

Case Study

Quad-core Intel® Xeon®
Processors and Intel®
Modular Servers

Health Care

Safe Data Repository for Researchers

The Clinic for Nuclear Medicine at the Universitätsklinikum Würzburg, Germany, uses an Intel® Modular Server for reconstructing images from data captured by its high-resolution μ PET (positron emission tomography) device, and as a safe data repository.

The Clinic for Nuclear Medicine at the Universitätsklinikum Würzburg, Germany, uses low emission, radioactive materials for the analysis, diagnosis and treatment of thyroid illnesses or tumours.

The technology the clinic relies on is known as positron emission tomography (PET), an approach that visualises biochemical processes such as human metabolism. The medical researchers use a special high-resolution μ PET device for their studies. As each case generates several hundred MB of data, the clinic needs a safe, high-capacity data repository. An Intel® Modular Server based on Intel® Multi-Flex technology fits the bill perfectly. At the same time, this compact system has a second blade which is used as an evaluation system for fast image data reconstruction.

„Thanks to the Intel Modular Server we now have a safe data repository with terabyte range storage capacity. On top of this we have faster access to data archives.“

Dr. Michael Lemke,
Head Physicist,
Clinic for Nuclear Medicine, at the
Universitätsklinikum Würzburg,
Germany

Challenge

- **At the Universitätsklinikum Würzburg's Clinic for Nuclear Medicine** each examination with the μ PET device generates hundreds of megabytes of data. The previous archiving system, which relied on external USB disks, had reached its capacity limits
- **The aim was to implement** a simple, compact and highly available system for safe data storage with capacities in the terabyte range which would fulfil the clinic's stringent safety standards
- **At the same time, the clinic** needed a second, fast machine to handle evaluation and image reconstruction based on data generated by the μ PET device
- **The condition was** that staff would be able to run the new system completely independently of the clinic network as a research system

Solution

- **The Universitätsklinikum Würzburg's Clinic for Nuclear Medicine** now relies on an Intel Modular Server with Intel Multi-Flex technology, which combines server, network and storage functions in a single system
 - **To be more precise, the system comprises of two blades**, a file server with a capacity of 1.2 terabytes and a Compute server for fast construction of image data. Each server is equipped with a Quad-Core Intel® Xeon® L5410 Processor with a clock speed of 2.33 GHz
 - **Deployment of the VMWare ESX 3.02 virtualisation software** in combination with Intel® virtualisation technology
 - **The fully integrated system** supports easy management via a Web-based user interface
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The Intel Modular Server combines server, network and storage functionality in a single system

The Scenario

The Clinic and Polyclinic for Nuclear Medicine, which was founded in 1956, is responsible for all examinations and treatments with open radioactive materials at the Universitätsklinikum Würzburg, Germany. The clinic's 70 staff includes doctors, physicists, chemists, biologists, care staff, and computer scientists. Special walk-in clinics are available for thyroid and osteoporosis patients, and there are special labs for thyroid hormone and iodine identification in blood and urine samples. The Clinic and Polyclinic has 14 special beds for treatment with open radioactive materials. Some 850 patients a year are treated here, mainly for thyroid complaints.

Spotlight: Clinic for Nuclear Medicine at the Universitätsklinikum of Würzburg, Germany

- The Clinic and Polyclinic for Nuclear Medicine is responsible for all examinations and treatments with open radioactive materials at the Universitätsklinikum Würzburg, Germany.
- The clinic's 70 staff includes doctors, physicists, chemists, biologists, care staff, and computer scientists.
- Special walk-in clinics are available for thyroid and osteoporosis patients, and there are special labs for thyroid hormone and iodine identification in blood and urine samples.
- The Clinic and Polyclinic has 14 special beds for nuclear medicine.
- Every year, the team at the Clinic for Nuclear Medicine performs around 9000 scintigraphic examinations with equipment such as gamma cameras, collimators, 3D ultrasonic devices, or the positron emission tomograph

For diagnostic purposes the team uses small quantities of a radioactive medicine that accumulates in the organ or tissue to be examined. The radiation emitted here is recorded by a measuring device located on the surface of the patient's body; this process creates two-dimensional images known as scintigrams. Using a computer, 3D sections can be calculated based on the measured values.

Scintigrams provide vital information on functional disorders and thus on abnormal changes in tissue. Every year, the team at the Clinic for Nuclear Medicine performs around 9000 scintigraphic examinations of organs such as the thyroid, heart, kidneys, brain and skeleton, or bone density, using equipment such as gamma cameras, collimators, 3D ultrasonic devices, or the positron emission tomograph.

