



Cellular**Networking**Perspectives

“We Explain Wireless Standards and Technology”

Résumé for David Crowe

President, Cellular Networking Perspectives Ltd.





Calgary, Alberta, Canada

Phone: +1 403 289 6609

Fax: +1 403 206 7717

Email: David.Crowe@cnp-wireless.com

web: cnp-wireless.com/Resumes/DCroweResume.php

David Crowe is a well known wireless network standards and numbering resource consultant who has fulfilled many technical and leadership responsibilities over more than 30 years. He has consulted for a number of major telecom corporations and startups since 1992 and before that was employed as a real-time software designer and manager in computer and communications applications.

David has extensive experience in the development and implementation of wireless telecom standards, telecom protocols and also in real-time software development, particularly software related to wireless telecommunications. He is a well known [writer](#) on wireless technology and standards. From 1992 to 2004 David was editor of [Cellular Networking Perspectives](#) and publisher of [Wireless Security Perspectives](#). His combination of written communication skills, technical expertise and industry experience are unique.

David is an excellent resource for strategic advice for wireless communications projects, melding his vast technical, numbering resource and standards experience with his understanding of the increasing importance of the political and social environment influencing the adoption and success of wireless initiatives. His experience is also invaluable in legal cases.

Items shown in [green](#) are ongoing responsibilities. Items shown in [red](#) are recent additions.

Availability:

David is available for limited amounts of highly focused consulting and speaking engagements. David's standard billing rate is US\$300 per hour.

Chronological List of Assignments, Activities & Achievements

Category	Details
<p>Expertise</p>	<ul style="list-style-type: none"> • Consulting and testifying expert witness in US, Canadian and Australian courts in the areas of telecom, wireless, numbering and software • Telecom numbering and identifier resource management issues. • International roaming issues. • Review of system designs with a wireless component. • Preparation of documents with legal/technical overlap. • Government telecommunications mandates including Emergency Services (9-1-1), Surveillance, Number Portability and Priority Calling. • Preparation of white papers for a general or specialist audience. • Editing of technical documents that require a particularly high level of clarity and technical accuracy. • Acting as a representative on a wireless standards or other specification development committees. • Wireless mobility standards and protocols (including ANSI-41 and GSM MAP) • Educator or presenter on complex technical issues. • Software development using C, Javascript, PHP, FileMaker, AppleScript. • AJAX web programming using html, javascript, css, mySQL, FileMaker and PHP.
<p>Expert Witness</p>	<ul style="list-style-type: none"> • Achieved CFLC (Certified Forensic Litigation Consultant) status with the Forensic Expert Witness Association • Engaged as expert in an Ontario, Canada criminal case (2019) • Engaged by a major tech company in a patent lawsuit as an expert witness (2019) • Member of the organizing committee for the 2019 FEWA national conference • Engaged by a Canadian municipality as an expert consultant (2019) • Engaged as testifying expert by K+L Gates/Voxson (2017-2018) in a patent dispute. Submitted reports and testified in court for four days. Trial discontinued after parties reached a settlement in March, 2018. • Engaged as a consultant for US Department of Justice (2018) • Provided expert report to Margaret Osadet, criminal defense lawyer (2017-18) in a murder trial. • Provided expert report to Jennifer Hue, criminal defense lawyer (2017-18). • Consultant, Cowlitz County Sheriff's Office (2017) • Professional (verified) member of the Forensic Expert Witness Association (2016-present) • Consultant to Jennifer Thomas Law Office (2016). • Consultant to Susan von Achten, criminal defence lawyer (2016, 2017) • Consultant for Cahn Litigation (2015). • Patent consultant engaged by Baker Botts (2014). • Patent consulting, TAEUS (2013). • Patent consultant engaged by Baker Botts (2012).

