"ShadeQuest" INTEGRATED IMAGE INFORMATION SYSTEM

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In recent years, along with the progress in digitization of medical images, PACS has spread primarily in the radiology department, and this has encouraged filmless data management in medical institutions. Furthermore, an expansion of medical image digitization out of the radiology department such as laboratory and clinical departments facilitates the availability of digitized images in surgery and research departments as well as in hospital wards. This has lead to an issue of managing and utilizing the enormous volume of image data that is generated.

The "ShadeQuest" integrated image information system, which comprehensively manages image data generated in the medical institution, allows referring image data quickly and certainly, while ensuring storage security, data centralization and consolidation. The "ShadeQuest" contributes to improvement in patient services and medical service quality through speed-up in diagnoses and work efficiency advancement.

INTRODUCTION

In recent years, the number of images generated in hospitals has been increasing substantially. Such images include not only examination images generated in radiology departments, but also those generated in laboratory, clinical, and other departments. In many hospitals, each department manages its own image information in its own information system which leads to many problems. For example, to refer examination images from different departments, system connection and coordination is required. In addition, when delivering images to clinical departments and hospital wards, system integration must cover all departments.

Our integrated image information system, the "ShadeQuest", manages various types of images in a integrated form, also provides an environment where images can be utilized quickly and comfortably without departmental gaps. In addition, the system achieves sharing of image information —which is significant clinical information on patients —and offers solutions to the aforementioned problems. Figure 1 shows an outline of the ShadeQuest.

FEATURES REQUIRED OF INTEGRATED IMAGE INFORMATION SYSTEMS

Integrated image information systems are required to deliver the following features:

(1) Image information for radiology departments, as well as for endoscopies, ultrasounds, physiological examinations, and other purposes, can be managed in an integrated manner. Large quantities of image information can be stored reliably in an electronic form.

(2) Image information can be referred without department gaps.

(3) Image information can be sent quickly to any place at any time at high speeds.

(4) System coordination with EPR system and user operability is fully addressed.

(5) Security and personal information protection are addressed.

(6) Inheritance from and integration with existing systems are addressed.
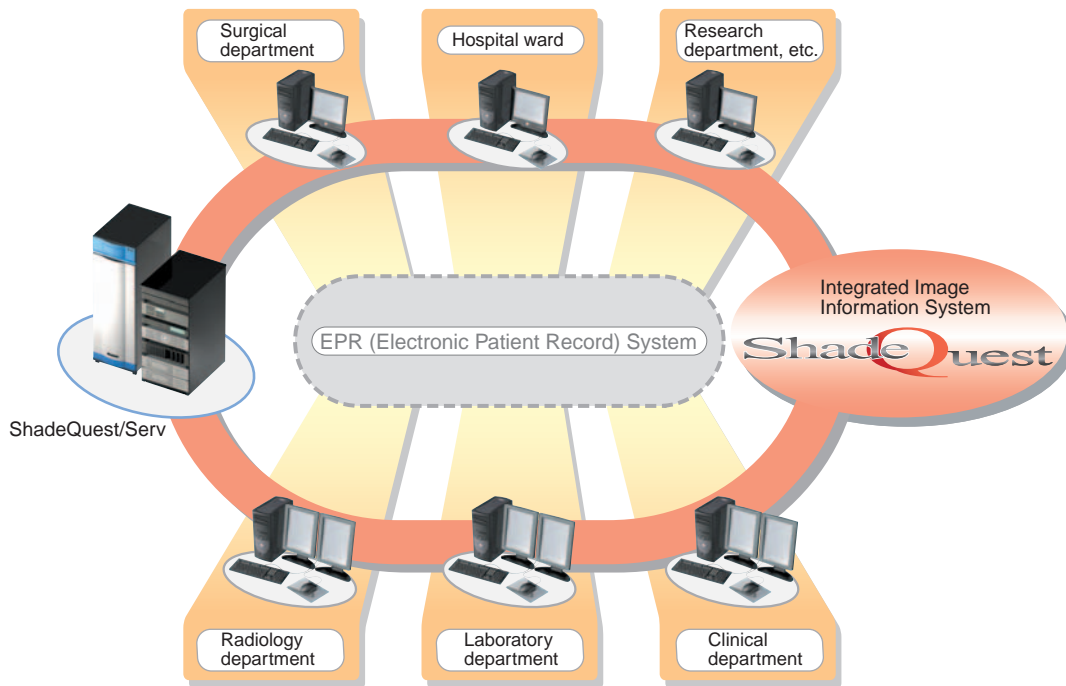
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Figure 1 Outline of Integrated Image Information System "ShadeQuest"

