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SUPERCOMM / ICC '92

DISCOVERING A NEW WORLD OF COMMUNICATIONS

SUPERCOMM/INTERNATIONAL CONFERENCE ON COMMUNICATIONS '92

CONFERENCE RECORD VOLUME 3 OF 4

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SERIES 300 SESSIONS

MONDAY, JUNE 15, 1992
9 a.m. - 12 noon

301 PERFORMANCE ANALYSIS OF DATA COMMUNICATION PROTOCOLS

McCormick Place North Lower Level (L - 8)

ORGANIZER: S. Jidarian, AT&T Bell Laboratories, USA
CHAIRPERSON: A. Acampora, Columbia University, USA
SPONSOR: Data Communications

301.1 **A Priority-Promoting Strategy to Improve the Fairness in DQDB Network**
Tien-Yu Huang, National Taiwan University, Taiwan, Jean-Lie Wu, National Taiwan Institute of Technology, Taiwan

301.2 **The Receiver Collision Avoidance (RCA) Protocol for a Single-Hop WDM Lightwave Network**
B. Mukherjee, Feiling Jia, University of California-Davis, USA

301.3 **A High Performance LAN/MAN Using a Distributed Dual Mode Control Protocol**
Maria C. Yuang, Meng-Cheng Chen, National Chiao Tung University, Taiwan

301.4 **A Throughput/Delay Comparison: Narrowband vs. Broadband Wireless LANs**
Zhenshen Zhang, Anthony Acampora, Columbia University, USA

301.5 **A Class of Protocols for Heavy Loaded Multiple-Channel Local Area Networks**
Krzyszto Pawlikowski, Victor Yau, University of Canterbury, New Zealand

302 TOPICS IN WIRELESS COMMUNICATIONS

McCormick Place North Lower Level (L - 5)

ORGANIZERS: P. T. Mathiopoulos, University of British Columbia, Canada, F. Abrishamkar, AT&T Bell Laboratories, USA
CHAIRPERSON: F. Abrishamkar
SPONSOR: Radio Communications, Communication Theory

302.1 **Parallel Acquisition of PN Sequences in DS/SS Systems**
Dilip V. Sarwate, University of Illinois at Urbana, USA, Kapil K. Chawla, AT&T Bell Labs, USA

302.2 **On the Efficiency of Fast Frequency Hopping Multiple-Access Systems**
Uwe C. Fiebig, German Aerospace Research (DLR), Germany

302.3 **Throughput Performance of Unslotted FH-CDMA Systems**
Shu Guangheng, Hong Fuming, Li Leming, Pan Xueyi, University of Electronic Sciences and Technology of China, Peoples Republic of China

302.4 **Comments on Tone Calibration in Time Varying Fading**
Michael Fitz, Purdue University, USA

302.5 **M-ary Differential Phase-Shift Keying with Diversity Combining for Communications Over a Doubly Selective Fading Channel**
Dan Noneaker, Michael Pursley, University of Illinois at Urbana, USA

303 ADVANCES IN VOICE TECHNOLOGY FOR PUBLIC AND PRIVATE NETWORKS

McCormick Place North Lower Level (L - 11)

ORGANIZER: B. Sankur, Bosphorous University, Turkey
CHAIRPERSON: B. Sankur, F. Marvasti, Consultant
SPONSOR: Signal Processing and Communication Electronics

303.1 **Optimum Filter Design for Partial-Response Class-IV Transmission Systems**
Giovanni Cherubini, S. Olcer, G. Ungerboeck, IBM, Switzerland

303.2 **ATC-based Hi-Fi Audio Coding for ATM Network**
Fumie Haza, Ichiro Kuroda, Takao Nishitani, NEC, Japan

303.3 **A Power-conserved Real-Time Speech Coder at Low Bit Rate**
Cuntai Guan, Yongbin Chen, Boxiu Wu, Southeast University, Peoples Republic of China

303.4 **Objective Estimation of Speech Quality Degradation Due to Transmission Error**
Tetsurou Yamazaki, Hiroshi Irii, NTT Telecommunications Networks Laboratories, Japan

303.5 **Speech Technology and Applications in the Intelligent Network**
Judith Tschirgi, Praful Shanghavi, Earle West, AT&T Bell Laboratories, USA

304 COMBINING RADIO AND FIBER

McCormick Place North Lower Level (L - 4)

ORGANIZERS: T. Rowbotham, British Telecom Research Labs, UK, P. Lemson, Southwestern Bell, USA
CHAIRPERSON: P. Lemson
SPONSOR: Optical Communications, Radio Communications

304.1 **Fiber Optic Antenna Remoting for Multi-Sector Cellular Cell Sites**
Douglas Tang, GTE, USA

304.2 **A Subcarrier Transmission Approach to Microcellular Systems**
H. Ohtsuka, R. Ohmoto, H. Ichikawa, M. Ogasawara, T. Murase, NTT Radio Communication Systems Laboratories, Japan

304.3 **Integration of Cordless Telephony with CATV Distribution**
D. W. Hardwick, GPT, UK, P. Fell, GEC Marconi Materials Technology Ltd., UK

304.4 **CTPON - Cordless Telephony Services Over a Passive Optical Network Using Fibre-Radio Techniques**
A. J. Cooper, D. M. Smith, R. P. Merrett, BT Labs, UK

304.5 **High Performance Analog Fiber Optic Links for Radio Applications**
D. Huff, H. Blauvelt, I. Ury, Ortel Corporation, USA

304.6 **A Wideband Millimetre Wave Fibre-Fed Radio Distribution Point Demonstrator**
Ian Smith, B. J. Ellis, BT Labs, UK

304.7 **Upstream-FDMA/Downstream-TDM Optical Fiber Multiaccess Network**
T. Shiozawa, M. Shibutani, J. Namiki, NEC, Japan

305 SIGNAL PROCESSING FOR DIGITAL STORAGE SYSTEMS

McCormick Place North Lower Level (L - 7)

ORGANIZERS: C. Melas, IBM Research, USA, H. Thapar, IBM SSPD, USA
CHAIRPERSON: C. Melas
SPONSOR: Signal Processing for Magnetic Recording

305.1 **Digital Signal Processing for a High Density Multitrack Tape Recorder**
J. Colineau, H. Soubaras, Thomson-CSF, France

305.2 **Geometric Representation of the Tree-Search Detector**
John G. Kenney, Oregon State University, USA, Richard Carley, Carnegie Mellon University, USA

305.3 **A Reduced-Complexity Trellis Search Decoding Algorithm for Extended Class IV Partial Response Systems**
H. Shafiee, J. Moon, University of Minnesota, USA

305.4 **Multichannel Digital Magnetic Recording**
Paul A. Voois, John M. Cioffi, Stanford University, USA

305.5 **Modified Viterbi Detection for Recording Channels with Jitter**
Weining Zeng, Jaekyun Moon, University of Minnesota, USA

305.6 **An Efficient Memory Fault-Test Technique for ASIC-Based Memories**
Steven Gorshe, NEC America, Inc., USA

306 PACKET SWITCHING

McCormick Place North Lower Level (L - 3)

ORGANIZER: D. Karvelas, New Jersey Institute of Technology, USA
CHAIRPERSON: D. Karvelas
SPONSOR: Communication Theory

306.1 **DQDB: A Fast Converging Bandwidth Balancing Mechanism that Requires no Bandwidth Loss**
D. Karvelos, M. Papamichail, New Jersey Institute of Technology, USA

306.2 **Integration of Synchronous and Asynchronous Traffic on the MetaRing Architecture and its Analysis**
Khosrow Sohraby, Yoram Ofek, IBM, USA, Ho-Ting Wu, UCLA, USA

306.3 **Delay Analysis of the DQDB MAN Based on a Simple Model**
Ioannis Stavrakakis, Randall Landry, University of Vermont, USA

306.4 **A Parallel Processing Architecture for GBPS Throughput in Transport Protocols**
N. Jain, Mischa Schwartz, Theodore Bashkow, Columbia University, USA

306.5 **Concurrent Execution of Communication Protocols in High Speed Networks**
Christian Engel, Michael Rupprecht, Aachen University of Technology, Germany

307 SELF-HEALING NETWORKS AND INTEGRATED NETWORK MANAGEMENT

McCormick Place North Lower Level (L - 4)

ORGANIZER: R. Ananthanpillai, AT&T Bell Laboratories, USA, G. Djuknic, Stevens Institute of Technology, USA
CHAIRPERSON: R. Ananthanpillai
SPONSOR: CNOM, Computer Communications

307.1 **A Preliminary Model for an Integrated Intelligent Network Management Support System**
T. Magedanz, Technical University of Berlin, Germany

307.2 **Reliability Evaluation and Protection Schemes for Dense WDM Network Architectures**
H. Sobol, V. K. Bhagavath, University of Texas at Arlington, USA

307.3 **Network Management in a Large-Scale OSI-based Campus Network Using SNMP**
G. Mansfield, M. Murata, K. Higuchi, K. Jayanthi, AIC, Japan, B. Chakraborty, Y. Nemoto, S. Noguchi, Tohoku University, Japan

307.4 **An Automatic Failure Isolation and Reconfiguration Methodology for Fiber Distributed Data Interface (FDDI)**
R. Sankar, Y.Y. Yang, University of S. Florida, USA

307.5 **Design of Reliable Networks**
R. H. Jan, National Chiao Tung University, Taiwan

307.6 **Software Development Enhanced On-line Monitoring of Digital Telephone Exchanges**
Magdi S. El-Soudani, Mahoud T. El-Hadidi, Ibrahim Al-Harami, Qatar University, Qatar

308 TRAFFIC ENGINEERING AND PERFORMANCE MANAGEMENT OF HIGH-SPEED LAN/WAN INTERCONNECT NETWORKS

McCormick Place North Lower Level (L - 6)

ORGANIZER: S. Jidarian, AT&T Bell Laboratories, USA
CHAIRPERSON: S. Jidarian
SPONSOR: Data Communications Systems, Computer Communications, CNOM

308.1 **Performance Evaluation of the Manhattan Street Network with Input Buffers**
Thomas G. Robertazzi, Hsin-Yua Huang, State University of New York, USA

308.2 **Performance Evaluation for Multiclass Traffic in ATM Systems**
Takashi Okuda, Haruo Akimaru, Kazunori Nagai, Toyohashi University of Technology, Japan

308.3 **Efficiency and Fairness Issues in Multihop Networks Supporting a Guaranteed Bandwidth Transport Service**
Laura Gratta, Francesco Bernabei, Marco Listanti, Fondazione Ugo Bordoni, Italy

308.4 **Loss Correlation for Queues with Bursty Input Streams**
James F. Kurose, Donald Towsley, Henning Schulzrinne, University of Massachusetts at Amherst, USA

308.5 **Dynamic Bandwidth Allocation for B-ISDN Based on End-to End Delay Estimates**
Victor Frost, Michael Mullen, University of Kansas, USA

308.6 **A Heavy-Traffic Comparison of Shared and Segregated Buffer Schemes for Queues with the Head-of-Line Processor-Sharing Discipline**
Kerry W. Fendick, Manoel Rodrigues, AT&T Bell Laboratories, USA

309 PERSONALIZED TV (PANEL)

McCormick Place North Lower Level (L - 9)

ORGANIZERS: C. N. Judice, Bellcore, USA, H. Yasuda, NTT, Japan
CHAIRPERSON: C. N. Judice
SPONSOR: Multimedia Services and Terminals

309.1 **An NTT View of Personalized TV**
Takshiko Kamas, Executive Manager, NTT, Japan

309.2 **Personalized TV from the Software Vendor Perspective**
Kazuhiko Nishi, President, ASCII Corporation, Japan

309.3 **Standards for Personalized Television**
Leonardo Chiariglione, CSELT, Italy, Hiroshi Yasuda, NTT, Japan

309.4 **Videotex and Teletext Evolving to Personalized TV**
Francois Colaitis, CCETT, France

309.5 **Extending the Classroom in the Home: Smarter TV**
Charlie Judice, Executive Director, Bellcore, USA

309.6 **Personalized TV from a Studio's Perspective**
Alan Cole-Ford, Vice President, Paramount Communications, USA

309.7 **U S WEST - TCI Trial of Video-On-Demand**
Nancy Sullivan, Director, U S WEST Communications, USA

310 CDMA FOR PERSONAL AND MOBILE COMMUNICATIONS (HALF SESSION)

McCormick Place North Lower Level (L - 1)

ORGANIZERS: L. Cimini, AT&T Bell Laboratories, USA, D. Borth, Motorola, USA
CHAIRPERSON: D. Borth
SPONSOR: Communication Theory, Radio Communications

310.1 **Effect of Transmitter Power Control Imperfections on Capacity in DS/CDMA Cellular Mobile Radios**
Eisuke Kudoh, Tadashi Matsumoto, NTT Radio Communication Systems Laboratories, Japan

310.2 **Improved PCN Efficiency Through The Use of Spectral Overlay**
Donald Schilling, City College of New York, USA, Raymond Pickholtz, George Washington University, USA

310.3 **Applications of Suppression Filters for CDMA Overlay Situations**
Laurence Milstein, Jiangzho Wang, University of California-San Diego, USA

SERIES 300 SESSIONS

MONDAY, JUNE 15, 1992
2 p.m. - 5 p.m.