	<ul style="list-style-type: none"> • Recognized as a technical expert in District Court in Chicago in a Motorola/Huawei lawsuit. Engaged by Covington Burling on behalf of Huawei (2011). Submitted a report to the court, and testified. Huawei won a judgment against Motorola. • Recognized as an expert witness in telecom by a Maryland Circuit Court for Dynacorp v Aramtel, an Iraqi-US civil dispute (2009). Deposed. • Patent consultant engaged by Baker Botts (2009). • Recognized as an expert in telecom by a Maryland Circuit Court judge for submission of an expert report and testifying. Engaged by Greenberg Traurig (2009). • Patent consultant engaged by Hahn Loeser Parks LLP (2007). • Author of a declaration submitted to the FCC as part of the CTIA comments on a US Department of Justice petition for expedited rulemaking on packet data support under the CALEA legislation (2007). • Patent consultant engaged by Perkins Coie (2006). • Recognized as a "forensic expert in the field of wireless technology" by Ontario Superior Court (2003).
<p>Current Positions</p>	<ul style="list-style-type: none"> • Certified Forensic Litigation Consultant from FEWA • Chair of TIA committee TR-45 (all CDMA standards) • Member of the Board of Directors of IFAST • Administrator for International Roaming MIN (IRM) network identifier codes to carriers on behalf of IFAST • Administrator of SID (System Identification) code ranges to countries and carriers, on behalf of IFAST • Chair of TIA subcommittee TR-45.8 (cellular core network standards) • Vice-chair of 3GPP2 TSG-AC WG1 on smart cards and provisioning • Consultant to CBRS Alliance regarding numbers and identifiers • Member of the Calgary organizing committee for the Lakehead University alumnus association
<p>Major Accomplishments</p>	<ul style="list-style-type: none"> • Achieved CFLC (Certified Forensic Litigation Consultant) status with Forensic Expert Witness Association • Led the industry wireless 9-1-1 standard, J-STD-036, to latest publication through editing and group leadership • Article on "VoLTE and the Future of 3G" for the Mobility Device Group • Chairman of a 3GPP2 Steering Committee ad hoc that produced a report on numbering resources for M2M, SC.R4005. • Consultant to major wireless corporations and trade associations. • Chairman of several TIA and 3GPP2 standards committees, Joint Expert Meetings and working groups. • Lead technical expert of a CDG initiative to encourage the completion of the MEID/EUIMID transition (from ES and UIMID). • Familiar with every aspect of telecom and computer protocols from conception and design through standardization and implementation. • A lead developer of the ANSI-41 mobility management standards. • Co-developer of standards and guidelines for the management of several wireless numbering resources – MIN (and IRM), ESN, IMSI, SID, MEID

and EUIMID.

- Co-founder of IFAST in 1996.
- Major contributor to wireless network standards for number portability, fraud prevention, PSTN interconnection and network authentication protocols.
- Lead developer of network standards to support wireless Emergency Services (e.g. 9-1-1) and International Roaming.
- Several articles critical of IPv6, calling it a massive technological failure.
- A prolific writer of technical articles about wireless communications and standards for a general audience both for his own newsletters (1992-2004) and for wireless industry magazines (1994-2009).
- Author of a number of reports on industry issues for both proprietary and public audiences.
- Editor of a number of major wireless industry standards.
- High level of expertise in the programming languages C, AppleScript, JavaScript, PHP and FileMaker.
- Extensive database design and implementation experience using Oracle, SQL and FileMaker.
- Extensive expertise using Adobe applications FrameMaker and Acrobat.
- Developer of number management and customer invoicing database for IFAST (FileMaker).
- Peer-reviewed scientific papers published on multi-dimensional analysis of taxonomic data and on the performance analysis of computer software.

2020

- Achieved FEWA CFLC status (Certified Forensic Litigation Consultant)

2019

- Member of the organizing committee for the 2019 FEWA national expert witness conference
- Supporting CBRS with initial assignments of shared spectrum identifiers
- Consultant to GHB regarding IMEI
- Consultant to a Canadian municipality over a legal telecom issue
- Engaged in a patent lawsuit involving a major internet company

2018

- Transfer MDG and CDG website content and software to the control of IFAST
- Consultant to CBRS Alliance on identifier issues
- Expert testifying witness engaged by K+L Gates/Voxson
- Testified in Federal Court in Sydney Australia for four days on a patent dispute involving GPS and cellphones.
- Designer of a management system for the North American MBI cellular identifier
- Started developing customer profiles for Rapidi, a company specializing in connecting disparate systems such as Salesforce and Microsoft Dynamics NAV.
- Editor of CBRS Alliance TR-0100, CBRS Alliance Identifier Guidelines
- Engaged as an expert by a major US government department

