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Telecom Educational Challenges in an Evolving Technological Scenario

By Helio Waldman, Michel D. Yacoub, João M. T. Romano, Brazil

Our century is almost over. As we look back on its achievements, the impact of new technologies on human life emerges as its signpost in history. Technological turning points have made their marks on the course of evolution, with the time span between these milestones so progressively smaller that it seems to be impracticable to keep pace with the changes. The old regulated, monopolistic telecom environment is now facing deregulation in almost all countries, unleashing a new wave of innovation that challenges the pace at which we used to run our businesses — even when business is not just strictly business, but rather science and education. Indeed, the implications of deregulation reach deeply into the realms of technology and engineering education, especially now in many developing countries, where deregulation and privatization are recent phenomena.

The implications on technology are already apparent to the general public, as more and more people realize the opportunities associated with the growth of mobile services, Internet access, cable TV, and new telecom services in general. While this is true worldwide, there are some important peculiarities to be considered in developing countries: in economically challenged environments, new telecom services are being introduced before the demand for plain old telephone service (POTS) is fully satisfied. This means that cellular phones may be the only phones for many subscribers, paging may be the only service many people receive, and so on. This situation may raise questions as to what constitutes the basic service kit to be universalized in our societies as they reach new connectivity levels, and technology discloses its bag of new opportunities. In the infrastructure, it also raises the option of offering POTS as a feature of new services, and using wireless techniques to avoid large startup capital investment and speed up deployment of both old and new services.

The idea behind deregulation is that many of these issues can be tackled by competition. Establishing a productively competitive environment where there was none, however, is no simple issue. Just "letting it happen" will not make it happen. It requires a business-friendly environment, a vigorous economy, and technically competent people. Training these people is the task of technical and engineering schools.

Engineering education for the new, deregulated, competitive environment is not the same as for the old, monopolistic telecom business. The most compelling difference lies in the pace of innovation. New technologies are now expected to reach the market concurrently with the R&D stage. The new time-to-market levels, brought about by competition, challenge the traditional boundaries between graduate and undergraduate teaching in our engineering schools. It used to be that new research subjects (e.g., ATM networks, compression algorithms, Java, wireless communications, etc.) would be initially inserted into our graduate courses, slowly drifting toward the undergraduate courses. This is not satisfactory any more, as new ideas now reach the market in much less time than it takes to educate an engineer. A new approach is needed whereby students are not only educated once, but trained to keep up with the changing scope and depth of their education for the remaining decades of their careers.

Another fundamental implication is the predominance of the market pull as a driving force of innovation, and the resulting need to educate people to understand the intricacies of the synergy between marketing and technology. While problem-solving abilities based on mathematical modeling, a traditional mainstay of engineering education, is still needed and valuable, the competitive environment requires the development of decision-making abilities. Decision-making is like finding the "best bet" answer when you do not have all the data and time that would be needed to find the right answer to a problem.

The total sum of these implications will have an enormous impact on the educational system. Cultural, structural and methodological changes will be needed. Computer literacy, as well as scientific and technological literacy, tend to become as much a fundamental part of a solid cultural foundation as arts and history. telecom literacy is emerging as a particularly engaging educational challenge, as society as a whole is more and more keenly interested in understanding the implications of the Internet, enhanced man-machine interactions, corporate networking, wired schools and homes, etc. Engineering schools may see this as an opportunity to relate to a larger audience, perhaps less willing to appreciate the rigor of the technical language but still eager to understand the implications of the technology in social life.

Inside the professional telecom community, continuing education will have an increasingly dominant role in the future. The certification of professional skills and educational content will be challenged to meet the ever changing needs of industry and society. Engineering schools will have to look for efficient ways of concurrently meeting the needs of undergraduate education, research-oriented graduate education, and market-oriented continuing education. Pressure to reach more people with diverse educational needs with limited resources is sure to lead us to new educational technologies. Distance education holds the largest promise in this respect, but its real potential is yet to be correctly evaluated.

