Case study

Intel vPro® platform
Intel® Active Management Technology (Intel® AMT)
Intel® Hardware Shield
Intel® Ultra Cloud Client

Changzhou University Increases Efficiency of Informatization-Based Learning Environments

The School of Computer Science and Artificial Intelligence leverages Intel vPro® platform technology for more efficient and secure IT remote management of its IDV Cloud Classroom environments

"Guided by Changzhou University's '14th Five-Year Plan' and the goal of creating a high-level university in Jiangsu, we will accelerate measures to create an industry-oriented school; construct new industrial learning environments; build a new-generation of programming rooted in information technology; deepen the integration of industry and education; and establish ourselves as a talent-training entity that incorporates training, scientific research, technological innovation, enterprise services and student entrepreneurship. The Intel vPro platform has enabled us to streamline progress toward achieving this goal."

School of Computer Science and Artificial Intelligence at Changzhou University

The School of Computer Science and Artificial Intelligence at Changzhou University is committed to driving the integration of digital technology with its education and research platform to deliver world-class learning capabilities. This includes fostering a real-world skills training environment though the creation of experimental research and innovation facilities like the Key Equipment Digital Twin Technology and Engineering Research Center of Petrochemical Processes in Jiangsu, the Changzhou Key Laboratory of Urban Big Data Analysis and Application Technology, and the Smart Interactive Experimental Center. These measures will enable a higher level of service capability in the teaching, research, and innovation arenas.

In order to help the school better achieve this goal, Nanjing Astute-Tec Co., Ltd. ("Astute-Tec"), a leading provider of digital education solutions in China, has built the Digital Twin Engineering Laboratory and the Big Data Smart Cloud Hands-on Training Workshop based on the cloud-terminal management solution.

Astute-Tec partnered with Intel on the solution, combining products like Intel vPro platform-powered devices with its Cloud Classroom technology based on the Intel® Ultra Cloud Client IDV (Intelligent Desktop Virtualization) architecture. This "IDV Cloud Classroom" infrastructure helps to enable better and safer teaching experiences for teachers and students, reduces the maintenance burden on IT teams, and improves the utilization efficiency of the informatization-based teaching environment.

Challenge: Informatization-based teaching needs a more efficient informatization environment

The rising tide of intelligent technologies is driving more traditional industries to actively embrace information technology and, through digital and intelligent technology transformation, accelerate business model revamps, production efficiency improvements, and management method optimization. Meanwhile, the shortage of talent in the transformation process requires the higher education domain to further emphasize informatization-based teaching.

Changzhou University has always viewed the collaboration of industry, education, and research as its mission and has trained an array of high-quality talent in the petrochemical and other fields. The university is responding to the enterprise needs by proactively creating a wide range of professional informatization-based teaching environments for the integration of information technology and industry. These include:

Figure 1 Digital Twin Laboratory at the School of Computer Science and Artificial Intelligence at Changzhou University

- **Digital Twin Laboratory:** Guided by the needs of petrochemical enterprises in the core intelligent equipment domain, the School of Computer Science and Artificial Intelligence at Changzhou University is creating a top-level general digital simulation laboratory. It includes a simulation platform for chemical enterprises and offers the first innovative simulation training course in universities across China to raise standards in talent training in the chemical industry.
- **Big Data Smart Cloud Hands-on Training Workshop:** Big data has become the fundamental information technology means for enterprises to carry out digital management and facilitate efficiency improvement. This has prompted the school to create a superior hands-on big data training workshop. Features include shared whiteboard, screen broadcast, and student presentation, meeting the teaching needs of big data courses.

Although these informatization-based teaching environments spur Changzhou University's research into key industrial information technologies and facilitate the training of first-class professional and technical talent, a number of challenges remain.

Traditional information-based classrooms are generally configured with PCs and LAN connections. Disadvantages include complexity of configuration, high failure rates, and difficulty of maintenance. For example, when switching to desktop systems, it is necessary to use software and hardware recovery cards, which not only slows down the switching speed, but also leads to a persistently high failure rate.

On the other hand, with the increasing breadth and depth of informatization-based courses, hands-on training workshops need to be able to handle a growing variety of course types. Improvements are also needed in terms of performance, security, and ease of maintenance. Maintenance is a particular issue since Changzhou University has two far-apart campuses.

With the continuous expansion of informatization-based teaching, staff cannot run back and forth between the campuses. On-site maintenance not only hampers efficiency, but also raises labor and maintenance costs.

In order to effectively deal with the aforementioned challenges, Astute-Tec worked with Intel to combine devices powered by the Intel vPro platform with its IDV Cloud Classroom solution. This helps the School of Computer Science and Artificial Intelligence at Changzhou University create an informatization-based teaching environment that offers high efficiency, security, and specific remote IT management capabilities.