	<ul style="list-style-type: none"> • Designer of a database and website to manage the US MBI identifier for cellular subscription identification.
2017	<ul style="list-style-type: none"> • Consultant, Cowlitz County Sheriff's Office • Chaired the joint TIA/ATIS standards process for republication of the E-911 emergency call network standard. • Edited to publication the revised joint ATIS/TIA emergency services standard, J-STD-036-C-2 • Testifying expert engaged by K+L Gates/Voxson. • Consultant, Susan van Achten, Toronto defense lawyer. • Consulting expert, Jennifer Hue, Toronto defense lawyer. • Consulting expert, Margaret Osadet, Toronto defense lawyer.
2016	<ul style="list-style-type: none"> • Graduated from the University of Calgary with a BA in Italian, also include Spanish and Chinese (Mandarin) studies. • Appointed vice-chair of TIA committee TR-45, responsible for all cdma2000 standards, and some microwave standards • Consultant to Jennifer Thomas Law Office • Appointed editor of J-STD-036 for development of Revision C addendum 2 (Enhanced 9-1-1 Phase 2) • Engaged as Hatsoft consultant for database and system design projects using Salesforce, FileMaker and others.
2015	<ul style="list-style-type: none"> • Article on 5G for InfoTelecom magazine • Speaker at Telecom 2015 conference in Toronto on "Faith in Failed (Telecom) Fads" • Appointed vice-chair of 3GPP2 TSG-AC WG 1 on smart cards and provisioning • Presentation at MDG summit in San Jose • Article on "Machine-to-Machine Communications and the Internet of Things" for the MDG magazine • Article on the failure of IPv6 in the Info Telecom newsletter – "Back to the Future Part IPv6" • Appointed TIA representative to the OneM2M ApplicationID ad hoc group • Industry Canada liaison for Kyocera • Technical consulting for Sharetracker • Consultant for Cahn Litigation • Editor of TIA TSB-29-F/3GPP X.R0070 (International Implementation of Wireless Telecommunications Systems Compliant with TIA/EIA-41) through publication
2014	<ul style="list-style-type: none"> • Technical consulting for Personics • Technical consulting for Starscriber • Patent consultant engaged by Baker Botts • Article on VoLTE in the Info Telecom newsletter, The Future of Voice in

4G

- Article on "[VoLTE and the Future of 3G](#)" for the Mobility Device Group
- Edited technical content for the 3GPP2 Location Based Service specifications C.S0022 and C.R0022
- Completed publication of the updated CSIM specification, C.S0065-B v3.0
- Technical consultant to [CDG](#) in the areas of the [MEID and EUIMID transition](#), [M2M](#) and numbering issues from 2008 to 2014.
- 3GPP2 editor for the [R-UIM \(C.S0023\)](#), [CSIM \(C.S0065\)](#) ‘Smart Card’, [CCAT](#) (CDMA Card Application Toolkit) and [USSD Service Option \(C.S0105\)](#) specifications.
- Appointed editor of TIA TSB-29/3GPP N.S0017 (International Implementation of Wireless Telecommunications Systems Compliant with TIA/EIA-41)
- Chair of TIA TR-45.5 Working Group 1 (publication of standards for cdma2000 smart cards, provisioning, voice coders and location-based services) from 2012 to 2014.
- Technical consultant to Qualcomm in the area of wireless standards and numbering resource management from 2002 to 2014.
- Edited all technical changes for 3GPP2 C.S0073 (MEID Conformance Testing) and CDMA Card Application Toolkit (CCAT; C.S0035).

2013

- Appointed editor of 3GPP2 C.S0073 (MEID Conformance testing)
- Patent consulting, TAEUS
- Speaker at CDG GHRC meeting in Beijing on Dual-IMSI devices and 3GPP2 standards
- Organized successful 3GPP2 technology webinar
- Editor of revised USSD air interface standards for 3GPP2 [C.S0105-A](#)
- Editor of revised standard for MEID and EIR, [X.S0008-A](#)
- Implemented live web-based queries for [IFAST](#) IRM and SID databases, and for several non-profit clients
- Technical consulting for GHB Services

2012

- Technical product design consulting, major network interoperability vendor
- Chairman of cdma2000 technology workshop in Guangzhou, China, sponsored by 3GPP2.
- Editing of CDMA Card Application Toolkit (CCAT) specification update to V&V (C.S0035-A v3.0)
- Editor of initial USSD air interface support for cdma2000 [C.S0105](#)
- Appointed chair of TIA TR-45.5 Working Group 1 (TIA standards for cdma2000 cards, provisioning and location services)
- Patent consultant engaged by Baker Botts

2011

- Edited a major bug fix release (about 500 changes) for the R-UIM card specification [C.S0023-D v2.0](#) through to publication.
- Received certificate of appreciation from ARIB, TTA, TTC, CCSA and TIA (3GPP2 Steering Committee): “a key contributor, most notably as Chair of

the SC M2M Numbering Ad-hoc Group and Chair of the workshop Planning Ad-Hoc Group. Your leadership is admirable and serves as a foundation to the continued success of the organization. In addition, your vision is invaluable...”

