70ᵗʰ Anniversary
International Teletraffic Congress

A look back at ITC

By **Prosper Chemouil, Gerald A. Ash, James W. Roberts**

This report does not aim at overviewing all ITCs, and it is only a testimony from 3 active participants who witnessed the vivacity of the teletraffic community during 35+ years and who want to share some memories in different directions, organizational, scientific or more personal.

It is based on contributions from the following ITC Fellows:

- **Gerald R. Ash**, formerly *AT&T Bell Labs*, USA, who participated in all events from ITC 9 till ITC 16
- **Jim Roberts**, formerly *CNET/France Telecom*, France, *Arne Jensen Lifetime Award 2010*, who actively contributed to all events from ITC 9 till ITC 27.
- **Prosper Chemouil,** formerly *CNET/France Telecom/Orange*, France, Past IAC Chairman and *Arne Jensen Lifetime Award 2015*, who attended all events from ITC 11 till ITC 28

Scientific and technical background of ITC

Since its inception, ITC has witnessed most of communications network evolution, starting from the basic plain old telephony services, providing solutions and guidelines in the network design and performance aspects. Over its 70-year lifetime, ITC has considered a wide range of networks, including:

- Telephone Networks
- Signalling Networks
- Narrowband ISDN
- Broadband ISDN and ATM
- Mobile Networks
- IP Networks
- Virtual Networks and new paradigms

Basically, over the years, the ITC community has, in a certain way, developed methods and algorithms initiated by **A.K. Erlang**, aiming at optimally considering the relationship between demand, capacity and performance for all types of networks. The characteristics of these elements were:

- **Traffic Demand**: Measurement, Data Analysis, Modelling and Characterization
- **Network Resources**: Dimensioning, Capacity Allocation, Routing, Traffic Control
- **Performance**: Metrics, QoS Parameters, Control
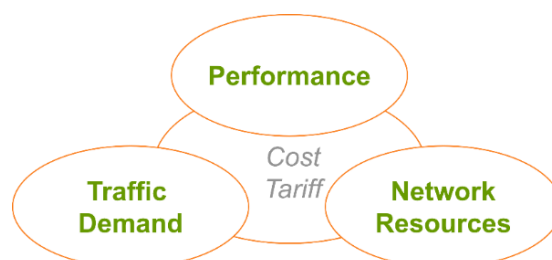
In a simplistic view, the challenge was (and still is) to adapt **Demand** to **Network Capacity** with respect to **QoS Objectives (or Constraints)** whatever the networks and the service.

The combination of 2 of the 3 main entities provided food for thoughts and many studies in the ITC community, i.e.:

- Demand & Capacity → Grade of Service (routing, resource management, flow control)
- Demand & Performance → Design, Dimensioning
- Capacity & Performance → Demand Estimation and Forecasting

As such, many papers addressed key areas such as:

- Traffic Estimation and Forecasting (ITC 9 → ITC 11)
- Network Design and Dimensioning (ITC 3 → now)
- Overload congestion (ITC 7 → ITC 18
- Dynamic routing (ITC 9 → ITC 15)
- Resource Management (ITC 5 → now)
- Network Control (ITC 10 → now)
- Network Management and Automation (ITC 11 → now)

Other considerations have been added to better design and operating networks and services, e.g.:

- Robustness (reliability),
- Cost (Design),
- Green networking (Sustainability)

ITC History

ITC was created by Arne Jensen to *initially cater to the emerging need to understand and model traffic in telephone networks using stochastic methodologies, and to bring together researchers with these considerations as a common theme*. The first Congress took place in Copenhagen, Denmark in memory of A.K. Erlang and was known as "*The First International Congress on the Application of the Theory of Probability in Telephone Engineering and Administration*". Likewise, the Second event has a similar naming. The event became the International Teletraffic Congress from ITC 3 held in Paris, France, and the name together with its acronym has so far remained ITC .

From the inception of the conference, an International Advisory Committee (IAC)was designated to represent the corresponding community, and its composition has evolved to expand beyond the original outreach.

The first IAC Chair was **Arne Jensen** until 1991. ITC events were organized every 3 years like many congresses by that time, and paper selection was mainly made by the IAC, first by invitations and later based on abstracts. From ITC 3 until ITC 13, ITC congresses spanned over a full week, from Wednesday till Tuesday, including social events during the week-end.

In 1991, The IAC designated **Paul Kuehn**, *University of Stuttgart*, Germany a new IAC Chair during ITC 13. Major changes were:

- From ITC 14, ITC Congresses will be organized from Monday till Friday
- From ITC 14 Paper Selection would be made based on reviews of the text, in extensive TPC meetings held in person over 2 full days.
- From ITC 15 in Washington D.C., ITC congresses took place every two years until 2007.

