Hitachi's Supporting Advanced Storage Solutions

In the background of expanding mission critical systems that support global business and the in-house corporate data that continues to increase at an accelerating rate, there is a growing expectation regarding the storage solutions that support protection, management, sharing, and application in the context of large-scale storage. Hitachi, Ltd. has established the original storage solution concept "True North," which combines both hardware and software elements, and is currently proposing three products that will support the realization of this concept: the large-scale disk array subsystem, the storage management software, and Open API (application programming interface).

From left: Senior Engineer Yoshifumi Yamashita of the Storage Software Dept., the Storage Area Network Systems Div.; Senior Engineer Hisao Homma of the Enterprise RAID Software Development Dept. 1, the Development Div. of the Disk Array Systems Div.; Senior Engineer Kenji Mori of the Enterprise RAID Hardware Development Dept., the Disk Array Systems Div.; and Senior Engineer Mitsuru Inoue, from the same Enterprise RAID Hardware Development Dept.

What is "True North"?

True North is a new storage solution concept that combines the world's top class storage with high-quality integrated storage management software to offer "strategic data applications that enable any type of information to be used securely, anytime, by anyone, from any location."

Up until now, the industry has adopted an approach that emphasizes either hardware or software in terms of increasing data availability or reducing TCO (total cost of ownership) through storage consolidation, disaster recovery, and data backup for supporting 24-hour, non-stop business operations. Hitachi, however, has achieved an advanced combination of highly reliable hardware and operation management software that maximizes the performance of that hardware, and has promoted a shift to public APIs and other open environments, in order to provide total storage solutions that respond to the needs of customers seeking to utilize storage in direct connection with their management strategies. True North is the key guiding principle for these activities, and the core products that will be used to achieve these goals are the enterprise disk array series, the storage management software, and Open API.

Features of Hitachi's Enterprise Disk Array Series

In addition to assuring scalability of up to 74 Tbyte with a maximum of 1,024 built-in disk drives, Hitachi's enterprise disk array offers substantially increased internal processing performance based on Hitachi star typed network architecture, an architecture that features network connections via high-speed cross bar switches. In this way, the product achieves the world's highest level of transaction performance and high-speed access, offers scalability to adapt to large-scale storage consolidation in SAN (storage area network) environments, and provides flexible connectivity that can accommodate IP networks and a wide range of other next-generation interfaces. Internal components have been duplicated or otherwise made redundant, enabling 24-hour/day, 365-day/year operations. In addition to core functions that support disaster recovery systems and other functions that have been achieved at the storage control equipment level, the main strengths of Hitachi's enterprise disk array are interconnectivity with other vendors' products, and the ability to respond even in hetero system environments in which differing OSs (operating systems) are operating simultaneously.

Features of Hitachi's Storage Management Software

The storage management software expands the technologies of Hitachi's system management software — which boasts Japan's top share in integrated system operation and management software in the storage management field, and secures maximum performance from Hitachi's disk array series, while at the same time achieving automation, simplification, and optimization of overall SAN system management. By providing an open API based on the industry standard CIM (common interface model), this series strengthens interconnectivity with a wide range of vendor products, thus realizing solutions that effectively utilize customer resources and respond to diverse operation and management needs.

Future Developments

In order to further increase ease of operation for the customer and reduce TCO through large-scale storage consolidation, we will promote even greater scalability and more advanced functions in the enterprise disk array series, fortifying this product as a core network storage component for systems. In terms of the storage management software series as well, we will establish close links with storage and provide storage management functions that will enable greater simplification and even automation of the customers' operation and management functions, enhancing and expanding this product group to provide powerful support for the "True North" concept.

