



e.huawei.com

Huawei Enterprise

1/2023

ISSUE 34

David Wang, Huawei's Executive Director of the Board,
Chairman of the ICT Infrastructure Managing Board, and President of the Enterprise BG

Intelligent Education for a Digital Future

Xia Zun, President of the Global Public Sector, Huawei Enterprise BG

Building a Digital Education Community to Facilitate High-Quality Education Development

Intelligent Lossless HPC
Network Empowers Peking University
with Unrivaled Performance





Huawei has helped more than 2800 customers, including educational ministries, universities and research institutes, in over 120 countries and regions explore the unknown

Intelligent Cloud-Network **for Education** Unleash Education with Powerful Network

From libraries to labs
From dorms to classrooms
200 Mbit/s borderless online learning anytime, anywhere



AirEngine
Wi-Fi 6



CloudEngine
S-series Campus



HiSecEngine
Security Gateways

Inside



Comment

P4 Intelligent Education for a Digital Future

Vision

P6 Collaborating for Acceleration: UNESCO Global Education Coalition's Journey towards SDG 4"

P10 Peking University's Practice and Exploration of School Affairs Data Governance

P15 Preparing Your Education System for the Digital Age

P18 Transforming Universities with Fiber-based Networking



Cover Story

P22 Building a Digital Education Community to Facilitate High-Quality Education Development

Success Stories

P28 Intelligent Lossless HPC Network Empowers Peking University With Unrivaled Performance

P31 SWU of Thailand: Transforming to an 'Innovative University' by Upgrading Digital Infrastructure

P33 The Digital Transformation of M.U.S.T.: Boosting Innovation and Building a Smart Campus

P38 MCC Builds a New Benchmark for Intelligent Education in Northern Philippines with Digitalization

P41 Mustaqbal University Makes Smart Classrooms a Reality Through Digital Transformation

P43 Transforming Tunisia Into the ICT Talent Center and Innovation Hotbed of North Africa

P46 The Hague University of Applied Sciences: A Secure, Robust, and Future-Proof Wi-Fi 6 Network for a Dutch University



Publisher:

ICT Insights Editorial Board,
Huawei Enterprise

To subscribe to *ICT Insights*,
contact the Editorial Board.

Email: liumei1@huawei.com
Address: G1, Huawei Industrial
Base, Bantian, Longgang,
Shenzhen 518129, China
Tel: +86 (755) 28780808
+86 (010) 82882758

出版人: 郝志臣 张勇
顾问: 郁赛华 张荣 孙鹏飞 邹思轶 赵祎鑫 杨少青 KOH HONG ENG
Nadim Abdulrahim

主编: 刘梅
特邀主编: 惠艳妮
编辑: 李智鹏 郭慧鹏 祁彬斌 赵丙双 邵文涛 李怡 郑年 蔡尹楚
周铭峰 崔洋洋 刘薇 张晶 黄秋兰
视觉指导: 陈衍财 韩可
翻译: 裴江浩 陆瑶
发行: 黄秋兰

Publishers: Hao Zhichen, Zhang Yong
Consultants: Yu Saihua, Monica Zhang, Sun Pengfei, Zou Siyi, Zhao Yixin,
Yang Shaoqing, KOH HONG ENG, Nadim Abdulrahim

Editor-in-Chief: Lorra Liu
Guest Editor-in-Chief: Hui Yanni
Editors: Alice Li, Guo Huipeng, Qi Binbin, Zhao Bingshuang, Shao Wentao,
Li Yi, Zheng Nian, Cai Yinchu, Zhou Mingfeng, Cui Yangyang, Liu
Wei, Zhang Jing, Huang Qiulan
Visual Guidance: Tan Yan Chay, Han Ke
Translators: Pei Jianghao, Lu Yao
Circulation: Huang Qiulan



ICT Insights



Scan the code to access
the Huawei Intelligent
Education official website



- P49 Selfnet e.V. Leverages Wi-Fi 6 to Build High-Quality Wireless Campuses
- P51 UNISA Partners With Huawei to Build a Future-Proof Smart Campus
- P54 Historic Honduran University Revitalized with an SDN Campus Network
- P58 Shenzhen University: F5G All-Optical Campus Network Facilitates Smart Development
- P61 Minzu University of China Draws on Huawei Qiankun to Create a Smart Campus with Ultimate Experience
- P65 Building Resilient Schools for Africa's Children
- P68 The MoE of the UAE Partners With Huawei to Deliver Intelligent Education
- P71 Beijing 101 Middle School Huairou Campus Makes Huge Strides in Digital Transformation
- P74 Entering a New Digital Era for Scientific Research in Egypt
- P77 Ankabut: Education Cloud Paves the Way for Digital Talent Development



Focus

- P82 "Five Ones" Intelligent Education Solution for a Digital Education Community
- P86 High-Quality 10 Gbps Campus Network: The Foundation for Future Digital Education
- P92 Build a Green All-Optical Base for intelligent Education With the Huawei FTTO Solution
- P96 Building a Robust HPDA Storage Base for Quality Education and Scientific Research
- P100 Building a Solid Foundation for Smart Campuses With Huawei's Product Portfolios
- P105 Huawei Builds Digital, Interactive, Collaborative, and Intelligent Classrooms to Offer More Engaging Learning Experience



Media Watch

- P109 A New Blueprint for Intelligent Education



Facebook



Twitter



YouTube

Copyright © Huawei Technologies Co., Ltd. 2023. All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the prior written consent of Huawei Technologies Co., Ltd.

NO WARRANTY

The contents of this magazine are for information purposes only, and provided 'as is.' Except as required by applicable laws, no warranties of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to contents of this document. To the maximum extent permitted by applicable law, in no case shall Huawei Technologies Co., Ltd. be liable for any special, incidental, indirect, or consequential damages, or lost profits, business, revenue, data, goodwill, or anticipated savings arising out of or in connection with any use of this document.

Intelligent Education for a Digital Future



David Wang
Executive Director of the Board,
Chairman of the ICT
Infrastructure Managing Board,
President of the Enterprise BG,
Huawei

As Mr. Cai Yuanpei, a Chinese philosopher who was an influential figure in the history of Chinese modern education, once said, "educators are not for the past, not for the present, but for the future."

During the course of human civilisation, society has grown and changed, but the essence of education always remains constant: spreading knowledge and resolving confusion. While this remains true, the technologies that now dominate industry are constantly evolving; the development of technologies like cloud computing, big data, and artificial intelligence are driving profound reform in the education industry.

As the technology available becomes smarter, and its potential to transform industry becomes greater, there are brand new skills that must be developed through education to ensure that today's students – and tomorrow's workforce – are prepared to build on the foundations of innovation being laid today.

To ensure this can happen, education must also follow these trends, adapting to the new round of technological and industrial revolution that is driving human society rapidly towards an era of digital economy. In order to effectively implement new lessons that will support the development of

a workforce equipped with the right new skills, we must first formulate a top-level strategy, follow it to develop solutions, and finally use technologies to support solution execution:

Strategy: to realise universal and equal education, it is nowhere near enough to rely solely on one enterprise. Based on our ICT strengths and in-depth understanding of the industry, Huawei proposes the concept of "digital education community" and hopes to work with partners and customers to build it. Together, we can facilitate the high-quality development of education digitalisation. Huawei brings to the table advanced technologies in terms of cloud, network, edge, and devices to connect, aggregate, and share education resources in all scenarios, as well as offer full-cycle O&M and continuous evolution.

Solution: the integration between digital technologies and education scenarios brings both opportunities and challenges. The bar has been set high in terms of solution development standards. Currently, Huawei uses the "Five Ones" technical architecture – one screen, one network, one cloud, one platform, and one entrance – to cover all education scenarios, including higher education, basic education, and scientific research. With ICT as the backbone, Huawei provides leading



intelligent education solutions for ever-changing education scenarios.

Technology: W. Brian Arthur wrote in his book *The Nature of Technology: What It Is and How It Evolves*: "In the real world, technologies are highly reconfigurable; they are fluid things, never static, never finished, never perfect." Huawei constantly seeks to enrich our understanding of technology evolution. Huawei believes in people-oriented education and is committed to integrating ICTs like cloud computing, big data, and artificial intelligence into the entire education process to make teaching, scientific research, management, and services more innovative.

Huawei cooperates with universities to develop industry specialists in a new model that combines teaching resources with real industrial practices. We also work with the Ministry of Education of China to build a regional education cloud platform based on big data, cloud computing, and mobile terminal technologies for hybrid learning to leave no learner behind. In addition, we cooperate with industry associations and regional partners to build robust education ecosystems through innovation centres. Through these measures, we have expedited the development of a smarter education ecosystem.