Paul steered the conference until ITC 20 in Ottawa, Canada in 2007 when **Prosper Chemouil**, by then *Orange*, France and IAC member since ITC 16, was appointed to be the next IAC Chair. It was also decided that ITC Congresses would take place every year like many conferences and over 3 days. He stepped down from this position at ITC 27 to be replaced by **Michaela Meo**, *Politecnico di Torino*, Italy, until 2022, when she handed over the role to **Sabine Wittevrongel**, *Ghent University*, Belgium, the current IAC Chair.

The list of ITC Congresses is available at: https://itc-conference.org/congresses.html.

- **ITC 10** was initially planned to be in Moscow, USSR in 1982. Due to the great political tension between the Eastern and Western blocks, ITC 10 was delayed by one year and re-located in Montreal, Canada
- Initially planned by mid-September in Salvador da Bahia, Brazil, **ITC 17** was postponed by nearly 3 months because of the 9/11 situation when the whole world was on hold after the terrorist attack in the USA. Most flights had been frozen around the world so none could travel to Brazil. Additionally, the proceedings sent from Europe by Elsevier were stuck in transit in New-York Harbor that was closed. The Core Team of the IAC had an emergency call with the Local Organizers and decided to reschedule the event. Fortunately, Carlos-Alberto Costa-Nunes, the General Chair, managed to successfully re-arrange the conference in a very short time in the same venue.
- **ITC 21** was planned to take place in Cairns, Australia in 2009. Despite many efforts , in particular from **Clemm Pratt**, it appeared in 2008 that this would be impossible to maintain. As an urgent matter, Prosper Chemouil, newly appointed as IAC Chair, invited ITC 21 in Paris, France and he acted as a General Co-Chair.

Other ITC events

Besides the 36 ITC congresses (see https://itc-conference.org/congresses.html), ITC has also organized **22 ITC Specialist Seminars** from 1977 till 2014 which each put emphasis on focused areas (see https://itc-conference.org/specialist-seminars.html).

Additionally, under the unrivalled involvement of **Lars Engvall**, *ITU-D Director* and *IAC member*, **Regional Seminars** have been regularly organized in developing countries with the support of ITC to promote the dissemination of teletraffic practice in the design and operations of their network infrastructure. 19 Regional Seminars took place in all continents between 1988 and 2003, when the last Regional Seminar was co-located with ITC 18 in Berlin.

Like many conferences in the early days, ITC was strongly supported and steered by Network Operators and Industry, mostly in the context of monopolistic governmental organizations (e.g. Telecommunications were a public service in various countries). This dramatically changed over the years with divestiture and deregulation first. The support of industry then slowly decreased. Additionally, the advent of IP networks introduced a new community, mainly from Computer Science, that progressively overlapped the traditional ITC Community. Finally, the busting of the Internet bubble in early 2000 resulted in a profound and definite shift toward academia research, though industry and network operators still contributed, but at much lower scale. This was also reflected in the composition of the IAC which was accordingly updated with experts from academia.

Impact and Legacy of ITC

One often question what the impact of ITC has been. In today's perspective, with so many conferences and a broad range of challenges, it seems that not much has resulted specifically from our community. On the other hand, ITC triggered a lot of activity in Standardization and Collaborative Research

Standardization

it is important to remember that before early 2000, there existed huge events that attracted participants on specific topics every 3 years. These events were gathering where innovations and trends would be presented and included ISS (the International Switching Symposium), ITC (the International Teletraffic Congress) and ISSLS (the International Symposium on Subscriber Loops and Services).

These congresses were closely linked with the Standardization activities, mainly at ITU-T. For example, ISS events were feeding the work of Study Group XI on switching and signalling with a huge number of Q.xyz Recommendations, at a time when the Common Channel Signalling #7 was upcoming to support the deployment of ISDN.

Likewise, ITC was seminal in feeding the activity of Study Group II (then SG2) regarding *Network Operations*. Numerous ITC members (including the authors of this document) were also delegates to this Study Group and had a great influence on Routing, Traffic Engineering, QoS and Network Management through the E.xyz recommendations series, including ISDN traffic. Delegates from major network Operators were often participants in ITC events and SG II Recommendations were often aligned with the work presented in ITC. Topics that were addressed include:

- Routing Principles and Design of Dynamic Routing
- Overload and Congestion Control
- Service Protection and Trunk Reservation
- Traffic Representation and Forecasting
- QoS and Network Management.

In addition, some ITC research outcomes also helped issuing specific I Series Recommendations regarding the Integrated Services Digital Network (ISDN), also addressed in Study Group XVIII (then SG 13) on broadband networks.

The relationship between research presented at ITC and the contributions to ITU-T was so close that ITC was considered as an official Partner by ITU-T for SG II.

Thanks to **Lars Engvall**, an IAC Member, this cooperation was also extended to ITU-D providing guidelines for developing countries, and many specific ITU-D Seminars hosted ITC Speakers, in addition to the Regional Seminars also set by ITC.

