

Evolving Wireless and Network Technologies and Applications

Information and Communication Technology as Social Infrastructure

MORIKAWA Hiroyuki

Evolving Wireless and Networking Technologies and Dissemination of New Application Services

KATSUBE Yasuhiro / SHOKI Hiroki

With the growing diversity and speed of Internet access networks achieved by various wired and wireless technologies in recent years, a broad range of network terminals in social and industrial infrastructure systems, in addition to conventional PCs and mobile terminals, are being connected to information and communication technology (ICT) infrastructures. Furthermore, new values and capabilities are being provided to users as a result of coordination between such terminals and a number of cloud services.

Based on these technological trends and social requirements, Toshiba has been engaged in the development of new value-added application services utilizing ICT infrastructures, as well as basic technologies to realize these application services.

High-Speed File Transfer Based on Millimeter-Wave Wireless Communication Technologies to Enhance File Mobility

SETO Ichiro / KASAMI Hideo / BAN Koichiro

With increasing opportunities to handle large volumes of video contents and high-definition (HD) picture files on constantly evolving digital consumer electronics (CE) products, millimeter-wave (mmw) communication systems using the 60 GHz frequency band are expected to serve as a high-speed wireless interface for transferring such data between individual CE products. To further expand the market for mmw communication systems, the realization of a mmw transceiver integrated circuit (IC) using an advanced complementary metal-oxide semiconductor (CMOS) process technology is required.

Toshiba has been engaged in research and development of mmw wireless communication technologies, including built-in antennas that can be easily mounted in CE products, as well as mw-band analog circuits and analog-to-digital converter circuits using CMOS process technology, in addition to communication schemes and protocols to reduce the radio reflection effects of CE product housings. Through these technologies, we are aiming to realize an easily implementable mmw CMOS transceiver IC with a high transmission rate exceeding 1 gigabit per second (Gbps) for various types of CE products including mobile phones, digital cameras, and so on.

Multimode Wireless Communication LSI Technology

FUJISAWA Toshio / HORISAKI Koji / UNEKAWA Yasuo

Accompanying the increase in wireless communication functions of mobile terminals, both rapid responses to new functions appearing in rapid succession and reductions in cost and power consumption are required. A number of wireless communication large-scale integrations (LSIs) equipped with smaller footprints for these products have been released in recent years.

With this as a background, Toshiba has developed a design platform for wireless baseband LSIs that can efficiently implement multiple wireless communication functions, including wireless LAN standardized under the IEEE 802.11n standard, Mobile WiMAX (Worldwide Interoperability for Microwave Access) standardized under IEEE 802.16e, and 3GPP-LTE (Third-Generation Partnership Project-Long Term Evolution). We have confirmed that this technology has the capability of processing up to 130 Mbps throughput and product-level reliability using our 90 nm complementary metal-oxide semiconductor (CMOS) process technology. We are continuing our efforts to further improve usability in such areas as performance, power consumption, and switching latencies between wireless standards.

Miniaturization Technologies for Tunable Antenna Using MEMS Variable Capacitor

NISHIO Masaki / TSUTSUMI Yukako / OBAYASHI Shuichi

With the wide dissemination of mobile terminals such as notebook PCs, mobile phones, and mobile audiovisual (AV) terminals, thin and compact built-in antennas are becoming essential for various wireless communication systems including wireless LAN and digital terrestrial broadcasting (DTB). However, performance degradation, including decreased gain and narrowing of the operational bandwidth, are serious issues accompanying the thinning of antennas and mounting closer to the printed circuit board as the size of built-in antennas is reduced.

To overcome these problems, Toshiba has developed miniaturization technologies using a microelectromechanical systems (MEMS) variable capacitor for the realization of a thin and compact tunable antenna with wideband and high-gain characteristics that can cover the low-frequency range such as that used for one-segment broadcasting, which is conventionally received by large pull-out antennas.