For example, in the higher education field, Macau University of Science and Technology cooperated with Huawei to establish a lightweight, elastic, high-performance, and highly reliable infrastructure under centralised management for data centres. In the basic education field, Huawei represents a comprehensive blueprint to enable fair and inclusive education based on technical capabilities like high-speed inter-school network interconnection, cloud classroom, and smart classroom. Huawei's wireless network solution has built an on-premise cloud management platform for the Ministry of Education of the United Arab Emirates. This platform allows the Ministry to manage over 400 schools at the same time. It provides convenient Wi-Fi access anytime and anywhere, helping schools explore more advanced teaching methods, for example, e-schoolbags, smart whiteboards, virtual classrooms, and online interactive teaching to make education smarter. In terms of scientific research, the new data centre within the Egypt National Research Center builds a cloud platform that connects research institutes across the country, supported by Huawei's modular design, NetEco intelligent management system, and UPS modular redundancy design.

Global advancement depends on talent, and the cultivation of talent depends on education. Education is the cornerstone for a country and the future of civilisation. Recognising this, Huawei takes an extremely proactive approach to ensuring this talent and new skills can be developed to bring through the next generation of technology adoption.

Huawei's global ICT Academy programme is a significant part of this effort, and is designed to bridge the digital skills gap and empower individuals with the knowledge and expertise required to thrive in a technology-driven environment. The academy offers a wide range of training programmes and certifications that are aimed at developing specialised skills in areas such as AI, big data and cloud computing, and are shaped and delivered by industry experts to ensure participants get the latest practical information.

In the future, Huawei will continue to invest in R&D and deeply engage in the education industry to apply more core technologies including the likes of IoT, big data, artificial intelligence, and cloud in education scenarios. We hope to keep setting benchmarks, build a digital education community, and use intelligent education to light up an intelligent future. ▲

Collaborating for Acceleration: UNESCO Global Education Coalition's Journey towards SDG 4"

By *Borhene Chakroun, Director of Policies and Lifelong Learning Systems Division at UNESCO*

Technological progress and shifting social demands are changing the way we think about education. More and more countries are reimagining the future of learning. UNESCO is launching innovative mechanisms that can support nations while they begin their next course of development.

The year 2023 marks the midway to the 2030 Agenda for Sustainable Development and with it the 17 Sustainable Development Goals (SDGs). However, despite much progress being made towards Sustainable Development Goal 4 (SDG4), which seeks to ensure inclusive and equitable quality education and lifelong learning opportunities for all, education remains in a situation of crisis.

Six out of 10 children cannot read and understand a simple story at age 10 while 244 million children and youth are still out of school.

Numerous disparities in access to learning persist. Children from the poorest households are up to four times more likely to be out of school than those of the richest households and disparities between rural and urban areas



remain high. Girls are also disproportionately affected by lack of access to education with 118.5 million girls currently out of school. This not only threatens decades of progress toward gender equality, but also puts girls around the world at risk of adolescent pregnancy, early and forced marriage, and violence.

Fulfilling the right to education requires bold action. Doing so will accelerate progress toward all the SDGs and help address some of the most pressing global challenges including the climate crisis. This is exactly what UNESCO aims to facilitate as the United Nations specialized agency tasked with leading and coordinating the achievement of the Education 2030 Agenda. In steering progress for the achievement of SDG4 and the transformation of education, UNESCO is fostering bold collaborations, new methods of knowledge sharing, and the use of innovative mechanisms that can support countries in their transformation.

To meet the educational needs of students during the COVID-19 pandemic, UNESCO initiated the Global Education Coalition. This unique and proactive multistakeholder coalition was born to address the educational needs generated by the global health crisis and driven by the goal of leaving no learner behind during this crisis. As a broad network of organizations, including private sector, multilateral, non-profit, civil society, networks and associations, and media partners, the Coalition has proven itself to be a transformational force in the global education landscape. Moving into its fourth year, it now has over 200 institutional partners deploying cross-country missions, conducting large-scale projects, and building the advocacy capacity of 112 countries to advance SDG 4.

This year, the Coalition has pioneered the Digital Transformation Collaborative (DTC) that leverages the expertise and resources of all sectors of society to promote the transformation of education at local, national, regional, and global levels. In response to the call of the Global Education Coalition, Huawei has joined hands with UNESCO to promote digital education through ICTs. Together, they aim to narrow the education divide and achieve education equity.

Global Skills Academy Facilitates Talent Development

COVID-19 has also put a spotlight on the employment and skills divide, with recovery patterns that vary significantly across regions, countries, and sectors. According to the International Labour Organization (ILO), the repercussions have been grave in particular for the youth. In many countries is a cause for concern, with a significant prevalence of informality and vulnerable employment among employed youth worldwide. Additionally, when young individuals are not engaged in employment, they encounter challenges in accessing the labour market. Not only that, but entering and staying in the workforce in such a competitive market is extremely difficult, resulting in high rates of youth unemployment and NEET (not in employment, education, or training). This difficulty in transitioning from school to work has prompted the international community to address the issue within the framework of the 2030 Agenda for Sustainable Development. SDG8, and target 8.6 specifically, commits to increasing youth employment opportunities and substantially reducing the proportion of youth who are not in education, employment, or training (ILO, n.d.; United Nations, 2015).



Global Education Coalition Annual Meeting in 2023



In recent years, the Coalition has pioneered the Digital Transformation Collaboration mechanism that leverages the expertise and resources of all sectors of society to promote the transformation of education at local, national, regional, and global levels. In response to the call of the Global Education Coalition, Huawei has joined hands with UNESCO to promote digital education through ICTs. Together, they aim to narrow the education divide and achieve education equity. >>

Under the umbrella of the UNESCO Global Education Coalition, the Global Skills Academy (GSA) is tasked with mobilizing the resources and programmes offered by the Coalition Members to help learners increase their employability. By leveraging the UNESCO-UNEVOC network of institutions, the GSA supports learners with an extensive range of free high-quality training programs. Its resources are designed to create toward more inclusive, sustainable, and resilient economies in a rapidly evolving and demanding labour market. In line with the UNESCO 2022-2029 Strategy for TVET, the mission has scaled up in order to support 10 million learners by 2029 and is currently working with 25 partners.

As a member of the Coalition, Huawei has been a committed partner of the Global Skills Academy mission since 2020. The “Huawei ICT Academy programme” aims to help learners and educators worldwide develop their ICT and employability skills as well as bolster their success in the ICT industry by giving access to online certified training at no cost. Through these trainings, available in nine languages, and the annual ICT Competition, Huawei has been helping to build an innovative education talent ecosystem. With the support of UNESCO, local ministries, and other higher education institutions, the initiative has already reached more than 500,000 learners since it was established, with 1,000 teachers enrolled in 2022 alone and 16 Huawei ICT Academy centres established that same year. The GSA was delighted to participate in the online closing ceremony of the Huawei ICT Competition, which highlighted the triumphs of this initiative.

Shifting to Focus on the Digital Transformation of Education

Increasingly, digital technology has become a necessity in ensuring access to education as a basic human right, especially in the context of more frequent crises and conflicts. During the COVID-19 pandemic, for example, it was those countries without sufficient ICT infrastructure and well-resourced digital learning systems suffered the greatest education disruptions and learning losses, and it became clear that a more sustainable change is necessary for a definitive transformation of education.

Digital technologies have the potential to speed up progress towards Sustainable Development Goal 4 (SDG 4) by offering new modes of access to learning opportunities and advancing inclusion, enhancing the relevance and quality of learning content, building ICT-enhanced lifelong learning pathways, strengthening education and learning management systems, and monitoring learning processes.

As the Coalition has pivoted from emergency response to the wider transformation of education - a journey that has been hampered in many countries by the disruptions of the pandemic on learning systems - Huawei has shifted its support to align with this agenda.

Thanks to a US\$ 3 million commitment, the “Technology-enabled Open Schools for All” project is assisting the Ministries of Education and other partners of Ethiopia, Egypt and Ghana to design, pilot test, and scale up Technology-enabled Open School Systems. This three-year project, to be completed in July 2023, aims to

enhance national platforms and connectivity in schools and learning centres to train teachers and students on digital skills through improved digital content and pedagogical resources.