Clearly, engineering schools are being challenged to reshape their telecom-oriented programs. This will be best

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Mobile Telecommunications in Egypt

By Khaled Elsayed, Egypt

It all started in 1996 when Egypt Telecom (then known as ARENTO, a fully governmental owned telecom operator) issued an RFP for a GSM-based mobile communication system with an initial capacity of 70,000 subscribers in Cairo and Alexandria. The intention was to have a working network before the Economic Conference for Middle East and North Africa to be held in October 1996. The mobile service was deemed necessary for VIPs, businessmen and country delegates as well as serving another non-declared goal of showing off Egyptís capability of acquiring and operating new technology. (It should be noted here that public Internet access was also introduced in synchrony with the UN Conference for population in 1994.)

Convinced of the huge market potential of Egypt (62 Million people) and the enhancing economic situation, most of the major GSM players responded to the RFP including Alcatel, Ericsson, Lucent, Motorola, and Nortel. Alcatel was awarded the contract and they worked hard to meet the deployment schedule set for operation in October 1996. Telecom Egypt started the subscription services early on. Although the service was offered at extremely high prices compared to that of well-developed markets, almost 50K lines were sold in few weeks. The service started in Cairo only in October 1996 as planned.

In 1997, Egypt Telecom influenced by the high winds of privatization wave in all sectors in one hand and the increasing demand for service as well as pressure from businessmen asking for a second GSM license for a private operator, made two major moves: first, offering the Mobile Services Unit for sale to investors and banks; and second, placing an RFP for a second GSM license Egypt Telecom offered 30 percent of the Mobile Services Unit to the public and the rest to be shared among the four major government banks and Egypt Telecom. In an unsurpassed public offering, the public hurried to grasp the shares and the demand exceeded the supply by thirty times. The new company was named Egyptian Mobile Telecommunication Services Inc. (EMTS).

For the second license, many offers were submitted, and only two went all the way to the final stages. The first offer was by MisrFon, a partnership of Alkan Group (a large private Egyptian conglomerate), Vodafone group, Airtouch, and Cairo Bank while the second was by MobiNil, a partnership of Orascom Group (another large private Egyptian conglomerate), Motorola, and France Telecom. MisrFon offered a better bid for the spectrum and promised to provide more economical and better services; it was awarded the license. MobiNil decided to make an aggressive bid for 70 percent of the EMTS shares owned by Egypt Telecom and the government banks. The offer was approved by the Government Telecom Board. MobiNil seized this huge business opportunity: the buyout operation was completed in Summer 1998 and MobiNil was in business.

In the meantime, MisrFon was building the second network. Ericsson won MisrFon's RFP. The operation was planned to start in November 1998. Price wars and commercial campaigns started to take off between the two companies early on. However, it was decided early in the beginning that the prices can not be freely left to the wish of the companies and must be approved by the Government Telecom Board. MisrFon network, codenamed "Click GSM," became operational in November 1998. The company introduced an attractive service based on prepaid cards without monthly service dues and this attracted about 30,000 customers in the first two weeks after service offering. A month later, MobiNil offered the same service. The two companies are competing in various areas: value-added services, coverage, quality, customer support, and pricing. Currently, coverage is MobiNil most advantage while service quality is MisrFon weapon.

The Egyptian users population is growing at steady rates although some users report poor service quality. The number of customers is estimated at 250,000 subscribers, with a network consisting of 390 base stations covering most urban locations. There are roaming agreements with 38 operators in 26 countries. The Egyptian market is yet to see more value-added services by applying IN concepts to the network.

This year, global coverage based on GSM and Satellite coverage are available. Iridium, GlobalStar, Thuraya, and ICO are competing for the exclusive niche of customers requesting global coverage.

In Egypt, the major market opportunity for cellular communications equipment manufacturers is not the mobile but fixed wireless access. There is a tremendous demand and long waiting lists for basic telephone service in rural and urban areas. In some rural areas, there is one phone line for a whole village. The waiting time to get basic phone service in heavily congested areas in Cairo can extend from 6 months to eight years! To support the growing economy, telecom services must penetrate to a large portion of the population. The government realized this fact and allocated good resources to Egypt Telecom to overcome the problem of basic phone service access.