One particular ITU-D Seminar that directly resulted from the ITC contributions was the *International Seminar on Intelligent Routing Strategies* organized in Zruc, Czechoslovakia, during two weeks in April 1986. This event provided in-depth material on dynamic routing systems presented in previous ITC conferences.

Keynote Speakers included **Jerry Ash** (DNHR), **E. Szybicki** (who was one developer of the BNR's *Dynamically Controlled Networks* (DCR) system), **Prosper Chemouil** (Dynamic Routing Trial), **Bernard Liau** (Cnet, on Multihour routing optimization), **Tom Saville** (BT, on Network Management), **Michal Pioro** (Warsaw University of Technology) **Gyula Sallai** (Communication Authority Hungary, on Congestion Control). See Jerry's report hereafter.

Research Collaboration and Projects

In addition to Standardization activities, ITC events were also the venue to exchange and initiate international collaboration. Some examples include:

- *European collaboration included COST projects*, which Jim Roberts was significantly involved with ISDN and broadband networks. These projects spanned over several years, from COST 201 on Network Optimization to COST 242 on Performance of B-ISDN.

- The *international collaboration between CSELT, Cnet and Telefonica I+D*, the research centers of main network operators in Italy, France and Spain that was set up right after ITC 12 in Turin, Italy. The research project aimed at designing performance evaluation platforms to assess different traffic routing and engineering strategies.

- The *international Project on Worldwide Intelligent Routing (WIN*) that was first discussed during the ITC Specialist Seminar in Adelaide, Australia in 1989. **Steve Katz**, AT&T and IAC Member, introduced some early concept, that were completed with a joint paper by AT&T, France Telecom and KDD in IEEE JSAC. A WIN Seminar was hosted in Cnet, Paris in 1990 and attracted additional experts from Network Operators (AT&T, BellCore, BT, France Telecom, KDD, OTC from Australia, etc.) as well as from Academia, among them **Richard Gibbens**, **Janusz Filipiak** and **Lorne Mason**).

The aim of this project was to automatically benefit of the non-coincidence on busy hours using dynamic routing in the International Networks around the globe, considering 3 mains areas (Europe, America and Asia/Australia). Some operational implementation was set for a limited time period.

Other gatherings

In the early 1980s, the main network operators from Western Europe decided to set a yearly Seminar in the French Alps to discuss Network Design and Engineering. This series of Workshops, named European Network Planning Workshops met from 1984 to 2002, mostly in Les Arcs during one week to share about best practice on network design, engineering and management. Though not directly triggered by ITC, several ITC experts duly contributed to these workshops that mixed technical presentations, afternoon skiing and evening social events. And participants enjoyed it... Since the workshops were limited in numbers (42 participants), there was some competition each year for the topic and talk selection 😉.

Current Status

Of course, it is obvious that the influence of ITC is no longer what it used to be. There are many reasons which justify this situation: first, a plethora of congresses run by important societies have become key events in networking. ITC is not the sole congress researchers would submit their findings to. In addition, as conference ranking has become of utmost importance for a career path in research and for research funding, prospective authors tend to privilege events like IEEE Infocom, or ACM SIGCOMM. Second, the low level of industry participation in today's events does not allow fast adoption of ideas so it takes more time to assess the influence of some contributions (note that it was not easy in the past either, but the participation of industry and telcos was helpful). Third, the influence of ITC on standards has consequently become much less prominent in the current bodies.

In the current context, one direction for improving the ITC impact could be to analyze whether ITC should not apply for recognition from conference ranking bodies, like CORE. It requires a demanding effort to prepare it. If well received, this would probably be a way to attract more submissions from renowned experts.

Yet the most important is the commitment of the community to support ITC events as much as they can.

Some Reflections on the Golden Years of ITC (1980-2005)

From our perspective, because of all the new innovations that were introduced and shared in ITC during this period when we have been significantly active, here are some analyses of our contributions to ITC. It is not intended to indicate that nothing was done previously and above all after 2005, but it should be seen as our own experience. We are sure that younger ITC Members may look at ITC in a more critical way 😉.

Memories from Jerry Ash

I was active in the ITC for about 20 years mainly through contributions and collaborations on dynamic routing, which I list below. It was during this time that DNHR and RTNR were developed and deployed in the AT&T network. A detailed description of these technologies and their deployment is given in the book [Dynamic Routing In Telecommunications Networks](#).

Our work on DHHR and RTNR proceeded in parallel with much other work on dynamic routing in other countries and administrations. Much of the work in these other countries and administrations is detailed in the above-mentioned book.