"ShadeQuest" SYSTEM CONFIGURATION

The ShadeQuest consists of independent components such as image storage, diagnoses, and report entry, which highly colligate and coordinate together, providing convenient speed, operability and information management environment. Figure 2 depicts a system configuration of the ShadeQuest.

• Integrated Image Information server: ShadeQuest/Serv

This integrated server consists of a database server, an image management server, a Digital Imaging and Communications in Medicine (DICOM) interface server, an electronic data storage server, a Web server, and a Storage Area Network (SAN). With function distribution and interaction performance, the ShadeQuest has achieved a high performance, high capacity, and high reliability image management. In addition, not only being compliant with DICOM communication, an international standard, also employing the Yokogawa Image Transfer Logic (YITL), Yokogawa's high-speed image transfer technology, this has enabled high speed image transmission and display.

Furthermore, ShadeQuest/Serv with its image modify history management and image management function considering authenticity, viewability and conservability, optimum storage device selection, and network spoofing prevention, fully supports electronic data storage.

• Viewer for Image Diagnosis: ShadeQuest/ViewR

High speed image display from ShadeQuest/Serv and configurating display and search settings per user, ShadeQuest/ViewR addresses operability for diagnosis. In addition, it operates in coordination with Maximum Intensity Projection (MIP) functions, Multi-Planar Reconstruction (MPR) functions, and other vendors 3-D functions.

Furthermore, ShadeQuest/ViewR fully supports multi-display settings on high-resolution grayscale and color monitors.

• Findings Report Entry System: ShadeQuest/Report

This system interoperates with ShadeQuest/ViewR for image display, report calling, and key image attachment. Other functions of this system include auxiliary input assist functions (voice/sound entry, templates, etc.), past report history management, bookmark functions (teaching files, significant cases, etc.), and a Web-based report distribution function.

Acquiring order information and examination performance information from the Hospital Information System (HIS) and the Radiology Information System (RIS), displaying required information for diagnosis on the report entry screen, the ShadeQuest/Report strongly supports paperless workflow.

• Clinical Viewer: ShadeQuest/ViewC

Utilizing web technology, ShadeQuest/ViewC has enabled image reference from any place in the hospital. Each user can configure initial display settings such as showing only key images or all DICOM images. Furthermore, allowing image display from order numbers, ViewC supports close coordination with the EPR system.

FEATURES OF THE ShadeQuest

The ShadeQuest has the following features:

• Personal Information Protection

Strict management and restrictions on use are needed for patient and examination information which is regarded as personal information. The ShadeQuest has functions that are essential for personal information protection, such as user management, authorization, activity record keeping, and encrypted
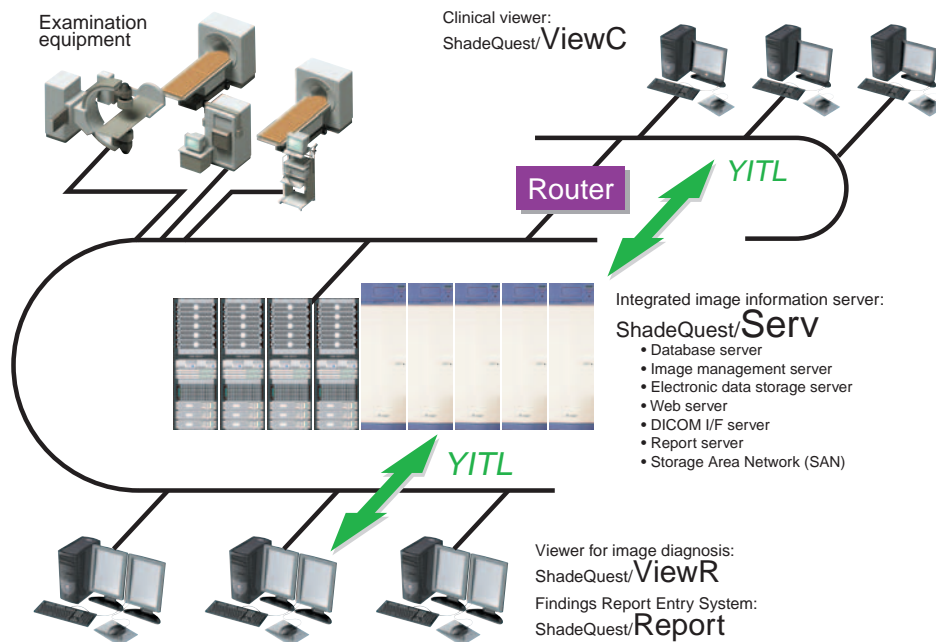
Figure 2 System Configuration of ShadeQuest

communication. These functions prevent the use of information for unauthorized purposes and perform safety management.

• Electronic Data Storage

Considering authenticity, viewability, and conservability of image information, managing image modify history, selecting optimum device (DVD, LTO etc.) for data storage, preventing network spoofing, the ShadeQuest fully supports electronic data storage.

• Compliance with Consistent Presentation of Images (CPI)

Images displayed on monitors should always be in the diagnosed condition. Recording image display and grayscale condition at diagnosis, the ShadeQuest supports image display consistency and is compliant with the Consistent Presentation of Images (CPI) proposed by the Integrating the Healthcare Enterprise (IHE). Furthermore, the Grayscale Softcopy Presentation State (GSPS) function reconstructs image display and grayscale information for image display consistency when the referred afterwards.

• Large Storage Capacity, High Speed

The employment of the Storage Area Network (SAN) and an effective image compression technology has enabled safe storage of examination images in large quantity, concurrently keeping images in a high-speed transferable state. Moreover, the ShadeQuest employs the Yokogawa Image Transfer Logic (YITL) realized by Yokogawa's information technology, which provides high-speed image transfer and display.

• Redundant Design

The database, network, power supply, and other components of the system, as well as the system as a whole, can be configured dual-redundant according to the operation and scale of the system. This design, enables immediate recovery at problem event occurrences.

• Flexible System Configuration

The optimum image management system can be designed according to the volume and storage duration of examination images. A flexible system configuration allows step-by-step expansion until filmlessness workflow is fully achieved.

• Integration with Other Systems (Figure 3)

This system integrates existing systems (e.g. our DICOM image servers, ImageARQS-V and ImageARQS-VP) and inherits past image data.

①When mounted with the ShadeQuest/Serv emulator, the existing systems, Image ARQS-V and Image ARQS-VP, demonstrate the same level of performance as that of ShadeQuest/Serv. For example, they can perform high-speed communications with ViewR and ViewC using the YITL. Also, ShadeQuest/ViewR and ShadeQuest/ViewC can display image data from existing systems with the ShadeQuest/Serv emulator as they do from ShadeQuest/Serv.

②Databases of ImageARQS-V and ImageARQS-VP can be integrated, so these data with images can be searched and displayed.

③The DVD-changer, etc., of ImageARQS-V or ImageARQS-VP can be connected to ShadeQuest/Serv to enable the inheritance of past image data.

• System Operation Support

We offer various service solutions as system operation support, ranging from system startup support to post-startup maintenance support.

①Support for the formulation of system operation rules regarding filmlessness, electronic data storage, personal information protection, etc.