950 MHz-Band Radio Receiver Unit for Indoor Local Positioning System

INAMURA Hiroyuki / IIDA Yasutaka / NAMBA Yoshiki

To improve business efficiency in factories and office buildings, the establishment of high-accuracy indoor local position detection technology to obtain an accurate grasp of the current situation inside a building, including the locations of workers and facilities, their working ratios, and so on, has recently become essential.

In response to this situation, Toshiba has been engaged in research and development of an indoor local positioning system based on the time difference of arrival (TDOA) method using 950 MHz-band radio, whose propagation distance is longer than that of 2.4 GHz-band radio. We have now developed a prototype radio receiver for the TDOA method as a key component of such a system, with a time resolution of about 1 ns. As a result, it is possible to detect wireless receivers within an average distance of several meters. This technology will contribute to the development of value-added applications such as working management systems, business support systems, and so on.

Time Synchronization Technology for Next-Generation Electric Power Substations

KOZAKAI Yasuyuki

With the increase in speed and reduction in cost of Ethernet devices in recent years, the replacement of networks for various industrial systems, such as electric power substations, factory automation systems, railways, and so on, by Ethernet systems has been accelerating. Highly precise time synchronization and high reliability are essential in such systems. Particularly in the case of next-generation substations, the Institute of Electrical and Electronics Engineers (IEEE) 1588 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems, which defines a protocol enabling precise synchronization of clocks in several time servers, is under consideration as a solution to improve reliability. However, the degradation of time accuracy in the event of primary time server failure is a crucial issue, because the definition in the standard specifies that only one time server distributes time information.

To solve this issue, Toshiba has developed both a network architecture in which two time servers distribute time information and a client that has redundant feedback loops, thereby achieving a time accuracy of 100 nsec even if a primary time server fails.

Networking of File-Based Workflow in Broadcast Stations Using VIDEOS neo™ Video Server

TAKENOUCHI Makoto / WATANABE Hiroyuki / TANAKA Shingo

The workflow in broadcast stations has conventionally used magnetic tapes to transfer video and audio contents during the production process. With the progress that has taken place in the filing of video and audio contents, these files are now being transferred via the network for improvement of the workflow. To maintain the quality of high-definition contents in broadcast stations, however, a high-speed wideband file transfer network is required due to the low data compression rates of such contents.

As a solution to this issue, Toshiba has developed the VIDEOS neo™ next-generation video server featuring the NPEngine™, which is a newly developed super-high-speed Transmission Control Protocol/Internet Protocol (TCP/IP) network hardware engine. The VIDEOS neo™ achieves a stable file transfer process including synchronization with the frame rate.

FEATURE ARTICLES

ES-5200 Commuter Pass Issuing Machine for Tokyo Metro Co., Ltd.

IDE Satoshi / HOSHI Kei

With the wide dissemination of integrated circuit (IC) cards for railway tickets in recent years due to their convenience, enhanced security has become necessary for commuter pass issuing machines that handle various types of information stored in IC cards, such as electronic money, privacy-related information, and confidential corporate data.

Toshiba has now developed a commuter pass issuing machine with a high level of security, featuring a new mechanism that makes it possible to automatically issue commuter passes using a two-dimensional (2D) code to protect it from computer virus infections via the memory device in IC cards. We have also developed an automatic cross-check verification system that improves the accuracy of verification and reduces the verification time based on information such as previous receipts and printed data of commuter passes issued by former issuing machines for comparison.

X-Band Solid-State Weather Radar for Observation of Local Torrential Downpours

KASHIWAGI Shunji / MURANO Takashi / HIRAI Kenichi

With the occurrence of many disasters in recent years caused by anomalous weather events, including local torrential downpours and wind gusts, weather radars have become increasingly important for weather observation.