311 ATM SWITCHING AND BROADBAND NETWORKING

McCormick Place North Lower Level (L - 3)

ORGANIZERS: K. Eng, AT&T Bell Laboratories, USA, T. Hsiao, Purdue University, USA
CHAIRPERSON: K. Eng
SPONSOR: Computer Communications, Data Communications Systems

311.1 **Parallel "ATOM" Switch Architecture for High-Speed ATM Networks**
Toshiya Aramaki, Hiroshi Suzuki, S. Hayano, Takeo Takeuchi, NEC, Japan,

311.2 **Broadband Packet Switches Based on Dilated Interconnection Networks**
Tony T. Lee, Soung C. Liew, Bellcore, USA

311.3 **N log N Dual Shuffle-Exchange Network with Error-Correcting Routing**
Soung C. Liew, Tony T. Lee, Bellcore, USA

311.4 **Performance of Hierarchical Multiplexing in ATM Switch Design**
Mark J. Karol, Kai Y. Eng, AT&T Bell Laboratories, USA

311.5 **A New Architecture for Modular Growability of ATM Switches**
Achille Pattavina, G. Ferrari, M. Lenti, Polytechnic of Milan CEFRIEL, Italy

311.6 **STM Signal Transfer Techniques in ATM Networks**
Hitoshi Uematsu, Hiromi Ueda, NTT Transmission Systems Laboratories, Japan

311.7 **DFIFO Protocol and Analysis**
Byung G. Kim, Ifen Yang, William Moloney, Charlie Steele, University of Massachusetts - Lowell, USA

312 DIGITAL CELLULAR AND MICROCELLULAR SYSTEMS

McCormick Place North Lower Level (L - 5)

ORGANIZERS: L. Cimini, AT&T Bell Laboratories, USA, D. Borth, Motorola, USA
CHAIRPERSON: D. Borth
SPONSOR: Communication Theory, Radio Communications

312.1 **A Comparison of Nonlinear Equalization Methods for the U.S. Digital Cellular System**
David Borth, Kevin Baum, Bruce Mueller, Motorola, USA

312.2 **Equalization of pi/4 Offset DQPSK Transmitted Over Flat Fading Channels**
Michel Fattouche, University of Calgary, Canada, Hatim Zaghloul, AGT Limited, Canada

312.3 **A New Methodology for the Evaluation of Outage Probability in Cellular Systems**
Gianni Immovilli, Maria Merani, University of Bologna, Italy

312.4 **Outage Probability of Microcellular Radio Systems in a Rayleigh/Rician Fading Environment**
John R. Haug, Motorola, USA, Donald Ucci, Illinois Institute of Technology, USA

312.5 **Bit-Error Probability of Uncoded QPSK Transmitted Over a 2-Ray Frequency Selective Rayleigh Fading Channel**
Paul Ho, Tony Chan, Simon Fraser University, Canada

312.6 **Proposed pi/4-CQPSK with Increased Capacity in Digital Cellular Systems**
Chia-L Liu, Kamilo Feher, University of California-Davis, USA

312.7 **Timing Recovery Techniques for Digital Cellular Radio with pi/4-DQPSK Modulation**
Ging-Shing Liu, Che-Ho Wei, National Chiao-Tung University, Taiwan

313 APPLICATION OF SIGNAL PROCESSING IN CODING

McCormick Place North Lower Level (L - 7)

ORGANIZERS: F. Marvasti, Consultant, USA, R. Blahut, IBM , USA
CHAIRPERSON: F. Marvasti, R. Blahut
SPONSOR: Signal Processing and Communications Electronics

313.1 **Bounds For Cylindrical Projection Codes**
Gang Yang, Dong Li, Donald Schilling, City College of New York, USA

313.2 **Concatenated Multilevel Coding**
A. Chouly, K. Fazel, Laboratories d'Electronique Philips, France

313.3 **Algebraic Signal Processing in Truncated p-adic Arithmetic for Linear Channels with Memory**
Martin Hassner, IBM, USA, G. Fettweis, Teknekron Communications, USA, K. Abdel Ghaffar, University of California - Davis, USA, C. J. Williamson, CPSU, USA

313.4 **Algebraic Survivor Memory Management for Viterbi Detectors**
Gerhard Fettweis, IBM, USA

313.5 **The Fundamental Theorem of Information Theory From the Sampling Theorum Point of View**
Farokh Marvasti, Chuande Liu, Illinois Institute of Technology, USA

314 COMMUNICATIONS SATELLITE TECHNOLOGIES

McCormick Place North Lower Level (L - 11)

ORGANIZER: C. Mahle, COMSAT Laboratories, USA
CHAIRPERSON: C. Mahle
SPONSOR: Satellite and Space Communications

314.1 **A Light-Weight LLC Protocol in High-Speed Satellite Data Networks**
Shuji Tasaka, Takahiro Suzuki, Nagoya Institute of Technology, Japan

314.2 **A Study on Satellite-Switched TDMA Systems for Applying to the Asynchronous Transfer Mode**
Kazuyasu Okada, Atsushi Ohta, Kiyoshi Shimokawa, Makoto Kawai, NTT Radio Communication Systems Laboratories, Japan

314.3 **Two Time Variant Models for Satellite Channels**
M. Aghadavoodi Jolfaei, D. Kreuer, O. Maly, U. Quernheim, RWTH Aachen, Germany

314.4 **The Effect of the Averaging Filter on the Cycle Slipping of NDA Feedforward Carrier Synchronizers for MPSK**
Geert De Jonghe, Marc Moeneclaey, University of Ghent, Belgium

314.5 **A Near Perfect Stable Random Access Protocol for a Broadcast Channel**
Graham Campbell, Illinois Institute of Technology, USA, Wenxin Xu, Reuters Information Technology, Inc., USA

314.6 **False PN-Code Lock Due to Off-Peaks of Gold Sequence Autocorrelation**
Hyuck M. Kwon, Lockheed, USA

314.7 **A Characterization of 'Cycle' Slipping in a Digital PLL Based MPSK Demodulator**
Michael Fitz, Purdue University, USA, R. Jean-Marc Cramer, TRW, USA

315 QUEUEING PERFORMANCE OF DATA NETWORKS

McCormick Place North Lower Level (L - 8)

ORGANIZER: S. Weinstein, Bellcore, USA
CHAIRPERSON: S. Weinstein
SPONSOR: Data Communications Systems, Computer Communications, CNOM

315.1 **Optimum and Suboptimum Tree Computation for Interconnected Multiple-Access Networks**
Adam R. Swanbery, Sprint International, USA

315.2 **MRACMAN: A High-Throughput Backbone Metropolitan Area Network Using Simplified Bridges**
Maria C. Yuang, Shih-C. Wen, National Chia Tung University, Taiwan

315.3 **Queueing Model of Gateways with Packet Fragmentation**
J. Wang, Y. Fan, C. Wang, Beijing University, Peoples Republic of China

315.4 **Limited-1 Cyclic Service System as an Imbedded Markov Chain at Server Arrival Instants**
T. Srinivasa Rao, P. R. K. Rao, Indian Institute of Technology, India

316 NETWORK SURVIVABILITY PERFORMANCE

McCormick Place North Lower Level (L - 6)

ORGANIZERS: A. Zolfaghari, Pacific Bell, USA, F. Kaudel, BNR, Canada, T. Ikuenobe, Bellcore, USA
CHAIRPERSON: A. Zolfaghari
SPONSOR: CNOM

316.1 **A Framework for Network Survivability Characterization**
Kevin W. Lu, Soung C. Liew, Bellcore, USA

316.2 **A Unified Framework for Survivable Telecommunications Network Design**
D. Medhi, University of Missouri-Kansas City, USA

316.3 **Performability Analysis of Large-Scale Packet Switching Networks**
C. Colbourn, University of Waterloo, Canada, M. Elbert, T. Weyant, Digital Equipment Corp., USA, E. Litvak, Harvard University, USA

316.4 **Protection Planning in Transmission Networks**
Mario Gerla, University of California Los Angeles, USA, M. Barezzani, E. Pedrinelli, Telettra, Italy

316.5 **Software for Designing Survivable SONET Networks Using Self-Healing Rings**
O. Wasem, R. Cardwell, T. H. Wu, Bellcore, USA

316.6 **Order-P: An Algorithm to Order Network Partitionings**
V. Li, S. Banerjee, University of S. California, USA

SERIES 300 SESSIONS

317 SPECIFICATION DESCRIPTION TECHNOLOGIES FOR COMMUNICATIONS SOFTWARE

McCormick Place North Lower Level (L - 2)

ORGANIZERS: K. Maruyama, NTT, Japan, M. Kajiwara, OMRON Corporation, Japan
CHAIRPERSON: M. Kajiwara, OMRON Corporation, Japan
SPONSOR: Communications Software

317.1 **The Management Software Design of a Packet Switch**
Yang Chuan-hou, Zeng Hua-qing, Shanghai Jiao Tong University, Peoples Republic of China

317.2 **Transformation Technique between Specification in SDL and Specification in Message Sequence Charts for Designing Protocol Specifications**
A. Ito, H. Saito, F. Nitta, KDD R&D Labs, Japan, Y. Kakuda, Osaka University, Japan

317.3 **Methodology and Tools for Mechanization of Telecommunication Systems Specification and Development in Real-Time Environment**
Devendra Verma, Ram Jha, NYNEX, USA

317.4 **Computer-aided Step-wise Service Creation Environment for Intelligent Network**
Y. Niitsu, Osamu Mizuno, M. Okamoto, NTT Communication Switching Laboratories, Japan

317.5 **The Programmable Protocol VLSI Engine (PROVE)**
A. S. Krishnakumar, USA, W. C. Fischer, K. Sabnani, AT&T Bell Laboratories, USA

317.6 **Communication System Generator on Layered Communicating Finite State Machine**
Yung - Chen Hung, Gen - Huey Chen, National Taiwan University, Taiwan

318 QUALITY MANAGEMENT FOR CUSTOMER SATISFACTION ICC FEATURE SESSION (PANEL)

McCormick Center Hotel (Ballroom 6)

ORGANIZER: R. Bonelli, AT&T Network Systems, USA
CHAIRPERSON: F. Tedesco, Juran Institute, USA
SPONSOR: Quality Assurance Management

318.1 **A Coming-of-Age Story**
J. La Macchia, Cincinnati Bell, USA

318.2 **Supplier Management Strategy**
H. E. D'Orazio, Ameritech Services, USA

318.3 **Putting Customers First: Defining Roles and Relationships**
D. Leonard, AT&T, USA

318.4 **A Global and Expanded Quality Focus**
G. Ray, NEC, USA

318.5 **World Class Quality and the Status in Telecommunications**
F. Tedesco, Juran Institute, USA

318.6 **Quality Management for Customer Satisfaction**
Panel Session

319 RADIO DESIGN TECHNIQUES AND ALGORITHMS FOR PERSONAL COMMUNICATIONS

McCormick Place North Lower Level (L - 1)

ORGANIZERS: H. P. Corrales, AT&T Bell Laboratories, USA, A. Ranade, Bellcore, USA
CHAIRPERSON: H. Corrales
SPONSOR: Radio Communications