Positron emission tomography (PET) relies on a radioactive medicine to visualise biochemical processes, such as glucose metabolism in living organisms. In clinical examinations it is mainly used to assess the status in cancer cases and to check how successful cancer treatment is. Special positron emission tomographs for research on small animals, also known as μ PET devices, have been under development for several years. These devices support a large number of examinations and can thus prevent uncertainty.

The Clinic for Nuclear Medicine at the Universitätsklinikum Würzburg also uses a μ PET device to examine small animals. The device helps researchers to identify how an illness (e.g. a tumour) changes the small animal's metabolism. "In the pre-clinical phase, we develop radioactive medicines and tracers with low levels of radioactivity to measure the metabolism and check where they (the radioactive medicines and tracers) accumulate in the body", Dr. Michael Lassmann, the Head Physicist at the Universitätsklinikum Würzburg's, Clinic for Nuclear Medicine explains.



„The system is very stable and easy to manage thanks to the intuitive Web-based user interface.“

Dr. Michael Lassmann,
Head of Physics,
Clinic for Nuclear Medicine, at the
Universitätsklinikum Würzburg,
Germany

Several hundred megabytes of data are generated by each examination. The Clinic for Nuclear Medicine previously archived its data on USB disks and kept the disks in a cupboard. "Access to required data took ages. And the data wasn't very safe", Michael Lassmann emphasises. This is what prompted the Head Physicist to look for a compact, highly-available system for safe data storage with terabyte range capacity. Another condition was that the system had to be completely independent of the clinic network. On top of this, the clinic needed a second, fast machine to handle evaluation and image reconstruction based on data generated by the μ PET device.

The solution

Michael Lassmann decided on an Intel Modular Server with Intel Multi-Flex technology, which combines server, network and storage functionality in a single system. The blade server is specially designed for small to medium-sized enterprises or institutions. The server is scalable up to six Server Compute Modules for multiple core Intel® Xeon® processors and thus perfectly geared to cope with increasing demands on the IT infrastructure. It offers a SAN repository (RAID storage) that is shared by all the servers with up to 14 2.5 inch hard disk drives and redundant storage controllers. All of the components are hot-swappable. The solution also integrates network functionality in the form of two redundant Ethernet switch modules.

In February 2008, the Clinic for Nuclear Medicine at the Universitätsklinikum Würzburg, Germany, rolled out an Intel Modular Server with two blades: a file server with a capacity of 1.2 terabytes and a Compute server for fast image data reconstruction. Each server is equipped with an energy-efficient Quad-Core Intel® Xeon® L5410 processor with a clock speed of 2.33 GHz and a maximum power consumption of just 50 watts.

It takes 20 minutes to reconstruct the image data supplied by the μ PET device to create a 3 dimensional PET scintigram. "The Compute Module in the new server gives us the ability to run two reconstructions in parallel to our existing evaluation system", Michael Lassmann emphasises.

Key Technologies

- Thanks to their fast performance, Quad-Core Intel® Xeon® 5410 processors provide a perfect platform for evaluation and image reconstruction based on data from the μ PET device. Their energy efficiency saves money on power and cooling.
- Intel® Multi-Flex technology supports an integrated, scalable system that combines server, network and storage functionality and can easily keep pace with growing IT infrastructure demands.

Quad-Core Intel Xeon Processor Saves Energy and Cooling Costs

Safe, high-capacity data repository

He places much emphasis on the file server function. "Thanks to the new system we now have a safe data repository with terabyte range capacity. Due to the large quantities of data that examinations using the μ PET device generate, this is very important for us. On top of this we have faster access to data archives."

Michael Lassmann is very satisfied with the integrated system in every respect: "It works very well, and is very stable and easy to manage thanks to the intuitive Web-based user interface." If needed, the administrator can use the Remote KVM function to remotely control and manage the server (virtual presence). The Intel Modular Server is also very maintenance-friendly, as components can be hot-swapped without powering off the system.

The Clinic for Nuclear Medicine is planning to invest in another blade next month. The blade will be needed to calculate radiation transport using the Monte Carlo simulation technique, a stochastic method based on random experiments. The clinic is also considering expanding the memory capacity and adding a further blade to provide a second file server. Michael Lassmann: "The Intel Modular Server is designed for scalable growth. This means that we can easily change it to match our individual requirements."

Customer benefits at a glance

- Scalable growth with up to six server modules and 14 storage disks
- Safe data storage with terabyte range capacity
- Simple administration of the whole system via a Web-based graphical user interface
- High available thanks to redundant systems, automatic fail-safe and backup
- Simple maintenance thanks to hot-swappable components



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