It was a privilege to create relationships with world-renowned technical experts and learn from them. Most of the leading experts in teletraffic theory and practice participated in ITC. Among these people were **Hugh Cameron** Bell Northern Research, **Prosper Chemouil**, France Telecom, **Lars Engvall**. ITU Switzerland, **Januz Filipiak**, University of Krakow Poland, **David Garbin**, Defense Communications Agency

USA, **Richard Gibbens**, Cambridge University, Joseph Hui, Rutgers University, **Konosuke Kawashima**, NTT Japan, **Frank Kelly**, Cambridge University, **Anis Khalil**, MCI USA, **Edward Knepley**, Defense Communications Agency USA, **Xiong-Juan Liang**, Beijing University of Posts & Telecommunications, **Kenichi Mase**, NTT Japan, **Debasis Mitra**, Lucent Technologies USA, **K. S. Narendra**, Yale University, USA, **Toshikane Oda**, KDD Japan, **Baron Petersen**, Telkom South Africa, **Michael Pioro**, Warsaw University of Technology, Poland, **K. G. Ramakrishnan**, Lucent Technologies USA, **Jean Regnier**, Bell Northern Research, **Martin Reiman**, Lucent Technologies USA, **James Roberts**, France Telecom, **Keith Ross**, University of Pennsylvania USA, **Gyula Sallai**, Communication Authority Hungary, **Mischa Schwa**rtz, Columbia University USA, **Yu Watanabe**, KDD Japan.

I met many colleagues and friends over this period, several named above, who greatly enhanced the technical and social enjoyment of the ITC meetings. It was this broad interaction at ITC's that I found so valuable. Over my 36-year career at Bell/AT&T-Labs I attended a wide variety of conferences hosted by many different organizations, including GLOBECOM, INFOCOM, ORSA/TIMS, EASCON, JACC, ICC, ComForum, INFORMS, and many others. I also made extensive technical contributions to ITU-T, IETF, and ATM Forum at innumerable meetings. In my active years, ITC was the premier technical organization in my opinion that had the most noteworthy experts and where I benefited the most.

Many spectacular "*Companions Programs*" were sponsored at each congress, which greatly enhanced the social interactions. Sometimes the "*Companions Programs*" were so good that the companions of the companions skipped the technical sessions and joined the companions. One memorable case was a train ride to Lake Como at ITC-12 in Turin in 1988. In Kyoto there was a reception with square Sake cups, and Yu Watanabe took off his tie clasp and gave it to me in thanks for my technical contributions, which made a big impression. In Copenhagen we visited Tivoli Gardens and the wonderful zoo, and later we drove to the North Cape in Norway. In Juan-les-Pins there was a wonderful reception in the Cannes Film Festival Building with a Live "ventriloquist". In Juan-les-Pins I backed into a cactus plant when my wife took a photo and endured painful quills pricking me for several days. In Washington D.C. there was a wonderful boat trip and tour to Mt. Vernon.

Some of the most gifted researchers have died in recent years. I mention three here: **Janusz Filipiak**, **Lorne Mason**, and **Richard Gibbens**.

Janusz was not only an outstanding technical contributor to network research but also a highly successful businessman. That is a rather rare combination of talents and something I found to be very impressive. Janusz visited Bell Labs a couple of times and gave seminars on his network research. His visits were always enjoyable and enlightening. We also had the pleasure of meeting Janusz at international meetings such as the ITC and the highly memorable WIN (Worldwide Intelligent Network) Seminar at CNET, for which Prosper Chemouil kindly provided a wonderful group picture. Janusz will be deeply missed and long remembered.

I got to know **Lorne Mason** quite well over the years that I was working on dynamic routing for Bell/AT&T Labs. He visited Bell Labs a few times to discuss his work on Learning Automata applications to dynamic routing. Several of us from Bell Labs visited Professor Bob Narendra at Yale University several times to discuss his and Lorne's research on dynamic routing. Lorne was one of the technical reviewers of my book on Traffic Engineering and gave a glowing recommendation for the book on Amazon; I always appreciated that so much. Lorne invited me to give a seminar on my Traffic Engineering studies at McGill University sometimes around 2005. It was a great experience, and I took the opportunity to give them all the details on my work contained in my book (I tend to give many details judging from the ITU Seminar on Intelligent Networks at Zruc Czechoslovakia 😉). I always so much appreciated Lorne's kindness and brilliance.

I also knew **Richard Gibbens** quite well from several interactions at Bell Labs and international meetings. Richard of course was a major contributor together with Professor Frank Kelly on the conception of Dynamic Alternative Routing (DAR) and its application to the British Telecom Network. I

remember that when Richard and Frank first published their work on DAR it grabbed international attention because of its simplicity and effectiveness compared to more complicated schemes like DNHR. Richard worked for a time as a visiting researcher under **Debasis Mitra** at Bell Labs. Richard was a very nice person and oh so very smart. Frank Kelly engaged on many occasions. He was an exceptionally smart and wonderful person.

