

# TOSHIBA REVIEW

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## Special Reports

### Short-Range Wireless Technology Realizing a Ubiquitous Network Society

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## Special Reports

### Short-Range Wireless Technology Realizing a Ubiquitous Network Society

#### \*Creating a Ubiquitous Network Society

ITO Haruhiko

#### \*Realization of Ubiquitous Network Society through Wireless Technologies

ADACHI Katsumi SAKURAI Shuichi OGASAWARA Takashi

The recent evolution of wireless technologies and the popularization of the 24-hour connected environment have made access to the network possible not only from offices, but also from the home and public spaces without the need for cables. In the ubiquitous network society, an authorized person can have access to the desired network and receive various services anytime and anywhere. An important business task in the future is therefore to provide more of these network services with full contents.

Short-range wireless technologies are the key to realizing the ubiquitous network society. Toshiba has been involved in the development and promotion of these technologies from the specification stage, and will continue to release products that help to create a higher quality of life for all people.

#### \*Advanced Office Environment with Wireless Networking

KOBAYASHI Hironobu AOSHIMA Kinya HARADA Shigeyoshi

Mobile computing is expected to develop strongly with the widespread use of wireless LAN for ubiquitous networks. This will also drastically change the office environment, as users will be able to create their own office environment wherever they move. However, the wireless LAN environment still has problems regarding security and mobility.

By introducing Toshiba's Seamless Office™ wireless solution, the above wireless LAN problems are resolved and a ubiquitous wireless network can be realized.

#### \*PC with Bluetooth™ and IEEE802.11a/b Wireless Communication Features

NAKAMURA Norimasa FUKUSHIMA Kazuya HIROTA Toshiyuki

Bluetooth™ and IEEE802.11b are wireless technologies utilizing the 2.4 GHz band, while IEEE802.11a is a wireless technology utilizing the 5 GHz band. Toshiba has already shipped notebook PCs with integrated Bluetooth™ technology for low-speed wireless peripheral devices such as mouse, printer, and mobile phone, and/or integrated IEEE802.11b wireless LAN technology enabling Internet access at the office, at home, and in public areas.

As the wireless market grows, the possibility of interference in simultaneous Bluetooth™ and IEEE802.11b operation has become an issue attracting attention and market demand for higher speed Internet access using IEEE802.11a wireless LAN technology has risen.

Toshiba has therefore developed a PC integrating the three wireless technologies (Bluetooth™, IEEE802.11b, and IEEE802.11a) with the aim of solving such issues and satisfying the market demand.

#### \*Specialized Software Designed for Wireless Technologies (IEEE802.11a/b, Bluetooth™)

SAKO Ikuo KONO Shigeo WATANABE Hiroyuki

Toshiba was the first in the world to offer notebook PCs with built-in IEEE802.11b-compliant 2.4 GHz and IEEE802.11a-compliant 5.0 GHz wireless LAN, and they are now being sold worldwide. A model with built-in Bluetooth™ technology was also introduced at an early stage, and its interoperability was authenticated as a designated profile interoperability tester (DPIT) by a Bluetooth Special Interest Group (SIG) for the first time in the world.

We have already implemented these Bluetooth™ and wireless LAN technologies as standard functions on Toshiba notebook PCs. Bluetooth™ Settings and ConfigFree™ software are also installed in each PC to ensure ease of use.

#### \*Bluetooth™ Wireless Headset Using Bluetooth™ AV Profile

TAKABATAKE Yoshiaki NAKASATO Shigemi

Various types of small portable equipment have appeared on the market, and many people are carrying and using portable devices together. The term ubiquitous network society has become popular, and attention has become focused on what new lifestyles will be created by connecting these portable devices.

Toshiba has proposed the Bluetooth™ Wireless Headset (BWH) for such an environment, as a device that connects people and the devices or data that surround them, especially through the medium of sound. This paper introduces the functions supported by the BWH and its internal configuration, and describes scenes of BWH application.