Solution: Streamlining informatization-based teaching environments with IDV Cloud Classroom solutions

In light of the school's goal of creating an informatization-based teaching environment, Astute-Tec met the needs of teachers and students by ensuring high-quality informatization-based teaching through different combinations of software and hardware products and technologies, all based on innovative IDV Cloud Classroom solutions.

Unlike a traditional informatization-based classroom, where there is only one server that plays the roles of device manager, file manager, and network disk, Astute-Tec's IDV Cloud Classroom solutions are cloud-configured. As shown in Figure 2, the operating system, virtualization software, local data, and security policies are deployed in the local IDV terminals (i.e. Fiber Access Terminals), while course-related resources such as desktop image, course application, and incremental data are centrally managed in the cloud. Both are connected through the campus network.

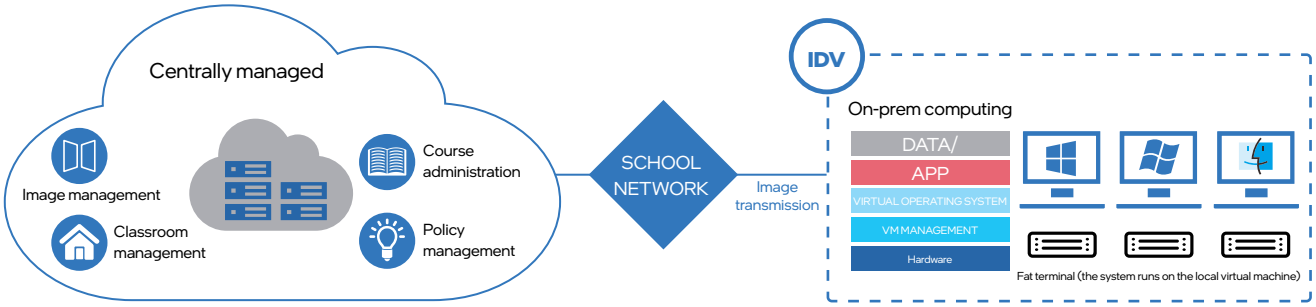

Figure 2 Cloud deployment architecture of Astute-Tec's new solutions

In hands-on training workshops, IDV Cloud Classroom solutions can provide a flexible and enriched teaching process for teachers and students alike through different course images and a series of interactive teaching methods. As shown in Figure 3, teachers and students can engage in the teaching process through the following steps:

1. The IT team of the training workshop remotely configures the course image template in the background and sends it to the teacher's PC and IDV terminals (i.e., students' PCs).
2. The teacher selects the specific course image template on their PC and clicks to start teaching.
3. Students open the course image on their IDV terminals and start a regular session.
4. At the end of the session, the system automatically shuts down each IDV terminal and its virtual machine.

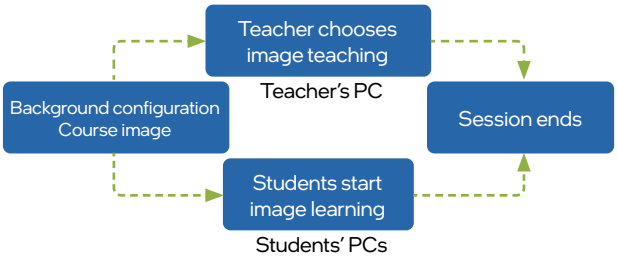

Figure 3 Teaching process of hands-on training workshop in Astute-Tec's new solutions

The above process shows that the informatization-based course configuration, adjustment, and management provided by the solutions do not need the physical presence of the IT team. Updates and switching of desktop systems are relayed to IDV terminals in image form with remote configuration in the background. Therefore, IDV terminals must have efficient, convenient, and reliable remote management capabilities, such that the IT team can quickly solve problems remotely even in downtime. At the same time, to ensure rich information presentation, technical practice and teacher-student interaction, IDV terminals must also have powerful data and media-processing capabilities. In addition, cloud-configured solutions set higher information security requirements.

To mitigate performance challenges, Astute-Tec chose Intel® NUC products running on Intel vPro® Core™ processors for the IDV terminal component. The enhanced processor performance helps deliver a smoother and more reliable interactive learning experience, seamlessly running specialized course applications, increasing in the overall quality of teaching in all informatization-based courses.

Figure 4 Intel NUC

> "In general, it is very difficult for IT teams serving educational institutions or schools to operate, but Intel vPro Platform with Intel Active Management Technology can provide a simple solution for remote IT support. Intel AMT helps reduce costs and keeps the workforce more secure and productive."
>
> **Stephanie Hallford**
> **VP, Client Computing Group**
> **VP & GM, Business Client Platform**
> **Intel**

In addition to performance, the Intel vPro platform also provides efficient and secure IT remote management capabilities for solutions through built-in Intel® Active Management Technology (Intel® AMT) and Intel® Hardware Shield.