ITC Meetings During My Work on Dynamic Routing

ITC 9	16–24 October	1979	Torremolinos	151 papers
ITC 10	8–15 June	1983	Montreal	86 papers
ITC 11	4–11 September	1985	Kyoto	203 papers
ITC 12	1–8 June	1988	Turin	207 papers
ITC 13	19–26 June	1991	Copenhagen	198 papers
ITC 14	6–10 June	1994	Juan-les-Pins	143 papers
ITC 15	22–27 June	1997	Washington D.C.	138 papers
ITC 16	7–11 June	1999	Edinburgh	131 papers

ITC Papers:
1. "*Intercity Dynamic Routing Architecture and Feasibility*," Tenth International Teletraffic Congress, Montreal, Canada, June 1983.
2. "*Use of a Trunk Status Map for Real-Time DNHR*," Eleventh International Teletraffic Congress, Kyoto, Japan, September 1985.
3. "*Integrated Network Routing and Design*," Twelfth International Teletraffic Congress, Torino, Italy, June, 1988.
4. "*Real-time Network Routing in a Dynamic Class-of-Service Network*," Thirteenth International Teletraffic Congress, Copenhagen, Denmark, June 1991.
5. "*Analysis and Design of Fully Shared Networks*," Fourteenth International Teletraffic Congress, Antibes Juan-les-Pins, France, June 1994.
6. "*Comparative Evaluation of Dynamic Routing Strategies for a Worldwide Intelligent Network*," Fourteenth International Teletraffic Congress, Antibes Juan-les-Pins, France, June 1994.
7. "*Real-Time Internetwork Routing in the AT&T Network*," 15th International Teletraffic Congress, Washington D.C., June 1997.
8. "*Routing Evolution in Multiservice Integrated Voice/Data Networks*," International Teletraffic Congress – 16 (ITC-16), Edinburgh, Scotland, July 1999.

I attended all of the above ITC Congresses and presented all the above papers. Participation at typical ITC Congresses was huge, 100's of participants. I got better at presenting papers as time went on. I was very nervous at ITC 10 in Montreal where our work on DNHR was first introduced, but the presentation went OK. My best presentation was at ITC-13 in Copenhagen in 1991, where we revealed AT&T's implementation of RTNR. This created quite a stir because, among other reasons, a) we were replacing DNHR, which no one expected, b) Canadians were implanting DCR at the time. One participant, an AT&T Vice President, would later promote me citing my participating in ITC and this presentation in particular as one justification. My co-author Alan Frey from AT&T Network Systems (later Lucent) attended and he was happy with the presentation and how it was received. Alan conceived the original idea of exchanging bit maps to learn network status, which was key to RTNR.

After ITC 13 in Copenhagen my wife and I rented a car and drove to the North Cape Norway and back to Denmark through Sweden, a round trip of perhaps 3000 miles. It was a fabulous adventure where we got to see the midnight sun.

After ITC 16 in Edinburgh my wife and I rented a car and drove north to Loch Ness Scotland and other points in Scotland. Great Trip and my first experience driving on the left. I did OK and even went around roundabouts the right (left) way.

Regional Seminars:
- "*Traffic Network Routing, Control, and Design for the ISDN Era*," Fifth ITC Seminar Traffic Engineering for ISDN Design and Planning, Lake Como, Italy, May, 1987.
- "*Robust Design of a Worldwide Intelligent Network in the Digital Era*," International Seminar on Teletraffic and Network, Beijing, China, September, 1988.
- "Robust Design for Switched Digital Services in a Worldwide Intelligent Network," International Teletraffic Congress Specialists Seminar, Adelaide, Australia, September, 1989.
- "*Traffic Control Architecture for a Worldwide Intelligent Network*," Conference on Design and Control for the Worldwide Intelligent Network, Paris, France, June, 1990. Also presented at ITU Workshop on Regional Telecommunication Planning, Kuala Lumpur, Malaysia, May, 1990.

The seminar in Lake Como in 1987 was especially memorable, held at the elegant Villa d'Este hotel set right on Lake Como. It was very expensive at the time, $400/night for a double room. We rented a car and drove all over France, Monaco, and Italy. One experience while driving up to Eze France our car suddenly stopped on the Cornish hill up to Eze, in the middle of nowhere, Forever the engineer, I analyzed the problem as a broken gas-line linkage and inquired at a nearby house (where they spoke no English) to get a piece of wire to fix the linkage. We had a magnificent boat ride on Lake Como, a gorgeous lake. Steve Katz was especially taken with the beauty of the scene.

During the WIN Conference in CNET, Paris, in 1990, Prosper Chemouil treated us to an elegant dinner in the Eiffel Tower. After Paris we rented a car and drove to Berlin, Dresden, Krakow, and Warsaw. In Warsaw we visited Michael Pioro and his charming wife Ala and family. Michael's mother Lilianna Pioro gave up her apartment for us to use during that time, an absolutely wonderful gesture of hospitality. Among many sites Michael and I visited the Warsaw Ghetto Memorial together.