319.1 **A Coherent Spread-Spectrum RAKE-Receiver with Maximum-Likelihood Frequency Estimation**
Urs Fawer, Swiss Federal Institute of Technology, Switzerland

319.2 **BER Performance of Continuous Phase Digital Angle Modulation in Aeronautical Mobile Radio Channels**
Said M. Elnoubi, The Mitre Corp., USA

319.3 **Discriminator-Integrator Detection With Decision Feedback Equalization of CPM Systems in Mobile Radio Channels**
Oreste Andrisano, M. Chiani, R. Verdone, University of Bologna, Italy

319.4 **High Speed PLL Frequency Synthesizer for Mobile Communications**
Akihiro Kajiwara, Research Lab, Defense Agency, Japan, Masao Nakagawa, Keio University, Japan

319.5 **Recursive Least Squares Estimation for QAM and QPSK Signals in the Presence of Frequency Offset**
Satoshi Denno, Yoichi Saito, NTT Radio Communication Systems Laboratories, Japan

319.6 **Fast Acquisition Frequency Synthesizer with n-Stage Novel Type Cycle Swallowers**
Duk-Kyu Park, Shinsaku Mori, Keio University, Japan

319.7 **Adaptive Decision Method for Restricted Band Digital FM**
Donald Schilling, City College of New York, USA, Nader Bolourchi, New York Institute of Technology, USA

SERIES 300 SESSIONS

320A QUEUEING MODELS FOR DATA COMMUNICATION NETWORKS (HALF SESSION)

McCormick Place North Lower Level (L - 9)

ORGANIZER: S. Jidarian, AT&T Bell Laboratories, USA
CHAIRPERSON: J. Hayes, Concordia University, Canada
SPONSOR: Data Communications Systems

320A.1 **The Effect of Message-Class Dependent Threshold-Type Scheduling on the Delay for the M/M/n Queue**
Iwao Sasase, Yoshifumi Nishio, Hitomi Nakamura, Keio University, Japan

320A.2 **An Integrated System for Video, Voice and Data Communications**
Jeremiah Hayes, Georgios Stamatelos, Concordia University, Canada

320A.3 **Performance Evaluation of a Circuit-Switched Node with Queuable Overflow Traffic**
J. F. Hayes, I. Lambadaris, X. Chen, F. Ghazi-Moghaddam, Concordia University, Canada

320A.4 **A Real-time Algorithm for "Burstiness" Analysis of Network Traffic**
Khalid Khalil, Bellcore, USA

320B ADVANCES IN VIDEO AND IMAGE COMPRESSION TECHNIQUES (HALF SESSION)

McCormick Place North Lower Level (L - 9)

ORGANIZERS: T. Huang, University of Illinois at Urbana, USA, W. B. Pennebaker, IBM, USA
CHAIRPERSON: T. Huang
SPONSOR: Signal Processing Communications Electronics, Multimedia Services and Terminals, Communication Theory

320B.1 **Using an Image Resampling Sequencer in a Video Compression System**
C.A. Papadopoulos, T.G. Clarkson, King's College of London, UK

320B.2 **Edge Modified Vector Quantization for Image Compression**
A. N. Venetsanopoulos, P. Yu, University of Toronto, Canada

320B.3 **CCITT H.261 Compatible Mixed Bit Rate Coding of Video for ATM Networks**
Shigenob Minami, Toshiba, Japan

320B.4 **Receiver Buffer Control for Variable Bit-Rate Real-Time Video**
Richard Lau, P.E. Fleischer, S. Lei, Bellcore, USA

320B.5 **A Study on Comparison between VBR and CBR Video Service in ATM Environment**
T. Tanaka, S. Okubo, H. Hashimoto, H. Yasuda, NTT Human Interface Laboratories, Japan

320B.6 **Multiresolution Broadcast for Digital HDTV Using Joint Source-Channel Coding**
K. Ramchandran, A. Ortega, K. M. Uz, M. Vetterli, Columbia University, USA

TUESDAY, JUNE 16, 1992
9 a.m. - 12:00 noon

321 THE EMERGING INTELLIGENT NETWORK: TRANSITION AND IMPLEMENTATION ISSUES

McCormick Place North Lower Level (L - 6)

ORGANIZERS: R. Fike, Ameritech, USA, J. Young, Bell Atlantic, USA
CHAIRPERSON: R. Fike
SPONSOR: Communication Switching, Multimedia Services and Terminals

321.1 **Virtual Private Network Call Processing in the Intelligent Network**
M. Atoui, The Mitre Corp., USA

321.2 **A Laboratory for AIN Service Design and Validation**
P. G. Bosco, F. Faraci, CSELT, Italy

321.3 **A Functional Testing Approach for Interworking Between CCS7TUP and Non-CCS7 Signaling Systems**
F.Joseph Lin, Eric Cheng, AT&T Bell Laboratories, USA, Lir-Fang Sun, DGT, Taiwan

321.4 **A Distributed-Processing Platform for Communication Network Systems Based on SDA**
Masato Matsuo, Y. Kondo, NTT Communication Switching Laboratories, Japan

321.5 **Transition Capabilities Application Part and Intelligent Network Services**
B. Jabbari, F. Yegenoglu, George Mason University, USA

322 THE IMPACT OF MULTIMEDIA SERVICES ON PROTOCOLS

McCormick Place North Lower Level (L - 9)

ORGANIZER: S. Minzer, Bellcore, USA
CHAIRPERSON: S. Minzer
SPONSOR: Multimedia Services and Terminals, Transmission Systems

322.1 **Synchronization in Real Time Multimedia Data Delivery**
Nicolas Georganas, L. Li, A. Karmouch, University of Ottawa, Canada

322.2 **Towards a Generic Service Control and Signalling**
Hubert Decuypere, J. Vandenameele, P. Hellemans, Alcatel Bell Telephone, Belgium

322.3 **Signalling Protocol for Broadband ISDN**
A. Paglialunga, A. Biocca, M. Siviero, CSELT, Italy

322.4 **A Signalling Architecture for Multimedia Services**
Mark Jeffrey, GPT, UK, Amardeo Sarma, DBP Telekom FTZ, Germany

322.5 **A Call Model for Multipoint Communication in Switched Networks**
Michael Gaddis, Rick Bubenik, John D. DeHart, Washington University, USA

322.6 **An Object-Oriented Resource Model for Supporting Signaling and Control of Broadband Services**
Greg A. Brenner, Sarina Tu, Bellcore, USA, Hyong S. Kim, Carnegie Mellon University, USA

323 MODULATION AND CODING I

McCormick Place North Lower Level (L - 7)

ORGANIZER: D. Divsalar, Jet Propulsion Laboratory, USA
CHAIRPERSON: D. Divsalar
SPONSOR: Communication Theory

323.1 **A Bit Error Probability Analysis of a Digital PLL Based Demodulator of Differentially Encoded BPSK and QPSK Modulation**
Michael Fitz, Purdue University, USA

323.2 **Spectral Correlation of BPSK and QPSK Signals in a Nonlinear Channel with AM/AM and AM/PM Conversions**
T. C. Hsia, T. Yang, J. H. Reed, University of California, USA

323.3 **TCM Schemes With Predistortion Techniques on Nonlinear Channels**
A. Brajal, A. Chouly, K. Fazel, Laboratories d'Electronique Philips, France

323.4 **An Analytical Expression for Power Spectra of M-ary LREC Continuous Phase Modulated Signals**
D. Sarwate, R. Korkosz, University of Illinois, USA

323.5 **Searching for Good Time-Variant TCM Codes as an Optimization Problem**
S. H. Leung, Xin Jin, City Polytechnic of Hong Kong, Hong Kong

323.6 **A Performance Analysis for Trellis Coded Hybrid-ARQ Protocols**
L. Rasmussen, S. Wicker, Georgia Institute of Technology, USA

324 PERFORMANCE ENHANCEMENT TECHNIQUES IN PCS RADIO

McCormick Place North Lower Level (L - 5)

ORGANIZERS: H. P. Corrales,P. Balaban, AT&T Bell Laboratories, USA
CHAIRPERSON: H. P. Corrales
SPONSOR: Communication System Engineering, Radio Communications

324.1 **Computation of Exact Interference and Probability of Error for Several CDMA Communication Systems**
Z. Kostic, E. L. Titlebaum, AT&T Bell Labs, USA

324.2 **Suppression of Adjacent-channel Interference in Digital Radio by Equalization**
David Falconer, Carleton University, Canada, Brent Petersen, IBM, Switzerland

324.3 **Interference Suppression and Multipath Mitigation Using an Adaptive Correlator Direct Sequence Spread Spectrum Receiver**
G. J. Saulnier, C. Pateros, Rensselaer Polytechnic Institute, USA

324.5 **A Coded 16-QAM Scheme with Space Diversity for Cellular Systems**
Dileeka Subasinghe-Dias, Kamilo Feher, University of California-Davis, USA

324.6 **Performance of a Ratio-Threshold Diversity Combining Scheme in FFH/FSK Spread Spectrum Systems in Partial Band Noise Interference**
Gang Li, Q. Wang, V. K. Bhargava, University of Victoria, Canada, L. J. Mason, Communication Research Centre, Canada

324.7 **Optimal Feedforward Estimation of Frequency-Selective Fading Radio Channels Using Statistical Channel Information**
Stefan Fechtel, Heinrich Meyr, Aachen University of Technology, Germany

325 DIMENSIONING AND CONTROL OF ATM NETWORKS I

McCormick Place North Lower Level (L - 2)

ORGANIZERS: B. Mukherjee, University of California, USA, C. Douligeris, University of Miami, USA
CHAIRPERSON: B. Mukherjee
SPONSOR: Computer Communications

325.1 **On the Significant Parameters for the Characterization of the Cell Loss Behavior in ATM Multiplexing**
Andrea Baiocchi, N. Blefari-Melazzi, F. Salvatore, University La Sapienza of Roma, Italy

325.2 **Variation of Traffic Parameters in ATM Networks**
D. Verma, D. Ferrari, University of California, USA

325.3 **Statistics of Cell Loss and Its Application For Forward Error Recovery in ATM Network**
Liren Zhang, Monash University, Australia

325.4 **Hybrid Connection Admission Control in ATM Networks**
Hiroshi Saito, NTT Telecommunication Networks Laboratories, Japan

325.5 **Decentralized Control of a Multiple Shared Memory Module ATM Switch**
Vijay Kumar, AT&T Bell Laboratories, USA, Sherry Wei, Purdue University, USA

325.6 **A Deadlock-free Routing Control Algorithm for Torus Network based ATM Switches**
John Y. Ngai, Sanjay Dhar, Bellcore, USA

325.7 **Simulation of Admission Control in ATM Network**
T. I. Yuk, M. K. W. Tse, H. Leung, B. Kamali, University of Hong Kong, Hong Kong

326 HIGH SPEED OPTICAL TRANSMISSION TECHNOLOGY

McCormick Place North Lower Level (L - 1)

ORGANIZERS: K. Nakagawa, NTT, Japan, Y. K. Park, AT&T Bell Laboratories, USA
CHAIRPERSONS: K. Nakagawa, R. E. Tench, AT&T Bell Laboratories, USA
SPONSOR: Optical Communications Committee, Asian/Pacific Committee

326.1 **Ultra High-Speed Optical Modulation and Detection Systems for Long-Haul Fiber Transmission**
K. Hagimoto, Y. Miyamoto, T. Ono, T. Kataoka, K. Nakagawa, NTT Transmission Systems Labs, Japan

326.2 **Key Technologies for a Coherent Optical Trunk Line System**
S. Yamazaki, A. Noda, T. Ono, T. Shiozawa, T. Tanabe, H. Shimizu, M. Kitamura, NEC, Japan

326.3 **High-Speed Lightwave Systems**
Alan H. Gnauck, AT&T Bell Laboratories, USA

326.4 **An OC-48 SONET Optical Transmission System for Gigabit Computer Networks**
Hossein Izadpanah, M. Z. Iqbal, M. Stern, J. L. Gimlett, Chinlon Lin, Bellcore, USA