Key to the success of this project is its adaptability to different contexts. In Ethiopia, for example, the project is supporting the new national major initiative on Digital Textbooks, which aims to create a vast digital library for secondary school students from which 12,000 students and 250 educators will benefit, in addition to enhancing access to educational national platforms and to digital content for all secondary students and educators in the country. Meanwhile, in Ghana, the project is empowering learning outcomes and the acquisition of 21st Century skills through integrating technology with new pedagogies to educate 1,000 teachers and 3,000 students.

With partnerships being a key pillar of the Global Education Coalition, I am delighted that Huawei has also been able to support numerous other initiatives under this umbrella, including the multi-partner ImaginEcole project which has been rolled out by UNESCO, Spacecom and the government of the Republic of Côte d'Ivoire. As part of this collaboration, last year Huawei purchased and supplied devices to participating schools, providing access to educational materials to 6,000 students and staff.

Growing Collaborations and Commitments

High quality online content marks a key aspect of digital transformation and for this change to be sustainable, local stakeholders must be empowered in education ecosystems to create and share their own learning content.

While local Ministries and professionals must take the lead on this, it is important that we continue to support them in providing learners with access to reliable, public, and effective learning platforms that are populated with quality digital education content.

Since November 2022 and in collaboration with UNESCO, Huawei's support has extended to the Latin America region

through a signed roadmap with the Regional Bureau of Education for Latin America and the Caribbean. The "Teacher training in digital competencies" regional roadmap will be piloted in Chile to identify through self-assessment the specific areas that teachers need to strengthen. The identified skills gaps will then be addressed through the creation of courses to equip teachers with the tools they need to utilize digital technologies both in the classroom and for distance learning, and evaluations will be carried out to certify the learning outcomes.

In the first quarter of 2023, Huawei has also joined UNESCO's Global Alliance for Literacy (GAL) as an associate member. GAL is made up of 30 countries strongly committed to improving youth and adult literacy. Worldwide an estimated 763 million still lack basic literacy and numeracy skills – two-thirds of whom are women. Southern Asia is home to almost one-half of this global youth and adult population with no basic literacy and numeracy, while 27 per cent live in sub-Saharan Africa.

But beyond its conventional concept as a set of reading, writing, and counting skills, literacy is now understood as a means of identification, understanding, interpretation, creation, and communication in an increasingly digital, text-mediated, information-rich and fast-changing world. As an associate member, Huawei is committed to promoting literacy in the target countries with a focus on digital skills and the use of technology and it will do this by supporting initiatives such as the UNESCO Institute for Lifelong Learning and Moodle project, which aims to build the capacities of youth and adult literacy educators through training modules and by designing digital skills monitoring and assessment tools.

As the partnership between UNESCO and Huawei continues to flourish, we will see more new content, trainings and initiatives empowering teachers and pupils in different regions. In facilitating the creation of quality education and promoting lifelong learning opportunities, Huawei demonstrates the important role that the private sector can play in accelerating progress towards the critically important Sustainable Development Goal 4. ▲



Peking University's Practice and Exploration of School Affairs Data Governance

By Jiang Guangxue, Director of the Data Office of Cybersecurity and Informatization Committee Office of Peking University

School affairs data is an objective record of university operation and management in the electronic school affairs information system. During data governance, Peking University continuously improves data standards, common data element representation, basic data aggregation, and information system design, as well as data exchange, sharing, and interoperability of the basic database in the information system to cater to the ever-growing data sharing demand.

School affairs data is an important intangible resource for universities. From the perspective of management, school affairs data refers to school management information generated during the operation process of universities and

their subordinate organizations based on their rights and responsibilities, stored or used through the Internet or computer systems. Such data includes but is not limited to data of personnel identity, asset and equipment, teaching and scientific

We should focus on the division of labor and emphasize collaboration, and consider whether it is beneficial to use the development of business as the measure of an endeavor's worth.

research, academic support, administrative operation, and service assurance. School affairs data is an objective record of university operation and management in the electronic school affairs information system. There is a basic logical relationship between data and university business. It is not the data that determines the business, but the business that determines the data, and the two are essentially an object and corresponding subject.

In Peking University's school affairs management, the main information resources stored in the system are usually used to study and define different types of school affairs data. After more than 20 years of on-going investment in informatization, Peking University also faces challenges in data quality, data sharing, data application, and data security.

Dilemma and Solution of Data Disorder

From the technical perspective, the preceding challenges are the inevitable result of asynchronous, insufficient, and unbalanced informatization in universities, due to the technical tools used by different fields and departments having different focuses.

From the perspective of management, there are issues of unreasonable planning and poor resource coordination. Technology practitioners often lack a sufficient voice on the business side. They can participate in planning

or develop plans, but cannot effectively coordinate resources to better implement them. On the other hand, due to traditional constraints, it is difficult for business departments to devote dedicated resources to understanding and executing informatization tasks.

These weaknesses force informatization departments to comprehensively manage data. Because they are not able to overturn everything, they can only ensure the smooth flow of basic elements in the smart campus system by breaking down barriers, sharing data, and promoting technical applications to serve the university's development.

For Peking University, we need to strengthen planning, resource coordination, and the collaboration between management and technical forces. With the management team coordinating the overall picture, more authority should be delegated to technical practitioners to remove the barriers between management and technology. We should focus on the division of labor and emphasize collaboration, and consider whether it is beneficial to the development of business as the core indicator to measure the pros and cons.

Management-oriented and Strategy-based Governance and Data Sharing

Over the past decade, Peking University has tried many



The three-dimensional data structure begins with understanding the essential relationship between school affairs data and university operations. It then aligns the data generated by business across each domain and returns the data to better meet business requirements. >>

ways to improve our working mechanism in the process of informatization, gradually clarified the functions and responsibilities of informatization departments, and enhanced management and technical collaboration.

At the end of 2018, the Cybersecurity and Informatization Committee of Peking University was established, with the university's Party Secretary and President named as the directors. In April 2019, Peking University aligned with the national cyber information governance systems and established a physical committee office (hereinafter referred to as the Office).

The working mechanism of the Office is as follows: The Office coordinates the whole picture of informatization on behalf of the university, and related departments are responsible for specific business implementation. For example, the computing center is responsible for the development, construction, and O&M of campus networks and information systems. The teacher teaching and development center is responsible for the management and maintenance of the online teaching platform and digital classrooms. The library is responsible for the management of electronic resources and the purchase of e-books and periodicals. Other level-2 departments are responsible for the informatization of their own business according to their respective functions.

The Office focuses on promoting data sharing and coordinating the management and technology. After nearly two years of efforts, we have greatly strengthened departmental collaboration, optimized

the platform, organizational structure, and working mechanism. In this way, we have gradually formed a distinguished school affairs data governance system and informatization system.

Intelligent Management Based on the Interactive Three-Dimensional Data Structure

To solve technical application issues, Peking University takes the lead in using the most advanced data 4.0 process platform in the industry to improve technical level and standards in data governance. To meet requirements of shared management, we build a three-dimensional model of people (X), event (Y), and time (Z) to solve the structure and model-related issues in data sharing.

Three-dimensional data structure starts from understanding the essential relationship between school affairs data and university operation, aligns the data generated by business in each domain and returns the data to better meet business requirements. This structure points out the basic direction for data governance, and finds the basic rules for data modeling. After a year, the data sharing platform has made marked progress. By April 2020, it had integrated large-scale, high-quality, and unified school affairs data (more than 800 million data records in six categories, covering personnel identity, asset and equipment, teaching and scientific research, academic support, administrative operation, and service assurance).

Data governance in universities should

not only focus on technologies, but also on understanding the nature of university operations. The essence of a university is knowledge production and knowledge dissemination, which runs through the whole process of university operation. The management, process, and data transfer derived from the production and dissemination of knowledge can be visualized in the process of informatization. This way of presenting information is people-centric, which is conducive to all types of business, such as teaching and scientific research, management, culture inheritance, and social services, as they are people-centric. And business categories are the extension or growth of basic data interactions.

Based on the people and event dimensions (X/Y) and the description of the time variable (Z), the data generated by all campus activities can become visible, known, perceptible, and controllable. Based on this data interaction structure, new technical means can be used to quickly apply new applications in corresponding scenarios. So far, we have completed large-scale data integration and several data analysis applications based on this solution.

Complete Systems

The management of school affairs data, which we understand, is essentially a function of university management and operation. It is a process of modifying, improving, or reengineering business processes or authority patterns through the improvement and governance of school affairs information and data. It is manifested as a series of specifications and complete systems.