Other Related Seminars:
- "*Seminar on Dynamic Nonhierarchical Routing (DNHR)*," ITU Seminar on Intelligent Routing Strategies Including Network Management Aspects, Prague, Czechoslovakia, April, 1986.
- "Real-Time Network Routing in an Integrated Network," Teletraffic Research Symposium, Holmdel, NJ, May, 1989.
- "*Proposal for Standardized Common Channel Signaling Messages for WIN Dynamic Routing*," Second Worldwide Conference on Design & Control for the Worldwide Intelligent Network (DC-WIN), Princeton, New Jersey, November, 1991.
- "*Comparative Evaluation of Routing Strategies for WIN Dynamic Routing*," Second Worldwide Conference on Design & Control for the Worldwide Intelligent Network (DC-WIN), Princeton, New Jersey, November, 1991.
- Seminars in China, "*Dynamic Routing in Telecommunications Networks*," Volume 1 (Viewgraph Copies), Volume 2 (Reference Material), December 1-9, 1994, Beijing and Hangzhou, China.

The seminar in Prague/Zruc in 1986 was sponsored by the ITU and headed by Lars Engvall of the ITU. This was the most wonderful conference focused on Eastern Block countries at the time. The reception was held in an elegant historic medieval castle in Zruc Czechoslovakia, a town where they manufactured shoes, but all product was sent to Russia. The Czechs obviously resented the occupation by the Russians. Our hotel room was completely bugged. If you looked above the ceiling you could see a maze of wires and

listening devices. Surely the Russians did not get any useful intelligence by listening to my wife and I chatter to each other. Rich Cardwell from AT&T, one of the major designers of DNHR, attended and gave several presentations. Between us we gave ALL THE DETAILS on DNHR. Cardwell and I won the Skittle's tournament, a game we had never played before. Our reward was a chocolate "medal". Strangely enough our respective dogs both ate the "medals" after we got home :-) [**Prospe**r: *There was not much to do in the evenings, so we happened to also stay in the meeting room and sing some songs, while Lyn, Jerry's wife, was playing guitar. Old times, good times*]

Memories from Jim Roberts

ITC has been important for me. I first attended in 1979 at Torremolinos (ITC 9). The social events were, as ever, more interesting than the congress proper. I joined a tennis competition and lost in the first round. I think Werner Bux was the eventual winner. There were visits to Alhambra, etc... I attended all subsequent congresses from ITC 9 to ITC 25 and then ITC 27, as well as a number of seminars. I had papers in all of those except ITC 14 where I was TPC chair.

The impact of my ITC papers is very variable as measured by Google Scholar citation counts. Number 1 is a paper on cache performance at ITC 24 (357 cites) followed by one on multi-rate traffic at ITC 10 (283 cites). There is not a clear pattern of increasing or decreasing visibility over the 36-year period. At least 3 papers have zero citations! There is a lot of randomness in the way papers become well-known or are just forgotten almost immediately …

I cannot think of any really notable ITC papers that have had an impact on me or the "world" (that doesn't mean there aren't any, just that I can't think of any). There were some impressive authors as I looked through the records on the ITC site, including Kleinrock, Kelly, Whitt as well as the golden oldies like Wilkinson, Cohen and Kosten. The ITC has not been very influential since the start of the internet era, however, certainly not in comparison to conferences like Sigcomm. My one Sigcomm paper (in 2001) has 572 cites while a comparable paper at ITC 17 (Salvador) has only 73 (still not bad…).

The congress was extremely valuable in creating a community. It was good to meet regularly and make friends with colleagues from all over the world. The side discussions were important for understanding what the most interesting topical subjects were and for gaining mutual respect between colleagues, etc. It was also good to meet new people and mingle at some very enjoyable social events!

ITC 14 was probably the best ever ITC from the social activities point of view thanks to generous contributions from industry, a very effective organizing committee and highly efficient "*General Secretary*" (aka **Prosper**). The technical content was also of a high standard thanks to the TPC paper selection. This is, of course, a biased opinion since I was TPC chair for ITC 14, :).

I cannot say much about the ITC since ITC 27 (2015). It seems to be living on borrowed time when we see what happens to other networking conferences. ITC content has naturally changed a lot over the years. Traditional traffic subjects, especially traffic theory, have fallen out of favour in networking research in general. On the other hand, I was surprised to see the impressive network calculus workshop in the ITC 36 program. Network calculus can be seen as a current manifestation of queuing theory whose development was one of the most significant contributions of early ITCs (cf. above-mentioned Kleinrock, Kelly, Cohen, Whitt).