Egypt Telecom realized the attractiveness of the fixed wireless solution and asked the major telecom equipment companies for demos. Recently, Egypt Telecom signed a $300M contract with Lucent to provision 700,000 lines in Cairo, Alex, Delta and Upper Egypt in a project code named "Golden Pyramids." Lucent will provide solutions based on DECT and CDMA technologies. Motorola and Nortel are piloting some other projects as well.

Telephony over IP in France: A Step Forward for a Global Service

By Hossam Afifi, Nicloas Gaillotte, Alain Leroy, France

After a certain number of successful academic trials in France across different national and European projects, multimedia over Internet is crossing new boundaries. Earlier pioneering applications such as the Institut National de Recherche en Informatique et en Automatique (INRIA) IVS system indicated the benefits of such audio and video multicast applications. Simple and direct access to these necessary tools were demonstrated across the globe with the help of the Internet. Other platforms and tests were accomplished subsequently in a certain number of French research laboratories with more emphasis on quality of service (QoS). More sophisticated tools were tested and larger bandwidth allowed usage of more advanced coding standards like MPEG II system for audio and video.

New steps forward are again being made in the field of multimedia over the Internet in general and in Telephony over IP in particular. Two challenging trials are being set up in two French research laboratories: ENST Bretagne and INRIA RODEO. The first trial, with ENST Bretagne project

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Asia-Pacific Region Gets Ready to Confront the New Millinium

By Byeong Gi Lee, Director of the Asia-Pacific Region

The Asia-Pacific Region has diverse cultures, peoples, and potential for future growth. Such features have been well combined in harmony to render a strong engine for collaborated efforts. The AP Region is an abundant source of volunteers for all ComSoc activities.

During the past two years, various countries in the AP Region suffered economic difficulties. Fortunately, the economic situation has improved; most economies are in the early stages of recovery. Economic hardship has not caused the AP Regional ComSoc membership to decrease; the region still accounted for 16 percent of the total total ComSoc membership as before. The technical activities of the AP Region were not lessened; the number of presented conference papers increased last year. Presented papers from the AP Region incresed to 32 percent in 1998 from 30 percent of 1997 for ICC; and to 45 percent from 28 percent for GLOBECOM (partly due to the conference site in Sydney, Australia). This is a good indication for a bright future; I believe the AP Region is now well poised to confront the new millenium, after surviving the economic turmoil of the last few years.

There are numerous activities taking place in the AP Region, and this year we plan to introduce in the following:

1. An election for the next AP Director in the second half of the year. The election precedures are well regulated and included in the APB Charter, so we may safely follow them for the election.

2. A ComSoc election, with three AP Regional candidates (T. Aoyama, B. G. Lee, T. Miki) included in the slate. It is desirable for the AP Region to keep some AP Regional representatives working in the decisionmaking core of ComSoc, so their candidacy is important to the AP Region.

3. Refinement on the APB logo that was designed last year through a prize contest. The AP logo adopts the ComSoc logo as the substrate on which the letters A and P are put.

4. A practical implementation plan is underway for the APB Best Paper Award, agreed upon at the last APB meeting, and the best papers from APCC '99 and OECC '99 (to be held in October) will be awarded. This project is managed by Dr. Koich Hagishima, the Technical Affairs Committee Chair.

5. A re-examination of the APB Charter, which was established last year, for possible improvements. The charter consists of six Chapters and 19 Sections with an Appendix.

6. A review of the structure of the APB organization for possible improvements. The APB organization consists of a Director, two Vice Directors, two Secretaries, a Treasurer, five Committees, and a Support Office.

7. In addition, a critical review of the overall structure and contents of the AP Region Web homepage in oder to initiate a substantial enhancement. The APR homepage as located at http://www.fujitsu.co.jp/hypertext/flab/APR and is managed by Dr. Hideo Kuwahara, the APR Homepage Vice Chair.

