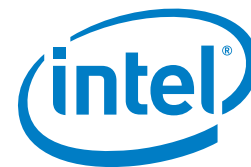


## CASE STUDY

Intel® Xeon® Processor 7500 Series

Healthcare

High-Performance Computing



# Taichung Veterans General Hospital Deploys Servers Based on Intel® Xeon® Processors in Place of Mainframe Computers

Intel Xeon processor 7500 series revolutionizes x86 servers, giving them a high level of stability and reliability, and making them an efficient replacement for the hospital's dated mainframe system



Established in 1982, **Taichung Veterans General Hospital (TVGH)** is a 1,500-bed hospital managed by the Training Center of Veterans Affairs Commission serving both Taiwanese veterans and the public. In 1991 it was accredited as a medical center and a first-class teaching hospital.

As a public medical center, TVGH offers safe, high-quality medical services with its advanced utilities, training programs, and outstanding research and development programs. TVGH is powered by 3,000 employees, serving 6,000 outpatients, 130 inpatients and 180 patients in the emergency room daily, totaling to an average of 1.5 million patients per year.

"TVGH chose to deploy the new system on servers based on the Intel® Xeon® processor E7 family because its multiple cores deliver the high performance we require in our applications. It also supports the use of high-capacity memory chips. The application systems used in the outpatient clinic demand these features. More importantly, servers based on the Intel Xeon processors E7 family also provide enhanced RAS capabilities."

Yang Qingwen  
Information Center Director  
Taichung Veterans General Hospital

## CHALLENGES

- **Boost the performance of the hospital's computer system.** The growing number of patients demand new applications and faster response times. Mainframe computers are insufficient to deliver the performance these additions require.
- **Upgrade the information system.** Most educational institutions have moved away from courses that equip students with the skills to operate and maintain mainframe systems.

## SOLUTION

- **Deploy multiple x86 servers powered by Intel Xeon processors.** Use x86 servers to ensure significant increase in reliability and the advanced capability of Intel Xeon processors 7500 series to modernize the hospital's outpatient system.

## Introduction

When Taichung Veterans General Hospital (TVGH) was founded, only a handful of large public hospitals in the north ran on information systems. Thus, the information system deployed at TVGH was closely modeled after systems used by the hospitals up north. In those days, there were not many types of information systems to choose from. Deploying a mainframe platform was the norm, which is why TVGH has always used a mainframe platform for its outpatient system. But through the years, the hospital has become one of the country's leading healthcare institutions. More and more outpatients sought treatment, averaging 1.5 million outpatients a year. To keep up with this high volume of outpatients, the hospital needs a computer system that can deliver fast response times. Mainframe computers are just not equipped to deliver the performance in demand.

## Exploring beyond mainframe

With the advent of advanced technology, computing in the medical field acquired new dimensions. It has become more dynamic, with patient records containing images and multimedia elements. Speed has also become vital, making the need to efficiently multitask a prerequisite for computer systems. These advances demand a higher hardware performance level, which led to TVGH's need to upgrade their computer system.

Yang Qingwen, information center director of TVGH, explains how today's needs make mainframe computers insufficient for their operations: "Mainframe computers are less able to deliver the performance required by new applications. It is inadequate when it comes to supporting multimedia applications, and is slower in computing compared to newer systems."

"There are four main problems with the mainframes deployed at TVGH," he explained, "including the high cost of maintenance, underperforming hardware, limitations of text-based interface for end-users, and the shortage of qualified technical support staff. In addition, mainframe computers differ from typical x86 servers and regular PCs where the cost of the operating system is based on the system's capacity or the CPU utilization rate. Mainframes typically incur annual licensing fees in addition to high upfront costs."

These days, doctors rely on computers during consultations to view reports of prior examinations, check for possible drug interactions, or verify a patient's health insurance coverage, among other tasks. Running these functions simultaneously, and cross-referencing from multiple sources, requires significant processing power. The costs associated with achieving that level of performance using mainframe computers are exorbitant.

Also, systems that run on mainframe computers are limited to using a text-based interface, which makes them inadequate for the new form of patient records. Furthermore, the shortage of manpower in this field is a perplexing problem for organizations still running on mainframe systems.