326.5 **Polarization State and Phase Noise Insensitive POLSK Phase-Diversity Homodyne System in Coherent Optical Communications**
Ichiro Seto, Iwao Sasase, Shinsaku Mori, Keio University, Japan, Tomoaki Ohtsuki, Hiroyuki Yashima, Saitama University, Japan

326.6 **Considerations on High Speed Transmission**
Alan Mitchell, J. V. Wright, D. M. Spirit, S. F. Carter, BT Labs, UK

327 GLOBAL INFORMATION NETWORKING (PANEL) ICC FEATURE SESSION

McCormick Place North Mezzanine (M - 2)

ORGANIZER: W. J. Barr, Bellcore, USA
CHAIRPERSON: W. J. Barr
SPONSOR: Technical Program Committee

327.1 **The Evolution of an Integrated Global Information Network within a Financial Enterprise**
C. Crook, Citibank, USA

327.2 **Information Networking Plans and Issues**
M. Hoshi, NTT, Japan

327.3 **French and European Steps Towards Deploying Information Networking Technology**
P. Collet, CNET Lannion A, France

327.4 **Situation and Development in Germany and Eastern Europe for Deploying Information Networking**
R. Slabon, Deutsche Bundepost Telekom, Germany

328 LAND MOBILE SATELLITE COMMUNICATION TECHNIQUES

McCormick Place North Lower Level (L - 8)

ORGANIZERS: F. Ananasso, Telespazio, Italy
P. Mathiopoulos, University of British Columbia, Canada
CHAIRPERSONS: K. Murthy, Telesat, Canada, F. Ananasso
SPONSOR: Satellite and Space Communications

328.1 **Frequency Shared Access Control for Multi-beam Mobile Satellite Communication Systems**
H. Kondo, S. Nakajima, H. Komagata, NTT Radio Communication Systems Laboratories, Japan

328.2 **Pilot Symbol Aided QPRS for Digital Land Mobile Applications**
S. Gurunathan, Kamilo Feher, University of California-Davis, USA

328.3 **Mobile Communications Via the European Mobile Satellite System (EMS)**
Fulvio Ananasso, I. Mistretta, TELESPAZIO, Italy

328.4 **Meeting the Challenge of Applying Cellular Concepts to LEO Satcom Systems**
Michele Pullman, Kenneth Peterson, Yih Jan, Motorola, USA

328.5 **Phase Synchronization in Satellite Mobile Systems**
Jose M. Riera Salis, Luis Mercader del Rio, Polytechnical University of Madrid, Spain

328.6 **Concatenated Trellis-Coded 8-ARY PSK for Land Mobile Satellite Communications**
K. Y. Tsie, P. Fines, A. H. Aghvami, King's College of London, UK

328.7 **Preamble-less Demodulator for Inmarsat Standard-C Coast Earth Station**
Tomoki Ohsawa, Motoya Iwasaki, NEC, Japan

329 APPLICATION OF ADAPTIVE FILTERING IN PULSE SHAPING AND ISDN

McCormick Place North Lower Level (L - 4)

ORGANIZERS: S. Ardalan,J. Karaoguz, North Carolina State University, USA
CHAIRPERSONS: S. Ardalan, J. Karaoguz
SPONSOR: Signal Processing and Communication Electronics

329.1 **Optimum Design of the Hard-Switching Dual Sign Algorithm for Adaptive Echo Cancellation**
Chin-Lia Wang, Rong-Yih Chen, National Tsing Hua University, Taiwan

329.2 **Linear-Programming Techniques for the Control of Intersymbol Interference With Hybrid FIR/Analog Pulse Shaping**
Jeffrey Coleman, Dean W. Lytle, University of Washington, USA

329.3 **Pulse Shape and Linearity Testing of ISDN Basic Access Transceivers**
David C. Jones, Alex F. Dietz, Bellcore, USA

329.4 **Matched Median Filter for Detecting QAM Signals**
Qin Liu, Jaakko Astola, Yrjo Neuvo, Tampere University of Technology, Finland

329.5 **Adaptive Estimator of Signal Amplitude in Unknown Noise Environment**
Qin Liu, Jaakko Astola, Yrjo Neuvo, Tampere University of Technology, Finland

329.6 **Modeling and Adaptive Filtering of Systems with Hysteresis Nonlinearities**
Ramin A. Nobakht, IBM, USA, Sasan H. Ardalan, North Carolina State University, USA

TUESDAY, JUNE 16, 1992
2 p.m. - 5 p.m.

330 PHOTONIC SWITCHING AND INTERCONNECTS

McCormick Place North Lower Level (L - 1)

ORGANIZER: A. Marrakchi, Bellcore, USA
CHAIRPERSON: A. Marrakchi
SPONSOR: Optical Communications, Communication Switching

330.1 **A Prototype Circuit-Switched Multi-Wavelength Optical Metropolitan-Area Network**
Rajiv Ramaswami, Frank J. Janniello, David G. Steinberg, IBM, USA

330.2 **Comparison of Central and Distributed Control in a WDMA Star Network**
Alan Willner, M.W. Maeda, J.R. Wullert II, Bellcore, USA

330.3 **The Wavelength Dilation Concept - Implementation and System Considerations**
Kwok-wai Cheung, Bellcore, USA, Jacob Sharony, Thomas Stern, Columbia University, USA

330.4 **Broadcast-Wavelength Architectures for a WDM Passive Star-Based Local Area Network**
Aura Ganz, Bo Li, University of Massachusetts, Amherst, USA

330.5 **A Multi-Channel Optical Star LAN and its Application as a Broadband Switch**
Mohsen Kavehrad, G. N. M. Sudhakar, N. D. Georganas, University of Ottawa, Canada

330.6 **Design and Implementation Considerations for Wavelength-Division Multiplexed (WDM) Photonic Dual Bus**
Kwok-wai Cheung, Bellcore, USA

331 PCN RADIO SYSTEMS ENGINEERING

McCormick Place North Lower Level (L - 3)

ORGANIZERS: P. Balaban, AT&T Bell Laboratories, USA, V. K. Prabhu, University of Texas, USA
CHAIRPERSON: V. K. Prabhu
SPONSOR: Communication System Engineering, Radio Communications

331.1 **A New Limiter/Discriminator Receiver for Mobile and Cellular Systems Employing MSK-Type Signals**
P. Takis Mathiopoulos, University of British Columbia, Canada, Dimitrio Makrakis, COM-ED, Canada

331.2 **Performance of MFSK Slow Frequency-Hopped SSMA System With Equal-Gain Diversity**
Weiqiang Ma, Peter E. Crouch, Arizona State University, USA

331.3 **Cell Design for a Broadband CDMA Personal Communications Network**
Laurence Milstein, University of California-San Diego, USA, Donald Schilling, City College of New York, USA, Raymond Pickholtz, George Washington University, USA, Vinko Erceg, Marvin Kullback, Nasser Abdelatif, SCM Mobilecom, USA, Thomas Smith, Alpha Resources, USA, William Metcalfe, COX Enterprises, USA

331.4 **Soft Output MAP Equalization and Trellis Coded Modulation for Severe Frequency-Selective Fading Channels**
Ralf Mehlan, Jurgen Wittkopp, Heinrich Meyr, Lehrstuhl fur Elektrische, Germany

331.5 **Analysis of the RMS Delay Spread of Indoor Radio Propagation Channels**
Homayoun Hashemi, Sharif University of Technology, Iran, David Tholl, TR Labs, Canada

332 RECENT PROGRESS IN BROADBAND SWITCHING SYSTEMS

McCormick Place North Lower Level (L - 5)

ORGANIZER: S. Bootman, DSC Communications, USA
CHAIRPERSON: F. Diaz, DSC Communications, USA
SPONSOR: Communication Switching

332.1 **Pipeline Banyan - A Parallel Fast Packet Switch Architecture**
P.C. Wong, M.S. Yeung, Chinese University of Hong Kong, Hong Kong

332.2 **A WDM Based Virtual Bus for Universal Communication and Computing Systems**
Lon Wang, K. C. Lee, Bellcore, USA

332.3 **Call Scheduling in Multicasting Packet Switching**
Jeremiah Hayes, Xing Chen, Concordia University, Canada

332.4 **Local and Metropolitan MultiMesh Networks**
Terence Todd, McMaster University, Canada, Ellen Hahne, AT&T Bell Laboratories, USA

332.5 **A Hybrid Shared-Memory/Space-Division Architecture for Large Fast Packet Switches**
Fabio M. Chiussi, Fouad A. Tobagi, Stanford University, USA

332.6 **Performance Analysis of Multipath Banyan Networks**
H. T. Mouftah, Queen's University, Canada, R. Venkatesan, Memorial University of Newfoundland, Newfoundland

333 MODULATION & CODING II

McCormick Place North Lower Level (L - 7)

ORGANIZER: N. A. Zervos, AT&T Bell Laboratories, USA
CHAIRPERSON: N. A. Zervos
SPONSOR: Communication Theory

333.1 **An Improved Approach for Importance Sampling of Multilevel Digital Transmission Systems**
Lin-Shan Lee, Cheng-Kun Wang, Yen-Wen Lu, Wenhsing Chen, Yung-Ping Hsu, National Taiwan University, Taiwan

333.2 **A New Realization of the Whitened Matched Filter Incorporating Easy Symbol Synchronization for High-speed Transmission**
Lin-Shan Lee, Cheng-Kun Wang, National Taiwan University, Taiwan

333.3 **Shaping of Multi-dimensional Signal Constellations Using a Lookup Table**
P. Kabal, INRS - Telecommunications, Canada, A.K. Khandani, McGill University, Canada

333.4 **A Novel Bandwidth-Efficient Trellis-Encoder with a Pulse Shaping Filter Bank**
Stefan Ramseier, Ascom, Switzerland

333.5 **Performance Analysis of a QAM Adaptive Receiver for 1.6Mbps Digital Subscriber Line Transmission**
Babak Daneshrad, Henry Samueli, University of California-Los Angeles, USA

333.6 **Noise-Predictive Partial-Response Equalizers and Applications**
E. Eleftheriou, P. R. Chevillat, D. Maiwald, IBM, Switzerland

333.7 **Cost Effective Maximum Likelihood Receiver for Multi-Carrier Systems**
Jacky S. Chow, John M. Cioffi, Stanford University, USA

334 HIGH-SPEED PROTOCOLS

McCormick Place North Lower Level (L - 9)

ORGANIZER: I. Rubin, University of California-Los Angeles, USA
CHAIRPERSON: I. Rubin
SPONSOR: Communication Theory, Data Communications Systems

334.1 **Efficient Adaptive Coding Rate Hybrid ARQ Protocols**
S. Kallel, University of British Columbia, Canada

334.2 **A Very High Speed Data Link Control System Using Multiple Protocol Controllers**
Takeshi Akaike, Keiji Ishikawa, Koichi Saito, Michiharu Mito, NTT Communication Switching Laboratories, Japan

334.3 **Unslotted ALOHA in High Speed Bidirectional Bus Networks**
Whay C. Lee, Motorola, USA, Pierre Humblet, Massachusetts Institute of Technology, USA

334.4 **RAP: A High Speed Protocol for Random Access Devices**
Giovanni Conti, AT&T Bell Laboratories, USA

334.5 **Impact of Implementation on XTP Throughout Performance**
Emilie Saulnier, Robert Mitchell, GE, USA

334.6 **Serial Extension for 800/1600 Mb/s Computer Interconnect**
Chu Yen, R. Walker, W. McFarland, D. Cunningham, G. Kwan, T. Hornak, Hewlett Packard, USA

335A DIMENSIONING AND CONTROL OF ATM NETWORKS II (HALF SESSION)

McCormick Place North Lower Level (L - 2)

ORGANIZERS: C. Douligeris, University of Miami, USA
B. Mukherjee, University of California, USA
CHAIRPERSON: C. Douligeris
SPONSOR: Computer Communications

335A.1 **Delay and Loss Control of an Output Buffered Fast Packet Switch Supporting Integrated Services**
Jon W. Mark, David X. Chen, University of Waterloo, Canada

335A.2 **Queueing Disciplines for Integrated Fast Packet Networks**
Amit Bhargava, Michael Hluchyj, Motorola, USA