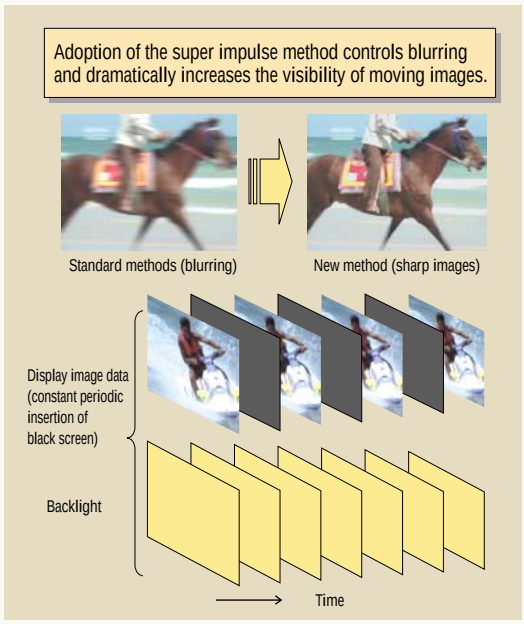
Advanced Super-IPS Type 20V-inch Wide LCD TV

With the popularization of digital high-definition broadcasts and DVDs (digital versatile discs), there has been an increase in needs related to enjoying high-definition videos in personal spaces. Two areas that have received particular attention are thin, large-screen plasma TVs, and LCD TVs which offer exceptionally compact size and low power consumption. Hitachi, Ltd. has developed an "Advanced Super-IPS (in-plane switching)" LCD TV panel that offers high picture quality on a par with CRTs along with superior video display performance, and has introduced a new addition to the lineup of high-definition TVs, releasing a 20V (visual)-inch wide LCD TV that adopts this new panel.

Senior Engineer Masakazu Hamaguchi of Ubiquitous Information Appliance Development Operation, the Internet Systems Platform Div. (right) and Senior Engineer Mutsumi Maehara of the Design Dept., the Large-sized FPD Div. of Hitachi Displays, Ltd. (left).

Background to Development

In recent years, there has been a great increase in the popularity of LCD TVs that not only offer low power consumption, but also enable a broader range of installation variations with more compact sizes and greater portability. At the same time, more viewers want to enjoy digital high-definition broadcasts and the high quality of DVDs on large screens. In terms of these trends, Hitachi has already received an excellent response to its plasma TVs, which are available in sizes ranging from 32V- to 50V-inch. Now, we have developed a 20V-inch WXGA (1,280 x 768 pixels) LCD TV panel that offers excellent video display performance and a wide viewing angle, as well as brightness and color reproduction on a par with conventional CRT screens. This new model has been added to the lineup, to enable viewers to enjoy digital high-definition broadcasts and high-quality DVDs with a display size under 30V-inches, to suit personal living spaces.



New "Super Impulse" technology for increasing video image quality

Dedication to High Picture Quality

Hitachi's LCD desktop PC is already well known for its clear, sharp LCD screen. The Hitachi Group's super TFT (thin film transistor) LCDs are recognized as being the best in their class, adopting Super-IPS, which achieves wide viewing angles, excellent color sharpness, and high contrast. Now, in order to optimize these technologies and know-how for television applications, we have incorporated the Advanced Super-IPS method, which further increases the Super-IPS open area ratio and offers greater brightness. In traditional LCDs, the switching speed for display content was very slow, making blurring a common problem when playing back videos. Hitachi has developed a technology that inserts black coloring based on internal processing each time the display content changes, as well as an original technology that combines DCC (dynamic contrast control), which increases the speed of response to gray levels, and the "Super Impulse method" for inserting black color, thus achieving video display performance approaching that of CRT displays.

We have also incorporated the DIPP (digital image pixel processor), which is a conglomeration of digital image processing technologies that have been adopted in our past high-definition and plasma TVs, enabling users to enjoy not only digital high-definition broadcasts, but also to convert video signals from standard broadcasts PCs, and other sources into appropriate pixel forms, for high-definition viewing pleasure.

Keys to Design

The new model adopts the same sleek design as the series of Hitachi's plasma TVs already on the market, and offers unrestricted position settings, including a "tilt and swivel" function that enables screen adjustments both up and down and left to right. The LCD panel has also been treated with a "glare processing" that adds sheen to the video display for even more beautiful images. Aside from its practicality, this feature adds a distinctive accent to the overall design.

