Global Communications Newsletter

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– Distinguished Article Series –
Multimedia in 2000

By Charles N. Judice, USA

It is hard to remember just when over the last two decades multimedia became elevated from an adjective to a noun. To a purist it still is an adjective meant to signify the combination of audio, video, still images, graphics, and animation in displaying, recording, and communicating information. The term took on a life of its own when it became clear in the late 1980s that it would be possible to compress TV programming into 1.5 Mb/s. This made synchronized audio and video as much a "computer thing" as it had been a TV or "entertainment thing." To a large extent, the business implications of this technology convergence had much greater impact than the technologists might have guessed. The telephone industry's promise of bringing video-on-demand into every home defined the information superhighway, a term all but forgotten today. To support this rapid introduction of multimedia services into the home, an industry forum representing hundreds of leading-edge companies from more than 40 nations around the world, an international collaboration called DAVIC, worked for more than five years to define the specifications of a new delivery system to support these new services and applications. Much of the technology and most of the business plans bit the dust, however, because no one fully appreciated the impact of the Internet.

Now What?

The fundamental technologies for compressing, packaging, and distributing multimedia data have evolved from the MPEGx standards and are available from multiple vendors as components, systems, and services. For example, MP3, which is the level 3 part of the MPEG1 audio standard, and also is in MPEG4 standards, is the enabling technology for Napster, the ".com" start-up that is radically challenging the entire business model of the music industry. MPEG2 video programming is available at retail stores in the form of DVD discs, over the airways from a number of satellite TV distributors, and over cable and telephone wires through DOCSIS cable modems and xDSL line cards, respectively. Consumer camcorders record MPEG video/audio, consumer still cameras capture megapixel JPEG images (and sound), and IEEE 1394 can pipe digital video directly from a camcorder to editing software on a consumer-grade PC (iMAC). The production, distribution, and consumption of multimedia information is keeping pace with and, perhaps closer to the truth, is driving the frantic pace of Internet development.

For communication engineers the question is, "How might communications technology evolve to support the needs created by this media type?" If we use the inverted index of GLOBECOM/ICC paper titles to suggest an answer, one might come to the conclusion that developing the technologies that allow for a negotiated quality of service is our most important issue. A close second would be "solving the last mile problem," or more precisely, developing low-cost, reliable high bandwidth to the home. The third option, which is the subject of more speculation than actual research and development investment, is finding the right marriage of wireless access and Internet connectivity.

To answer this question I have been asking myself why is it that Minitel, developed by France Telecom, didn't become the dominant design for information services. Back in the late '70s and early '80s, when the PC was still being born, the communications industry met regularly under the auspices of the CCITT Study Group VIII to discuss applications standards such as videotex, teletex, color facsimile, and office document architecture. A single term to describe these technologies and evolving standards was *telematics*, borrowed from the French telematique service (i.e., Minitel). Within the Communications Society these developments were considered so important that we even named our committee the Telematics Committee (which was subsequently changed to Multimedia Committee). What happened? How did the Communications Society miss the boat? One might argue that display, storage, and processing technology simply had not matured enough for these concepts to take hold in the '80s. This is understandable, yet one must be very generous to say that the World Wide Web evolved from those deliberations in Study Group VIII or from the thousands of services offered over Minitel terminals. Instead of Yahoo we should have Voila!

I submit that the communications industry lost it when the computer guys could not get their 1000-byte packets into ATM standards. While those of us with the "Bell Shaped Heads" thought we won a great compromise in establishing 53 bytes as the ATM packet size, what we really did was demonstrate to the computer industry that we had little understanding of their requirements or the implications of their design. So rather than design the next-generation network with us, they just kept making their datagram network work harder and faster. So if arrogance was the root cause of the communications industry missing the significance of the Internet, then can we learn from that lesson and drive the next tidal wave of multimedia products and services? I hope so, and here is the recipe. Understand the requirements of the next generation of products by listening to the youth of the world. They understand how to use this technology better than we do. They are imagining the features and capabilities of services yet to be explored in our research labs. Let life-long education be the vision and then work backward to understand what protocols, middleware, data representation schemes, security policies, interoperability standards, and hardware performance are needed.

The Standardization of the Third Generation Cellular Systems

By Pietro Porzio Giusto and Francesco Vatalaro, Italy

The UMTS (Universal Mobile Telecommunications System) standard has been mostly completed, and its first release (Release 99) is expected very soon. The idea to design a third generation (3G) mobile radio system originateded in the second half of the 1980's. At that time it started to be clear that cellular systems were having a success greater than expected, and that second generation systems would not have been suitable to meet the demand for advanced data services.