335A.3 **Limiting Removal Depth in the Pushout Scheme for ATM Networks**
S. Marano, R. Beraldi, University of Calabria, Italy

335A.4 **On Performance Characteristics of ATM Networks**
Raif O. Onvural, IBM, USA

335B NETWORK CONTROL AND SERVICE MANAGEMENT IN ATM NETWORKS (HALF SESSION)

McCormick Place North Lower Level (L - 2)

ORGANIZERS: R. Kishimoto, NTT Transmission Systems Lab, Japan, M. Schwartz, Columbia University, USA
CHAIRPERSON: R. Kishimoto
SPONSOR: Data Communications Systems, CNOM

335B.1 **A Generalized ATM Traffic Model and its Application in Bandwidth Allocation**
Dhadesugoor Vaman, Sitaram Kowtha, Stevens Institute of Technology, USA

335B.2 **Proposal of Intelligent Telecommunication Network Model in ATM Networks - Distributed Cooperative Multi Agent Model**
Ryozo Kishimoto, Ichiro Yamashita, NTT Transmission Systems Laboratories, Japan

335B.3 **Structural Representation of Management and Control Information in Broadband Networks**
Mitsuru Tsuchida, Aurel A. Lazar, Nikos Aneroussis, Columbia University, USA

336 ISSUES IN WIRELESS COMMUNICATION NETWORKS

McCormick Place North Lower Level (L - 6)

ORGANIZER: S. P. Kumar, Northwestern University, USA
CHAIRPERSON: S. P. Kumar
SPONSOR: Computer Communications

336.1 **Wireless In-Building Network (WIN) Architecture and Protocols**
Dale Buchholz, Paul Odlyzko, Mark Taylor, Richard White, Motorola, USA

336.2 **Adaptive Measurement Intervals For Handoffs**
Jack Holtzman, Rutgers University, USA

336.3 **Virtually Fixed Channel Assignment For Cellular Radio-Telephone Systems: A Model and Evaluation**
Pitu B. Mirchandani, Zuoying Xu, University of Arizona, USA

336.4 **Crosslink Transmission Scheduling in Multiple Satellite Systems with Pseudo-Random Potential Receive Times**
Bruce Hajek, University of Illinois at Urbana, USA, Michael Carr, Raytheon Company, USA

336.5 **Modeling of Mobile Frequency Hopped VHF Channels and Error Correction on the Channel**
A. Van Heerden, H. C. Ferreira, Rand Afrikaans University, South Africa

337A PROPAGATION EFFECTS IN SATELLITE COMMUNICATIONS (HALF SESSION)

McCormick Place North Lower Level (L - 8)

ORGANIZER: F. Davarian, Jet Propulsion Laboratory, USA
CHAIRPERSON: F. Davarian
SPONSOR: Satellite and Space Communications

337A.1 **Propagation Characteristics at 20 GHz for Satellite Communications**
Mazin S. Mahmoud, University of Surrey, UK

337A.2 **Planning of In-Orbit-Testing Activity of the Italsat Propagation Experiment in the 20, 40 and 50 GHz Bands**
A. Paraboni, CSTS/CNR, Italy, M. Mauri, A. Castellani, Telespazio, Italy, B. Giannone, G. Di Sanza, A. Saitto, Alenia Spazio, Italy

337A.3 **The Effects of Atmospheric Turbulence on Broadband Communication Channels Above 10 GHz**
Hugues Vasseur, D. Vanhoenacker, A. Vander Vorst, Catholic University of Louvain, Belgium

337B MULTIMEDIA COMMUNICATIONS FOR COOPERATIVE APPLICATIONS (HALF SESSION)

McCormick Place North Lower Level (L - 8)

ORGANIZER: J. R. Ensor, AT&T Bell Laboratories, USA
CHAIRPERSON: J. R. Ensor
SPONSOR: Multimedia Services and Terminals

337B.1 **Cooperative Control for Sharing Applications Based on Distributed Multiparty Desktop Conferencing System: MERMAID**
Toyoko Ohmori, K. Maeno, S. Sakata, H. Fukuoka, K. Watabe, NEC, Japan

337B.2 **Multimedia Groupware for Code Inspection**
Laurence Brothers, Bellcore, USA

337B.3 **Application Management Services Collaboration in Branch Banking**
Frank Miller, Albert Gross, Kendall Draeger, Edward Wasser, NCR, USA

337B.4 **A Multimedia System for Flexible Cooperation**
Sylvia Wilbur, Betty Hewitt, Sarom Ing, Queen Mary and Westfield College, Univ. of London, UK

338 HIGH-SPEED MANS

McCormick Place North Lower Level (L - 4)

ORGANIZERS: I. Rubin, University of California-Los Angeles, USA, H. Rudin, IBM Research Lab, Switzerland
CHAIRPERSON: I. Rubin
SPONSOR: Communication Theory, Data Communications Systems

338.1 **Adaptive Bandwidth Balancing on DQDB Networks**
A. Albanese, Bellcore, USA, Shih-Fu Chang, D. G. Messerschmitt, University of California, USA

338.2 **Improving DQDB Throughput by a Slot Pre-Use Technique**
Sergio Palazzo, University of Catania, Italy, A. R. Pach, University of Mining & Metallurgy, Poland, D. Panno, University of Catania, Italy

338.3 **A Frame-based Priority Scheme for Gbit/s Metropolitan Area Networks**
P.C. Wong, P.T. To, The Chinese University of Hong Kong, Hong Kong

338.4 **Solving Bandwidth and Priority Domination Problems of DQDB Metropolitan Area Networks**
Nen-Fu Huang, Shiann-T. Sheu, National Tsing Hua University, Taiwan

338.5 **An Efficient and Fair Probabilistic Scheduling Protocol for Multiple-Channel Lightwave Networks**
Biswanath Mukherjee, Subrata Banerjee, University of California-Davis, USA

338.6 **Analysis of Buffering for a Shared Medium Fast Packet Switch**
B. K. Jayaram, University of Massachusetts, USA, Utpal Mukherji, Indian Institute of Science, India

339 CUSTOMER EVALUATIONS

McCormick Place North Lower Level (L - 11)

ORGANIZERS: J. Rinehart-Selby, AT&T Network Systems, USA, G. Miklos, Bell South, USA
CHAIRPERSON: J. Rinehart-Selby
SPONSOR: Quality Assurance Management

339.1 **The Customer/Supplier Quality Process: Telecommunications Quality Through Teamwork**
M.L. Marabello, Bellcore, USA, W.J. Nauman, Bell Atlantic, USA

339.2 **In Pursuit of Vendor Quality Excellence**
John Christensen, GTE, USA

339.3 **Report Cards: An Excellent Method for Customer/Supplier Communication**
J. S. Dickson, D. Ecklund, Northern Telecom, USA

339.4 **Total Customer Satisfaction**
John C. Kohler, Tellabs, USA

339.5 **A Customer/Supplier Partnership: Groundwork for Improved Report Card Grades**
Judith Rinehart-Selby, AT&T, USA, Ken Walling, Pacific Bell, USA

339.6 **Customer Evaluations: Customer and Supplier Perspectives**
Dennis Matter, Siemens Stromberg-Carlson, USA

SERIES 300 SESSIONS

WEDNESDAY, JUNE 17, 1992
9:30 a.m. - 12:30 p.m.

340 PHOTONIC NETWORKS I
McCormick Place North Lower Level (L - 9)

ORGANIZERS: T. Miki, NTT Transmission Systems Labs, Japan, M. O'Mahony, University of Essex, UK, L. Burton, Alcatel Network Systems, USA
CHAIRPERSONS: T. Miki, M. O'Mahony
SPONSOR: Optical Communications, Asian/Pacific Committee

340.1 **On the Performance of Wavelength Division Multiple Access Networks**
Jonathan Lu, Leonard Kleinrock, University of California-Los Angeles, USA

340.2 **Coherent Subcarrier Multiplexing System with Distributing Local Oscillator in Local Loop**
Tomoaki Ohtsuki, Iwao Sasase, S. Mori, Keio University, Japan, Hiroyuki Yashima, Saitama University, Japan

340.3 **Optical Frequency Division Multiple Access Network Design Using Optical Amplifiers**
Hiroshi Nakamoto, Norihisa Ohta, NTT Transmission Systems Laboratories, Japan

340.4 **Multilevel Optical Networks**
Mario Gerla, Milan Kovacevic, University of California-Los Angeles, USA, Joseph Bannister, The Aerospace Corporation, USA

340.5 **Multiwavelength Ring Networks for Switch Consolidation and Interconnection**
Stuart Wagner, Thomas Chapuran, Bellcore, USA

340.6 **10 GBIT/S To 260000 Subscribers Using Optical Amplifier Distribution Network**
B. Wedding, B. Franz, B. Junginger, R. Heidemann, E. Zielinski, D. Schlump, Alcatel, Germany, S. Dahl-Petersen, K. Schuesler, NKT Elektronik, Denmark, J. Hauenschild, M. Rein, Ruhr-University Bochum, AG Halbleiterbauelemente, Germany

341 CONGESTION CONTROL AND ROUTING IN HIGH-SPEED NETWORKS
McCormick Place North Lower Level (L - 4)

ORGANIZERS: C. Douligeris, University of Miami, USA, B. Mukherjee, University of California, USA
CHAIRPERSON: C. Douligeris
SPONSOR: Computer Communications

341.1 **Access to a Network Channel: A Survey into the Fairness Problem**
Christos Douligeris, Laxman Kumar, University of Miami, USA

341.2 **Configuration and Control of Gateways**
Imrich Chlamtac, Eric Wong, University of Massachusetts-Amherst, USA

341.3 **Discrete Time Analysis of Leaky-Bucket Congestion Control**
J. W. Mark, G. Wu, University of Waterloo, Canada

341.4 **Effectiveness of Leaky Bucket Policing Mechanism**
Ke-Qiang Liao, Z. Dziong, L. Mason, N. Tetreault, INRS - Telecommunications, Canada

341.5 **A Combined Montecarlo/GEVT Extrapolating Method for the Estimate of Buffer Length Distribution Tails**
Marco Listanti, Francesco Bernabei, Duilio Matrullo, Giuseppe Zingrillo, Fondazione Ugo Bordoni, Italy

341.6 **Evaluation of Overflow Probabilities in Resource Management**
Dinesh Verma, Domenico Ferrari, University of California-Berkeley, USA

341.7 **Multicast Routing of Hierarchical Data**
Nachum Shacham, SRI International, USA

342 WIRELESS LOCAL AREA NETWORKS
McCormick Place North Lower Level (L - 1)

ORGANIZER: K. C. Chen, National Tsing Hua University, Taiwan
CHAIRPERSON: K. C. Chen
SPONSOR: Communication Theory

342.1 **Delay Spreads and Channel Dynamics Measurements at ISM Bands**
Chia-chi Huang, IBM, USA, Rana Khayata, Columbia University, USA

342.2 **Comparative Performance Evaluation of Sector Antenna and DFE Systems in Indoor Radio Channels**
Kaveh Pahlavan, G. Yang, Worcester Polytechnic Institute, USA

342.3 **A Novel Multiple-Address Digital Communication System Using Chaotic Signals**
Ghobad Heidari-Bateni, C. D. McGillem, M. F. Tenorio, Purdue University, USA

342.4 **Throughput Analysis of Asynchronous CSMA Protocols on Star-like LAN Topologies**
Kenneth Vastola, Ivan Vukovic, Rensselaer Polytechnic Institute, USA

342.5 **Some Selective Repeat ARQ Schemes for Point-to-Multipoint Communication**
Tsern-Huei Lee, Jo-Ku Hu, National Chiao Tung University, Taiwan

342.6 **A Personal Communication Network Architecture Using the IEEE 802.6 MAN**
Robert Donaldson, Andrew Malyan, Victor Leung, University of British Columbia, Canada

342.7 **Statistical Characterization of a Partitioned Indoor Radio Channel**
K. Pahlavan, Worcester Polytechnic Institute, USA, R. Ganesh, David Sarnoff Research Center, USA

343 NEURAL NETWORK TECHNIQUES IN ADAPTIVE FILTERING

McCormick Place North Lower Level (L - 7)