8. We continue to improve the quality of the well established *AP Newsletter*. The issues 15 and 16 will come out this year along with the new AP logo and many informative articles. The AP Newsletter is edited and managed by T. K. Tan, the *AP Newsletter* Vice Chair.

9. A re-examination of the structure and the contents of the AP Regional e-mail group lists to reflect the membership changes of the last year. This list contains the e-mail addresses of about eight thousand AP Regional ComSoc members and is managed by Dr. Hyeong Ho Lee, the Membership Development Committee Chair.

10. We are proud of the AP Regional ComSoc Chapters for their high activity level as well as quality, which is well demonstrated by the Chapter Award recipients: This year, the award goes to the Victorian Chapter (Craig Skinner, Chair), and a previous one was awarded by the Indian Chapter (Ram Gopal Gupta, Chair). We will be making more efforts to encourage and promote the activities of the comparatively less active Chapters. Chapters activities coordination is made by Dr. K. C. Chen, the Chapters Coordinations Committee Chair.

11. Contact and encourage Chapters to further promote Distinguished Lecturer Program invitations this year. Last year, the Singapore Office (Fanny Su Beh Noi, Manager) made great efforts to coordinate DLT tours among several Chapters. Consequently, very successful DLT visits were possibly made by Dr. Manu Malek with large audiences giving warm welcomes and much applause.

12. The Student Travel Grant program will continue this year as usual. Within the AP Region, applications are ranked according to a predefined guideline which reflects the paper review score with the highest priority.

13. We plan to review the activities and growth we have achieved in the AP Region during the past decade or so. This should help us know where we stand and which direction to go in the new millenium. For this purpose, we will collect various data and update statistics on major conference papers, membership growth, and so on.

14. We support regional/international conferences, which are held this year as follows:

APCC/OECC '99, Oct. 19-21, in Beijing, China
SPACS '99, Dec. 8-10, in Phuket, Thailand
APNOMS '99, Sept. 15-17, in Kyungju, Korea

Information on the conferences are available from Dr. Dan Keun Sung, the Meetings and Conferences Committee chair. His e-mail address is dksung@ee.kaist.ac.kr.

Mexican Telecom Market and Auctions Update

By Carlos Hirsch,Mexico

As I have reported in previous *GCN* issues, since 1996 Mexico has implemented an auction mechanism to assign spectrum. Licenses are granted for 20 years, with the potential to renew for a similar 20-year period.

In 1997, a 15 and 23 GHz point-to-point short haul microwave auction resulted in 14 companies paying US$ 42 million for 35 national bands. At the same time, several companies paid US$ 51 million for 45 regional point-to-multipoint licenses in the 10 GHz band intended for the deployment of a new promising technology.

In March 1999, 4 companies won 24 regional point-to-point licenses in the 38GHz band paying US$ 4.7 million. A new auction for long-haul 7 GHz point-to-point microwave is in process, involving five long distance and local carriers.

It is interesting to remark upon the procedures created for this microwave management. The winning companies need to select and contract (subject to regulatory approval) an independent and technically experienced company to produce "non-interference studies" required for any new link installation. Each company is able to freely set spectrum rental prices, which must be public, registered, and non-discriminatory. With these rules Mexico is trying to promote a competitive, fair, and open market for spectrum usage. At the same time, the government is protecting existing links, national control, and flexibility to implement new technologies. It is a fresh and successful approach to answer an old question: how to assign spectrum to the most efficient carrier?

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TELECOM EDUCATIONAL CHALLENGES/*(Continued from page 1)*

accomplished in an environment that grants due recognition to the importance of integrating the roles of research and graduate education, industry interaction, undergraduate education, continuing education, cooperation with technical schools, technological literacy programs, etc. For this reason, the University of Campinas (UNICAMP) in the State of São Paulo, Brazil, is creating a Center for Research, Innovation and Education in telecom, to be run with the participation of industry and government, as well as leading scientists and educators. With a focus on new telecom services, the new center will integrate ongoing research efforts on the areas of Optical and Wireless Communications, Transmission and Processing of Digital Signals, Networking, Multimedia, and Software for Telecommunications with the purpose of transferring knowledge to and from industry, expanding the scope of technological education, and reshaping it for the future.