ITC was the first networking conference in 1955, but it has clearly had to coexist with more and more competitors as the subject area has grown in scope and in importance. However, the original ITC scope, "to *understand and model traffic in (telephone) networks using stochastic methodologies",* remains extremely important and is a specific feature of the ITC that would justify its continuing existence over many years to come.

Memories from Prosper Chemouil

ITC has meant a lot for me, and it has been a highlight of my career to be part of the ITC Community. Of course, each ITC event brought its share of knowledge, social events and personal relationships, and I mentioned hereafter the most memorable events.

My contribution to ITC community has been as follows:

- Authorship, Presentation and Participation at all ITC from 1985 to 2016 (1985-2016)
- IAC Member (1995-2015)
- IAC Communications Chair (1997-2003)
- IAC Secretary (2003-2007)
- IAC Chair (2007-2015)

As part of my role in the IAC, I created and administered by myself the generic ITC website in the early 2000s. The initial setup was made by my then teen-age son, **Simon**, who even designed the previous ITC logo (as it appears in the t-shirt of the 60th anniversary of ITC). I maintained the website for 10+ years until it was transferred to the University of Wuerzburg.

I was awarded the **Arne Jensen Lifetime Award** in 2015, which represents one of the most important recognitions of my achievements in my life.

Most memorable events

- My first ITC event was ITC 11 in Kyoto, Japan, and first times have always a particular flavor 😊. I had missed the opportunity to be at ITC 10 in Montreal, Canada, so I made sure that I would not miss the next one. I was fortunate that the 3 papers that I co-authored were accepted, and they all addressed different topics: flow and congestion control in signalling networks, performance evaluation of dynamic routing systems with an extension of the Learning Automata approach (poke **Deep Medhi**), and traffic forecasting based on Kalman filtering which I presented. With my wife and another couple, we went to South-Korea and Japan during 4+ weeks, traveling from ryokans to minshukus (hostels and B&Bs) across Japan, culminating in Nara and Kyoto. Besides the many interesting talks, we enjoyed the Japanese culture during social events and, during the week-end, we rented bikes to visit the numerous temples and Japanese gardens. That was such an incredible experience.

- Then the second and maybe most important highlight of my ITC was the organization of ITC 14 in Juan-les-Pins, in the French Riviera in 1994. I am not very neutral here since I was the General Secretary (kind of General Chair in today's wording), as it was the acme of ITC congresses, with an excellent technical program set by **Jim Roberts** and **Jacques Labetoulle**, and a memorable social program that some old friends still remembers: Dinner by the Cannes beach, conference dinner in the film festival Palace, visits to Perfume workshops in Grasse and to Monaco. As for ITC 11, it was said that many attendees preferred to follow the companion's program instead of the technical program 😊. *Note that we had a flag sewn by IAC companions.*

- What I remember most at ITC 15 in Washington D.C. was the severe heatwave that we experienced, in particular during the boat ride on the Potomac River. We all got a T-shirt to witness this climate issue. I traveled with my wife, Catherine, and my younger son, Simon. After the conference, **Arik Kashper**, AT&T Bell Labs, and his wife invited us to stay in their home and he drove us there in Holmdel, before we visited **Morris Flory** and his family, another AT&T friend living in New-Jersey, to celebrate Independence Day. We terminated our trip in New-York City.

- ITC 17 was held in Salvador da Bahia in Brazil as it was shifted by 3 months due to the 9/11 event. We had a great time and **Carlos-Alberto Costa-Nunes** was an incredible host. Carlos-Alberto was already a good friend of mine since we visited his home and family back in 1998, and we shared the same table during the conference dinner at ITC 14. The venue was by the beach. As we celebrated Catherine's anniversary, Carlos-Alberto had been nice to have a birthday cake prepared for her during the Welcome Reception.

- ITC 21 returned to France in 2009, though it was initially planned in Cairns, Australia. The conference took place in the Latin District in Paris. We had a walking tour to the Seine River where we got on board for a dinner cruise. This was the first year that the IAC Lifetime award was presented as the **Arne Jensen Lifetime Award** and it was rightly handed over to **Paul Kuehn** for his dedication to ITC. From this year, ITC became a yearly event.
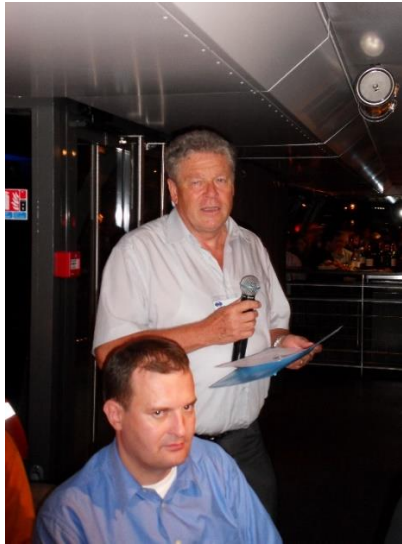
- ITC 27 in Ghent Belgium was my last ITC as IAC Chair and we celebrated the 60th anniversary of ITC, providing a T-shirt (which I designed) to all participants for them to remember. We had nice visits to landmarks and also a boat cruise in the canal before having the conference dinner. I appreciated that the 3 TPC Co-Chairs were all women, and that **Michaela Meo**, from Italy agreed to serve as the new IAC Chairwoman.

