TOSHIBA REVIEW

2011 VOL.66 NO.8

Special Reports 1

Smart Community Solutions Contributing to Reconstruction after Earthquake Disaster

Smart Technologies for Reconstruction of Damaged Communities in Japan
YOKOYAMA Akihiko

Proposal of Potential Measures to Revive Communities after Earthquake Disaster
SHINOHARA Tetsuya / MATSUI Shoko
At 14:46 on March 11, 2011, the Great East Japan Earthquake struck with its epicenter located east of the Oshika Peninsula in Miyagi Prefecture. It was the most powerful earthquake in recorded Japanese history, having a magnitude of 9.0. The tsunami triggered by the earthquake flooded 561 km^2 of land extending from Aomori Prefecture in the Tohoku region of northern Japan to Chiba Prefecture in the Kanto region. The number of people confirmed dead or listed as missing exceeded 20,000 and the number of damaged or destroyed houses totaled more than 170,000, making it the worst postwar disaster in Japan.
With many problems to be overcome, restoration efforts are expected to continue for a long time. The main objective of these efforts is not only to simply return to the pre-earthquake conditions, but also to surpass them and create communities that are intrinsically in harmony with the environment.
Toshiba is contributing to the restoration and reconstruction of the affected areas, making full use of its community solutions based on control technologies and system technologies acquired through the development of social infrastructures.

Smart Grid Technologies for Robust Power Supply Infrastructure against Disaster
TAKAGI Kikuo / TAKEDA Daisuke / IINO Yutaka
Japan's power supply infrastructure systems with their reputation for high supply reliability are currently facing the risk of wide-area blackouts and serious shortages of electricity as a result of the Great East Japan Earthquake. Smart grid technologies, which are being rapidly developed in order to introduce renewable energy sources and improve the efficiency of energy usage, are now also a focus of rising expectations in terms of a new functionality; namely, the achievement of reliable power supply systems that are robust against disasters.
In response to this situation, Toshiba has been engaged in the development of next-generation smart grid technologies based on the μEMS (Micro Energy Management System)—which is an integrated technology utilizing photovoltaic (PV) energy, battery storage systems, and various forms of distributed generation—and technologies for the community energy management system (CEMS).

Smart PV Battery System with Combination of Photovoltaic Power Generation and Battery System
KATAYAMA Kyosuke / SAMEDA Yoshito / HASEGAWA Yoshiaki
Photovoltaic (PV) power generation systems are currently attracting attention as a decentralized form of power supply that is useful during outages of the social energy infrastructure in the event of disasters and so on.
Toshiba is proposing a "smart PV battery system" comprising a PV power generation system and a battery system, which is able to supply stable power regardless of the grid connection. The smart PV battery system features an autonomous control mechanism associated with external conditions such as grid connection of power systems, the weather, and so on. We are making efforts to develop and verify the related technologies in order to realize the smart PV battery system.

HEMS and BEMS Energy Management Solutions to Realize Disaster-Robust Houses and Buildings
YOGO Masashige / NISHIMURA Nobutaka / OGITA Yoshihiro
Huge amounts of energy have been consumed to provide a safe, secure, and comfortable life in Japan. However, now that electricity conservation and blackouts have become a critical issue following the Great East Japan Earthquake of March 11, 2011, there is an urgent need to implement measures for houses, buildings, and facilities against the serious shortage of electricity.
In order to realize a social infrastructure with robustness against disasters as well as a good balance between comfort and energy saving, Toshiba has been developing and providing total energy solutions called the home energy management system (HEMS) and the building energy management system (BEMS). Among the technologies employed by these systems are a technology for effective usage of renewable energies such as photovoltaic (PV) generation, technologies for electricity and thermal storage, and a demand response control technology to regulate power supplies by peak cut and peak shift adjustment.

Modular Data Center Providing Business Continuity Planning Solutions
SATO Kazuhide / HONDA Makoto
Information and communication technologies (ICTs) have become increasingly important in recent years as a platform supporting people's activities through efficient information and knowledge sharing via networks. In the event of problems occurring in an information system, however, serious damage might be caused to the whole of society depending on the circumstances.
Toshiba has developed a modular data center that achieves high durability equivalent to that of a building, realizes cost saving, and can be rapidly constructed. With the combination of a facility solution using the modular data center and an ICT solution, we can offer business continuity planning (BCP) decision-making and disaster recovery (DR) capabilities in order to maintain enterprise continuity when a disaster occurs.

Efforts Aimed at Restoration and Reconstruction of Water Supply and Sewage Facilities Damaged by Great East Japan Earthquake
TOMIZAWA Yukihiko / TAMURA Kunio / TAKATSU Mitsuru
The Great East Japan Earthquake on March 11, 2011, caused widespread damage to water supply and sewage facilities. In particular, the tsunami generated by the earthquake damaged a number of sewage facilities located along the coasts of the affected areas.
In order to restore the lost functions of these damaged water supply and sewage facilities, Toshiba is making full-fledged efforts to examine the sites and provide temporary facilities and equipment for urgent repairs. Through these activities, our aim is to contribute to the restoration and complete reconstruction of the areas affected by the disaster by offering useful solutions.

