Global Communications Newsletter

August 2003

Turin, Italy — Hollywood, California: A Virtual Connection

By Guglielmo Girardi, Giancarlo Pirani, and Sara Monaci, Italy

When a museum is devoted to multimedia contents, a multimedia interaction mode to assist visits is particularly suitable. This is the case at the National Museum of Cinema in Turin, Italy. The National Museum of Cinema is hosted inside the Mole Antonelliana, the architectural symbol of the city of Turin. Its spectacular setting, unveiled in July 2000, has transformed this building into a vertical museum unique in the world, in the Italian city that gave birth to the movie industry, Turin.

Two years after its inauguration, the National Museum of Cinema launched MultiMuseum and Wireless Museum, marking the beginning of an important path of experimentation and research in the field of new media and advanced telematic networks. Conceived as an innovative communications solution, the project represents a tool for dissemination of the cultural inheritance of the museum. The museum has had about 1 million visitors since its opening in July 2000.

The new paradigm for a multimedia interaction mode seems a good way to overcome some drawbacks typical of a traditional guided visit: too large and too many groups, rigid timetables, the need to follow the group without being able to stop and satisfy one's own interests.

In order to provide the visitor with a flexible and ubiquitous interaction tool, some leading edge technologies have been integrated: WLAN IEEE 802.11b (WiFi), palmtop computers, and Web technologies allow the integration of text, audio, and video without significant bandwidth limits.

Particular features of the system, the result of a joint effort of Telecom Italia Lab, CSP (R&D Center for ICT), Hewlett Packard, and Netbrain, are the following:

- Implementation of a dynamic model that allows the visitor to access contents in a huge variety of ways, and the museum to reorganize and broadcast all digital information in a flexible and continuous way.
- Use of localization systems based on WLAN access points distributed through rooms that allow the visitor's location to be identified by cooperating with the mobile terminal (palmtop) he/she uses; thus, it is possible to personalize information according to the location and the visitor's profile.
- Access to the museum's LAN connected to the Internet through the broadband experimental network RESEAU in the metropolitan area: this allows fixed and mobile working points to process the contents the visitor is interested in.
- An overall configuration system encompassing administration of the network infrastructure, distribution of basic services according to different user profiles, management of access to digital information areas of the museum, and control and update of the contents and information made available to the visitors.

Based on these technologies, an experimental multimedia guide system has been working at the museum. At the entrance, the visitor is given a palmtop that he/she can steer to organize the ideal path, according to his/her interests. He/she can start from the Aula del Tempio (Temple Hall), the heart of the museum, surrounded by 10 chapelles devoted to the Seventh Art's themes; then he/she can move to the Caffè Torino (a famous old coffee shop in Turin) to experience, through movies and sounds, the atmosphere of the cinema's first days; he/she can stop at the corner of horror movies and listen to an interview to Dario Argento explaining why he chose Turin for his film *Profondo Rosso* (*Deep Red*); he/she can find everything on *Cabiria* and the old *Kolossal* or the life of Vivian Leigh.

All this is possible by surfing on a palmtop and instantaneously downloading multimedia contents through the installed WiFi network, remaining immersed in the atmosphere of the museum.

Besides the traditional channels like the catalog, the guided visit with a cicerone, and the materials shown in the exhibit, it is also possible to imagine a sort of *multimuseum*, a virtual museum that lives in different time dimensions: its fruition is more and more in the hands of the user.

Structured cabling integrated with a Wi-Fi network wraps a 167 m high building in an information flow that can be reached from anywhere through fixed workstations, laptops, and PDAs.

As an extension, one can continue or begin a visit at home accessing the contents on the Web site www.museonazionaledelcinema.it, which also offers a virtual tour of the museum together with a number of movie extracts. In fact, the museum's LAN will be connected to Internet by means of RESEAU that has been set up by Telecom Italia in some cities like Turin. By means of RESEAU, it will be possible to create a virtual community to interconnect different laboratories in the territory to work on digital montages of multimedia objects based on the material stored in the museum.