#### \*Wireless LAN Data Projector

SHINOZAKI Hiroshi YAMAGUCHI Shogo MURAI Shinya

The use of data projectors has recently broadened from large conferences to ordinary meetings as the prices of the projectors and notebook PCs have been reduced. However, connecting to a projector is still troublesome, especially when speakers change in a session and have to bring their computer close to the projector in order to connect to it using a cable.

In August 2002, Toshiba released a new data projector that allows wireless connection with a PC. Users can connect their PC to the projector easily and project their screen images through the wireless connection. This projector releases users from the annoying cable connection and creates a new style of meetings.

#### \*Smaller, Higher Performance, Lower Cost Bluetooth™ SD Card

ITO Takafumi MUROHASHI Masahiko

A small-size Bluetooth™ card is necessary to enable wireless communications to be easily used with mobile phones and handheld devices such as PDAs and notebook PCs. To satisfy this need, in 2001 Toshiba developed a small Bluetooth™ card, model SD-BT00, that conforms with the secure digital input/output (SDIO) card specifications.

We have now developed an improved version of the Bluetooth™ SDIO card, model SD-BT2, to meet the requirements of the market. The SD-BT2 card features the following improvements: (1) smaller size, (2) improved Bluetooth™ interface, (3) implementation of Bluetooth™ upper layer, (4) lower power consumption, (5) improved radio frequency (RF) characteristics, and (6) lower cost.

#### \*Current Status of and Future Trends in Wireless Technologies

TAKAGI Eiji TAKABATAKE Yoshiaki

Wireless connection systems such as wireless LAN and Bluetooth™ are becoming pervasive throughout the world. Particularly wireless LAN, whose main application is wireless connection of PCs to a network but even includes such uses as wireless transmission of moving pictures at home, is witnessing spectacular growth in popularity. Bluetooth™ is also a promising wireless interface solution in mobile ubiquitous environments and is expected to predominate among such applications soon. On the other hand, some new technologies such as ultra wideband (UWB) have been proposed for short-range wireless applications. They are expected to spread as a complement to developed technologies such as wireless LAN (IEEE802.11) and Bluetooth™ or to be merged with such established technologies.

Toshiba will continue to contribute to the standardization of such wireless technologies and to develop related ICs and appliances.

#### \*Smart Antennas to Realize Comfortable Wireless Communications in Indoor Environment

SHOKI Hiroki OBAYASHI Shuichi KASAMI Hideo

Smart antennas have been studied since the 1960s as adaptive antennas having the ability to adaptively optimize antenna performance, such as beam patterns, according to the radio environment. Smart antennas were originally applied to defense uses and radar, and their technology progressed in such special application fields for about 30 years. Recently, however, increasing demand for wireless communication systems, including mobile phones and wireless LANs, has stimulated many wireless engineers to apply smart antennas to such commercial wireless systems. The key objectives here are effective use of limited frequency resources and cost reduction. Toshiba has proposed and developed a novel smart antenna system with intermediate frequency (IF) local signal phased shifters, for application to such commercial wireless systems.

## Feature Articles

#### \*Ultrafast Digital Circuit Utilizing Flux Quantum as Information Carrier

KATSUNO Hiroshi NAGANO Toshihiko YOSHIDA Jiro

The unique properties of superconductors enable novel digital circuits to be created utilizing flux quantum as the information carrier. Such a circuit is composed of Josephson junctions and superconducting wiring, and is expected to work in the sub-THz range with extremely low power consumption.

We have developed a novel junction structure and its integration technology based on high-temperature superconductors and confirmed the correct operation of a ring oscillator. The signal delay per gate was as low as 1.8 ps, indicating the ultrafast performance of this new digital circuit technology.