Special Reports 2

Storage Products for ICT Society

Storage Products as Social Infrastructure for Safe and Comfortable Life
NISHIKORI Hironobu

Trends in Technologies for HDDs, ODDs, and SSDs, and Toshiba's Approach
HATTORI Masakatsu / SUZUKI Hiroshi / SUGAYA Seiichi
Demand for data storage devices has been exponentially increasing with the widespread dissemination of the Internet and cloud computing.
In response to this situation, Toshiba has been developing and supplying all of the main types of storage devices, including hard disk drives (HDDs), optical disc drives (ODDs), and solid-state drives (SSDs) using NAND flash memories. With the ongoing diversification of storage device market needs ranging from personal use to data centers, we are making efforts to accelerate several new technical innovations to meet a wide variety of storage requirements.

2.5-inch Hard Disk Drive with High Recording Density and High Shock Resistance
KUSUMOTO Tatsuharu / TODA Akio
Toshiba has developed the MQ01ABD100 dual-platter 2.5-inch hard disk drive (HDD) with a capacity of 1 TB in a chassis of 9.5 mm in height.

In order to achieve a high mean surface recording density of 1,153 Mbit/mm^2 (744 Gbit/in^2), we have developed the following technologies: a low-density parity check (LDPC) coded modulation technology applying a new read channel architecture, a new write head structure, a smaller track pitch achieved by using a smaller grain size for the medium, and a newly designed mechanism and servo technology to improve the head positioning accuracy. In addition, this model features a newly developed arm, suspension, and base that enhance shock and vibration resistance.

MK4001GRZB Solid-State Drive for Enterprise Use Achieving High Performance and High Reliability
KIUCHI Hidemichi
With the expansion of cloud computing in recent years, there is strong demand for enterprise servers and storage systems with higher performance and lower total cost of ownership (TCO).
In response to these market needs, Toshiba has developed the MK4001GRZB 2.5-inch solid-state drive (SSD) for enterprise use with a capacity of 400 GB and the world's top-class random access speed. The MK4001GRZB is equipped with NAND flash memory devices in order to compensate for existing performance gaps between onboard cache memories and hard disk drives (HDDs) in servers and storage systems. In particular, it incorporates state-of-the-art 32 nm-process single-level cell (SLC) NAND flash memories in consideration of the requirements for higher throughput and a five-year service life for enterprise storage devices. Furthermore, longer life and greater robustness of data integrity are provided by a wear leveling technology and our highly efficient proprietary error correction function.

Self-Encrypting 2.5-inch Hard Disk Drives Equipped with Wiping Technology to Reduce Information Security Risks
YAMAKAWA Teruji / NAKASHIMA Kazuo / ICHIMURA Shotaro
With the increasing volume of data stored in information systems as a result of the expansion of information and communication technology (ICT), safeguarding the security of information systems is now a crucial issue. In response to this situation, the Trusted Computing Group™ (TCG) provides a specification for self-encrypting drives to avoid various security risks including data breaches. The specification defines two functions–pre-boot mode and multi-locking range–which allow users to consolidate self-encrypting drives via a network.
Toshiba has developed a unique technology that invalidates encryption keys and data when a drive is removed from its housing or connected to an unauthorized host system. We have implemented this system in our TCG-standard-based encryption products including self-encrypting 2.5-inch hard disk drives (HDDs).

Next-Generation Optical Disc Technologies
WATABE Kazuo

High-capacity optical discs including CDs, DVDs, and the Blu-ray Disc™ are now widely used as recording media for various purposes, and there is growing demand for a next-generation optical disc in the enterprise market that can store information for long periods and offer enhanced environmental robustness in addition to large-capacity storage. However, as high-density recording utilizing shorter-wavelength light sources such as the blue-violet laser for Blu-ray Disc™ reaches its performance limit, new technologies other than shortening of the wavelength are required for the next-generation optical disc, including multilayer recording, holographic data storage, near-field recording, and so on.
To fulfill these requirements in the enterprise market, Toshiba has developed novel holographic data storage technologies for practical application comprising a temperature compensation technology and a vibration compensation technology for use during the recording process.

Drive Mechanism for Slim DVD Recording Optical Disc Drive Using Value Engineering Method
LEE HyunWoo / KIM HagRyeol / ROH MinShik
The development of products with high cost-competitiveness is required in the mature market for optical disc drives.
Toshiba Samsung Storage Technology Corporation has developed a drive mechanism for the SN-208B slim DVD recording optical disc drive of 12.7 mm in height, providing superior cost performance through the use of the value engineering (VE) method. New mechanical concepts reviewed from the basic structure of the drive mechanism have reduced the number of parts by half while doubling the productivity of mechanical parts compared with conventional products. Noise and vibration characteristics equivalent to or better than those of conventional mechanisms have been achieved despite the simplicity of the mechanism, by developing an aero acoustic noise reduction air flow system (ARAS) and a new damping mechanism.