Intel® AMT offers hardware-based remote management capabilities

Intel AMT enabled by the Intel vPro platform offers a cloud-based remote repair solution for Astute-Tec's new solutions. Its advantages include out-of-band connection capability separate from the operating system and a boot redirection function so that the IT team can, through a remote connection, ensure recovery in serious failures such as system crash and hard-disk damage.

With Intel AMT, if a terminal in any training workshop of the school is down or otherwise fails, the IT team can remotely carry out recovery without working on-site, helping to improve workshop utilization efficiency and cut labor costs.

Figure 5 Intel vPro Platform

Intel Active Management Technology (Intel AMT)

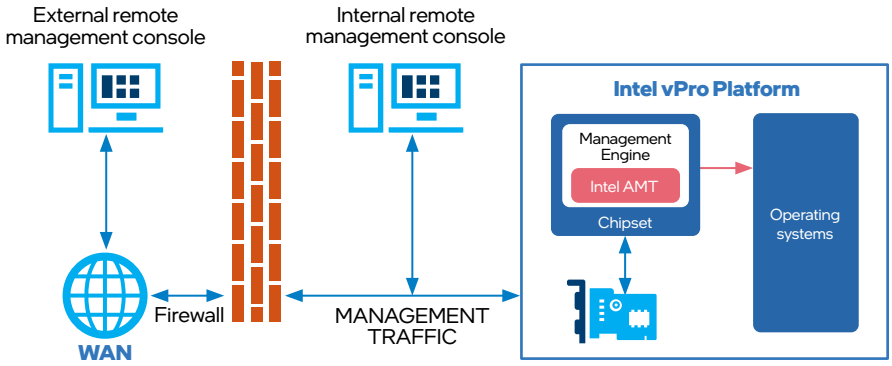

Figure 6 Intel AMT Overview

Intel AMT can remotely access devices for diagnosis and management through wired or wireless LAN connection, even if the devices are powered down or the operating system is not running. Intel® Endpoint Management Assistant (Intel® EMA) extends this capability to all environments inside and outside the corporate firewall, including local, off-site, and hybrid cloud-based environments. Access to Intel EMA console can be controlled through directory services credentials, including:

- **Power control.** Power on a single system or multiple systems for remediation and patching. This capability can also be accessed through APIs.
- **Alarm clock.** Remotely program devices to wake up or power on at predetermined dates and times. Devices can be powered on 10 minutes before the start of the working day or for a scheduled maintenance task, for example.
- **Remote control over hardware-based Keyboard, Video, and Mouse (KVM).** View and resolve user PC and operating system issues with hardware based KVM remote control, maintaining the KVM connection through reboot cycles.
- **Access to hardware asset information.** Remotely view hardware configurations—even when the PC is off or asleep—including parameters such as CPU, memory, and disk type. If a part fails, the hardware asset capability can confirm the correct replacement part before a desk visit, helping to reduce the number of visits and shortening time to resolution.
- **Discovery and inventory.** Remotely discover the hardware asset, along with its configuration and Intel vPro platform capabilities. Automatically identifying how many Intel vPro platform-based systems are within the environment is the first step to activating Intel AMT.
- **Optional user consent.** Display a 6-digit random authorization code independent of the operating system to ensure that user consent is granted for remote remediation commands on the device.
- **Support beyond the firewall.** With Intel EMA, IT organizations can now use Intel AMT functionality to remotely manage devices beyond the corporate firewall.
- **Cloud-based manageability.** With cloud-enabled Intel EMA, Intel AMT enables IT organizations to manage a global cluster of devices hosted inside and outside the firewall over the cloud (and even within the DMZ).

Intel Hardware Shield provides reliable below-the-OS security features

Traditional security protection methods are often oriented to application program design, but increasingly security threats are present on a broader front, attacking operating systems and hardware. This poses new challenges to IT security protection.

Intel Hardware Shield and other security technologies enabled by the Intel vPro Platform can help provide reliable protection for Astute-Tec's new solutions, using a security strategy of hardware integration. This helps the school's informatization-based teaching environments cope with potential hacker intrusion, intercept ransomware and other threats, and ensure that sensitive information is free from leakage risks.

