

CUSTOMER SUCCESS STORY | HITACHI CONSTRUCTION MACHINERY

IMPROVING DESIGN EFFICIENCY AND REDUCING MANAGEMENT COSTS WITH NVIDIA VIRTUAL GPUS

HITACHI CONSTRUCTION MACHINERY WAS FIRST IN ITS INDUSTRY TO INTRODUCE NVIDIA vGPU TO ACCELERATE APPLICATIONS—FROM 3D DESIGN TO OFFICE PRODUCTIVITY.



WITH NVIDIA vGPU, HITACHI CONSTRUCTION MACHINERY BUILT A GPU-ACCELERATED VDI ENABLING DESIGNERS TO ACCESS 3D CAD APPLICATIONS FROM ANYWHERE.

SOFTWARE

Virtualization Software:

Citrix XenDesktop
NVIDIA® Quadro® Virtual Data Center Workstation (Quadro vDWS)
NVIDIA GRID® Virtual PC (GRID vPC)

Key Applications:

Siemens NX
Advanced CAD

HARDWARE

Server: Cisco UCS C240

GPU: NVIDIA K2 (original deployment). Upgrades to M60, P40, and M10

Storage: NetApp

Networking: Cisco Nexus

OVERVIEW

Hitachi Construction Machinery (HCM), a leading manufacturer of construction and transportation machinery, has been designing construction machines for nearly 50 years. The company owns seven major factories in Japan and has development and manufacturing bases in China, Indonesia, and the Netherlands. With a high ratio of overseas sales, HCM is expanding its business globally and has entered the construction machinery rental business in North America.

In 2014, HCM was one of the industry's first to introduce NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS) software at Tsuchiura Works, one of the company's core factories. With the Quadro vDWS environment, HCM built a virtual desktop infrastructure (VDI) that uses NVIDIA virtual GPU (vGPU) technology to improve the design and development of construction equipment and reduce management costs.

With Quadro vDWS software, HCM's designers can use the Siemens NX 3D CAD application in VDI. This makes it possible to check and correct 3D models and drawings from remote locations, improving the efficiency of their design and development processes. Introducing VDI also allowed HCM to upgrade their operating system (OS) and applications, which had previously taken a long time, with a small team in a short period of time. Based on the success of the virtualized 3D CAD environment, HCM introduced NVIDIA GRID Virtual PC software (NVIDIA GRID vPC) across the company to virtualize their 2D Advanced CAD software. Going forward, HCM also plans to use NVIDIA GRID for collaboration with its domestic and overseas group companies.

CUSTOMER PROFILE



Organization

Hitachi Construction Machinery Co., Ltd.

Industry

Manufacturing

Location

Japan (as well as overseas factories and group companies)

Headquarters

Tokyo, Japan

Founded

October 1970

Capital

81,576,59 million yen



“With the introduction of NVIDIA Quadro vDWS and NVIDIA GRID vPC, office work, 3D CAD, 2D CAD, and analysis could all be performed on the same secure PC. As a result, it not only improved user convenience, but the total cost of ownership for the hardware, software, and management was greatly reduced, a result that we greatly appreciated. I can’t imagine an environment without NVIDIA vGPU anymore.”

Satoshi Tabata
Assistant Manager, System Operation and
Planning Department, IT Solutions Center,
IT Promotion Division, HCM

THE CHALLENGE

Tsuchiura Works is an important factory among HCM’s development and manufacturing bases, whose role is to develop and manufacture hydraulic excavators and dump trucks.

Satoshi Tabata, assistant manager of the System Operation and Planning Department in the company’s IT Solutions Center, has been working for many years to provide software support to their design team. According to Tabata, until a few years ago, there weren’t many designers at Tsuchiura Works, so several workstations with 3D CAD were placed together on the design floor. When a designer wanted to use a workstation, they would move to that location. However, as the number of engineers increased, there wasn’t enough space for the extra workstations, so workstations were placed at each engineer’s desk instead. The company soon realized that usage of 3D CAD varied considerably among the engineers. And preparing workstations for everyone—including designers who only used 3D CAD occasionally—increased the cost of purchasing and managing the hardware.

For this reason, HCM built a remote desktop environment and attempted to use 3D CAD remotely. Minor tasks were possible via a remote desktop, but when engineers tried to do serious work, 3D CAD performance suffered. In addition, when support for Windows XP ended in April 2014, it became necessary to update all the remaining Windows XP machines at HCM. Tabata and his team were eager to update to a solution that would allow engineers to operate 3D CAD comfortably even in a virtual desktop environment.

DOUBLING MEMORY CAPACITY AND GRAPHICS PROCESSING IN MINUTES

Tabata had two challenges—renewing the remaining Windows XP machines in the company and building an environment that would allow engineers to operate 3D CAD comfortably, even in a virtual desktop environment. He became interested in NVIDIA virtual GPU technology, a solution for virtualizing GPUs that could run 3D CAD in a VDI environment.