- Interactive web-based database access project for non-profit client using AJAX techniques.
- Appointed chair of the 3GPP2 ad hoc workshop committee to plan an industry workshop on CDMA2000 for 2012.
- Presentation for [CDG Africa Forum in Lagos, Nigeria](#)
- Led 3GPP2 Steering Committee ad hoc on M2M Numbering through completion of report, [3GPP2 SC.R4005](#) and publication by TIA.
- Completion of a major [CSIM](#) bug fix release – [3GPP2 C.S0065-B v2.0](#).
- Appointed editor of CDMA Card Application Toolkit (CCAT) specification 3GPP2 C.S0035.
- Speaker at [CDG DSC](#) meeting on [IPv6](#).
- Expert witness testifying in Chicago-based intellectual property dispute between major telecom manufacturers. Engaged by Covington Burling.
- Technical SMS consulting for Telsis

2010

- Developed revisions to US [IMSI](#) guidelines to support Public Safety [LTE](#) networks and [MVNOs](#).
- Discussions with [CDMA2000](#) operators in China, Morocco, Indonesia, Thailand, Malaysia, Vietnam, Philippines and elsewhere.
- Participated in revisions to [MEID/SF_EUIMID](#), [UIMID](#) and [ESN](#) guidelines.
- Discussions with handset manufacturers in China and Canada regarding [MEID](#) and [EUIMID](#) issues.
- Survey of [R-UIM](#) card vendor preparedness for [EUIMID](#).
- Editor of new point releases for 3GPP2 specifications [C.S0023](#) ([R-UIM](#) cards) and [C.S0065](#) ([CSIM](#) cards).
- Submitted [C.S0065-B v2.0](#) for V&V and [TIA](#) ballot.
- Received Award of Merit from [3GPP2](#) TSG-C for activities in Working Group 1.
- Appointed chair of the [3GPP2](#) ad hoc on [Machine-to-Machine](#) numbering.
- Modifications to CDMA2000 Global Handset Requirements document to support [MEID](#) and [EUIMID](#) and presentation at a [CDG](#) meeting leading to acceptance.

2009

- Lead technical consultant for the [CDG](#) on the [MEID/EUIMID transition](#).
- Developer of an [eLearning course on the MEID/EUIMID transition](#).
- Featured speaker at a numbering forum sponsored by the TIA in Mumbai.
- Representative of the [CDG](#) at joint meetings with the TIA and China Telecom, Samsung, Qualcomm, LG Electronics, KT Freetel, ZTE, Huawei and four Nigerian operators.
- Representative of the [CDG](#) in meetings with the TR-45 EUMAG, 3GPP2 TSG-S Numbering Working Group 1 and other numbering forums.
- Appointed editor of 3GPP2 [C.S0023](#) (Removal UIM) and [C.S0065](#) ([CSIM](#)).
- Consultant for [CDG](#) on [OMH](#) 'smart card' standardization. Contributions to