ORGANIZER: S. Ardalan, North Carolina State University, USA
CHAIRPERSON: S. Ardalan
SPONSOR: Signal Processing and Communication Electronics

343.1 **Linearly Constrained Interference Rejection for Improved Spread Spectrum Performance**
John F. Doherty, Iowa State University, USA

343.2 **Fractionally Spaced Decision Feedback Multilayer Perceptron for Adaptive MQAM Digital Mobile Radio Reception**
Zengjun Xiang, Guangguo Bi, Southeast University, Peoples Republic of China

343.3 **Adaptive Bayesian Decision Feedback Equalizer Based on a Radial Basis Function Network**
S. Chen, B. Mulgrew, S. McLaughlin, University of Edinburgh, UK

343.4 **A Soft Decision-Directed Blind Equalization Algorithm Applied to Equalization of Mobile Communication Channels**
J. Karaoguz, S. H. Ardalan, North Carolina State University, USA

343.5 **Nonlinear Channel Equalization Using Clustering Techniques**
S. Theodoridis, University of Patras, Greece, C. M. S. See, C. F. N. Cowan, University of Loughborough, UK

344 COMPUTER-AIDED MODELING ANALYSIS AND DESIGN OF COMMUNICATIONS SYSTEMS

McCormick Place North Lower Level (L - 6)

ORGANIZER: J. K. Townsend, North Carolina State University, USA
CHAIRPERSON: J. K. Townsend
SPONSOR: Communication Systems Engineering

344.1 **Modeling and Distributed Simulation of Complex Broadband ISDN Networks Under Overload On Loosely-Coupled Parallel Processors**
S. Ghosh, A. B. Bhimani, Brown University, USA

344.2 **TEStool: An Environment for Visual Interactive Modeling of Autocorrelated Traffic**
Daniel Geist, Benjamin Melamed, NEC, USA

344.3 **A Dynamic Importance Sampling Methodology for the Efficient Estimation of Rare Event Probabilities in Regenerative Simulations of Queueing Systems**
J. Keith Townsend, Michael Devetsikiotis, North Carolina State University, USA

344.4 **Performance Evaluation of Coherent CPFSK Lightwave Systems**
John C. Cartledge, L. S. Berg, Queen's University, Canada

344.5 **On Biasing Gaussian Noise in Importance Sampling: Optimization and Implementation**
Jyun-Cheung Chen, Ericsson GE Mobile Communications, Inc., USA, John S. Sadowsky, Purdue University, USA, Ding Lu, EEsof, USA, Kung Yao, University of California, USA

344.6 **Computer Aided Modelling, Analysis and Design of Communication Systems**
Roy Sumit, J.S. Stadler, University of Pennsylvania, USA

345A MOBILE COMMUNICATION NETWORKS (HALF SESSION)

McCormick Place North Lower Level (L - 5)

ORGANIZER: S. Rappaport, State University of NY, USA
CHAIRPERSON: S. Rappaport
SPONSOR: Communication Theory

345A.1 **A New Dynamic Channel Assignment Strategy in Cellular Mobile Communication Systems**
Yang Jun, Shixin Cheng, Southeast University, Peoples Republic of China

345A.2 **Extended Integrated Channel Manager (EICM) - An Architecture For Fast Adaptive Channel Allocation In Cellular Networks With Multi-Terminal Platforms**
Jelena F. Vucetic, Dragomir Dimitrijevic, GTE, USA

345A.3 **An ARQ Protocol for Mobile Radio Systems**
Giuliano Benelli, Universita di Pavia, Italy, F. Argenti, Universita di Firenze, Italy

345A.4 **Call Blocking Performance of Distributed Algorithms for Dynamic Channel Allocation in Microcells**
Leonard Cimini, Jr., Gerard Foschini, Chih-Lin I, AT&T Bell Laboratories, USA

345B PACKET RADIO NETWORKS (HALF SESSION)

McCormick Place North Lower Level (L - 5)

ORGANIZER: E. S. Sousa, University of Toronto, Canada
CHAIRPERSON: E. S. Sousa
SPONSOR: Computer Communications

345B.1 **Performance Evaluation of Power Level Division Multiple Access (PDMA) Scheme**
S. Shimamoto, Y. Onozato, The University of Electro-Communications, Japan, Y. Teshigawara, NEC, Japan

345B.2 **Staggered Multicast Protocol with Collision-free Acknowledgement in Multihop Spread Spectrum Packet Radio Networks**
Kwok-Wah Hung, Hong Kong Polytechnic, Hong Kong, Tak-Shing Yum, The Chinese University of Hong Kong, Hong Kong

345B.3 **A Bound and Algorithm for Four Sender Contention Resolution**
Mark S. Andersland, University of Iowa, USA, James E. Jantzen, Rockwell International, USA

346 CODING FOR DIGITAL STORAGE SYSTEMS

McCormick Place North Lower Level (L - 2)

ORGANIZERS: C.M. Melas, IBM Research, USA, H. K. Thapar, IBM SSPD, USA
CHAIRPERSON: H. K. Thapar
SPONSOR: Signal Processing for Magnetic Recording

346.1 **On the Capacity of the (d,k) Constrained BSC: Computed Bounds and Estimates**
Cathy French, University of Idaho, USA

346.2 **Construction of High Rate Codes from an Infinite Memory Constraint Graph**
James Fitzpatrick, Jack K. Wolf, University of California-San Diego, USA

346.3 **Timing Recovery for Two-Dimensional Modulation Codes**
Michael Marcellin, Alan K. Ma, University of Arizona, USA,

346.4 **A Coding Technique For Recovery Against Double Disk Failures In Disk Arrays**
Mario Blaum, IBM, USA

346.5 **Coding Gain of Reed-Solomon Codes on Disk Memories**
E.J. Weldon, Jr., University of Hawaii, USA

346.6 **Runlength Limited Codes And Sequences For Binary Asymmetrical Channels**
C. Menyennett, H. C. Ferreira, I. Broere, Rand Afrikaans University, South Africa

347 ADVANCED TECHNOLOGIES IN MANAGEMENT OF TRANSPORT NETWORKS

McCormick Place North Lower Level (L - 3)

ORGANIZERS: K. Murano, Fujitsu, Japan, G. R. Ritchie, Bellcore, USA, T. Yasushi, NTT, Japan
CHAIRPERSON: K. Murano
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347.1 **Object Oriented Specification For Performance Analysis of Multi-Layered Protocols**
A. Watts, C. Smythe, D. Pitt, University of Surrey, UK

347.2 **A Network Control Architecture for Bandwidth Management**
Brian J. Wilson, R. D. Doverspike, Bellcore, USA

347.3 **Nondistributed Multiparty Connection Establishment for Broadband Networks**
Minfa Huang, Ivan T. Frisch, Polytechnic University of New York, USA, Ching-Hua Chow, University of Colorado, USA, Howard Bussey, Bellcore, USA

347.4 **Channel Reconfiguration Management of SDH-based Leased Circuit Network**
Hiroshi Uno, Ken Murase, NTT Network Systems Development, Japan, Kazuyoshi Morino, NTT Network Engineering, Japan

347.5 **An Object-oriented Operation System Configuration for ATM Networks**
T. Yoshida, Nobuo Fujii, K. Maki, NTT Transmission Systems Laboratories, Japan

347.6 **Allocation of the Cross-Connect Function in Leased Circuit Networks**
Keiichi Hoshi, Takao Kawata, NTT Telecommunications Networks Laboratories, Japan

348 ADVANCES IN DATA COMMUNICATIONS

McCormick Place North Lower Level (L - 8)

ORGANIZER: R. Cupo, AT&T Bell Laboratories, USA
CHAIRPERSON: R. Cupo
SPONSOR: Communication Theory , Data Communications Systems

348.1 **Numerical Evaluation of QAM Self-Noise Spectra for Fourth-Power Law Clock Recovery**
T. T. Fang, National Chung Cheng University, Taiwan

348.2 **Investigation of Capture Time in Digital Synchronizers**
David Strickland, University of Melbourne, Australia

348.3 **A New Technique for High-Performance Computer Data Compression**
Boris Ya Kavalerchik, BeINIPIASU, Belarus

348.4 **Maximum Likelihood Frame Synchronization for Flat Fading Channels**
Patrick Robertson, German Aerospace Research (DLR), Germany

348.5 **Using a Prefix Code for Addressing the Voronoi Constellations Based on Lattices Dn and D*n**
Peter Kabal, University of Quebec, Canada, A.K. Khandani, McGill University, Canada

348.6 **Synchronization in a M-PSK Modem**
William Osborne, Brian Kopp, New Mexico State University, USA

348.7 **A New Approach for Evaluating the Performance of a Symbol Timing Recovery System Employing a General Type of Nonlinearity**
Erdal Panayirci, Elisha Bar-Ness, New Jersey Institute of Technology, USA

348.8 **Using a New Technique to Obtain Generating Function for Convolutional Codes**
Donald Schilling, Dong Li, Gang Yang, City College of New York, USA

WEDNESDAY, JUNE 17, 1992
2 p.m. - 5 p.m.

349 PHOTONIC NETWORKS II
McCormick Place North Lower Level (L - 9)

ORGANIZERS: M. O'Mahony, University of Essex, UK, T. Miki, NTT Transmission Systems Laboratories, Japan, L. Burton, Alcatel Network Systems, USA
CHAIRPERSONS: M. O'Mahony, T. Miki
SPONSOR: Optical Communications, Asian/Pacific Committee

349.1 **A WDM Cross-Connected Star Multihop Optical Network**
Mohsen Kavehrad, University of Ottawa, Canada, Mansour Irshid, Jordan University of Science and Technology, Jordan

349.2 **Receiver Allocation in Photonic Bus Networks**
Terence Todd, Soori Sivakumaran, McMaster University, Canada

349.3 **All-Optical Bidirectional Manhattan Networks**
Marco A. Marsan, G. Albertengo, A. Francese, E. Leonardi, Politecnico di Torino, Italy, F. Neri, Universita di Parma, Italy

349.4 **Traffic Scheduling in Multiple WDM Star Systems**
Aura Ganz, Yao Gao, University of Massachusetts-Amherst, USA

349.5 **Contention-Based Reservation Protocols in Multiwavelength Optical Networks with a Passive Star Topology**
C. K. Un, Korea Advanced Institute of Science and Technology, Korea, H. B. Jeon, Korea Telecom Research Center, Korea

350 ADVANCED TECHNIQUES FOR TERRESTRIAL DIGITAL RADIO
McCormick Place North Lower Level (L - 2)

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SPONSOR: Radio Communications

350.1 **Shadowing Algorithms in Estimating Ground Scatter Interference**
Wm. Turin, V. K. Prabhu, AT&T Bell Labs, USA, A. L Kahn, AT&T Network Services Division, USA

350.2 **Bit Interleaving Technique as a Radar Interference Canceller in Digital Microwave Radio Systems**
S. Aikawa, T. Okuno, M. Hatai, NTT Network Systems Development Center, Japan, R. Ohmoto, NTT Radio Communication Systems Labs, Japan

350.3 **Empirical Modifications to Microwave Radio Signal Fading Models for Basic Exchange Radio**
Jean-Fu Kiang, Sing H. Lin, Bellcore, USA

350.4 **140MBIT/S 32QAM Cross-Polarized Co-Frequency Trial Results**
U. Casiraghi, L. Saini, P. Vitali, ALCATEL Telettra, Italy

350.5 **A Robust and Fast-Locking All-Digital Carrier Recovery Loop for QAM Signals**
P. Vandamme, J. Kervarec, CNET, France

351 ADAPTIVE EQUALIZATION OF TIME DISPERSIVE CHANNELS
McCormick Place North Lower Level (L - 8)

ORGANIZER: J. Proakis, Northeastern University, USA
CHAIRPERSON: J. Proakis
SPONSOR: Signal Processing and Communication Electronics

351.1 **A Full-Duplex Fast Training Algorithm for Simultaneously Estimating Echo and Channel Response**
X. Chen, Bejing University of Posts & Telecommunications, Peoples Republic of China, M. Suzuki, N. Miki, N. Nagai, Hokkaido University, Japan

351.2 **A Globally Convergent Adaptive Blind Equalizer Based on Second and Fourth Order Statistics**
Jitendra Tugnait, Auburn University, USA