If we want to ensure the long-term development and normal data governance and sharing on the basis of building a three-dimensional interactive data structure consisting of people, event, and time, a complete institutional system, which should integrate organization and platform, and an effective practice system, which can assure management, technology, and

service growth, must be developed. By promoting cross-domain data sharing and application, implementing advanced management ideas, optimizing institutions, and improving capabilities, a strong institutional-practice system can be eventually formed. The mutual promotion of the institutional system and practice system ensures that all data is manageable, controllable, reliable, and available, and that the managed services cover all domains and the whole business process.

In general, in the theoretical community, there is still much disagreement on the attribution of data information, and laws and regulations need to be further formulated and improved. In the current phase of rule adjustment, we need to properly address the relationship between data sharing and protection. In this context, Peking University formulated the Peking University School Affairs Data Management Measures in July 2020 to regulate school affairs data collection and cataloging, sharing, and security assurance, protecting public information resources and personal information rights and interests.

Along with improving the institutions, Peking University has further upgraded the organizational structure. In July 2020, the Peking University School Affairs Data Management Working Group (hereinafter referred to as the Data Group) was established. As the leading execution organization of data governance, the Data Group sets up an office (Data Office) under the leadership of the Cybersecurity and Informatization Committee Office. The Data Group consists of the main heads of functional departments that serve as the main source of school affairs data. It is responsible for planning and developing school affairs data regulations and coordinating related business.

Direct Results and Long-term Achievements of Data Governance

Based on the consensus on joint and shared data governance, cybersecurity and informatization-related



During data governance, Peking University continuously improves data standards, common data element representation, basic data aggregation, and information system design. It looks to enhance the data exchange, sharing, and interoperability of the basic database within the information system to cater to the ever-growing demand for data sharing. >>

departments keep deepening the relationships between management and technologies, business and data, specifications and benefits, inheritance and innovation. They set rules for sharing and coordinating school affairs data, and improve the pilot mechanism for data sharing approval, offering data sharing services for more than 100 business systems to which level-2 departments belong.

The university attaches great importance to data security, and has been strengthening the top-level design and coordination to clarify the main content and responsibility matrix of data security management. By improving management systems, fulfilling security responsibilities, and allocating resources, we control over the security of processes such as data collection, data transmission, data storage, data use, data sharing, data export, and data destruction.

During data governance, Peking University continuously improves data standards, common data element representation, basic data aggregation, and information system design, as well as data exchange, sharing, and interoperability of the basic database in the information system to cater to the ever-growing data sharing demand. Based on new data standards, we further expand data governance capacity and use the people-event-time data model to integrate and sort out data, enriching derivative data such as organizations, business, activities, and transaction records in light of personnel data governance. In this way, we

can also preset expansion methods for the ever-increasing volume of data processing

Data governance in universities should not only focus on technologies, but also on understanding the nature of university operations. The essence of a university is knowledge production and knowledge dissemination, which runs through the whole process of university operation. The management, process, and data transfer derived from the production and dissemination of knowledge can be visualized in the process of informatization. This way of presenting information is people-centric. ▲

Expert views



The management of school affairs data, which we understand, is essentially a function of university management and operation.

It is a process of modifying, improving, or reengineering business processes or authority patterns through the improvement and governance of school affairs information and data. It is manifested as a series of specifications and complete systems.

— Jiang Guangxue, Director of the Data Office of Cybersecurity and Informatization Committee Office of Peking University

Preparing Your Education System for the Digital Age

By Mark Yang, Director of Education Dept of Global Public Sector, Huawei Enterprise BG

The education industry agrees that digital transformation is crucial, but what does it look like in practice? How can we guide digital transformation at different stages of learning? To answer these questions, Huawei teamed up with education experts to develop the maturity assessment model for intelligent education.

Digital transformation is marked by the rapid advancement and large-scale application of various technologies, such as 5G, IoT, AI, cloud computing, and big data. Our education systems now need to produce a stable supply of digital talent, ready to support an intelligent society. For this, the sector is adopting digital technologies.

The question is, what is at the core of digital transformation in education? How should education organizations evaluate their own level of informatization and systematically promote smart learning and teaching?

During the education session at HUAWEI CONNECT 2022, Huawei officially launched the Opportunities for Digital Transformation of Education White Paper. The document offers insights into strategies and outcomes of digital transformation in the education sectors of various countries. This White Paper also explores and proposes a maturity assessment model for intelligent education. The model was designed with input from industry experts, and is intended to help education organizations evaluate their level of informatization. Finally, it provides practical guidance for the





Huawei focuses on three key scenarios in education: smart classroom, smart campus, and research and innovation. We believe that the future of education and research is fully aware, connected, and intelligent. As such, we will continue working with partners in the sector to speed up digital transformation and enable all-scenario education.

—Mark Yang, Director of Education Dept of Global Public Sector, Huawei Enterprise BG



digital transformation of education.

Benefits of IT-Based Teaching and Learning

Education is our future. To enhance national competitiveness, many countries prioritize education in their digital transformation strategies. China, South Korea, Singapore, the US, and EU countries have all issued relevant policies to improve the digital literacy of learners.

As education goes digital, intelligent education is becoming a new engine of innovation. Organizations are building an IT-driven digital learning environment, so that students can enjoy convenient, efficient, and intelligent learning, which enables personal growth and social benefits.

For teachers, IT-driven environments are often more efficient and allow a higher degree of personalization for each student's unique needs, enabling schools to evaluate student progress and provide feedback for future improvement.

Maturity Assessment Model for Intelligent Education

The education industry agrees that digital transformation is crucial, but what does it look like in practice? How can we

guide digital transformation at different stages of learning?

To answer these questions, Huawei teamed up with education experts to develop the maturity assessment model for intelligent education.

The model assesses six dimensions: digital strategy, digital governance, smart environment, smart teaching, smart assessment, and transformational impact. Using these, schools can evaluate their transformation plans and digital teaching processes.

Other types of education organizations can also use the model to evaluate their digital vision and planning, digital governance system, data standards and security, smart environment, classroom teaching methods, evaluation systems, and digital transformation impact based on the different learning stages they target. This allows organizations to create clearer pathways for their digital transformation journeys.

Huawei and industry experts have designed this model based on extensive experience in helping education organizations go digital. We are seeing rapid growth in IT-based teaching, spurred on by the global pandemic. We believe that the future of education and research is fully aware, connected, and intelligent. As such, we will continue working with partners in the sector to speed up digital transformation and enable all-scenario education.

Huawei is deeply committed to the education industry, and works with partners to develop all-scenario education solutions that have helped more than 2,800 educational ministries, universities and research institutes, in over 120 countries, accelerating the digitalization of education.

Huawei's Technologies Enable Digital Education

Huawei focuses on three key scenarios in education: smart classroom, smart campus, and research and innovation. We provide all-scenario education solutions that draw on analysis, innovative intelligence, and full connection and collaboration.

Since 2019, we have been working with Côte d'Ivoire Ministry of National Education and Technical Education in building a national-level e-education system. Through the introduction of remote, interactive teaching, E-Learning platform, and Virtual Desktop Infrastructure (VDI) system, hundreds of classrooms are becoming smarter. In addition, the campus video security system, unified communications system, data center, and campus networking also made schools a better place for both teachers and students.

With 133 sites providing network coverage in 74 campuses and educational institutions across the country, Côte d'Ivoire has built a digital, next-gen education system, achieving more balanced development of urban and rural educational resources, as well as raising the overall level of education of the country.

Another example is Ankabut, UAE's National Research and Education Network (NREN). The organization worked with Huawei to build a full-stack education cloud, offering open cloud access services to universities and other education institutes. Huawei also draws on the superb performance of OceanStor all-flash storage to prepare Ankabut for its future service expansion. Plus, Huawei set up software-defined networking (SDN) to simplify O&M and reduce costs,

increasing research efficiency.

Huawei is deeply committed to the education industry, and works with partners to develop all-scenario education solutions that have helped more than 2,800 educational ministries, universities and research institutes, in over 120 countries, accelerating the digitalization of education. In the future, as the sector goes digital, we expect to work on more education domains, such as integrated online and offline education models, tech-enabled education trustworthiness assessment, after-school services and collaborative education, future-oriented schools and smart applications, IT-enabled education, and borderless learning, injecting digital momentum into education. ▲



Opportunities for Digital Transformation of Education White Paper

Opportunities for Digital Transformation of Education White Paper

Scan the code to read 'Opportunities for Digital Transformation of Education White Paper'

Transforming Universities with Fiber-based Networking

By *Julie Kunstler, Senior Principal Analyst of Broadband Access at Omdia*

Education is at the heart of national development. Countries around the world are focused on achieving digital transformation of education, making it an important development goal. Huawei's FTTO solution builds a unified bearer network that is fully connected, sensed, and intelligent for all services of teaching, management, and research. This solution meets the construction and reconstruction requirements of campus networks in all kinds of scenarios and builds a green all-optical base for intelligent education.