Future Developments

In addition to the current 20V-inch model, we plan to expand the lineup of LCD panels with a range of supplementary sizes, to offer the enjoyment of plasma and LCD TVs to an even broader range of customers.

New DUV Optical Wafer Inspection System Supporting Next-generation Semiconductor Device Fabrication

As semiconductor feature sizes descend into the deep submicrometer range, wafer inspection equipment must not only be able to detect defects with enormous sensitivity, such systems must also provide fast processing throughput, better efficiency, and capability to accommodate new materials. To meet these requirements, Hitachi High-Technologies Corporation and Tokyo Seimitsu Co., Ltd. joined forces in the development of HA-3000, an advanced deep-ultraviolet (DUV) optical wafer inspection tool. The HA-3000 system is fully capable of supporting 90 nm and finer dimension fab processes, the typical feature size of next-generation semiconductor devices.

Key people involved in the development of HA-3000: Atsushi Shiozaki, General Manager of Product Development (right rear) and Yasutsugu Usami, Senior Engineer (left rear) who work in the Semiconductor Process Control Systems Sales Div., Hitachi High-Technologies Corporation, Tadashi Suzuki, Senior Engineer (right front) and Takayuki Ono, Senior Engineer (left front) affiliated with the Electronics Systems Design Dept. 1 of Hitachi High-Technologies Corporation. In the foreground are the objective lens (right) and camera (left) of the HA-3000 system that provide a window on the nanometer-scale realm.

DUV Optical Wafer Inspection System: the Development Background

Semiconductor device geometries are shrinking at a phenomenal rate, and it will not be long before we enter mass production of devices for the 90 nm node. However, this raises an urgent need for new wafer inspection equipment because the light sources of available inspection systems are incapable of resolving feature patterns so small. This situation and the desire to not delay the timely development of next-generation devices led Tokyo Seimitsu and Hitachi High-Technologies to leverage their complementary technological strengths and work together on this project. As long-time rivals there was some initial question as to which technology to employ, but this was quickly ironed out as the project got under way based on the overriding goal of satisfying our customers.

HA-3000 Features

HA-3000 is the first implementation of an inspection system that employs DUV laser light. By using DUV light with its short wavelength, resolution is markedly enhanced thus permitting the detection of minute defects that until now would be overlooked. A problem with such high resolution is that it fails to differentiate fatal defects from nuisance defects that don't affect device performance. To address this issue, a real-time defect classification (RDC) function was added to screen out the nuisance defects, and thus realize a system that accurately identifies just the fatal defects. The urgent need to increase inspection speed has emerged as wafers have increased in size. The HA-3000 features a newly developed high-speed image processing module that speeds up the inspection processing four times faster than conventional systems, and indeed has set a new world surface inspection speed record. A host of other challenges stood in the way—development of an optical system that could fully exploit the power of laser light, technology to suppress vibrations of the inspection stage to improve accuracy, and more—but all were resolved in the final implementation of the HA-3000 inspection system.

HA-3000 co-developed by Tokyo Seimitsu Co., Ltd. and Hitachi High-Technologies Corp.

Future Prospects

Our achievement through this collaborative effort has been highly significant, for it enabled us to seize the initiative in developing the first DUV optical system-based inspection system, and the fact that the HA-3000 has already been shipped to some of the world's most advanced semiconductor device manufactories reveals that we have opened up a new area of inspection system growth. One thing is certain: once 90 nm and finer node processing enters production, the market for DUV optical system-based inspection equipment will grow very rapidly. Yet we are not content to just remain satisfied with what we have accomplished so far. We plan to continue to enhance the functionality and upgrade the HA-3000 system to meet the specific needs of our customers. Through this and other means we will continue to promote the fabrication of highest quality semiconductor devices that support the ubiquitous information society that is now unfolding.