## Intel Xeon processor 7500 series boosts x86 servers, enabling Taichung Veterans General Hospital to modernize its outpatient system—gearing it up for new applications and faster response

### Revolutionizing the system to achieve more

The Information Centre team, composed of 50 members responsible for maintaining all of TVGH's software and hardware, planned to revamp the outpatient systems two years ago. They evaluated the total cost of ownership for the new system and, after their analysis, believed they would be able to obtain a higher level of performance if they deployed x86 servers which have more performance capabilities than mainframe computers.

While mainframe computers are generally considered more reliable, the team reasoned that by deploying multiple x86 servers in a cluster, they would be able to implement a level of redundancy that ensures a significant increase in the reliability of the system. Furthermore, the upfront cost of x86 server hardware is not prohibitive, and there is a much larger pool of support and technical staff to choose from in the marketplace. The team also noted that current end-user terminals already possess reasonable computing power. Therefore, by using x86 servers and end-user PCs in a client-server configuration, they would be able to achieve the performance level the outpatient clinic system required. It would also enable them to switch to using more intuitive graphical user interfaces.

Once the plans for migration were finalized, the team began to port many of the programs used at the outpatient clinic over to the new system. At the same time, they began to develop new routines. Due to the availability of x86 systems, no prior purchase was required for the team to begin their development work. They were able to simply test the new software on generic PCs.

Although the ultimate goal for the Information Centre team is to move away from mainframe computers entirely, they took into consideration the large number of applications currently hosted on the mainframe and decided that a phased migration onto a new platform was a safer way to go. They expected issues as a result of the migration. And since they could not afford any service disruptions that might affect the hospital's operations and, consequently, its reputation,

they decided that migrating systems used by each department in succession would ensure smoother implementation. A phased implementation would also enable them to learn from issues that arise from running the systems in production and allow them to make enhancements before bringing more applications online. Furthermore, the Information Centre was able to collect feedback on the user experience based on the modules that were in production.

### Modernizing the system

In October 2010, the new x86 servers came online at TVGH. Due to the phased approach of the migration, the outpatient systems came online without causing any major disruptions to the hospital's operations.

The initial purchase for an evaluation platform included four servers based on Intel Xeon processors 7550. Once the team migrated and tested the outpatient clinic system successfully, they determined that the systems used by the rest of the hospital needed to have a high level of interoperability, be able to perform standards-based conditional operations, and be highly reliable.

Having run on the x86 platform in production, TVGH procured 14 more blades of two-way servers during the second quarter of 2011. Each two-way blade is powered by Intel processors E7 family. The team deployed the new system on servers based on Intel Xeon processors E7 family because its multiple cores deliver the high performance required by their applications, and because it supports the use of high-capacity memory chips. These application systems used in the outpatient clinic demand these features. More importantly, servers based on Intel Xeon processor E7 family also provide enhanced reliability, availability and serviceability (RAS) capabilities.

The RAS capabilities of the servers were pivotal in TVGH's selection of the Intel® platform for this implementation. Mainframes are known for their stability and reliability, while typical x86 servers are unable to match the level of stability and reliability associated with mainframes. The RAS capabilities built into servers based on Intel Xeon processors

E7 family provide many failover mechanisms for both software and hardware. By deploying the server in a cluster, whenever a fault occurs in any single server component, the other servers take over quickly to prevent service disruptions. This greatly increases the stability and reliability of the system, enabling it to replace mainframe systems successfully. It is this high level of stability and reliability that ensures smooth operations at the outpatient clinics, eliminating concerns and systems issues that might interrupt daily operations at TVGH.

### Moving ahead with greater performance

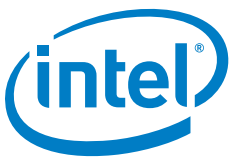
Since the deployment of the new system, TVGH has successfully run the outpatient clinic system. The team is yet to perform system benchmarks, but users have attested to the benefits of the migration. Despite exacting demands from the medical staff, the system has been able to meet their expectations and is deemed a success in its support for a large, public hospital.

The new graphical user interface, supported by high-performance server hardware, provides doctors convenience in their consultations. They use it to review patients' test results, check the coverage of their health insurance, or look up drug interactions. The system never fails to deliver prompt responses, including cautionary messages, making the system an invaluable tool for doctors and other medical staff.

Now that the outpatient clinic system is online using an x86 server platform, TVGH can be confident that this platform will be able to take the place of its mainframe systems and deliver all the functionalities required by the hospital's users. With this upgrade, TVGH will be able to provide quality healthcare to more Taiwanese and continue their journey to becoming a leading healthcare provider in the country.

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