Universities are facing multiple challenges and COVID-19 has only exacerbated them. Students are seeking cutting-edge educational programs that will improve their performance outcomes while at university, and then in the workforce. Universities are striving to adopt new educational approaches but lack the underlying infrastructure to support seamless collaborative education between students and professors, regardless of their respective physical locations. In parallel, many universities are under pressure to reduce campus-related operational costs, such as electricity



"A POL provide a campus with an easy-toupgrade, high-capacity fiber communications network, connecting classrooms, labs, administrative and security offices, dorms, and auditoriums. In addition, POLs are less expensive to operate and manage than traditional LANs, a key factor as universities face rising costs."

—Senior Principal Analyst of Broadband Access at Omdia

consumption and labor. The adoption of optical networking and, specifically, Passive Optical LAN (POL) is a key enabler for universities, providing a reliable, secure, and sustainable communications network, meeting the strict performance parameters required by new educational programs. In addition, POLs provide meaningful cost advantages over traditional Local Area Networks (LANs), including ease of upgrades, longevity, and less power and real-estate use.

The Problem

While universities are leaders in implementing advanced smart building infrastructure, they are not leaders in adopting optical networking to support high-bandwidth applications throughout their campuses. The quick fixes implemented by university Information technology (IT) departments during COVID-19 are not sufficiently robust for Augmented Reality (AR) and Virtual Reality (VR) applications and collaborative, cloud-based educational programs. Many students suffered during lockdowns, trying to learn through tedious online lectures without the benefit of immersive or interactive learning experiences. Various studies have highlighted that online coursework generally yields worse performance than in-person coursework.

The underlying communications networks at universities must be modernized, taking advantage of new communications technologies, while supporting students, professors, and support staff, on campus and remotely. For example, universities are adding AR and VR to support educational instruction and real-life simulations, but older, copper-based networks cannot support the required bandwidth and low-latency requirements. In addition, many educators are focused on the metaverse, a virtual world facilitated by use of high-quality video, mixed with AR and VR. This metaverse supports collaborative work, whether between students on the same campus, or between on-campus and remote students, or across universities located in different countries. This educational approach can lead to truly international collaboration on classroom projects. It can train today's students to take advantage of different knowledge bases and ways of thinking to solve international problems, such as climate change, sustainable, energy, or pandemics.

However, new immersive education techniques require both bandwidth and low-latency. Figure 1 provides an overview of bandwidth requirements for different types of applications. An Extended Reality (XR)-free viewpoint requires 2000 Mbit/s or 2G and this level of bandwidth requires optical networking.



The key strengths are summarized in Figure 2. POL advantages range from cost and upgradeability to security and sustainability. >>

POL can support this bandwidth throughout a campus environment.

The Solution: Optical Networking and POL

POL is a type of LAN that uses fiber-based equipment for campus-type settings. POLs have been deployed in campus settings throughout the world, offering reliable and secure broadband communications. POL uses passive optical cabling, single-mode fiber, and passive (non-powered) splitters. A POL consists of an Optical Line Terminal (OLT), which can be based in a university's communications room, and Optical Network Units (ONUs), which can be placed throughout a campus, in labs, classrooms, auditoriums, offices, dormitory rooms, sports arenas, and cafeterias, for example. Each ONU supports multiple services and functions including voice, data, and video.

A POL offers numerous advantages compared to copper-based Ethernet LANs. The key strengths are summarized in Figure 2. POL advantages range from cost and upgradeability to security and sustainability.

Case Studies

The University of Canada in Egypt (UCE) is located in New Cairo, the new administrative capital of Egypt, located 60 kilometers east of Cairo. UCE is an accredited university and offers students the opportunity to transfer and complete or further education in Canada. UCE installed POL for data, video, and voice connectivity throughout its campus. Now, POL is supporting collaborative research

and education with the main campus in Canada and with its other remote campuses around the world. The POL is connecting labs, classrooms, stadiums, auditoriums, offices, dormitories, and cafeterias. UCE's POL deployment is providing high-speed broadband communications, along with edge computing, and cloud-based applications.

Southwest University (SWU) installed its POL in 2012 to reduce network complexity and support cloud-based digital education. The university was facing network operational challenges, managing multiple networks for different services for different users. Its POL covers the entire campus, including classrooms, labs, offices, student centers, and dormitories. Since 2012, SWU has expanded and upgraded its POL, supporting growing bandwidth demand and cloud-based educational applications, for its 60,000 students, professors, administrators, and support staff. SWU continues to benefit from POL's operational and management advantages, compared to traditional LANs.

In America, Washington State University (WSU) chose a POL to meet the broadband connectivity expectations of its students, while reducing capital investment and ongoing operating costs. The estimated cost of a traditional switched Ethernet infrastructure solution was nearly US\$4700 per bed for a new residence hall compared to US\$2900 for a POL. The university chose a POL as an affordable alternative, requiring less space, lower power consumption, and less time to implement than traditional copper-based solutions. The significant space savings made have enabled WSU to provide additional living areas for its students. ▲



Huawei FTTO Solution

Building a Green All-Optical Base for Intelligent Education



Huawei OptiXstar Series
Optical Terminal

Building a Digital Education Community to Facilitate High-Quality Education Development

By Xia Zun, President of the Global Public Sector, Huawei Enterprise BG

Education is the cornerstone for national strength and economic development, the lighthouse for talent and innovation, and the vessel for cultural exchange and inheritance. The latest round of technological revolution brings precious opportunity to the education industry. Digital resources are essential to improving teaching quality, efficiency, and experience.



Promoting the Collaborative Development of Digital Education

As we stride boldly into the digital age, nations across the globe are exploring ways to foster the transformation of their education sectors. Applying emerging technologies to drive education's digitalization has become commonplace. So, how can this be achieved?

• Connect and aggregate education resources under all scenarios

The development of education requires a well-established infrastructure and advanced digital technologies to integrate services, management, technologies, data, and applications. Digital education should also be 'all-scenario-oriented,' covering multiple applications. Integrating teaching, research, governance, and services at multiple levels empowers

intelligent education.

• Support all-round openness and collaboration

Digitalization requires cooperation from the involved parties, including governments, schools, enterprises, and society, to eliminate digital barriers, narrow the digital gap, improve crisis response, promote transformation and innovation, and coordinate ICT application's in-depth integration. Digital education needs converged connectivity, computing, cloud computing, artificial intelligence, and security support, along with the digitalization of services and management to enable multi-layered and all-around collaboration among network hubs, applications, and connections. If governments, schools,

enterprises, and society can shake hands on this concept, nations can bridge the digital divide and make education more accessible than ever.

• Full-lifecycle O&M and continuous evolution

For digital education to continue evolving, we must change the idea to emphasize construction over operation and short-term gains over long-term results. Construction is only the first step. After that, we need to integrate educational data and content resources, devise new service scenarios, and improve the service experience. This calls for cooperation between governments, schools, enterprises, and the public so digital education can develop smoothly and sustainably.