DVD Camcorders: Easy to Use, Exceptional Picture Quality, and Only Half the Size of Earlier Models

DVD camcorders have significant advantages over tape type camcorders — they eliminate the danger of overwriting errors and let you jump right to the sequences you want to see without rewinding — but they have tended to be bigger and bulkier than the camcorders using cassette tapes. Now Hitachi, Ltd. has developed the DZ-MV350, a lightweight and compact DVD camcorder that provides exceptional picture quality, is novice-friendly, and is only about half the size of previous models*.

Members of Hitachi's Camera Group of the Digital Recorder Engineering Dept. in the Digital Media Div.: Eiji Moro, Senior Engineer (left front), Kazunori Uemura, Engineer (rear), and Koji Mori, Engineer (right front).

Appeal of DVD Camcorders

A major advantage of the DVD over tape type camcorders is the simplicity of shooting and playing back pictures. Even a total novice can record and take shots without having to worry about overwriting earlier pictures. You can also locate the scene you want to view from a summary view screen, and play it immediately without rewinding or fast-forwarding. The ability to record video sequences and still images on the same DVD-RAM disk also makes the storage and management of your pictures much more convenient.

New Model's Features

The past image of DVD camcorders as big and unwieldy now must be completely revised with the appearance of a whole new generation of slim, compact, and lightweight DVD camcorders. The new model has been scaled down by about 50% in volume and 30% in mass compared to the previous DZ-MV250 camcorder by phasing out the old square 8-cm DVD disk cartridges in favor of the new round holder type media, by developing a new slim and compact DVD camcorder drive, and by achieving new levels of chip integration to reduce the number of parts.

A Universe of Possibilities

People can now easily process and edit their videos and pictures right on their own home computers, and content can be passed back and forth between DVD camcorder and PC at very high speed over a USB2.0 high-speed mode connection. All the things that people want to do with their pictures—storing images on an SD (secure digital) memory card, copying content to a compatible TV or PC, making prints on a compatible printer—can now be done easier and more conveniently than ever before.

The new DZ-MV350 series also includes the single-chip MPEG2/JPEG codec DVD camcorder engine implementing Hitachi's renowned digital image processing technology. The new DVD camcorder engine produces far better picture quality than earlier DVD camcorder models, and this enhances peoples' enjoyment in shooting and editing and playing back their movies and pictures.

Future Development

Following the DZ-MV350 series, the next model in Hitachi's DVD-RAM/-R camcorder lineup is the DZ-MV380. Already slated for release, the DZ-MV380 features a 1.02M-pixel CCD (charge coupled device) sensor versus 680 thousand pixels for the DZ-MV350. This year should also see a critical transition from magnetic tape cassettes to DVDs as the primary recording medium for camcorders. To propel the DVD camcorder market toward a full-blown mass phenomenon, Hitachi will continue in its steadfast commitment to the development of products having a real impact and market opening initiatives.

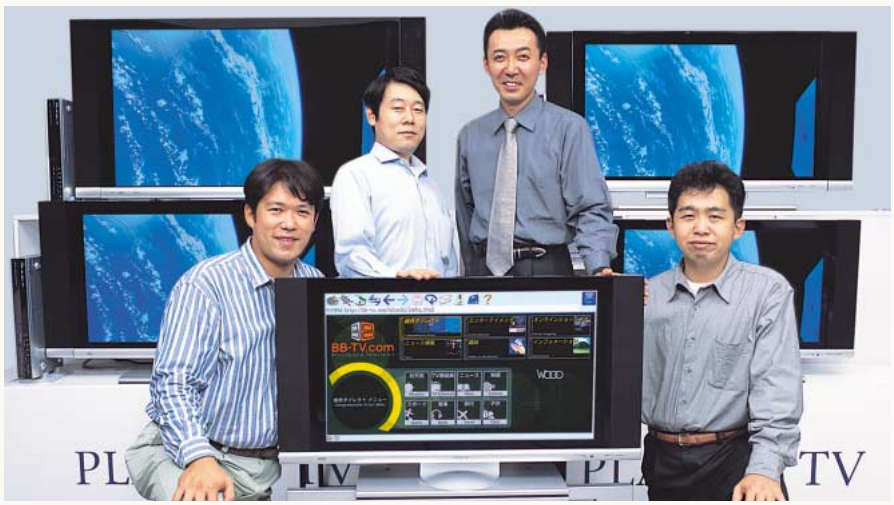
* Compared with Hitachi's previous DVD-RAM/-R DZ-MV-250 series.