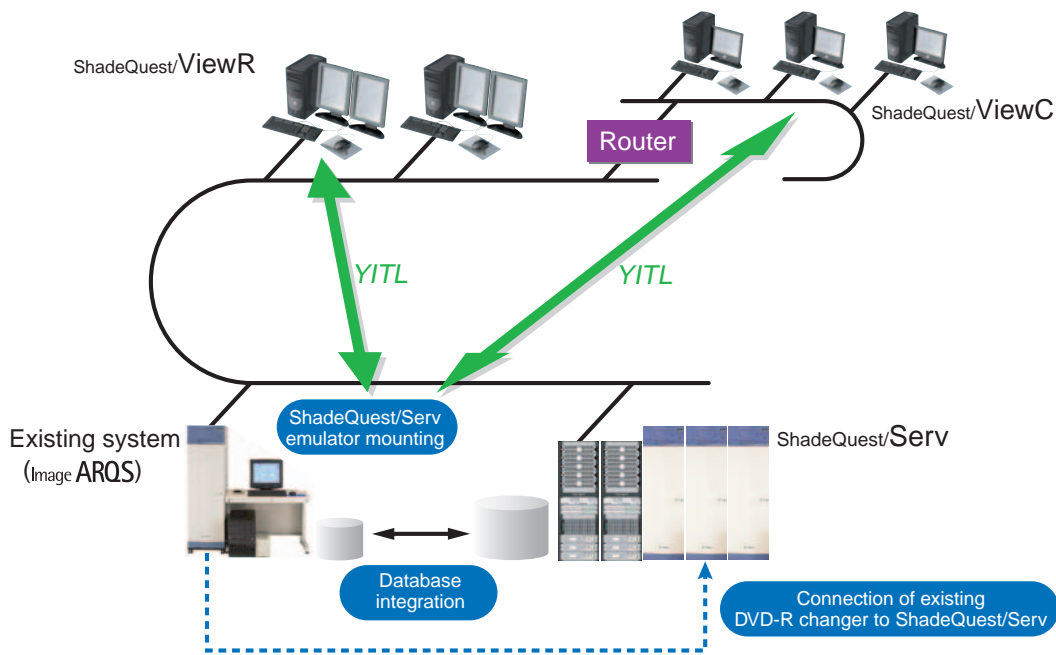②Comprehensive support consisting of system maintenance support for determining system failure, and hardware

Figure 3 Integration with Existing System

maintenance for hardware component repair.

③ System failure response by the response center which operat round the clock three hundred and sixty-five days a year.

④ Remote maintenance service via the network for system failure response, preventive maintenance, software updating, and the like.

⑤ Vendors designate different support durations for their hardware products. Gradual expansion and update or system replacement are proposed to the client through system maintenance support in accordance with the service expiry date of hardware components.

CONCLUSION

The ShadeQuest has been developed as an integrated image information system that goes beyond the bounds of Picture Archiving and Communication Systems (PACS) and several hospitals have introduced the ShadeQuest thus far. Compliance with standard formats, including the DICOM and the Health Level Seven (HL7), was promptly adapted, and to strengthen multi-vendor system correspondence, we will proactively examine compliance with integration profiles of the IHE, such as the Scheduled Workflow, Patient Information Reconciliation (PIR), and CPI.

In hospitals, there are various information other than examination images, such as examination reports for radiology, endoscopy, ultrasound and pathology or electrocardiograms and ultrasound motion pictures. These information need to be shared not only inside the hospital, but also among regional hospitals, and integrating these information in a comprehensive state is required. We have developed the NEXTAS, an integrated information system to achieve information organization both inside and outside the hospital, and together with the ShadeQuest, we will offer "Integrated Clinical Information System" in the days ahead.

We hope our endeavors will contribute to medical information sharing, and as a result, improve the efficiency in medical administrative work and advance the quality of medical treatments and services.　　　　　　　　　　　　　　◆

REFERENCES

(1) Yoshimura Hitoshi, "Run through the IHE Technical Framework", Journal of Radiological Technology, Japanese Society of Radiological Technology, Vol. 58, No. 10, 2002, pp. 1303-1310

(2) Kihara Hiroyuki, Harashima Shigeo, Kimura Makoto, Otsuki Akira, "DICOM Image Server ImageARQS", Yokogawa Giho, Vol. 44, No. 3, 2000, pp. 131-134