In this framewor it is worthwhile to mention the recent news of the launch of a new course, Ingegneria del Cinema e dei Mezzi di Comunicazione (Engineering of Movies and of Communication Media), which will start next fall at the Politechnic of Turin with the support of the museum together with other multimedia and ICT local entities like Telecom Italia Lab, the Istituto Superiore Mario Boella (see *GCN*, December 2002), Euphon, and MultiMedia Park.

To conclude, this experimental multimedia interactive approach to the National Museum of Cinema in Turin may pave the way to the development of new cultural high-tech services that combine the synergic use of state-of-the-art technologies with the distinctive features of the environment in which the services are expected to be offered.

Country Report: India

By Dr. Ram Gopal Gupta, India

India, the world's largest democracy with the world's second highest population and seventh largest area is also the fourth largest economy in terms of purchasing power parity. One of India's important assets is its vast reservoir of skilled manpower. The farreaching and sweeping economic reforms undertaken since 1991 have unleashed the immense growth potential of the Indian economy. A new spirit of economic freedom is now steering the country. A series of Second Generation Reforms aimed at further deregulation and stimulating foreign investment has moved India firmly into the front ranks of growth international economies.

India's 42-million-line telephone network, including mobile, is the fifth largest in the world and second largest among emerging economies with a wide range of services: basic, cellular, internet, paging, v-sat, and so on. Given its low telephone penetration rate (about 4/100 population), India offers vast scope for growth. It is therefore not surprising that India has one of the fastest growing telecommunication systems in the world with an average annual growth of about 22 percent for basic telephone services and over 100 percent for cellular and Internet services. Telephone lines added to the basic services network over the last five years have been one and a half times those added over the preceding 50 years!

The Indian telecommunications sector has undergone a major process of transformation through significant policy reforms, particularly beginning in the 1990s, that led to gradually ushering in competition for greater consumer welfare, particularly in terms of lowering of tariffs and improvement in quality of service. The reform phase began with general liberalization of the economy in the early 1990s. Telecom equipment manufacturing was delicensed in 1991, and value-added services were declared open to the private sector in 1992, following which radio paging, cellular mobile, and other value-added services were opened gradually to the private sector.

The most important landmark in telecom reforms came with the New Telecom Policy in 1999, called the new or third generation of reforms. NTP-99 envisages a teledensity of 7 by 2005 and 15 by 2010. To achieve this, approximately 75 million telephone connections would be required to be provided by 2005, 175 million by 2010. At current prices this translates into US$37 billion by 2005 and US$69 billion by 2010. With the software industry booming and Internet/mobile phone market exploding, telecommunications in India is gaining due importance. Moreover, rural telephony, maintenance of already existing networks, and products of strategic importance offer huge business opportunities.

NTP-99 is not just a policy document. It reflects a new philosophy, a new vision, a new direction, and a new commitment. The government has undertaken its implementation with utmost earnestness, in letter and spirit.

The Ninth Five-Year Plan 1997–2002: Progress Report

During the Ninth Plan period, the number of DELs has already increased by more than 2.5 times; from 14.5 million at the beginning of the Plan, the number of DELs is expected to reach 40.53 million by its end. From 0.34 million at the beginning of the Plan, cellular mobile phones too have crossed the 5.5 million mark. Teledensity has increased from 1.57 as of 31 March 1997 to 3.58 on 31 March 2001, and is expected to reach 4.5 by the end of the Plan. Rural teledensity has also increased from 0.34 percent in March 1997 to 0.93 percent in March 2001, and is expected to cross 1 percent by the end of the Plan. Internet connections had reached 3 million by the end of March 2001. The total estimated investment by public and private sector operators during the first four years of the Ninth Plan (1997–2002) was US$12,470 million. The average annual investment by the public sector operators (BSNL and MTNL) during the first four years of the Ninth Plan has been about US$2590 million, whereas the investment by the private sector during the same period has been about US$527 million per annum.