	<p>the project recognized by Qualcomm in November, 2009.</p> <ul style="list-style-type: none"> • Recognized as an expert in telecom by a Maryland Circuit Court judge for submission of an expert report and testifying. Engaged by Greenberg Traurig. • Patent consultant engaged by Baker Botts
2008	<ul style="list-style-type: none"> • Speaker on numbering and identification issues related to international roaming at a CDG IRT meeting in Vancouver, Canada. • Speaker on a CDG (CDMA Development Group) webinar on MEID and EUIMID. • Speaker on a Rural Cellular Association webinar on the MEID and EUIMID transition. • Gave presentations on technical issues related to the MEID and EUIMID transition to two US-based telecom infrastructure manufacturers. • Articles on Removable UIM cards and user interfaces for Wireless Telecom magazine.
2007	<ul style="list-style-type: none"> • Author of a declaration submitted to the FCC as part of the CTIA comments on a US Department of Justice petition for expedited rulemaking on packet data support under the CALEA legislation. • Patent consultant engaged by Hahn Loeser Parks LLP • Consultant to Qualcomm/CDG on issues related to the implementation of MEID (replacement for ESN) and EUIMID (replacement for UIMID) including detailed presentations to a number of carriers in Asia. For more information on the package of information that David developed see cdg.org/meid. • Co-author of a report on the use of wireless communications for utility data transmissions. • Technical consultant for Luutronics
2006	<ul style="list-style-type: none"> • Received Certificate of Appreciation from chair of 3GPP2 TSG-X • Received Certificate of Appreciation from Matt Flanagan, President of TIA • Completed a two year term as chair of TIA TR-45.2. • Completed more than three years as chair of 3GPP2 TSG-X ERA working group (Evolution, Requirements and Architecture). • Technical consultant for Cal Edwards • Patent consultant engaged by Perkins Coie
2005	<ul style="list-style-type: none"> • Completed editing of 3GPP2 documents X.S0006 (AKA) and X.S0008 (MEID) through to ballot and publication for both 3GPP2 and TIA. • Resolution of a dispute between TIA subcommittees TR-45.2 and TR-45.6 over responsibility for US lawfully authorized electronic surveillance standards. • Completion of J-STD-036 Revision B (published in June 2005). • Completion of an addendum to 3GPP2 X.S0008 to define the decimal

	<ul style="list-style-type: none"> representation for MEID. Drafted modifications to the IFAST SID assignment guidelines to allow national assignment by IFAST.
<p>2004</p>	<ul style="list-style-type: none"> Prepared a report on the use of wireless phones as part of the Emergency Alert Service for the Rural Cellular Association which was included as part of their submission to the FCC. Elected chair of TIA subcommittee TR-45.2 (effective September 2004) on the third ballot following two ties. Developer of a presentation on the MEID (Mobile Equipment ID) for the TIA TR-45 ad hoc group on Equipment Identification now published on the TIA Equipment ID website. Writer for Network Cabling magazine Completed editing of joint TIA/ATIS standard for GSM/ANSI-41 Interworking: J-STD-038 Revision B (CDMA support) which was published in October 2004. Completed editing of 3GPP2 X.P0008 standard for MEID. Editor of Cellular Networking Perspectives from 1992 through 2004 and Wireless Security Perspectives from 1999 through 2004.
<p>2003</p>	<ul style="list-style-type: none"> Approved as a “forensic expert in the field of wireless technology” for the Ontario (Canada) Superior Court. Editor of J-STD-036 Revision B to incorporate field experience with enhanced 911 and provide enhanced GSM emergency services capabilities (“interim position”). Editor of 3GPP2 X.P0008 on MEID (Mobile Equipment Identification). Development of standards for location services (LCS) for both commercial and emergency purposes. For Telcordia developed a SID management proposal for the FCC. Appointed chair of 3GPP2 TSG-X ERA working group (Evolution, Requirements and Architecture). Telecom training for Fair Isaac
<p>2002</p>	<ul style="list-style-type: none"> Invited speaker at the Second Symposium for CDMA Global Roaming in Seoul. Ulticom technical consulting on E911 and location services Acting chair of the TIA TR-45.2 ad hoc group on Emergency Services. Edited the wireless industry Enhanced 911 specification – J-STD-036-A – through to publication. Articles on Wireless Security, m-commerce, Short Message Service Interoperability and “IP versus SS7” for Wireless Telecom magazine. Author of an internal report on international roaming for a major wireless equipment vendor. Elected chairman of TR-45.2/TSG Working Group I on Service Descriptions (Stage I) by acclamation.