In most countries, telecom-oriented engineering education is normally delivered inside electrical engineering courses. This approach does not seem adequate anymore, as space can hardly be found in the electrical engineering curriculum to gather basic telecom concepts with new technologies and new systems. Hence the already visible trend towards the creation of telecommunications engineering courses based on reduced electrical and computer engineering prerequisites, and detached from electrical engineering courses. In this endeavor, however, much will have to be learned about the professional profiles that are really needed by industry. Shaping a telecommunications engineering course and a continuing education structure around it is a natural challenge for the new center.

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TELEPHONY OVER IP IN FRANCE/*(Continued from page 2)*

leader supported by Bouygues Telecom, aims at exploiting an academic Internet testbed to set up a semi-operational telephony over IP network. In this trial, sites in Rennes and Brest (two cities in Brittany) will be equipped with telephony gateways and gatekeepers to offer a global telephony cross-connect network for local users from and to any of these sites. The first step in the trial will be the configuration of telephone numbers prefixes and IP to telephone numbers mappings. In the second step, new IP telephony entities will be tested on the network. A proprietary (ENST Bretagne) gatekeeper for H.323 standards and a SIP server will be tested in combination with the other equipment and interfaces for the intelligent network. New sites in Paris will also join the trial. Finally, performance tests and benchmarks will be published for this one-year trial. Some of this program is being financed by a Bouygues Telecom grant. The INRIA RODEO project, based in the fields of multimedia applications and Satellite protocol specification, will lead the second trial across Europe on a 2 Mb/s link from Sophia Antipolis to Italy, where telephony over IP will be again considered as an application with specific QoS needs and more strict time constraints than normal Internet applications. The trial will aim at using the differentiated services QoS infrastructure to assure such constraints with several European partners. We expect that the outcome of this first and leading experience in Europe will be a step forward in managing, dimensioning, and operating a global federal IP network, which offers services to Internet users and telephony networks at the same time. The final goal of these projects is clearly to replace gradually fixed and mobile telephony networks by one infrastructure — the Internet.

It is to be noted that, despite a large number of ITU and IETF standards, IP Telephony usage is still in its preliminary stages. We distinguish mainly three standard bodies working in this domain. ITU-T was the first to publish H.323 recommendations to offer multimedia communications for terminals operating on different kinds of netwoks such as the Internet and ISDN. The TIPHON ETSI European Standardization group is also working on other aspects of telephony over IP, such as naming and numbering, and lately mobile issues in telephony over IP. The IETF is also working on a certain number of themes related to IP telephony through different working groups. PSTN to Internet Interfaces, Signaling Transport over IP, and Media Gateway Controllers are the main active groups in this field. There is still a large number of problems that need to be adressed in IP telephony, e.g., naming and numbering between the Internet and the PSTN. Scalability and performance will decide whether it is possible to definitely replace the PSTN network with all its related mechanisms (voice, signalling, and Intelligent Network) by a global Internet.

MEXICAN TELECOM UPDATE/*(Continued from page 3)*

On the other hand, local telephony competition is facing its first conflict. In May 1998, the WLL and PCS auctions ended with eight winners bidding more than US$ 1 billion for 72 regional licenses. The winners were required to pay 100 percent of their highest bids in September 1998. Six carriers met their commitments, but two of them failed, representing more than 40 percent of the auction results. These two companies received a six-month waiver, followed by yet another extension (when they were still unable to pay) until June 15, which introduced uncertainty into the whole auction procedure. In the first half of 1999, one PCS and one WLL firm, in addition to a wireline local company and a fiber carrier, will begin operations. If all of these new local carriers can succeed in their projects the Mexican telecom market will change dramatically in the upcoming years.