The Tenth Five-Year Plan 2002–2007: Projections

Keeping in view the present trend of growth of the telecom network, the teledensities to be achieved by the end of the Tenth Plan (31 March 2007) would be 11.5/100 population at the national level; 3/100 for rural areas and 30.74/100 for urban areas. Based on this, the annual compound growth rate of telephones (fixed + cellular) is required to be 22.62 percent, consisting of 17.48 percent for fixed lines and 46 percent for cellular lines. During the Plan, a total of 81.7 million phones, including 31.55 million cellular phones, are to be provided. Of these, 14.72 million will be in rural areas. To achieve these targets, a total investment of US$ 32.135 billion has been estimated; of this investment, an amount of US$8.832 billion will be required for the rural areas. The public sector is expected to invest about US$22.876 billion, and the private sector US$9.258 billion. In addition, in the manufacturing industry, an investment of about US$1.2 billion is also required during the Plan to have state-of-the art facilities.

Telecom Equipment Manufacturing Sector

Introduction

The telecom equipment manufacturing sector in India has undergone a sea change since the commencement of economic reforms in 1991. India today manufactures a wide range of state-of-the-art telecom equipment. The public and private telecom services providers, BSNL/MTNL, meet most of their requirements for telecom equipment from indigenous manufacturers. Government policy encourages local manufacture of telecom equipment and is geared toward developing India as a major base for production and export of telecom equipment. As a result of these policies as well as the opportunities India offers, the telecom equipment manufacturing sector has shown sustained growth over the last five years. The production of telecom equipment in the country increased from US$1.66 billion in 1996–1997 to over US$3.4 billion in 2002–2003.

C-DoT Technologies

Developing indigenous technologies suitable for Indian conditions and other developing countries has been a prime objective of the Center for Development of Telematics (C-DoT), a premier institute engaged in research and development of state-of-the-art technologies in switching, transmission, terminal equipment, and network management. C-DoT has a very advanced Pilot Production Centre ensuring smooth transfer of technology to manufacturers and supporting them in establishing production facilities for commercial production.

Switching

Digital switching system technologies of foreign companies (Alcatel, Lucent, Siemens, Fujitsu, AT&T, Ericsson, and NEC) have been validated and approved by DoT for introduction into the Indian network. Manufacturing facilities based on these technologies have been set up, and a capacity of about 10 million lines based on indigenous and foreign technologies now exists in the country. In addition, switching systems based on the indigenous technology developed by C-DoT have also been introduced into the national network.

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Country Report: India (cont'd)

Transmission

Radio transmission systems: With the introduction of value-added services, demand for radio transmission systems has undergone a major change. A large number of public and private sector manufacturers, in collaboration with telecom giants such as Lucent, Fujitsu ,and Siemens, have set up manufacturing facilities in India for digital transmission equipment.

Satellite systems: Indian companies manufacture a wide range of equipment for satellite communications. The main equipment being manufactured is IDR, MCPC-VSATS, an entire range of HPAs, Earth station antennas, and low-noise amplifiers by leading manufacturers such as ITI, ECIL, BEL, and India Satcom.

Wireless local loop system: Wireless local loop based on Cor-DECT technology has been indigenously developed by the Indian Institute of Technology (IIT) Chennai. Shyam Telecom, ECIL, Crompton Greaves, and HFCL have been licensed by IIT Chennai to manufacture this system. A WLL system based on code-/time-division multiple access (CDMA/TDMA) is also being manufactured in India.

Optical fiber transmission systems: Investors in manufacturers of optical fiber transmission equipment as well as infrastructure equipment of cellular and paging services are sure winners for the future. With surging interest in the Internet and expanding value-added services, the long distance network is being converted to optical fiber media rapidly.

Terminal Equipment

With rapid growth in basic and value-added services, requirements for a wide variety of terminal equipment, including telephone instruments ranging from normal pushbutton to multiline feature phones, are growing. Production of telephone answering machines, key telephone systems, cordless telephones, pagers, cellular phones, and handsets for radio trunk services, pay phones, fax machines, ISDN terminals, line jack units, data terminals, and modems provide excellent opportunities for prospective investors.

Telecom Cables

The Indian telecom cable market is estimated at US$1.26 billion excluding the cables that have been imported, with an estimated growth rate of 17.15 per cent. On the optical fiber cable (OFC) front, cable manufacturers have imported cables from the worldwide market, while the jelly filled telecom cable (JFTC) market has been entirely taken care of by Indian manufacturers. The total OFC market in terms of kilometers for the year ending in 2001 was 2,55,000, which catered to the Indian market as well as the export market, whereas the total JFTC market in India was estimated at 638 lakh cable kilometers.