DZ-MV350 DZ-MV380

Newly developed DVD camcorders

High-definition Plasma Television: Evolution of an Extended Lineup and Even Higher Picture Quality

Since its launch in 2001, Hitachi's lineup of plasma televisions has taken a leading role in the market. Moreover, with the introduction of the new ALIS (alternating lighting of surfaces) and DIPP (digital image pixel processor) technologies in 2002, even better picture quality has become available in Japan. In response to the demand of consumer environments, consumers can now choose from an expanded lineup of ten models in four different sizes; accordingly, they are rapidly acknowledging plasma TVs as a familiar household product.



From the left: Engineer Hiroshi Aoki of Flat Panel Display Design Section, the Broadband Devices Div.; Engineer Takahiro Tatsumi of Structural Design Section, the Broadband Devices Div.; Specialist Designer Takashi Yamamoto of No. 2 Product Design Section, the Design Div.; and Engineer Haruki Takata of Image Media Design Section, the Broadband Devices Div.

Features of Extended Lineup

The new lineup on Japanese market offers four screen sizes—32, 37, 42, and 50 inches—and is based around an audio-visual control (AVC) center that provides three kinds of multimedia through (1) a built-in UHF/VHF tuner, (2) a BS/CS (broadcast satellite/communication satellite) digital tuner, and (3) an Internet-browsing function. These three multimedia features (note that the 50-inch model supports one medium only) combined with the ten models available allow users to customize their selected model to meet their individual demands. Furthermore, in line with the anticipated broadband era, as well as Internet-browsing, an e-mail function is available. This means that since it simply takes one touch of a button to switch to the Internet screen, the whole family can effortlessly enjoy Internet entertainment.

Technologies for High Picture Quality

The new lineup is centered on the concept of "dynamic" picture quality—in other words, the fusion of the latest cutting-edge technologies to produce the highest quality pictures. One of these newly developed technologies, the ALIS display method, produces dynamic images that express fine detail at a high resolution of 1,050,000 pixels (37- and 42-inch models) and that boast industry-best levels of brightness and contrast.

Another newly developed technology—called a digital image pixel processor—makes use of the latest digital image-processing techniques to maximize the performance of the plasma display. The digital image pixel processor performs high-speed, high-density processing on a standard television signal and creates images with fine picture quality near that of high-definition television. At the same time, it performs a function called "dynamic contrast" that can render contrast sensitivity even in, for example, dimly lit scenes in a movie. Moreover, by means of a color-correction technique called "digital color management," specified colors such as deep blues can be independently controlled so that even more realistic color sensation can be reproduced. On top of that, a multi-band-pass (MBP) filter is fitted on the front of the plasma display in order to maximize the screen brightness and guarantee solid, fresh-looking black reproduction.

Design Concept

The design concept is achieved through a simple, high-grade "black-on-metal" frame. In particular, the highly textured finish to the black frame gives the lineup a high-class look.

In addition, the angle of the plasma screen can be remotely adjusted, creating the first so-called "remote screen swivel" setup on the market. The 32-, 37-, and 42-inch models can be adjusted electrically in 30-degree steps on both sides; however, for safety reasons, while the screen is in motion, if it happens to be touched, it will automatically stop its movement.

These plasma televisions are extremely thin, so they do not have to be put in the spaces conventionally chosen for TVs; they can be hung on walls instead and relocated with ease. In regards to the rack and stand, an abundant range of options to match particular interior settings is available.

It is thanks to the above-described superior functions that the lineup of plasma televisions has won Japan's "Good Design Award" for the last two years.

