar*, Morristown, NJ, Oct., 1990 (with S. Parekh).
33. "Performance characterizations of traffic monitoring and associated control mechanisms for broadband packet networks," *Proc. of IEEE Globecom '90*, No. 400B.2, 359054, San Diego, 1990 (with A.W. Berger, A.E. Eckberg and T.C. Hou).
34. "Queueing systems having phase-dependent arrival and service rates," Chapter 10 of *Numerical Solutions of Markov Chains*, Editor: W.J. Stewart, Marcel Dekker, INC., 161-202, 1991 (with J.N. Daigle).
35. "A traffic/performance analysis of the bandwidth management throughput-burstiness filter," *Proc. of Conf. of Decision and Control*, Dec., 2118-23, 4, 1990 (with A.E. Eckberg).
36. "New results on the single server queue with a batch Markovian arrival process," *Stoch. Mod.*, 7, No. 1, 1-46, 1991.
37. "An approach to controlling congestion in ATM networks," *International Journal of Digital and Analog Communication Systems*, 3, 199-209, 1990 (with A.E. Eckberg and D.T. Luan).
38. "A single server queue with server vacations and a class of non-renewal arrival processes," *Adv. Appl. Prob.*, 22, 676-705, 1990 (with K.S. Meier-Hellstern and M.F. Neuts).
39. "Buffer sizing for synchronous self-routing broadband packet switches with bursty traffic," *International Journal of Digital and Analog Cabled Communications*, 2, 253-60, 1989 (with T.C. Hou).
40. "Meeting the challenge: Congestion and flow control strategies for broadband information transport," *Proc. of IEEE Globecom '89*, Nov., 1989 (with A.E. Eckberg and D.T. Luan). Also appeared in *Integrated Broadband Networks*, pp. 255-59, A. Bhargava, editor, Artech House, Inc., 1991.
41. "Queueing systems having phase-dependent arrival and service rates," *Proceedings of the First International Workshop on the Numerical Solution of Markov Chains*, pp. 179 - 215, Raleigh, 1990. (with J.N. Daigle).
42. "Traffic monitoring/policing mechanisms for high-speed integrated services packet networks," Fourth Annual Workshop on COMPUTER COMMUNICATIONS, Dana Point, CA, Oct.30-Nov. 1, 1989 (with A.E. Eckberg and T.C. Hou).
43. "Bandwidth Management: A congestion control strategy for broadband packet networks - Characterizing the throughput-burstiness filter," *Proc. of the 5<sup>th</sup> International Teletraffic Congress Specialists' Seminar*, Adelaide, Australia, September, 1989 (with A.E. Eckberg and D.T. Luan).

44. "Traffic smoothing effects of bit dropping in a packet voice multiplexer," *IEEE Trans. on Comm.*, 37, Issue 7, 1989 (with K. Sriram).
45. "Throughput analysis of an adaptive window-based flow control subject to bandwidth management," *TELETRAFFIC SCIENCE for New Cost-Effective Systems, Networks and Services*, ITC-12, M. Bonati (editor), 1989 (with D.T. Luan).
46. "Performance analysis of an integrated voice/data transport mechanism with built-in congestion control," *Proc. of IEEE Globecom '88*, Hollywood, Florida, 1988 (with T.C. Hou).
47. "The effect of bandwidth management on the performance of a window-based flow control," *AT&T Technical Journal*, 67, No. 5, 17-26, 1988 (with D.T. Luan).
48. "Moments of the stationary waiting time in the  $GI/PH/1$  queue," *J. of Appl. Prob.*, 25, 636-41, 1988 (with V. Ramaswami).
49. "Traffic smoothing effects of bit dropping in a packet voice multiplexer," *Proc. of IEEE Infocom '88*, New Orleans, 1988 (with K. Sriram).
50. "Throughput analysis of a window-based flow control subject to bandwidth management," *Proc. of IEEE Infocom '88*, New Orleans, 1988 (with D.T. Luan).
51. "Throughput analysis of a window-based flow control subject to bandwidth management," *Proc. of IEEE COMSOC International Workshop on Future Prospects of Burst/Packetized Multimedia Communications*, Osaka, Japan, Nov. 22-24, 1987 (with D.T. Luan).
52. "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 (with H. Heffes).
53. "Characterization of Packetized Voice Traffic and Related Statistical Multiplexer Performance." *Proceedings of AT&T Symposium on Performance Analysis*, May 1985, 12 pp. (with H. Heffes, K. Sriram and W. Whitt).
54. "Algorithms for the multi-server queue with phase type service," *Stoch. Mod.*, 1, No. 3, 393-417, 1985 (with V. Ramaswami).
55. "Stationary waiting time distributions in queues with phase type service and in quasi-birth-and-death processes," *Stoch. Mod.*, 1, No. 2, 125-36, 1985 (with V. Ramaswami)
56. "Efficient algorithms for solving the non-linear matrix equations arising in phase type queues," *Stoch. Mod.*, 1, No. 1, 29-52, 1985 (with V. Ramaswami).
57. "An algorithmic analysis of a communication model with retransmission of flawed messages." London: *Pitman Books Limited*, London, 1983.
58. "Algorithmic analysis of a dynamic priority queue." In *Applied probability-computer science, the interface, Volume II*. Boston: Birkhauser, 157-206, 1982 (with V. Ramaswami).
59. "A  $GI/M/c$  queue with a different service rate (for customers who need not wait): An algorithmic solution," *Cahiers du Centre de Recherche Operationnelle*, 24, 5-20, 1982.
60. "A Markovian queue with  $N$  servers subject to breakdowns and repairs," *Mgmt. Sci.*, 25, 849-61, 1979 (with M. F. Neuts).
61. "On the merits of an approximation to the busy period of the  $GI/G/1$  queue," *Mgmt. Sci.*, 25, 285-89, 1979 (with V. Ramaswami).
62. "Numerical methods for a class of Markov chains arising in queueing theory," M.S. Thesis, and Tech Rep. No. 78/10, Applied Mathematics Institute, University of Delaware, Newark, 1978 (with M. F. Neuts).
63. "On the distribution of the union-intersection test of internal independence," Tech. Rep. No. S 49B, Applied Mathematics Institute, University of Delaware, Newark, 1978 (with J. Schuenemeyer).