The first European project established to study the air interface for a 3G system was the COST 231 project "Evolution of Land Mobile Radio (Including Personal) Communications," a co-operative action of the European Union (EU). COST 231 was launched in 1989 and lasted until 1996. In the years 1992 to 1995 important studies were put forward in the framework of RACE II (R&D in Advanced Communications-technologies in Europe) of the EU. Two different air interface solutions — CODIT, based on CDMA (Code Division Multiple Access), and ATDMA, based on TDMA (Time Division Multiple Access) — were proposed and tested within RACE II. Further studies and experiments followed within the ACTS (Advanced Communications Technologies & Services) program in the years 1995 to 1999. In the same period, SMG (Special Mobile Group), the ETSI (European Telecommunications Standards Institute) committee in charge of the GSM standardization, started activities on UMTS. Following the success of GSM, in a first phase of R&D activities in Europe, a major emphasis was put on TDMA techniques, and the advantages of CDMA were overlooked.

To promote UMTS development, as well as to lobby for frequencies, in December 1996 the "UMTS Forum" was established, collecting operators, manufacturers, regulators, and service providers interested in the 3G system.

Based on very innovative concepts mainly developed in the early '90s by Qualcomm Inc., in 1993 TIA, the U.S. Telecommunications Industry Association, standardized IS-95, the first CDMA cellular standard. Following successful operational demonstrations of IS-95, it was clear that CDMA would have been the most suitable basic technique for the UMTS radio access interface. Early in 1997 in Japan, the Association for Radio Industry and Business (ARIB) decided to undertake the standardization of a detailed 3G solution based on a wideband-CDMA (W-CDMA) concept. That technological push convinced Europe to progress from the research phase to the definition of detailed characteristics for a 3G system. This was also related to the results of many market studies that showed the growing need for wireless multimedia services, especially connected to the exponential success of the Internet. According to the UMTS Forum, approximately 60 percent of traffic in Europe will be mobile multimedia traffic in 2010.

In 1997 manufactures in Europe were divided over two CDMA-based proposals, one based on the W-CDMA approach, and the other based on a time-division CDMA (TD-CDMA) technique. European operators had not yet disclosed official positions. The first European operator to officially take a position was TIM, Italy. In October 1997 TIM signed a Memorandum of Understanding with NTT DoCoMo, Japan, for common support of the development of a W-CDMA solution, to be combined with a "core network" based on GSM platform evolution.

Then, to reconcile W-CDMA and TD-CDMA supporters, in mid January 1998 TIM organized a meeting at which a compromise solution was identified. By the end of that same month this solution had been endorsed by ETSI. The solution took into account that for UMTS two types of frequency bands are foreseen: the bands in which transmission and reception take place on different carrier frequencies (as for GSM), and the bands in which transmission and reception take place on the same carrier frequency (as for DECT). The bands of the first kind (60 + 60 MHz) are suitable for cellular systems with large coverage areas, while the bands of the second kind (35 MHz in Europe) are suitable for cordless services and for services having sensibly different data rates in the two transmission directions. The adopted solution entails the W-CDMA technique for the "paired" frequency bands and the TD-CDMA technique for the "unpaired" frequency bands. Several operators in Asia and in America agreed on that choice.

In order to draft UMTS specifications that would gain wide support, in December 1998 the Third Generation Partnership Project (3GPP) was established. It included several standardization bodies: TTA (Telecommunications Technology Association) from Korea, ETSI from Europe, ARIB and

(Continued on page 4)

Activities in North America

By Celia Desmond (Director North America Region), Canada

The North American Region, as defined within the Communications Society, is a very large Region, both geographically and in membership. The area covers IEEE Regions 1-7, which is all of the United States and Canada. Within this Region there are 63 Chapters. There is a North American Region subcommittee made up of:

Javan Erfanian	Toronto Section
Dennis Hartley	Jamaica Section
Jacek Chrostowski	Ottawa Section
Lori Jeromin	Central New England Council (CNEC) Providence
Weider Yu	Chicago Section

Most of the activity to date has involved assessing student grant applications for INFOCOM, NOMS, and ICC.

Chapter of the Year awards are presented at ICC and GLOBECOM to high-performing Chapters. Any Chapter world-wide is eligible, and Chapters can nominate themselves. The criteria are quite stringent, but the nominations demonstrate that we do have Chapters that are very active. This year we are very pleased to announce that the Dallas Chapter has won this award. This chapter has clearly demonstrated a high level of energy and activity, and is strongly committed to IEEE and the Communications Society, bringing many valuable programs to its members. The Chapter has increased membership, nominated quite a few people for awards, and upgraded many members to Senior member. Congratulations to this vibrant Chapter.

At this point, no Distinguished Lecture Tours are planned, but if there are requests, tours could certainly be arranged. We have responded to one request for a speaker, but as yet no arrangements have been requested.