351.3 **Blind Identification and Equalization of Multipath Channels**
Lang Tong, West Virginia University, USA, Guanghan Xu, Thomas Kailath, Stanford University, USA

351.4 **Candidate Admissible Blind Equalization Algorithms for QAM Communication Systems**
Zhi Ding, Auburn University, USA, Ken Yamazaki, Rodney Kennedy, Australia National University, Australia

351.5 **Start-up Behavior of a Neural Network Assisted Decision Feedback Equalizer in a Two-path Channel**
Olli Simula, Kimmo Raivio, Teuvo Kohonen, Helsinki University of Technology, Finland, Jukka Henriksson, Nokia Research Center, Finland

351.6 **Fully Digital Adaptive Slope Equalizer For Advanced Digital Radio Systems**
B. Lankl, G. Sebald, Siemens AG, Germany

351.7 **Sequential Sequence Estimation for ISI Channels with Convolutionally Coded Input Sequence**
Fuqin Xiong, Cleveland State University, USA

351.8 **A "Quantized" Channel Approach to Blind Equalization**
E. Zervas, J. Proakis, Northeastern University, USA, V. Eyuboglu, Motorola Codex, USA

352 ARTIFICIAL INTELLIGENCE APPLICATIONS IN TELECOMMUNICATIONS

McCormick Place North Lower Level (L - 7)

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352.1 **Access Provisioning Expert (APEX): A Knowledge-Based Approach to "No Order Provisioning" in the Interexchange Carrier Market**
J. O. Hawkins, L. M. King, M. Kreps, Pacific Bell, USA

352.2 **Using Artificial Intelligence and a Graphical Network Database to Improve Service Quality in Telecom Australia's Customer Access Network**
John R. McIntyre, Telecom Australia, Australia

352.3 **Visual Prototyping Design Support System Using Message Sequence Rules for Communication Network Services**
Kazumasa Takami, Kagetomo Genji, Toyofumi Takenaka, ATR, Japan

352.4 **Integration of Rules and Linear Program Models in Network Traffic Management**
G. Martini, C. Moiso, M. Porta, CSELT, Italy

352.5 **Using a Machine Learning Tool in Diagnosis of Network Overloads**
Rossella Bisio, R. Gemello, E. Montariolo, CSELT, Italy

352.6 **Neuroutin': A Novel High-Speed Adaptive-Routing Scheme Using a Neural Network as a Communications Network Simulator**
Takao Matsumoto, NTT Transmission Systems Laboratories, Japan

353 DIGITAL SIGNAL PROCESSING FOR SATELLITE AND SPACE COMMUNICATIONS

McCormick Place North Lower Level (L - 3)

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353.1 **Multidimensional Trellis Coded PSK**
Chin-Fen Lin, Arizona State University, USA

353.2 **Pragmatic Trellis Coded Modulation: A Hardware Implementation Using 24-Sector 8-PSK**
Michael Ross, William Osborne, Frank Carden, Jerry L. Stolarczyk, New Mexico State University, USA

353.3 **Universal-Coding-Rate Scarce-State-Transition Viterbi Decoder**
K. Kawazoe, Shunji Honda, Shuji Kubota, Shuzo Kato, NTT Radio Communication Systems Laboratories, Japan

353.4 **A New Symbol Timing Tracking Algorithm for pi/2-BPSK and pi/4-QPSK Modulations**
Francois Patenaude, Michael Moher, Government of Canada, Canada

353.5 **Error Probabilities of Bootstrapped Blind Adaptive Cross-Pol Cancelers For M-ary QAM Signals Over Non-dispersive Fading Channel**
Yeheskel Bar-Ness, Abdulkad Dinc, New Jersey Institute of Technology, USA

353.6 **Novel Satellite Digital Video TDMA System for Business Video Communications**
Shuji Kubota, H. Kazama, M. Morikura, S. Kato, NTT Radio Communication Systems Laboratories, Japan

353.7 **A Vector Quantization Based Coding Scheme for Television Transmission via Satellite**
L. Lee, A. Rao, S. Bhargava, COMSAT Labs, USA

354 ADVANCES IN ATM SWITCHING

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354.1 **Performance Analysis of Banyan Network Based ATM Switches**
Yanhe Fan, Jianli Wang, Chuan Wang, Beijing University of Posts & Telecommunications, Peoples Republic of China

354.2 **Approximate Analytic Performance Study of an ATM Switching Element with Train Arrivals**
Herwig Bruneel, University of Ghent, Belgium, Yijun Xiong, Alcatel, Belgium

354.3 **Performance Models for ATM Switching of Mixed Continuous-Bit-Rate and Bursty Traffic with Threshold-Based Discarding**
Parviz Yegani, IBM, USA

354.4 **Call Admission Control Method in ATM Networks**
Hiroshi Esaki, Toshiba, Japan

354.5 **Multichannel ATM Switch with Preserved Packet Sequence**
Hyong S. Kim, Carnegie Mellon University, USA

354.6 **A Fault-Tolerant Switching Architecture for ATM Networks**
Arata Itoh, NTT Communication Switching Laboratories, Japan

354.7 **Limited Intermediate Buffer Switch Modules and their Interconnection Networks for B-ISDN**
Nicolas Georganas, Anil Gupta, Luis Barbosa, University of Ottawa, Canada

355 GLOBAL QUEST FOR QUALITY PRODUCTS AND SERVICES

McCormick Place North Lower Level (L - 4)

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SPONSOR: Quality Assurance Management

355.1 **Quality Trends and Perspectives at Beginning of the Next Millennium**
Flavio Riciniello, SIP, Italy

355.2 **The Influence of Quality Standards ISO 9000 on Telecom Manufacturers**
Horst Neswadba, Siemens, Germany

355.3 **SONET Self-Healing Networks for STS 1/Nc Path Restoration**
Yasuyo Okanoue, Osamu Tabata, Hideki Sakauchi, Junko Iwasaki, Satoshi Hasegawa, NEC, Japan

355.4 **Structural Way of Thinking as Applied to Good Design (Part 2, Increasing Customers' Satisfaction)**
Kagehiro Yamamoto, Zenya Koono, Hitachi, Japan

355.5 **Improving the Software Engineering Process**
Sinclair Stockman, Mark Norris, BT Labs, UK

355.6 **Structural Way of Thinking as Applied to Design of Embedded System**
Zenya Koono, Saitama University, Japan

355.7 **Reliability Specifications Methods for Preventing Long Service Outages in Telecommunications Networks**
P. Shinomiya, S. Nojo, H. Wantanabe, NTT Telecommunication Networks Laboratories, Japan

356 PERSONAL COMMUNICATION SYSTEMS AND THEIR IMPLEMENTATION

McCormick Place North Lower Level (L - 5)

ORGANIZERS: D. Moghe, BNR, USA, M. Beller, Bellcore, USA
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356.1 **Adaptive Borrowing of Ordered Resources for the Pan-European Mobile Communication (GSM) System**
Svetislav Maric, City College of New York, USA, Eduardo Alonso, Rutgers University, USA

356.2 **The Use of SS7 and GSM to Support High Density Personal Communications**
Kathleen Meier-Hellstern, Rutgers University, USA, Doug O'Neil, BellSouth Enterprises, USA

356.3 **Hot-Spot Traffic Relief in Cellular Systems**
Takshing Yum, Chinese University of Hong Kong, Hong Kong, Wing S. Wong, AT&T Bell Laboratories, USA

356.4 **A Functional Model and Analysis of Personal Communications Services**
R. S. Wolff, S. Parlamas, D. Hakim, M. Beller, Bellcore, USA

356.5 **Using Speech Recognition in a Personal Communications System**
Andrew Burstein, Anton Stolzle, Robert Brodersen, University of California-Berkeley, USA

356.6 **Performance Evaluation of a Hierarchical Location Registration and Call Routing for Personal Communications**
Chuan Wang, Jianli Wang, Yanhe Fan, Beijing University, Peoples Republic of China

Using Speech Recognition in a Personal Communications System

Andrew Burstein
Anton Stölzle
Robert W. Brodersen

EECS Department
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University of California at Berkeley
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Abstract: **State of the art speech recognition systems can recognize continuously spoken speech from a large vocabulary in real time. In the future, portable speech recognition systems will be made possible by advances in integrated circuit technology, by optimizing system architectures, and by exploiting the special features of personal communications systems. This paper gives an overview of speech recognition systems and discusses design strategies for their use in portable communications.**

1. Introduction

Recently, the concept of "personal communication," in which individual users will have portable access to fixed computing facilities, has come to the forefront of communications research. The ultimate goal is to provide a personal communications system (PCS) which will move information to and from people, through an advanced wireless network supporting a wide range of services (see Figure 1). Moving beyond today's portable computers, a high-speed wireless link allows the advent of lightweight, multimedia graphics terminals, whose function would be to connect the user to powerful fixed processing units and data storage. It would be capable of providing speech communication, data transfer, computing services, and high-quality, full-motion video. Speech recognition would be performed both on the portable communicators and terminals, and by the centralized service providers.

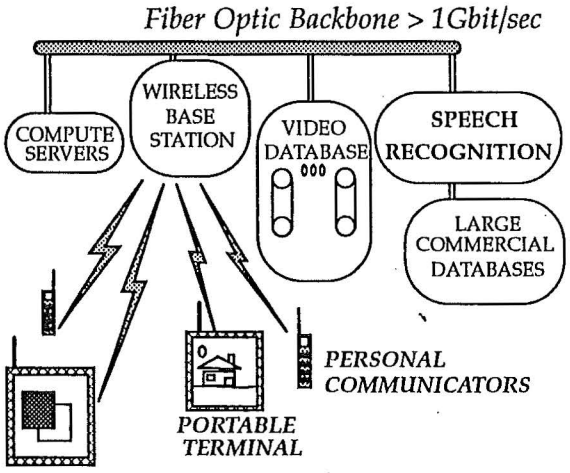

Figure 1: Personal Communication Services

There are three powerful motivations for including speech recognition capabilities in a PCS. First, portable hardware that includes speech recognition can be made much smaller because the user no longer needs to use a keyboard, one of the few electronic components that cannot be miniaturized. Second, new or untrained users can use these systems more easily and efficiently because speaking is more natural than typing and most people can speak faster than they can type. Third, these systems can be used in circumstances in which a keyboard system is not practical, for example while walking or driving.

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2. Types of Speech Recognizers

It is important to determine what type of speech recognizers will be used in a PCS because the hardware complexity and recognition accuracy of speech recognition systems vary greatly depending on the type of recognition task. The recognition task can be classified by several parameters: connected word versus isolated word, phone (a phonetic unit) based versus word-based, speaker independent versus speaker dependent, and large vocabulary versus small vocabulary.

- Isolated word systems are easier to implement because they do not need to perform the surprisingly difficult task of identifying word boundaries. (It was the difficulty of this task that motivated many researchers to switch from dynamic time warp algorithms to hidden Markov models.) However, speaking in isolated words is arduous, and is considerably slower than normal speech,.So except for simple control applications (in which one-word commands such as "on" or "off" are sufficient), a PCS should use a connected word recognizer.
- The differences between phone-based and word-based systems are not noticeable to the user, but have a large effect on the recognizer's architecture and training. For the same sized vocabulary, a word based system will require a much larger memory because it must store every parameter for every state in every word, rather than merely storing pointers to the parameters in the relatively small number of phones that make up all words. A word-based system requires more training data (many utterances per word) than does a phone based system (many utterances of each phone in different contexts), but it will have a higher accuracy. Some systems use a combination of words and phones, training whole word models only on frequently used words such as the word "the"[9]. A PCS could easily switch between word-based vocabularies for tasks with small vocabularies, such as dialing a telephone number, and phone-based vocabularies for more complicated tasks.
- Speaker-dependent systems can attain higher recognition accuracies because they do not have to account for variations between different people's voices and pronunciations. However, they must still be flexible enough to account for the variations in an individual's voice under different conditions of stress, time of day, health, background noise, etc. This leads to the largest disadvantage of speaker dependent systems: the need for a long, repetitive training period for each user. This can be acceptable for some PCS users who need extremely high recognition accuracies for tasks with small grammars, but only a PCS with speaker independent recognition can be used "off the shelf."
- A speech recognition system with a large vocabulary requires more memory and faster computation than one with a small vocabulary. However, the accuracy of speech recognition is not affected so much by the vocabulary as by its associated grammar. It is the grammar's perplexity, a measure of the average number of words that could follow any given word, that has the largest impact on accuracy. The better a grammar can predict the following word, the higher the probability that the hardware will recognize it correctly. Since only one PCS application can be spoken to at a time, each application can use a specifically tailored vocabulary and grammar.