<p>2001</p>	<ul style="list-style-type: none"> • Engaged by Telos for technical telecom consulting • Appointed vice-chairman of 3GPP2 TSG-N/TIA TR-45.2 Working Group I on service descriptions. • Speaker at CITO (Communications and Information Technology Ontario) conference in Ottawa. • Appointed to Advisory Board of Wmode. • Content provider for the CDG website. • Editor of ongoing enhancements (Addendum 2) to Emergency Services Phase II Network Standard (J-STD-036). • Appointed as International SID (System Identification) number administrator by IFAST.
<p>2000</p>	<ul style="list-style-type: none"> • Invited speaker and panelist at IIR Wireless Internet Forum in Toronto. • Xybridge E911 consulting • Invited speaker on International Roaming MINs at CTIA Wireless Partners conference. • Appointed Contributing Editor for Wireless Review magazine. Articles written on topics such as Wireless Markup Language (WML), Wireline Replacement, Emergency Services (911), Numbering, Authentication, Network Reliability and Security. • Regular columnist for Canadian Wireless Telecommunications Association (CWTA) magazine Wireless Telecom. Articles published include Numbering Conservation, Calling Party Pays (CPP), Wireless Application Protocol (WAP) and Bluetooth. • Managing IFAST International Roaming MIN (IRM) assignments. • Consultant to other wireless equipment manufacturers. • Writer and editor of Cellular Networking Perspectives. • Publisher and editor of Wireless Security Perspectives. • Editor of Emergency Services Phase II Network Standard (J-STD-036). • Editor of the TR-45.2 3G enhanced authentication standard.
<p>1999</p>	<ul style="list-style-type: none"> • Invited speaker at the GTE conference “Global Roaming–Resolving Technical and Business International Roaming Issues” in Washington, DC. • Invited speaker Wireless Partners conference in Miami sponsored by Cibernet and the CTIA • Founded Wireless Security Perspectives • Scheduled speaker Institute for International Research (IIR) conference on Calling Party Pays/Local Number Portability in New Orleans. • Appointed representative for AT&T Wireless on the TIA TR-45.2 standards subcommittee • Author of feature article in Wireless Review magazine on the impact of advances in SS7 technology on wireless telecommunications systems. • Monthly columnist in the bimonthly Wireless Review magazine (successor to Cellular Business) covering 3G Systems; Location Technology; International Roaming; Numbering Issues; WAP; Beyond SS7; Billing and more. • Representative on TIA Standards Subcommittee TR-45.2 • Consultant for CTIA and author of several reports.

<p>1998</p>	<ul style="list-style-type: none"> • Feature article on planned Australian AMPS closure in Cellular & Mobile International magazine • Monthly columnist in the bimonthly Wireless Review magazine (successor to Cellular Business) with articles on Wireless radio advances; Authentication; Future of SS7; Electronic Surveillance (CALEA); IS-124 for call detail/billing records; Wireless Data; Calling Party Pays; Local Number Portability; International Roaming Problems; Wireless Intelligent Network (WIN); Opportunities with Gateway MSCs. • Content provider for IFAST and CTIA web sites. • Leadership of effort to complete the internationalization of the TIA/EIA-41 standard for intersystem operations (IS-807). • Consultant to CTIA regarding the US IMSI Management Council • Author of IFAST SID Assignment Guidelines.
<p>1997</p>	<ul style="list-style-type: none"> • Guest columnist in Cellular Business PCS'97 Show Dailies with an article on third generation wireless systems. • Leadership of successful effort to publish Revision B of TSB-29 (as chair of TIA TR-45.2 WG VI) providing recommendations for international applications of IS-41 based systems. • Leadership of effort to publish IS-751 (as chair of TIA TR-45.2 WG VI) providing support for IMSI (International Mobile Station Identity) in IS-41. • Consultant to CTIA regarding the IMSI Management Council (now the IMSI Oversight Council) and Calling Party Pays (CPP). • Completed the first MIN Assignment Guidelines. Now updated and used by the MBI Assignment Authority. • Consultant to other wireless equipment manufacturers.
<p>1996</p>	<ul style="list-style-type: none"> • Monthly columnist in Cellular Business • Moderator and speaker for Wireless World '96 panel on Analog vs. Digital Features. • Liaison between International Forum on AMPS Standards Technology (IFAST) and TIA standards committee TR-45.2 (on behalf of Alcatel). • Author of CTIA reports on the "Open Wireless Network Architecture" and "A National Authentication Center". • Certificate of Appreciation from TIA In appreciation of your personal efforts and dedication in the development of TIA/EIA IS-41-C. • Speaker on IS-41 Rev. C at CTIA Wireless '96 session Incumbency 101. • Speaker on TSB-29 at International Forum on AMPS Standards Technology (IFAST). • Article on border cell problems published in Wireless'96 Cellular Business Show Dailies. • Feature article on the IS-124 call detail record standard published in Wireless'96 Cellular Business Show Dailies. • Guest speaker for Natural Microsystems at a customer function associated with Wireless'96.