Plans are underway for a Chapter Chairs meeting. At this time we hope to have such a meeting at GLOBECOM in San Francisco in November. If some funding is approved, we plan to invite all Chapter Chairs to meet at GLOBECOM for a day of networking, team-building and planning. I look forward to the opportunity to meet the Chapter representatives and discuss potential directions with them.

Report on 1999 Activities of ComSoc's Asia Pacific Operations Center

By Fanny Su, Sinagapore

Our Communications Society membership continues to grow with innovative membership promotions that ComSoc headquarters has been conducting. At last count, ComSoc world-wide membership is 47,774 (February 2000 Membership Progress Report) and ComSoc's Asia Pacific membership is 8,859 (December 1999 SAMIEEE Active ComSoc members). ComSoc members in the Asia Pacific Region make up approximately 18 percent of total ComSoc members world-wide. Our office will continue efforts to retain our new members into the year 2000 with excellent service and to encourage and support our volunteers in promoting and organizing more ComSoc activities for our members in this region.

In April 1999, I attended the Region 10 meeting in Bali for the latest updates in Region and Section activities. This has always been a good forum to gather feedback from our Section volunteers. Of particular interest is that our Tokyo Section is now reorganized into eight new sections that will come under a Japan Council. The Communications Chapter also reports to the Japan Council.

IEEE President Dr. Ken Laker and his wife visited Singapore in May. Dr. Laker was here as an external examiner of the programs conducted at our local universities. We were pleased to be able to meet up with Dr. Laker and his wife over dinner during his hectic schedule in Singapore.

I was invited to join the TAB Colloquia team and was able to complete the visit to five cities in India from 19-27 Sept 1999. The TAB Colloquia team consisted of Dr. Laker, Dr. Michael Adler (VP-Technical Activities), Wes Spencer (TAB Colloquia Steering Committee Chair), Dr. Vijay Bhargava (ComSoc Distinguished Lecturer and President-Elect of the Information Theory Society), Dr. Shan Rajagopal (invited speaker on project management), Mary Ward-Callan (Managing Director-IEEE Technical Activities), and myself. The TAB Colloquia team visited and was hosted by the Delhi Section, the Gujarat Section, the Bombay Section, the Bangalore Section, and the Calcutta Section.

The team presented a good mix of general topics for engineers and IEEE members as well as technical lectures, which were well attended by audiences that varied from 40 to 500. Round table discussions with students, IEEE members and Section leaders touched on various issues and gave our team valuable insights and understanding about the needs of our members in India. I was delighted to meet ComSoc volunteers and many current and past Section chairs from India, including our Past Region 10 Director, Harbans Bajaj. The hospitality we received was enthusiastic, warm and generous which made our visit memorable.

Earlier in the year (20-30 January 99), Dr. Manu Malek was very well received on the Distinguished Lecture Tour to Singapore, Australia (Melbourne), and New Zealand (Auckland). A second Distinguished Lecture Tour by Nelson Sollenberger in the Asia Pacific from 11-28 September took him to South Korea, Taiwan, Malaysia, Singapore and Hong Kong. Mr. Sollenberger narrowly missed the earthquake in Taiwan and the typhoon in Hong Kong, and despite a bad bout of flu he completed his tour. We take this opportunity to thank our Distinguished lecturers for their time. Our gratitude also goes out to ComSoc chapter chairs and their committees in hosting the event in their respective locations and making it a success. We hope to arrange a year 2000 Distinguished Lecture Tour for Sections/Chapters in India as a follow-up to the 1999 TAB colloquia.

Jenny Long set up a booth at APCC/OECC '99 in Beijing (19-21 October) and attended the first meeting of our Asia Pacific ComSoc chairs called by our 1999 AP Director, Prof. Byeong Gi-Lee. The meeting went well and she was pleased to meet with our active volunteers.

We look forward to working with Dr. Naohisa Ohta, our new ComSoc Asia Pacific Board Director, and his committees in making the Asia Pacific a vibrant Region for our members as we move into the new millennium.

New Possibilities for Mobile Multimedia Broadcasting

By Amitabh Mishra, USA

One of the well known communications equipmnet vendors recently added Bluetooth to a live 3G mobile network, showing high-speed IP services. For the first time, while driving around in a demonstration van at the Telecom '99 conference, Ericsson showed live IP based videoconferencing over a 3G mobile network with Bluetooth connections between devices. The demonstration is the world's first to integrate a 3G (third generation) system and Bluetooth wireless technology, providing high-speed packet-based services. The videoconference uses the new video standard MPEG-4, optimized by a new encoder developed by the same company that is especially well suited for real-time mobile multimedia. One of the key advantages of Bluetooth, which is a new short-range radio technology, is that during connection set-up time a wireless connection can be provided between a PC and a mobile phone, thus allowing applications like the following:

- A doctor can provide first-help advice while looking at the patient miles away
- A Grandmother can see her newborn grandchild from the other side of the globe
- A rock band can send footage of a new song to their music video producer in an instant
- A rescue team can include a small camera in their equipment to send footage back to their operations team
- TV journalists working in the field can broadcast their latest multimedia scoop immediately.