Result: Achieving a high efficiency informatization-based teaching and training model

Through its excellent IT remote management model, Astute-Tec's informatization-based teaching environment created by the Intel vPro Platform and other products and technologies helps ensure that the computing power of all terminal equipment can meet the needs of high-load applications with reliable information security mechanisms. This enables IT to provide quick updates and troubleshooting support for the PC desktop systems used in the hands-on training workshops on both of Changzhou University's campuses. After solution deployment, new experiences in the informatization-based teaching of the School of Computer Science and Artificial Intelligence at Changzhou University can be expected as follows:

- The informatization-based teaching environment opens the door to enriched and highly professional informatization-based teaching activities for both teachers and students. For example, using the digital twin hands-on training workshop, students can get real-world experience with the workflow in the digital twin platform for key equipment and a more detailed understanding of digital management methods, techniques, and processes in the petrochemical industry.
- If a failure occurs at the other campus, IT staff now can deal with it remotely without having to travel in person. This not only helps to effectively reduce the workload of the IT team, but also to ensure the utilization efficiency of the informatization-based teaching environment.
- With the addition of new hardware-based security technologies, potential information security threats such as hacker attacks and data leakage are further reduced.

Prospect

With the steady deployment and use of the new solutions at the School of Computer Science and Artificial Intelligence at Changzhou University, the faculty, students, and IT team have unanimously recognized the performance, security, and ease-of-maintenance merits they have experienced. Now, in order to achieve the goal of world-class capabilities in digital education applications and digital twin R&D within five years, the school is deploying more information-based courses in various informatization-based teaching environments supported by this Cloud Classroom model.

In the future, Astute-Tec plans to work with Intel to further explore how the advantages of the Intel vPro platform can help free IT teams at educational institutions of all levels from tedious daily chores, allowing them to devote themselves and their resources to IT facility innovation and information application optimization in order to contribute more to the development of educational informatization.

Intel Hardware Shield

Intel Hardware Shield can be used on Intel vPro platform-based devices. It can provide integrated hardware-based PC protection so as to optimize the production efficiency of enterprises while further improving safety. These security protections include:

- **Security in the operating system:** Intel Hardware Shield can help minimize the risk of malicious code injection and prevent planted malware from compromising the operating system by locking down memory in BIOS when software is running. Meanwhile, it also provides support for hardware-based safe booting functionality to ensure that the operating system can be safely started and placed in a trusted state.
- **Application and data security:** With Intel Hardware Shield, users can complete virtualization with a hardware-based encryption process, which provides top-down data protection and also security isolation among applications with different operating systems running on the same PC. Furthermore, Intel's virtualization feature can speed up virtualized security software such as Windows Defender Credential Guard and Application Guard and help fend off a variety of threats, including kernel-level malware attacks on the operating system and browser-based attacks.
- **Advanced threat detection:** Software developers can take advantage of Intel® Control Flow Enforcement Technology (Intel® CET) in Intel Hardware Shield to defend against diverse types of attacks, ranging from memory security-based attacks to control-flow hijacking attacks. This breakthrough technology helps users cope with attacks beyond the capabilities of software protection mechanisms. Intel® Threat Detection Technology (Intel® TDT) enabled by Intel Hardware Shield can provide IT teams with real-time insights into end-user devices. With cutting-edge chip-based artificial intelligence threat detection technology exclusively from Intel, this enhanced security feature can give full play to Intel Hardware Shield's advanced telemetry function and detect the latest types of attack, such as encryption mining and ransomware, without affecting performance.

About Intel Ultra Cloud Client

intel 超能云终端 UCC

Intel Ultra Cloud Client solutions include IDV and TCI architectures. Through local computing and cloud management, they take into account users' requirements in terms of performance, convergence, flexibility, and stability. They can control complex businesses, providing balanced cloud and local computing power for different application scenarios and achieving excellent user experience.

ABOUT ASTUTE-TEC

As a high-tech enterprise focusing on cloud-computing product development and integrated cloud-informatization solutions, Nanjing Astute-Tec Co., Ltd. ("Astute-Tec*") is committed to providing customers with practical and efficient integrated cloud-computing solutions that meet their needs. Its cloud-computing products, including Astute-Cloud, are deeply customized, optimized, and enhanced based on open-source projects such as OpenStack* and Ceph*, integrating a number of specialized technologies, including big data, hyper-convergence, mobile Internet, artificial intelligence and Internet of Things (IoT). They are widely used by customers in various industries. For more information, please visit: www.astute-tec.com/main.

ABOUT INTEL

Intel (Nasdaq: INTC) is an industry leader, creating world-changing technology that enables global progress and enriches lives. Inspired by Moore's Law, we continuously work to advance the design and manufacturing of semiconductors to help address our customers' greatest challenges. By embedding intelligence in the cloud, network, edge and every kind of computing device, we unleash the potential of data to transform business and society for the better. To learn more about Intel's innovations, go to www.intel.com/newsroom and www. intel.com.