Building a Digital Education Community to Facilitate High-Quality Education Development





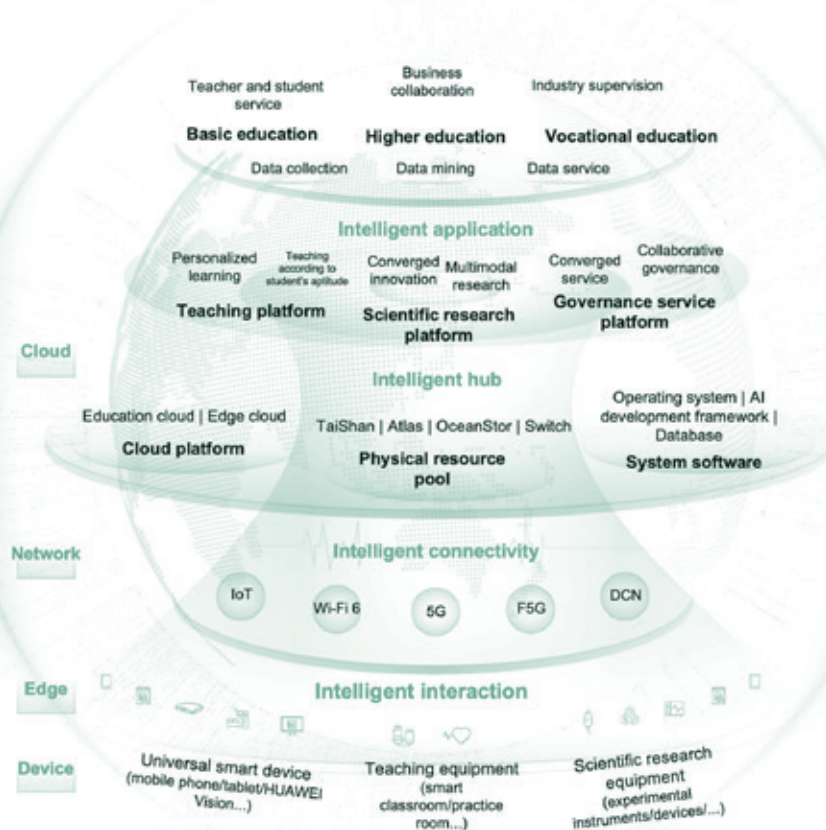
A Digital Education Community

Just as people are at the heart of all development efforts, teachers and students lie at the heart of education. With this in mind, Huawei has proposed the concept of the 'digital education community,' an

industry first. The most important thing to advancement in this space is the experience and feedback of teachers and students. The guidance of government policies, the practices of colleges and universities, and the

support of enterprise products and services without the feedback of the people who are entrenched in them risk becoming tone-deaf. These elements, however, build a sustainable digital education community that

Architecture of the Digital Education Community



As time goes on, Huawei will leverage our technical advantages in connectivity, cloud, computing, and artificial intelligence as well as the assets of the ICT industry chain to drive the development of the education industry. We will work to advance related upstream and downstream industries and foster a new digital education ecosystem.
— Xia Zun, President of the Global Public Sector, Huawei Enterprise BG



thrives sustainably. To constantly make evolution and optimization possible, digital education should connect physical, digital, and public spaces.

The digital education community aims to make the industry smart. First, we must focus on teachers and students and upgrade intelligent teaching applications to improve teaching quality, efficiency, and experience. This encompasses our core vision. Second, we can build an intelligent hub that keeps up with the demands of the industry by applying cloud, AI, and computing technologies. Third, through intelligent connections and interaction systems, teaching and research environments and devices can be widely connected. Finally, the digital education community must require a consensus on digital education. It needs to come together to accelerate digital transformation

across all education and research sectors. Collaboration is what will create a win-win situation where all can enjoy the fruits borne of digitalization.

• **The iHarbour — Intelligent Education Town in Shaanxi: Huawei's first launch of the digital education community in China**

Intelligent Education Town in Shaanxi is Huawei's first execution of the digital education community practice in China, set up in partnership with the Ministry of Education, Shaanxi Province, and Xi'an Jiaotong University. It is a four-in-one body that combines campus, town, industrial campus, and community. By integrating technologies, services, and industries, it is expected to serve as an example of higher education reform and urbanization across China.

By providing industry-leading,

future-oriented products, and solutions, Huawei has built a smart campus featuring cloud-network integration and multi-network convergence to widely apply various services and applications in iHarbour. The Intelligent Education Town caters to the needs of production, education, and research, providing valuable experience and reference for the development of new infrastructure and intelligent education in China's 'new cities'.

• **Macau University of Science and Technology: Synergy between campus environment, teaching, and research**

Macau University of Science and Technology houses well-equipped research platforms and teaching buildings. As it has discovered, a people-centered campus service system built by all that benefit all



To promote fair education, we need to interconnect digital devices efficiently and share high-quality education resources in a timely manner. This is exactly why connection, computing, cloud, and artificial intelligence are key technical elements for building a digital world and are also the cornerstone for developing digital education.

>>

allows synergy between the campus environment, teaching and research, and campus services. It cooperated with Huawei to provide highly reliable infrastructure under centralized management for data centers. It also applied an intelligent O&M platform with big data analysis and machine learning algorithms to transform passive O&M into proactive O&M. It signed a cooperation agreement with Huawei on Huawei ICT Academy to send excellent digital talent to the Greater Bay Area while introducing HUAWEI IdeaHub to build smart classrooms that harness high-quality teaching materials and encourage student-centric learning.

• **Join hands with other countries and regions to explore the digitalization of education**

Huawei built a next-generation wireless network covering all scenarios, including classrooms, auditoriums, and offices in Hasseris Middle School, Denmark. The wireless network realizes virtual network planning and deployment and also supports automatic and intelligent network management as well as minute-level service rollout, greatly simplifying

network construction and deployment.

In Honduras, Huawei has built an intelligent next-generation digital campus network for the Universidad Nacional Autónoma de Honduras (National Autonomous University of Honduras). The network connects the university's nine campuses and offers wireless coverage, allowing teachers and students to access high-speed network services at any time and from any location. Wired and wireless networks are integrated to ensure online education for the university's eight regional, five remote, and eight remote learning resource centers.

Huawei helped the Ministry of Education and Sciences in Paraguay to provide broadband access and wireless network coverage for over 3000 primary and secondary schools. This supports education resource sharing and narrows the gap between urban and rural education nationwide.

More and more practices show that digital education requires the support of a strong and collaborative community where participants from the education industry, services, technologies, management, funds, and talent are all centrally planned.



New Advantages in High-Quality Education

The digital education community boasts the following advantages when it comes to promoting the high-quality development of the education industry:

- **Drive the construction of new infrastructure and build a novel basis for education fairness**

To promote fair education, we must interconnect digital devices efficiently and share high-quality education resources promptly. This is why connection, computing, cloud, and artificial intelligence are key technical elements to building a digital world and are considered the cornerstone for developing digital education. High-speed networks implement cross-school and cross-region sharing and learning, enabling people in different countries, regions, and environments to enjoy high-quality education resources through wired and wireless networks.

- **Improve education quality, efficiency, and experience**

Digital technologies are inseparable from modern teaching and learning activities. Teaching results and student growth can be accurately and precisely reflected through information aggregation, mining, analysis, supervision, and evaluation, providing teachers with data-based teaching feedback and students with personalized learning solution suggestions. As a result, teachers can tailor their teaching approaches and students can learn based on their needs anytime, anywhere. In addition, digital technologies backed up with the support of data help government

education management departments scientifically evaluate and improve teaching across regions. All these things will tremendously improve education quality.

- **Facilitate talent cultivation, scientific research, and industry innovation and transformation**

The digitalization of teaching and scientific research environments like campuses, classrooms, libraries, and labs is gradually coming to support applications in scenarios such as learning analysis, teaching evaluation, online and offline hybrid learning, and teaching and scientific research linkage. This improves the experience and results of teaching, scientific research, management, and service processes. Data allows more precise teaching method analysis, education management, and evaluation so that teachers can personalize their teaching approaches to each student's aptitude, personality, and interests.

The digital education community arose naturally according to time and circumstance. As time passes, Huawei will use its technical advantages in connectivity, cloud, computing, and artificial intelligence, as well as the assets of the ICT industry chain, to propel the education industry. We will work to advance related upstream and downstream industries and foster a new digital education ecosystem. With the digital education community, we will transform classroom teaching and talent cultivation models, integrate and innovate teaching technologies, and accelerate the growth of high-quality education. ▲



Intelligent Lossless HPC Network Empowers Peking University With Unrivaled Performance

Huawei's hyper-converged data center network (DCN) makes a leap in computing power, maximizing operation efficiency. With the intelligent lossless high-performance computing (HPC) network, teachers and students of Peking University can run simulations and process data much faster, helping scientific research climb to greater heights.

"I really need to run this task to catch up with my deadline. The queuing time for resources is way too long. What do I do?"

"My experiment deadline's next week, but I just noticed some data was incorrect. It's going to take more than 100 hours to run the simulation again. Can it go any faster?"

"This experiment is so important to me. The deadline is coming up fast. Will I be able to run my task first?"

What troubles scientific researchers is not only molecular motion, deoxyribonucleic acid (DNA) composition, wind tunnel testing, and complex modeling and simulation experiments, but also having

This award-winning project improved the simulation limit of molecular dynamics. It allowed up to 100 million atoms via machine learning, which was astonishing. This is considered one of the most significant breakthroughs made in the computational science field to date.

to manage limited computing resources and coordinate around long queuing times.

In order to improve HPC efficiency and reduce the costs of scientific research, the public HPC platform of Peking University organized a vendor appraisal to select an HPC network that can live up to their expectations. Huawei's intelligent lossless HPC network ranked No. 1 due to its unrivalled computing performance.