1995	<ul style="list-style-type: none"> ● Co-Founder of IFAST (International Forum on AMPS Standards Technology). ● Speaker on international issues at CTIA/PCIA sponsored Wireless Interconnect Forum. ● Speaker on IS-41 at Universal Wireless Communications conference in Cancun. ● Speaker on seamless network standards at SPIE conference. ● Speaker on wireless 9-1-1 standards development at SPIE conference. ● Columnist for Cellular Integration (previously Cellular Marketing) magazine. ● Speaker on international roaming and priority access at Bellcore WIF. ● Guest speaker at the first Excel Inc. user's conference.
1994	<ul style="list-style-type: none"> ● Appointed chair of TIA subcommittee TR-45.2 Working Group VI on international issues. ● Chair of TIA International Roaming Joint Expert's Meeting that led to the replacement of MIN by IMSI as the future AMPS mobile identification. ● Speaker at CTIA forum on Extension Phone Service. ● Panelist at IEEE ICUPC conference. ● Panelist at CTIA forum on Commercial Mobile Radio Services.
1993	<ul style="list-style-type: none"> ● Contributed to the development of the TIA/IS-93 PSTN interconnection standard. ● Panelist at Cellular Business convention Wireless World'93. ● Presenter at CTIA forum on Authentication. ● Editor of TIA Border Cell Standard TSB-65 (later incorporated in TIA/EIA/IS-41 Revision C).
1992	<ul style="list-style-type: none"> ● Contracted to represent Alcatel on the TIA TR-45.2 standards subcommittee. ● Founded the Cellular Networking Perspectives technical bulletin. ● Appointed editor of the IS-41 test plan standard (TIA/EIA/TSB-56).
NovAtel Communications 1984–1992	<ul style="list-style-type: none"> ● Canada Award for Business Excellence (Bronze in innovation category) for SMC product ● Oracle Training (API programming and optimization) ● Representing NovAtel on TIA TR-45.2 standards subcommittee. ● Manager of cellular switching software development. ● Designer of call processing kernel and common channel signaling (in C on RSX and Unix operating systems). ● Designer of a protocol for a pre-ANSI-41 mobility management system ● IS-41 Rev. 0 inter-system operations team leader for first US and Canadian field trials ● Designer of call detail record format and collection software (in C on VMS)

	<p>Operating System). Negotiated support for the format with CBIS (Cincinnati Bell Information Systems) the major billing system provider at that time.</p> <ul style="list-style-type: none"> • Designer of real-time and software development software tools (in C on RSX) • Published a paper on CPU Probes (a software analyzer of software performance) • Base Station to MSC data link design (for redundancy options) • Maintenance of schedules for each SMC revision (including hardware). • Conversion of C code from PDP-11/RSX to 80386/Unix • Real-time in-memory database and message passing system design and implementation. • CPU performance analysis tools for RSX and Unix.
<p>Sentrol Systems (now Valmet Automation) 1981-1984</p>	<ul style="list-style-type: none"> • Dual-Standby redundancy software • Realtime software development in C • Designer and implementer of a realtime hypertext system for customer created realtime interconnected displays. • Customer configurable rule-based emergency shutdown for Home Oil pipeline. • WYSIWYG editor for creation of customer monitoring screens
<p>Glenayre Electronics, Vancouver 1980– 1981</p>	<ul style="list-style-type: none"> • Real-time software development for BC Rail and truck transportation systems in Pascal. • Software tools and extensions to MP/M operating system.
<p>University of British Columbia (UBC) 1978–1980</p>	<ul style="list-style-type: none"> • COBOL certification • Development of a data entry and retrieval system for the university's herbarium in PL/I, Pascal and C. • Studies in Botany • Publication of Agamospermy and Hybridization in Bidens in Northwestern Ontario in the journal "Taxon" • Development of true-perspective 3-dimensional software to illustrate biosystematic data reductions from many dimensions to 2 or 3 dimensions. • Development of Principle Coordinates Analysis data reduction software in Fortran and C. • Programming in APL, Algol68, BASIC, BCPL and SNOBOL
<p>Lakehead University 1974– 1978</p>	<ul style="list-style-type: none"> • HBSc degree in Biology/Mathematics (First Class Honours) with thesis containing extensive and innovative computer analysis of botanical data. • Gold Medal for Science Faculty (ex aequo). • Biology Department Prize. • Recipient of NSERC (Canadian National Science and Engineering Research Council) graduate studies full scholarship.