Bluetooth also allows the wireless interconnection of a wide range of devices, for example between a PC and a printer. Bluetooth was launched as a license-free specification in May 1998 by the Bluetooth Special Interest Group, led by Ericsson, IBM, Intel, Nokia, and Toshiba. Today, the Bluetooth technology has more than 850 adopters worldwide.

The key technology enablers for the demonstrated 3G service were Bluetooth for wireless local short-range connectivity between devices, and packet switching and WCDMA for the mobile wide-area network. The above demonstrations are the latest in a series of Ericsson's first 3G calls, including the first WCDMA calls over public networks last year. Ericsson made the world's first mobile-to-mobile WCDMA multimedia call, when showing services at 472 kb/s between a demonstration van in Japan and a similar demomstration van in Sweden. Ericsson completed the first WCDMA voice call in April 1998. Previous breakthrough WCDMA calls also included video calls from Italy to Germany over the air having the Japanese video standard meet the European video standard.

Report on 1999 Activities of ComSoc's European Operation Center

By Jacques Kevers, Belgium

The 1999 activities in the Brussels office could be summarized as follows.

Member Services

•On-line processing, directly on the Oracle system, of membership applications received from Region 8.

•On-line inquiry response and problem resolution, including order/renewal status, subscription claims, back issues and replacement issues, changes of address for local members.

•Attend local IEEE (co-)sponsored conferences in Region 8 to promote IEEE membership, and serve as a local source of membership applications, conference material, marketing brochures, etc.

Customer Services

The office has been "selling" Press books, Proceedings, Standards, and educational products. Orders for IEEE products are processed on-line, directly on the Oracle system.

Society Support

•Member support and information over a dedicated phone line.

•Update of local ComSoc Chapter contact details (Jan.-Feb. 1999).

•Promotion of Society membership at Telecom 1999 in Geneva.

•Hotel arrangements for Telecom 2003.

•Support provided to the organizers of Eurocomm 2000; contacts with remailers, meeting with organizers (local volunteer contacts, cover letters, mailing lists, etc.)

Volunteer Services

•Participation in the newly created "Section 99" team within IEEE's Region 8 Committee, representing all members in areas without a Section. This team is supposed to help those members with all kinds of problems, either trying to link them to neighbour Section activities, or to encourage the formation of new Chapters, branches, subsections or Sections. Some of these proposals will be directly related to Comsoc.

•Respond to local Section/Chapter requests for membership/mailing lists, using Oracle and the SAMIeee diskette program for Region 8.

For more details on the above, reactions or suggestions, you can contact:

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3G STANDARDIZATION/*(Continued from page 2)*

TTC (Telecommunication Technology Committee) from Japan, and T1 from the U.S. CWTS (China Wireless Telecommunications Standard) joined 3GPP at a later date.

In the U.S. the standardization process followed a different path, due to the need to safeguard backward compatibility with IS-95, and for other technical reasons. Therefore, in December 1997 TIA adopted a wideband-CDMA standard, named cdma2000, having system parameters derived from IS-95. Then a difficult struggle between the supporters of cdma2000 and the supporters of UMTS started. The core of the legal discussions concerned the issue of cellular CDMA patents owned by Qualcomm that are essential to the W-CDMA standard. Agreement could not be reached on the terms and conditions to license such patents, as the cdma2000 supporters requested modification to some characteristics of the UMTS for compatibility with IS-95, while the UMTS supporters did not wish to introduce significant changes in the standard. As a consequence, ITU (International Telecommunication Union) was not in a position to accept the W-CDMA technique as a standard.

To solve this "Gordian knot" a group of operators, the OHG (Operators Harmonization Group) attempted to broker a compromise, but the problem could be solved only after Ericsson, in March 1999, took over part of Qualcomm's mobile radio activities and plants. In the end, three air interfaces, using in different ways the CDMA technique, have been defined: W-CDMA, TD-CDMA, and MC-CDMA (Multicarrier-CDMA), i.e., the radio access technique for the cdma2000 downlink. Additionally, ITU includes in the "3G family" a TDMA-based standard that draws on IS-136 and EDGE (Enhanced Data Rates for GSM Evolution), and, for cordless applications, DECT (Digital European Cordless Telecommunications).

The ITU has been involved in activities in the 3G area since the mid 1980s. Within the ITU the universal system was originally identified as FLMPTS (Future Land Mobile Public Telecommunications System), and then renamed IMT-2000 (International Mobile Telecommunications-2000). ITU activities concentrated on the comparative evaluation of the so called IMT-2000 "radio transmission techniques" (RTT). The process of evaluation and selection required all of 1998 and 1999.