A Computing Center With Remarkable Achievements

Peking University took the lead in setting up a computing center among universities in China when it bought its very first computer in 1963. In 2001, it gathered experts from various fields to found the Center for Computational Science & Engineering. This center is positioned as a multi-disciplinary research platform that can serve the university's teaching and research activities. In 2018, the public HPC platform was unveiled, and three clusters — Weiming No. 1, Weiming Teaching No. 1, and Weiming Biological Science No. 1 — were gradually put into operation. The total number of computing cores on the public platform reached 31,732, and the peak computing power 3.65 PFLOPS. The platform provided an HPC environment for a host of disciplines such as mathematics, mechanics, physics, chemistry, biology, and geology.

A Solid Foundation for Scientific Research

An HPC platform functions as a key support for a university's scientific research. By May 12, 2023, the HPC platform of Peking University had 5070 users distributed in 96 faculties. The platform has supported more than 545 research projects with a total fund of CNY3.136 billion and over 1400 high-quality papers. It also supported the release of the Gordon Bell Award in 2020. This award-winning project improved the simulation limit of molecular dynamics. It allowed up to 100 million atoms via machine learning, which was astonishing. This is considered one of the most significant breakthroughs made in the computational science field to date.

Higher Computing Demands Make Network Reconstruction Urgent

As the number of users on the platform continues to increase, the operation workload is gradually creeping beyond its upper limits. This has led to an unprecedented level of network infrastructure throughput and complexity. Take Weiming Biological Science Number 1 as an example. The node utilization has remained above 95% for a long time. Its maximum task operation time is as long as 109 hours, and the maximum queuing time is 550 hours. It is clear that the reconstruction of the system and network is urgent.



768x400

GE ports



10E-level

ultra-large
compute cluster



17%

shorter than that
of IB

The HPC platform of Peking University has a leading supercomputing cluster in China. The LINPACK efficiency of the entire system consistently ranks first place, which poses extremely high requirements on network performance, reliability, and advancement.

To solve these problems, vendors proposed to use lossless network technologies such as InfiniBand (IB), RoCEv1, and RoCEv2. After strict tests, the public HPC platform of Peking University finally chose Huawei's CloudFabric 3.0 hyper-converged DCN solution due to its unrivaled performance. Based on an intelligent lossless HPC network, this solution is ideal for building HPC clusters that can unleash 100% of computing power and minimize the task operation and queuing times.

Huawei's Intelligent Lossless HPC Network Helps Peking University Improve Scientific Research Efficiency

The tests focused on the performance of TCP/IP, IB, and RoCEv2 in different application scenarios including the HPC benchmark test tool LINPACK, Community Earth System Model (CESM), and the molecular dynamics software Virtual Analogue Switching Point (VASP).

In the VASP test, Huawei's intelligent lossless HPC network — 100GE RoCEv2 — outperformed IB. In the LINPACK and CESM tests, Huawei's 100GE RoCEv2 had basically the same performance as IB. All of this proved that Huawei's intelligent lossless HPC network could replace IB in real application scenarios.

Huawei's intelligent lossless HPC network solution uniquely enables lossless Ethernet. Compared with the conventional Ethernet, the lossless Ethernet can double computing power at the same server scale. Another highlight of the solution is the CloudEngine 16800 switch. This feature-rich switch offers the industry's highest density of 768 x 400GE ports, and is ideal for building a 10E-level ultra-large compute cluster. Furthermore, Huawei is the only vendor that implements network-assisted computing, that is, in-network computing (INC). As verified by Tolly, the job completion time (JCT) of Huawei's solution is 17% shorter than that of IB.

The HPC platform of Peking University boasts ownership of the leading supercomputing cluster in all of China. The LINPACK efficiency of the entire system consistently ranks first place, which poses extremely high requirements on network performance and reliability. These tests prove again how powerful Huawei's hyper-converged DCN is and help win Huawei more recognition from the supercomputing industry. Looking ahead, Huawei's intelligent lossless HPC network will see its wider application across various fields like education and scientific research, laying a solid foundation for scientific computing, engineering innovation, and high-end scientific research. ▲



SWU of Thailand: Transforming to an 'Innovative University' by Upgrading Digital Infrastructure

To build an innovative university, Thailand's SWU is upgrading its infrastructure and digital systems in an effort to drive digital transformation and develop digital talent for Thailand.

Founded in 1949, Srinakharinwirot University (SWU) was the first upper-education institution in Thailand to concentrate solely on teacher training. With a population of more than 25,000 students, SWU comprises four colleges and seventeen faculties at two campuses:

The Prasarnmit campus, in downtown Bangkok (Sukhumvit Soi 23), houses several

faculties, mainly in Social Sciences (i.e. Education, Humanities, Fine Arts, etc.)

The Ongkharak campus, Northeast of Bangkok, hosts the Faculty of Engineering and several Health Science faculties (i.e. Medicine, Dentistry, Nursing, Pharmacy, etc.)

All faculties and colleges offer Bachelor degrees and most of them offer Masters and Doctoral degree programs.

"SWU believes that things will change so fast in the next 5-10 years, Hence, SWU have started the transformation and fully pushed the digital development with the focus on infrastructure and systems."

*—Assoc. Prof. Dr. Somchai Santiwatanakul
President of Srinakharinwirot University*

Several faculties also run joint programs with overseas institutions, broadening the University's knowledge base. SWU aims to provide a well-rounded education and produce good citizens who will contribute to Thailand's development.

Upgrade ICT Infrastructure to Expand Wi-Fi Coverage

To reach its objective of becoming an "Innovative University", SWU management realized the need to upgrade its ICT infrastructure to support the use of educational applications in its two campuses.

The existing ICT system did not have enough bandwidth. There was no centralized identity authentication and access management. The monitoring system infrastructure was not up-to-date and unable to detect problems in real time. The wireless network was unstable and did not cover all areas.

Huawei suggested a 2-phase transformation roadmap that comprised the overhaul of SWU's core network, core backbone and monitoring system.

- **Phase 1**

To provide Wi-Fi connections around the two campuses, especially at the College of Social Communication Innovation (COSCI)

- **Phase 2**

To use Virtual Reality (VR) in classrooms, with additional devices as part of the new ICT infrastructure

To ensure a Safe Campus, using AI applications managed

from a centralized command center

A Superior Campus Network Helps Build an Innovative University

Huawei Cloud Campus allows the use of smart applications through the network, with low latency. Huawei High Speed Core Switch brought a 20-fold increase in bandwidth. All buildings now have 20-Gbps bandwidth with an access to 40-Gbps in high-traffic data usage areas. Firewall 20 Gbps increased the speed of security checkup. The speed of the wireless network system increased to 2.5 Gbps.

Huawei Agile Controller, with Huawei SDN and eSight, enabled SWU to organize, monitor and categorize various group users, based on priorities and bandwidth requirements, regardless of users' location.

Students and professors enjoy full Wi-Fi coverage anywhere anytime within the university's two campuses, facilitating communication, creativity and innovative ideas.

SWU can control, manage and monitor its ICT system more efficiently.

The smart campus solution will make SWU more intelligent and digital by comprehensively upgrading its academic, research, and management activities. It not only strengthens the leading position of SWU in Thailand's education community, but also provides a new smart campus model for the construction and upgrade of ICT infrastructure in other universities in Thailand, promoting talent development in a digital Thailand. ▲



The Digital Transformation of M.U.S.T.: Boosting Innovation and Building a Smart Campus

By Zhao Xichen, Director of the M.U.S.T. Information Technology Development Office

M.U.S.T. began developing its WeMust smart campus application as early as in 2007. In 2021, it forged a strategic partnership with Huawei to build a smart, innovative campus that speeds up the university's digital transformation.

Founded in 2000, Macau University of Science and Technology (M.U.S.T.) is the largest multi-disciplinary university in Macao and is ranked among the world's top 300 universities by Times Higher Education. Currently, the university is home to over 17,000 students.

Last year, M.U.S.T. began the implementation of its latest 2021–2025 Strategic Plan, which

focuses on promoting cultural exchange, nurturing intellectual growth, fostering economic development, and furthering societal progress. The plan emphasizes teaching and innovative research, both of which require smart campus operations.

Currently, M.U.S.T. is home to three state-level research platforms and multiple key research institutes and centers. It also houses



Huawei's data center virtualization solution integrates underlying hardware resources, which enables the sharing of computing, storage, and network resource pools and flexible expansion. It also eliminates resource silos and improves the Data Center's ICT infrastructure resource utilization.