3. An Overview of Speech Recognizer Design

In order to understand the trade-offs involved in designing a speech recognition system for a PCS, it is important to understand the four major subsystems of a speech recognizer: the front end, speech model, training method, and recognition method.

A typical speech recognition front end [8] is shown in Figure 2. Here, the speech signal is filtered, windowed, and

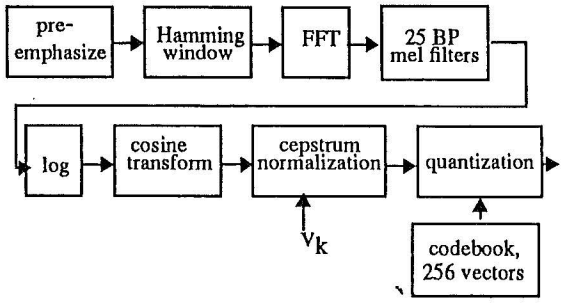

Figure 2: Front End Algorithm

then transform coded[4], typically with mel-frequency weighted cepstrals or LPC-based cepstrals. Transforms are taken over 30ms windows that are staggered every 10ms, the approximate duration of the shortest perceptible speech feature. The front end also computes the average power over each window. Next, the power and cepstrals are subtracted from past values, to create a set of delta parameters. Finally, each of the four parameters — cepstrals, delta cepstrals, power, and delta power — are separately vector quantized using 256 word codebooks. This set of parameters for time i is called an observation, o_i, and the entire observation sequence is $O_N = o_1 .. o_N$.

Many current systems use a hidden Markov model [5], such as the one shown in Figure 3, to model speech. (Other models, such as neural nets, are also being investigated[6].) In a

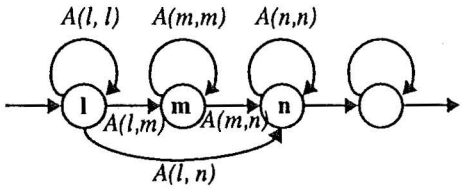

Figure 3: A Hidden Markov Model

hidden Markov model (HMM), speech is modeled as a series of transitions from state to state along arcs. After entering a state s, the HMM randomly emits an observation, o, according to the probabilities in a set of probability density functions (pdf's) $P(o \mid s)$ associated with each state. Thus, a given speech sound has a different probability of being observed in each state in the HMM. Each arc has an associated probability $A(m,n)$, which gives the probability of the transition from state m to state n at the end of the 10ms frame. Thus, the connectivity of the arcs determine the allowable state sequences. The self–loop probabilities (such as $A(m,m)$) determine the probability of staying in the same state over several frames, and thus determine the relative durations of the components of speech. Although HMM's are widely used, there is no universal agreement on the best HMM topology; Figure 3 merely shows one possible example. HMM's are flexible enough that comparable results can be obtained from very different topologies.

This flexibility is in large part due to the training techniques for HMM's, the third design choice. The most widely used training technique is the forward-backward algorithm [5], a probabilistic technique that automatically creates pdf's and transition probabilities. The forward-backward algorithm creates an HMM that (locally) maximizes the probability that the HMM would produce the observation sequences in the training data. Training an HMM requires a large amount of speech data that has been transcribed into its component parts, either words or phones. However, it is not necessary to know the time or duration of each component; the forward-backward algorithm will determine this automatically. It is important that the training data contains many instances of each speech component. Therefore, systems with large vocabularies usually train phone models, and then create entire words by concatenating their component phone models. This has the added advantage of making it possible to add new words to the vocabulary without any additional training; one simply has to add the right sequence of (previously trained) phones. On the other hand, because the same phone can be pronounced differently in different contexts, a well-trained word model will usually be more accurate than a word model composed of phone models.

The final design choice is between two commonly used recognition algorithms: Viterbi [5] and N best[7]. The Viterbi algorithm is fast, straightforward, and yields the single most likely spoken sentence, given the observation sequence and the HMM. The core of the Viterbi algorithm is to recursively compute the state probabilities $P(O_i,s)$ using (EQ 1) and (EQ 2), where $\pi(s)$ is the initial probability of state s. N best algorithms yield a list of several likely sentences, which can be useful if the speech recognition or its associated applications can use some other, nonacoustical criteria (such as natural language processing) to determine which sentence in the list was most likely spoken. However, N best algorithms require more computation than Viterbi.

$$P(O_1,s) = \pi(s) \cdot P(o_1 \mid s)$$

$$P(O_i,s) = MAX_{p \in pred}[P(O_{i-1},p) \cdot A(p,s)] \cdot P(o_i \mid s)$$

4. Current Speech Recognition Systems

As a demonstration of the maturity of speech recognition research, Table 1 shows a number of speech recognition systems that achieve high recognition accuracy. Furthermore,

Table 1: Recognition Accuracies [1]

Institution	Correct (%)	Substitutions (%)	Deletions (%)	Insertions (%)
Speaker Dependent Systems				
BBN	98.5	1.1	.5	.1
MIT/LL	98.7	.9	.4	.2
Speaker Independent Systems				
CMU	96.2	2.9	0.9	0.5
MIT/LL	94.8	3.8	1.3	0.7
SRI	95.6	3.4	0.9	0.4
AT&T	94.9	3.7	1.4	0.6

hardware has been developed which can run systems such as these in real time. This hardware, which consists of one full custom board and two boards containing general purpose DSP chips [1][3][8], is described below to provide a reference point for future PCS speech recognition systems.

In order to minimize the amount of hardware needed to implement the Viterbi algorithm, all probabilities are represented by their negative logarithm, so multiplications become additions and max operations become min operations (probabilities never need to be added together when computing the Viterbi algorithm). In addition, the hardware employs a pruning algorithm: during Viterbi backtrace com-

putation, the processor discards paths whose probabilities fall below a pruning threshold. Nevertheless, real time operation still requires 460 million add and min operations, and 8 GBits of memory I/O per second.

This hardware uses the hierarchical scheme shown in Figure 4. Each phone is stored in memory once, and then

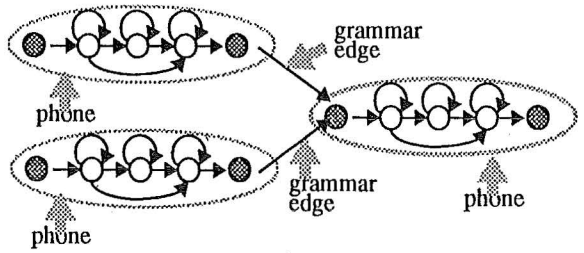

Figure 4: HMM hierarchy

instantiated and concatenated with grammar edges to form the words in the vocabulary. This hierarchy is also reflected in the hardware partitioning, as shown in Figure 5. The cus-

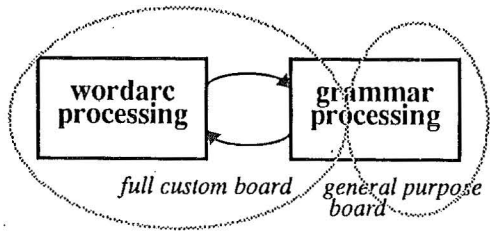

Figure 5: Hardware Partitioning

tom board computes (EQ 2) for all transitions within each phone. It also performs the max operation for the (grammar level) transitions between phones because this is the most demanding operation in grammar processing. The custom board, shown in Figure 6, contains two parallel processors, each implemented with three custom VLSI circuits. During any frame, one of the processors computes the transitions within the phones (Viterbi process) while the other processor performs the max operation on the grammar edges (ToActiveWord process). Since the output of each process forms the input of the other for the next frame, the two processors swap processes each frame, rather than swapping data, in order to facilitate memory access. The remainder of the computation of (EQ 2) for the grammar edges is performed on a set of general purpose signal processing boards using TI TMS320C30 processors. This hierarchy exploits the different characteristics of phone level and grammar level computations. Phone HMM topology is very regular, having few transitions per state, and very constant, rarely changing from phone to phone. These conditions allow the custom hardware to use a high degree of parallelism and pipelining to

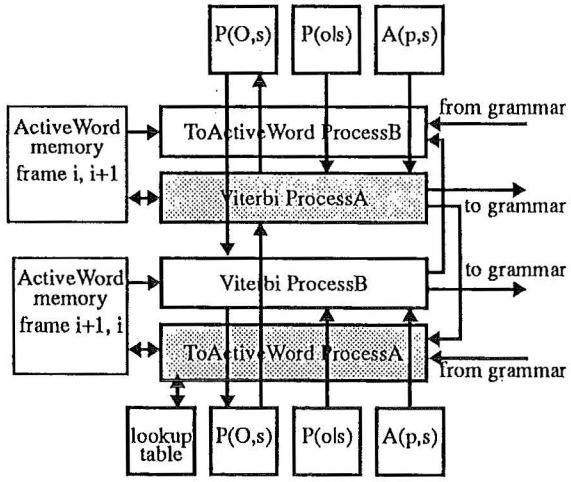

Figure 6: Switching Processor Architecture

achieve high computation speed and high throughput. Grammar level connectivity, on the other hand, is irregular, with a widely varying number and type of connections between phones, and can change greatly depending on the application and vocabulary. Therefore, it is best to wait until future research can create more standardized grammars before implementing grammar processing in full custom hardware.

5. Personal Communication Systems with Speech Recognition

Portable applications place some strict requirements on a speech recognition system, but they also have several benefits. Of course, the most severe constraints are on power, size and weight. The system described in section 4. resides on three triple height VME boards. Clearly, such a system is not portable.

However, if the speech recognizer is well integrated with the rest of the PCS, a much smaller amount of hardware could equal the performance of the larger system, by having specific grammars and vocabularies for each application that can run on the PCS. Most applications, such as dialing a telephone number, running a spread sheet, or manipulating windows, can be controlled by tens or hundreds of command words. Since a user can only control one operation at a time, the speech recognition hardware only needs to keep active one application's control vocabulary at a time; each application can swap in its vocabulary when it becomes active, just as windows can be displayed and hidden on a video monitor. Since some of these vocabularies will be small, it will be practical to store some of them as word models, rather than phone models. For example, a phone dialer could store digits as words, rather than modeling them by their component

phonemes. The computational load would not be greatly reduced by having individual grammars for each application, but the recognition accuracy would be enhanced.

Furthermore, the existence of the portable data link in the PCS environment creates a new degree of freedom in designing a portable speech recognizer: the recognition task can be partitioned between portable hardware and larger, centrally located, multi-user speech recognition servers. This might be needed for some applications, such as word processing, where the vocabulary must span the entire English language. In this case, the PCS could still use its speech front end, then send the vector quantized speech observation sequence (at approximately 3200 bits per second) to the central recognition server. The hardware described in Section 4. was designed to be readily extended to multi-user service by processing different observations (from different users) within each frame. This scheme allows the architecture to accommodate many users without having to empty its pipelines when switching between users.

6. Conclusion

In the future, portable speech recognition systems will be implemented on a small portion of a board using a few custom integrated circuits. Shrinking this system will be accomplished by taking advantage of several factors.

- The special conditions of the PCS environment mentioned in section 5. will reduce the amount of memory, memory bandwidth, and computation by having only a small part of the total vocabulary active at one time.
- As HMM based speech recognition technology matures, certain features — such as phone model topology, the number and type of phone models, and the size and nature of the speech feature set — can be standardized. By removing unneeded flexibility to accommodate variations in these features, dedicated hardware can be greatly simplified, thereby reducing size and power consumption.
- Advances in integrated circuit technology, packaging technology, and greater memory densities will eliminate silicon area as a constraint, allowing the use of new design techniques that trade power consumptions for silicon area [10].

These small, portable systems, together with large, central speech servers, will provide a variety of speech recognition services to PCS users.

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