Research and Development

Research and development activities are being carried out at various manufacturing units of India-based MNCs. Notable R&D is also being carried out at C-DoT, whose rural exchanges are very successful in the world market, apart from IIT Chennai who have developed COREDECT technology.

Telecom Services Sector

Basic Telephone Services

The Department of Telecom Services provides basic telephone services all over India except in Mumbai and Delhi, where basic services are provided by Mahanagar Telephone Nigam Limited (MTNL). In accordance with NTP-99, a number of private companies are providing basic telephone services in states like Andhra Pradesh, Gujarat, Maharastra, Madhya Pradesh, Punjab, and Rajasthan

Cellular Mobile Telephone Services

Since their introduction, cellular services have shown a fair growth, with the subscriber base exceeding 10 million by the 1Q 2003. India has adopted the Global System of Mobile Communication (GSM) for provision of cellular services. Cellular services in India operate in the frequency band 890–902.5 MHz/935–947.5 MHz. In cities, each operator has been allocated a frequency spectrum of 6.2+6.2 MHz (except Chennai, where 5.8+5.8 MHz spectrum has been allocated), while for other telecom circles a spectrum of 4.4 +4.4 MHz has been allocated.

Internet Services

Recognizing information technology (IT) as an important vehicle in the development of the country, the government has resolved to make India a global IT superpower and a frontrunner in the Information Revolution. The government considers IT an agent for transformation of every facet of human life that will bring about a knowledge-based society in the 21st century.

To date, 175 licenses have been issued to private ISPs: 25 for Category A (all India), 60 for Category B (territorial circle and four metro telephone districts: Delhi, Mumbai, Calcutta, and Chennai), and 90 for Category C (city). The liberal ISP policy and significant reduction in leased line charges are expected to promote fast proliferation of the Internet within the country and boost applications like electronic commerce, Web hosting, and virtual private networks. The subscriber base had crossed over 8 million by the first quarter of 2003.

Global Mobile Personal Communication by Satellite (GMPCS)

Keeping pace with the rapid developments in the international telecom markets, the government of India has already announced its policy on GMPCS services.

Radio paging: This service is available in all 27 cities. The service has already commenced in most of the circles. The entry of more operators in a service area shall be recommended by TRAI. At present, there are over 2 million paging subscribers in the country.

Public mobile radio trunked services: In India, licenses were granted to private operators in three different frequency bands: 300 MHz, 400 MHz and 800 MHz. To date services have already commenced in 30 cities by 20 companies.

Other value-added services: The value-added services segment has been considerably liberalized. These services include electronic mail, voice mail/audiotex, 64 kb/s domestic data service using VSAT, fax/data broadcast, videotext, and videoconferencing. Companies registered in India are already permitted to operate these services under license nonexclusively.

National Long Distance Service

National long distance (NLD) services have been opened to free competition. Requirements are minimum paid-up capital of US$50 million and promoter's combined network of US$500 million with an one-time entry fee of US$20 million; and an additional four bank guarantees of US$20 million each to be released on fulfillment of network rollout obligations.

License fee is in the form of revenue share at 10 percent, plus contribution to the Universal Service Obligation Fund, with a total cap of 15 percent. The license is issued for a period of 20 years, extendable by 10 years. The operator is permitted to carry intercircle long distance voice and data traffic; intracircle traffic is to be carried based on mutual agreement with basic service operators. As of now, there are three letters of intent granted to private sector service providers in addition to the state-owned company, Bharat Sanchar Nigam Limited.

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Hot-Spots in Israel: A Communications Chapter Technical Seminar

By Jacob Baal-Schem, Chapters Corner Editor

The Wi-Fi, Bluetooth, and IEEE 802.11 standards are catching on worldwide and raising the interest of many IEEE members. Therefore, the Israel IEEE Communications Chapter recently sponsored a technical seminar on "Short Range Communication Networks" that was attended by more than 180 participants.