#### \*Voice over IP Business Telephone System

FUNATO Yasuo SHIBASAKI Fumio SHIBATA Tsutomu

In recent years, there has been a trend toward reducing the maintenance costs of telecommunications infrastructure through integration of computer networks and voice communication networks. By introducing Voice over Internet Protocol (VoIP) into the Strata™ CTX670/CTX100 business telephone system, it has become possible to realize integration of a computer network and a voice communication network.

Toshiba is proposing system solutions to customers in which the total cost of ownership (TCO) of telecommunications infrastructure can be reduced by the newly developed VoIP business telephone system.

#### \*Partial Discharge Telemetering System for Insulation Diagnosis of High-Voltage Motors

TOMIZAWA Yukihiko ITO Makoto HOSHINO Masaru MORI Koji

A major concern of users is how to preserve the reliability of high-voltage motors that are close to the renewal stage, while also saving maintenance costs. In order to achieve this, it is important to accurately identify motors with deteriorated coil insulation.

Toshiba has established a telemetering system for diagnosing the coil insulation of motors using a new measuring method. A field test has begun on high-voltage motors operating under load, whose partial discharge level changes with temperature. Deteriorated coil insulation is diagnosed by analyzing the phase distribution and partial discharge magnitudes under operation.

#### \*X-ray Imaging System--Imaging Support Solution for Interventional Radiology

FUJII Senzo NISHIKI Masayuki YAMADA Naoki

From the dawn of diagnostic imaging, X-ray diagnostic imaging was employed as a means of definite diagnosis due to its ability to provide more high-definition diagnostic information. With the progress of other modalities in recent years, however, the positioning of X-ray diagnostic imaging has significantly changed from the role of definite diagnosis to primary diagnosis in emergencies and medical treatment support, taking advantage of its real-time characteristics.

In response to the changes taking place in cardiovascular diagnosis, Toshiba has developed a new X-ray cardiovascular system equipped with an X-ray flat panel detector (FPD). The introduction of the FPD is expected to reinforce the characteristics of X-ray diagnosis and further clarify its role.

#### \*Mercury-Free HID Lamps for Automobiles

ISHIGAMI Toshihiko UEMURA Kozo ISHIZUKA Akio

We have developed mercury-free high-intensity discharge (HID) lamps for automotive headlamps. This lamp system is environmentally friendly and has good spectral characteristics during the startup period. Moreover, the changes in lamp characteristics are smaller compared with conventional lamps. The Japanese proposal for the international standard for HID headlamps, based on the proposal of the Toshiba Group, was approved in 2002. The new lamp system will be in practical use from 2004.

#### \*Outdoor Type Observation Elevator and Huge-Capacity, High-Speed Elevator

KINOSHITA Toru MABUCHI Motohiro ISHIKAWA Yoshinobu

Many outdoor type observation elevators having a glass wall cage and no hoistway wall to enable enjoyment of the panoramic view can be seen in hotels and high-rise buildings in various countries.

Toshiba Elevator and Building Systems Against environmental studies and developed a number of countermeasures for such elevators against environmental factors such as wind, rain, and so on. These high-technology features have been employed in elevators installed in the Izumi Garden Tower in Roppongi 1-chome, Tokyo, which have a 17-person capacity and 360 m/min rated speed. Huge-capacity, high-speed elevators capable of carrying 75 passengers have also been installed in the same building.

#### \*Digital Archives System for Art and Culture

HASEBE Kenji WAKIZONO Ryuji HIRAYAMA Hirokazu

Toshiba has had the experience of developing the Cultural Digital Library System for the Japan Arts Council (The National Theatre of Japan). On the basis of our accumulated Web technology and know-how, we have now developed a new digital archives system called Dento-Navi as a packaged product. This makes the construction of a digital archives system easy, and can contribute to the preservation, public presentation, and promotion of traditional Japanese arts such as kabuki, ukiyo-e, and so on.

## Frontiers of Research & Development

#### \*X-Ray Detector Promoting Medical IT Systems

#### \*HfSiON Gate Dielectric as New Gate Insulating Material for Future Low-Power-Consumption CMOS-LSIs