Future Developments

As well as further enhancing the picture quality and definition of the plasma displays, Hitachi is striving to broaden the range of functions provided by the AVC (audio visual controller) center so that users can enjoy customizing their setups by hand. Hitachi's goal is to position the plasma television as a window for accessing the multimedia world, playing the role of a "home network server," centrally managing the digital content of various types of media.

Furthermore, as plasma displays continue to be recognized as animated advertising boards, the demand for them in institutional applications continues to grow. Focusing on this demand, Hitachi is aiming to keep the largest share of the world market.

Compact DNA Analysis System for "Tailor-made Medicine"

One problem that has arisen along with the development of various types of drugs is that their effectiveness and side effects differ from one person to the next. One solution to this problem is "tailor-made medicine" that could provide optimal medical treatment for individuals. In July 2002, Hitachi, Ltd. announced the development of a compact DNA analysis system as a major step toward realizing this goal.

Aim of Development

The Human Genome Project to decipher all human DNA (deoxyribonucleic acid) information has been completed, and genome research has now shifted to understanding the functions of genes and applying the genome information to the diagnosis and medical treatment. Against this background, Hitachi has developed a compact, highly sensitive DNA analysis system that enables simple and easy typing of single nucleotide polymorphisms (SNPs) in DNA base sequences. This system, which was performed as part of a research and development project supported by New Energy and Industrial Technology Development Organization (NEDO) in Japan, can determine the presence of SNPs within tens of seconds by simply adding a reagent to a sample solution. In addition, the small size of the equipment making up the system (it can practically fit in the palm of your hand) makes it easy to carry around and therefore ideal for on-site medical treatment and other on-site applications.

When administering a drug, its effects and side effects depend on the constitution of the individual in question and the disease itself. In this regard, SNPs play a role in the formation of an individual's constitution. If SNPs could be typed in an easy manner, it then becomes possible to provide optimal medical treatment for an individual. Achieving such "tailor-made medicine," however, required the development of a simple and compact system which could be used at various locations as opposed to the large, complicated and expensive equipment used in the past. Further, a simple and compact system could also be applied not only to on-site medical treatment but also to on-site food and environmental inspections.

Senior Researchers, Masao Kamahori (left) and Kunio Harada (right) of the Biosystems Research Dept., Central Research Laboratory

What Kind of Technology Is Used?

The simple measurement system was realized by adopting a bioluminescence technique. When double-stranded DNA formation takes place by adding a reagent (combining a DNA probe and drug) to a sample solution including SNPs, inorganic pyrophosphates are released and bioluminescence occurs. This luminescence is the same as that produced by a firefly. The SNPs typing can be easily carried out by detecting this light with an optical sensor. One major advantage of adopting a bioluminescence assay is that laser irradiation equipment as used in the past becomes unnecessary. In addition, the use of microfluidic technology enables the reagent solution of less than 0.1 µL to be easily handled also contributing to a smaller equipment. Further, while it is common to use a photomultiplier tube (used even by the Super-Kamiokande detector) for measuring minute amounts of light, the developed system employs integrated optical sensor technology that can capture the light emitted from the reaction at a high focusing efficiency of 7% using a simple optical system.

How Was the High Accuracy Achieved?

The system uses a DNA probe structure with an artificial-mismatch primer (a mismatch base is introduced at the third position from the terminus). This greatly reduces background noise due to mismatch extension that occurred in the past even in the case of a base-sequence mismatch. As a result, highly sensitive detection of more than two orders of magnitude compared with previous bioluminescence method has been achieved.

Future Developments

The most difficult task in this development was downsizing the equipment. In general, a compact configuration and high sensitivity are not compatible. We nevertheless aimed for a compact unit that could almost be set on the palm of your hand as we wanted to develop a device that could be used just about anywhere. In the future, as clinical research continues to progress, we feel that the system described here will make a great contribution to clarifying data on genetic background and disease and differences in the effects and side effects of drugs.