However, there were concerns about the performance of virtual GPUs. “At that time, NVIDIA K1 and NVIDIA K2 were available, but the performance when actually using them in a virtual desktop environment was unknown,” said Tabata. At the end of 2013, Tabata worked with Cisco to conduct preliminary verification of NVIDIA vGPU technology. HCM used Siemens PLM Software 3D CAD NX for the design and development of their construction machinery, and the preliminary tests found NVIDIA vGPU performance to be sufficient for the application. HCM decided to introduce the system in 2014.



Fumitaka Gotou
Assistant Manager, System Operation and Planning
Department, IT Solutions Center,
IT Promotion Division, HCM

EVOLVING THE SOLUTION TO MEET CHANGING NEEDS

The hardware introduced by Tabata's team in 2014 was comprised of five Cisco UCS C240 rack servers, including three servers with NVIDIA K1 GPUs and two servers with NVIDIA K2 GPUs. HCM used I-DEAS software in addition to NX for 3D CAD. Because I-DEAS requires lower hardware specifications than NX, it was decided to use I-DEAS mainly on NVIDIA K1 and NX on NVIDIA K2. At that time, the number of virtual machines (VMs) was slightly less than 100, and multiple 15,000 RPM hard-disk drives (HDDs) were installed on each server for storage.

Although Tabata's team confirmed that NX worked in a VDI environment using NVIDIA vGPU in the preliminary verification, they didn't perform a load test for operating multiple VMs simultaneously. But even when running nearly 100 VMs at once, there were no complaints about performance. The system has been strengthened many times since NVIDIA vGPU was introduced in 2014. In 2015, Fumitaka Gotou joined the CAD team and worked on system construction and maintenance with Tabata. To support remote use of 3D CAD, they introduced Cisco UCS Manager, which can manage multiple servers at once. Seven servers equipped with NVIDIA K2 were added, and the network was increased from 1 Gbps to 10 Gbps. In addition, they changed storage from HDD to flash, greatly improving performance. "In 2015, we introduced FlexPod, a virtualization infrastructure that combines NetApp storage with Cisco servers and network devices. At the same time, we converted the HDDs to flash, eventually becoming an all-flash system," said Gotou.

The number of servers has increased year by year. In 2018, the number of servers increased to 23, the number of VMs increased to 440, more than four times that of 2014, and almost no physical workstations or PCs were used for design work. The NVIDIA P40, M60, and M10 GPUs have all been added to the environment as well.

Initially, HCM only introduced NVIDIA Quadro vDWS, a solution for running professional graphics applications such as 3D CAD, but the company has now introduced NVIDIA GRID® virtual PC (GRID vPC), which can efficiently run applications for business users. GRID vPC is mainly used to run the 2D CAD software Advance CAD. While the main design work is done in 3D CAD, there are some situations where 2D CAD is needed. "We still use 2D CAD when we want to add drawings to documents such as nameplate drawings or order specifications rather than designing," said Tabata. "Also, construction machinery has a long product lifecycle, so for some products, we only have 2D CAD data."



Fumitaka Gotou and Satoshi Tabata, Assistant Managers, System Operation and Planning Department, IT Solutions Center, IT Promotion Division, HCM

Before the introduction of NVIDIA GRID vPC, 2D CAD, as well as some analysis work, was run on normal office PCs without dedicated GPUs. HCM decided to update the office PCs to Windows 10 while, at the same time, moving from normal fat PCs to secure, thin clients with no internal data. The goal was to promote workstyle reforms and strengthen security. To achieve this, Tabata and Gotou built a system that uses VDI with NVIDIA GRID vPC for 2D CAD and analysis work. This made it possible to connect office work, 3D CAD, 2D CAD, and analysis work to the VDI from the same terminal, simplifying management.

In addition, the significant reduction in the time and effort required to upgrade the OS and applications was a major advantage of introducing NVIDIA GRID. "Upgrading the OS and applications of 3D CAD systems is not as easy as office PCs," Tabata explained. "For example, when updating from Windows 7 to Windows 10, office PCs can be updated one by one. But with 3D CAD, designs are often being worked on in teams, and there is a data management system in the back end upon which the 3D CAD client runs. So, if you have 400 PCs, you cannot maintain consistency unless you update all the PCs at once, but this is impossible to do over the weekend. However, if you use a VDI, you can update all 400 VMs at once by shutting down all Windows 7 VMs and then redeploying the newly created VM template for Windows 10. In our case, eight workers completed the transition to the new 3D CAD system for Windows 10 in about six hours. That is a huge advantage."

LOOKING FORWARD

HCM plans to continue leveraging virtual GPU technology to optimize operations and plans to add NVIDIA T4 GPUs in the future. They're working on computerized construction using drones, and AI technology such as deep learning will become important in the future. With NVIDIA Virtual Compute Server (vComputeServer), AI and deep learning workloads can be run in a GPU-accelerated, virtualized environment, and HCM wants to develop such an environment in the future. HCM also plans to use NVIDIA vGPU technology to collaborate with their domestic and overseas group companies and remotely connect to servers at Tsuchiura Works for joint development. For HCM, NVIDIA vGPU is the gateway to further evolution and growth.

To learn more about NVIDIA vGPU technology, visit www.nvidia.com/virtualgpu
www.nvidia.com



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