The IEEE Israel Section is a veteran of IEEE Sections in Region 8 and was established back in 1954 by the late Prof. Ollendorf at the Technion in Haifa. The Communications Chapter was initiated in 1977, and I had the privilege to serve as its first Chair. Currently the Communications Chapter has about 600 members (out of 1600 members of the IEEE Section) and is very active, with Prof. Cohen of the Technion as its Chair.

The seminar on short-range communication networks was organized during the Electronica 2003 exhibition held at the Israel Trade Fair and Convention Center, Tel-Aviv, on June 11, 2003, and was chaired by Prof. Jacob Gavan of the Holon Academic Institute of Technology. At the same occasion, a Wi-Fi hotspot was demonstrated at the exhibition.

Following the cover story on Wi-Fi in *Business Week* (April 28, 2003) the seminar opened with a "View Towards the Future" of short-range networks by Dr. J. Baal-Schem. The lecture presented the actual and forecast growth path of Wi-Fi, Bluetooth, and similar systems, and discussed especially the phenomenal expansion of hotspots worldwide. It discussed the "rivalry" between hotspots and cellular telephony (3G), stressing future applications: linking computers, stereos, and appliances in the home.

Engineer Shaul Katz of the Israel Ministry of Communications provided a view of the actual and future allocation of the different frequency bands needed for short-range communications.

Prof. Gavan and Dr. Alen Bensky presented technical views on wave propagation in the different frequency bands allocated to Wi-Fi and the problems encountered in operating short-range networks. They based their presentations on research conducted in Israel and abroad on radio wave propagation in gigahertz frequency bands.

Prof. Jacob Gava introduced the concept of nano-, pico-, and femtocells for defining the limits of short-range communication networks. He analyzed the main limitations for nano and especially picocells. Adequate standardization and reduction of mutual and self interference effects are mandatory. For indoor picocells, the main sources of interference are self interference of the desired signals from selective fading and shadowing effects, especially for high-rate signals. The main interference for outdoor nanocells is mutual interference from other radio equipment. Some examples and mitigation methods were described.

Alan Bensky's presentation, "Bluetooth and WLAN Coexistence," reflected concern about increasing interference between Bluetooth and Wi-Fi devices on the 2.4 GHz industrial, scientific, and medical band as the use of both standards proliferates. Bensky described the mechanism of interference between the two systems, showed how throughput is affected, and discussed ways coexistence may be promoted using adaptive frequency hopping for Bluetooth, and closed loop packet fragmentation and data rate modification in Wi-Fi. In particular, he outlined a procedure for determining the interference radius within which Bluetooth devices are likely to affect the throughput of data between a Wi-Fi access point and a mobile terminal.

Finally, Naphtali Hirsch of Vectronix presented the hotspot concept and system concepts for the installation of hotspots. His company also operated a hotspot at the exhibition, covering the entire exhibition area up to the entrance to the conference room.

The participation of more than 180 interested engineers in the presentations of this seminar and the discussions during and following the presentations showed the large amount of interest in this developing activity in Israel, especially at high rates.

Global Communications Newsletter

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A publication of the
IEEE Communications Society

COUNTRY REPORT: INDIA*(continued from page 3)*

Telecom Software Sector

As the world of telecom is fast moving from proprietary systems to open standards-based systems, a lot of network intelligence has shifted to software. The phrase *telecom software*, which until very recently meant applications run by telecom service providers on their computing platforms (e.g., billing and customer care, network management and, traffic monitoring), has assumed a much broader meaning. Broadly, telecom software can be classified into three areas: embedded software, system software, and application software, all used by service providers.

In the last two years, the telecom software scene in India has changed drastically, both qualitatively and quantitatively. The total size of the telecom software industry in India crossed US$1.02 billion in 2001–2002. This includes exports of telecom software as well as domestic sales. However, while the export revenue includes embedded and system software, domestic sales mean only software sold to Indian service providers, like OSS/BSS and network management. Telecom software exports, as a percentage of total software exports, were 14.23 percent. By 2003 telecom software will account for almost one-fourth of India's software exports.

Almost all major OSS/BSS companies are coming to India to set up facilities. Also, integration of these solutions, especially in Asia-Pacific markets, is creating another opportunity for Indian companies.