- My last in-person ITC was in 2016 in Wuerzburg.

In addition, I remember that, in the conference hotel for ITC 25 in Shanghai, there were a lot of North Koreans. While I was waiting for dinner with **Ulf Koerner**, we heard some revolutionary songs. I opened the door, and we entered a North-Korean Party while they sang the International Song. I joined them with the French version of that song, and they were so happy that they invited us to join for beers. All waitresses were North-Korean girls dressed in their traditional Korean clothes. Yet no group pictures were allowed (except this one).

Besides Plenary congresses, other important ITC events for me were:

- The 6th ITC Specialist Seminar on Traffic Theory for New Telecommunications Services in September 1989 in Adelaide, Australia. Indeed, I was on sabbatical at the Teletraffic Research Center of Adelaide, earlier in 1989, working with **Janusz Filipiak** who was Deputy Director. We set ground for this event during which the use of Dynamic Routing in International Networks was introduced by AT&T, opening for an international project right after the Seminar.

- The 4th ITC Regional Seminar held in Krakòw, Poland in 1991. Though labelled Regional for some obscure diplomatic concerns, this seminar hosted by **Janusz Filipiak** was indeed a specialist Seminar in terms of scientific scope. It attracted most of the ITC experts. I drove from Paris to Krakòw by car with my elder son, **David**. We stopped over in Nurenberg and Prague on our way and drove back through Vienna. The car stopped kilometers away from Krakow due to unexpected snowfall, but we eventually reached Krakow. The main highlight was the dinner in the Salt Mine in Wieliczka, and I remember that we might have had too many drinks (vodka indeed 😊).

- The 13th ITC Specialist Seminar on Internet Traffic Measurement and Modelling, in Monterrey, USA in September 2000. I could witness the very live debate between the members of the ITC community and those from the local IP community. The topic of the closing panel was: *What role will traffic modeling and engineering play in the future Internet?*, which might still be questioned with the advent of machine learning and artificial intelligence. On a side note, it was the opportunity for me and my wife, Catherine, to visit the major national parks, from Arizona to California for 4 weeks, following part of Road 66 and enjoying a rock concert in Albuquerque, New Mexico.

Already mentioned by **Jerry Ash**, I would also add the two following events:

- the *International Seminar on Intelligent Routing Strategies* organized in Zruc, Czechoslovakia, in April 1986
- the Seminar on *Worldwide Intelligent Routing (WIN)* that I organized in Paris France in 1990, which gathered key experts in the domain.

These were two significant achievements since I was in charge of research on dynamic routing in Cnet.

Though I lightly contributed to some ITC event after 2018 (as Student Travel Grant Chair), my involvement in the ITC community has significantly decreased.

To conclude, while I prepared this ITC summary with **Jerry Ash** and **Jim Roberts**, it was clear that a priceless outcome of our participation in ITC events lay in the personal relationships that we created along the years. While preparing this document, tens of names of ITC colleagues resurfaced in my head with some specific souvenir, and it would be really too long to list them all. I could even forget many of them inadvertently. Nonetheless, I definitely agree with the people listed by Jerry hereabove as we were working in a similar topic at that time. At least, I would probably add **K.R. Krishnan** (BellCore/Telcordia Technologies) who had a key contribution on dynamic routing.

Over the years, I have tried to keep some more or less continuous contact with my fellow experts, though I witnessed several losses in recent years. These fellows include **Jim Roberts**, **Jacques Labetoulle†**, **Al Lewis**, **Len Forys†**, **Lorne Mason†**, **Jerry Ash**, **Charlie Pack**, **Andrzej Jajszczyk**, **Clem Pratt†**, **Bob Warfield**, **Phuoc Tran-Gia†**, **David Songhurst**, **Peter Key**, **Carlos Alberto Costa-Nunes**, all my IAC friends, and, last but not least, **Janusz Filipiak†**.

The Networking community has significantly evolved and fortunately, there is still a lot to do to address the design and management of communications. I have been fortunate to be active in ITC in a period of technological advances, and I am sure that today's researchers can have the same experience. It involves new technologies, new architecture, new protocols, new tools (mostly AI techniques which are eating most of our usual methodological solutions), hence new skills and expertise. Many researchers who participated in ITC events as telecom engineers leveraged their background and are now data scientists or AI experts.

There is an opportunity for ITC to address the upcoming challenges in a more complex world, and the future of networking belongs to the current ITC participants.

Let's check again the time capsule of ITC in 10 years 😉