To capture such phenomena, Toshiba has developed the latest-model X-band solid-state weather radar. Through the application of new technologies such as multiparameter (MP) observation and a solid-state transmitter, the new weather radar achieves high-precision rainfall observation and features small size, light weight, and reduced life-cycle cost. This radar has been installed at the Jubusan Radio Relay Station of the Kinki Regional Development Bureau as the first in-service X-band solid-state weather radar in Japan. By providing useful weather observation data, it can contribute to the realization of a safe and secure society.

Completion of On-Site Tests of Main Equipment for First Stage of 400/220/33 kV Grid Station at ICAD in UAE

ARAKAWA Hideo / TAKASHIMA Chikara

The Abu Dhabi Water & Electricity Authority (ADWEA) has concluded a contract for a 400/220/33 kV grid station at the Industrial City of Abu Dhabi (ICAD) in the United Arab Emirates (UAE) as the 8th full-turnkey (FTK) project awarded to Toshiba. As this grid station is planned to be controlled by two end users, the Abu Dhabi Transmission & Despatch Company (TRANSCO) and the Abu Dhabi Distribution Company (ADDC), we have developed a substation control and monitoring system (SCMS) equipped with functions for interconnection between the end user's SCMSs for the first time.

On-site tests of the main equipment for the first stage of the project, including a 245 kV gas-insulated switchgear (GIS), 220/33 kV-100 MVA transformers, and a 36 kV cubicle GIS (C-GIS), were completed in October 2010.

RD-X10 REGZA Blu-ray™ Recorder Succeeding RD Series DVD Recorders

ARIYOSHI Masaaki / SHIBUTANI Manabu

Since the launch of the RD series DVD recorder equipped with a hard disk drive (HDD) in 2001, Toshiba has continued to release RD series recorders on the market. We have now developed the new REGZA Blu-ray™ recorders equipped with a Blu-ray Disc™ drive. The new models inherit the abundant editing functions of the RD series while adopting a new management system for recording contents according to the Blu-ray Disc™ standard.

The REGZA Blu-ray™ recorder is able to dub contents recorded in the HDD of a REGZA series liquid crystal display (LCD) TV to Blu-ray™ discs via HDMI® cable, and also has a function allowing long-duration recording for 12 times the recording time compared with the direct recording of broadcast contents. Furthermore, the RD-X10, as our flagship RD series recorder, has high-level specifications such as dedicated terminals for HDMI® audio and analog 7.1-channel audio.

D-TR1 Digital High-Definition Tuner Featuring Multiple Functionality and Thin Chassis

AZUMA Daisuke

With the spread of digital terrestrial broadcasting in recent years, many simplified digital tuners have been released on the market. However, there are few digital high-definition (HD) tuners offering digital terrestrial, broadcast satellite (BS), and 110° east longitude communication satellite (CS) broadcast receiving functions.

To meet the demand for digital tuners with high performance, Toshiba has developed the D-TR1 REGZA tuner. Based on our proprietary technologies cultivated through our experience in developing the REGZA liquid crystal display (LCD) TV, the D-TR1 tuner offers high performance and multiple functionality, including HD recording to an external universal serial bus (USB) hard disk drive, as well as a thin chassis design.

Document Readability Diagnostic Technology Focusing on Syntax Characteristics

ZU Guowei / YOSHIMURA Yumiko / KANO Toshiyuki

As business documents are the basic media for sharing and distributing information in corporate activities, correct and efficient transmission of the contents to readers as well as correctness of the contents are required. To meet these requirements, it is necessary to eliminate ambiguities and maintain the quality of business documents to the greatest extent possible.

Toshiba Solutions Corporation has been developing a technology to evaluate the readability of sentences applying syntactic analysis of sentences and to identify unclear sentences that increase the workload of document translation. This technology can be used to support improvements in the quality of a wide range of documents, particularly for pre-editing in human and machine translation.

Frontiers of Research & Development

High-Accuracy Online Writing-Box-Free Handwritten Japanese Character String Recognition Technology