>>

several modern teaching buildings and labs with world class equipment and facilities where students can learn the latest advances in science and technology.

To deliver the best quality of education, the university needs to upgrade its IT infrastructure, assure safety management, and deploy new applications. It is also working on a centralized platform for research innovation, smart teaching, refined management, and proactive services.

M.U.S.T. began developing its WeMust smart campus application as early as in 2007. In 2021, it forged a strategic partnership with Huawei to build a smart, innovative campus that speeds up the university's digital transformation.

Supercomputing Center: A Digital Innovation Platform for Macao Science 1 and Its Deep-Space Exploration

M.U.S.T. houses the State Key Laboratory of Lunar and Planetary Sciences — China's first such lab. M.U.S.T. is also the first university in the Hong Kong & Macao area to participate in state lunar exploration projects. It has been part of several key projects, including the Shenzhou Program, Chang'e Lunar Program, and Tianwen 1 Mars exploration.

The year 2019 marked the launch of Macao Science 1, Macao's first scientific satellite project. In 2022, M.U.S.T. and the Chinese Academy of Sciences established the Macao Satellite Science and Application Data Center (Data Center) for the project. The Data Center serves as a reliable and innovative platform featuring advanced technologies, high computing power, excellent energy efficiency,

and robust security for the country's deep-space exploration.

The Macao Science 1 project works on science's cutting-edge, including South Atlantic Anomaly (SAA), one of the most important features of the Earth's magnetic field; the nature of the Earth's dynamo mechanism, the evolution of the geomagnetic field, and the influence of the mantle on the core of the Earth.

These studies require the processing and calibration of massive amounts of high-precision data, which beyond the capacity of the university's legacy data center. The lack of information sharing and resource elasticity capabilities also curb M.U.S.T.'s advances in research.

Funded by the state and the Science and Technology Development Fund (FDCT) of Macao, M.U.S.T. teamed up with Huawei to design a full-stack data center that combines virtualization software and ICT hardware (including CPU & GPU servers, distributed storage, and network construction by partition and domain). The result is an integrated solution that delivers lightweight, elastic, high-performance, and high-reliability infrastructure.

Huawei's data center virtualization solution integrates underlying hardware resources, which enables the sharing of computing, storage, and network resource pools and flexible expansion. It also eliminates resource silos and improves the Data Center's ICT infrastructure resource utilization.

The modular architecture supports building-block combos of container and DR functions to meet future expansion needs. In addition, the open architecture supports heterogeneous resource management and smooth

The AI Fabric solution builds a hyper-converged, intelligent, and lossless data center network using CloudEngine switches unleashing 100% of its computing power without expanding data center.

interconnection with third-party management platforms, facilitating flexible deployment and modernization of data centers in different scenarios.

The OceanStor mass data storage enables the Data Center to share and store unstructured data. In the future, even as the amount of data generated by the Macao Science 1 project grows exponentially, the Data Center will still be able to stably carry high-performance services.

The AI Fabric solution builds a hyper-converged, intelligent, and lossless data center network using CloudEngine switches unleashing 100% of its computing power without expanding data center.

The network design features level-3 protection, effectively ensuring Data Center security. The intelligent O&M platform supports telemetry-based data collection in milliseconds and AI knowledge graphs. This enables fast fault locating and network construction by partition and domain, facilitating smooth evolution in the future.

Currently, the system delivers 265 TFLOPS CPU computing power, 73 TFLOPS GPU computing power, 1.2 PB storage capacity (expandable to 83 PB), and 5.5 Gbit/s bandwidth. This enables high-concurrency data processing, openness, scalability, security, high reliability, energy conservation, and easy management.

Innovation + Talent: Helping Macao Become a Science and Technology Innovation Center in the Western Greater Bay Area

M.U.S.T. has been cultivating a culture of innovation,

particularly through its Faculty of Innovation Engineering and the Kangze-MUST Innovation and Technology Center, a multi-disciplinary innovation platform that integrates various innovation resources.

The e-Lab of the Faculty of Innovation Engineering delivers a seamless network experience to students and teachers, powered by Huawei CloudEngine switches.

The Kangze-MUST Innovation and Technology Center has adopted the leading Wi-Fi 6 continuous networking solution to build an all-wireless office network with high speed, large capacity, and ultra-low latency. The solution centrally manages the main campus, visualizes user experience, and intelligently optimizes Wi-Fi quality. Plus, the reliable intelligent power supply system uses an intelligent temperature control system to ensure data center running in a safe environment.

M.U.S.T. values both teaching and research. It actively promotes collaboration among academia, institutes, and private companies to cultivate well-rounded technical talent. As part of these efforts, the university and PwC Macau established the Macau Cybersecurity Collaboration Centre (MCCC) to promote research in cybersecurity. They also cultivate top industry talent to benefit the Guangdong-Hong Kong-Macao Greater Bay Area as well as other regions.

The university has also signed a strategic cooperation agreement with Huawei to establish a Huawei ICT Academy on campus. Together, they have prepared a talent development plan for cloud computing, big data, IoT, and AI skills building to cultivate excellent ICT talent for the Greater Bay Area.



WeMust is an integrated smart campus service platform consisting of "one center, nine platforms, and four standard systems". "One center" refers to the university's data center. "Nine service platforms" include basic, office, payment, teaching, research, support, external, third-party, and integration services. Finally, the "four standard systems" cover products, development, O&M, and security. >>

WeMust Smart Campus Platform: Accessing Campus Services Anywhere in the World

M.U.S.T. has always prioritized IT infrastructure. In October 2017, the university unveiled a smart campus development plan. In 2022, it was certified by the Quality Assurance Agency for Higher Education (QAA), which recognizes the achievements of the university in building the WeMust campus.

WeMust is an integrated smart campus service platform consisting of "one center, nine platforms, and four standard systems". "One center" refers to the university's data center. "Nine service platforms" include basic, office, payment, teaching, research, support, external, third-party, and integration services. Finally, the "four standard systems" cover products, development, O&M, and security.

WeMust streamlines all data, establishes the "one number, one source" rule, and builds a data exchange middle platform. It provides one-stop, universal intelligent applications by associating multiple micro-applications. This assures comprehensive service coverage for the entire university. It also organically connects the physical campus with the digital platform, so that teachers and students can access resources and services from anywhere.

Since users access the campus network from different locations, the university needs a stable network that features high bandwidth, high availability, full service support, and free mobility. For this, M.U.S.T. uses the CloudCampus solution that integrates wired and wireless networks and IoT.

The solution's flexible VxLAN Fabric architecture is compatible with third-party

devices. VxLAN Overlay technology is used on the underlay physical network to divide multiple dedicated networks, independently bearing various services for easier live network reconstruction.

In addition, the free mobility feature allows students and teachers to access the network anytime, anywhere with consistent authentication and experience. They only need to authenticate once, even if they access the network from different locations. This solution also supports smooth evolution from 10GE to 40GE and 100GE, growing with the campus for the next 5 to 10 years.

Smart Campus Network: All-Wireless Coverage, Unified Network, and All-Intelligent O&M

Remote learning has become more common since the outbreak of the pandemic. Teachers and students use different devices to connect to the online classroom from various locations. Plus, universities are experimenting with XR and immersive teaching. These new models require a unified smart campus network featuring all-wireless coverage and all-intelligent O&M.

M.U.S.T. has been building its smart campus in several phases, supporting WeMust with high-quality networks with all-wireless coverage and all-intelligent O&M. During the pandemic, students were able to access virtual classrooms through WeMust, minimizing interruptions in learning.

The campus network serves as a solid digital foundation for smart campus construction. Take the new Building R as an example. Its all-scenario wireless coverage brings

In this way, the university eliminates the restrictions of time and space, and shares high-quality resources for better experience and higher efficiency.

an unparalleled experience to teachers and students. The integrated teaching building is equipped with a multi-functional hall, movie theater, classrooms, research and teaching labs, studios, faculty offices, and logistics support rooms. Building R is an important space for academic activities, leisure, and administrative affairs, so it's often quite crowded.

M.U.S.T. has deployed the state-of-the-art Wi-Fi 6 solution and AirEngine series high-density indoor APs with smart antennas across the entire building. The small-angle directional antennas accurately control signal coverage, reduce interference, and increase user concurrency to 50%. These prevent issues like frame freezing, delay, and interference during online teaching, live streaming interactions, video sharing, and staff meetings. Both students and teachers can even access the network outside the building with access rates reaching 100 Mbit/s.

In addition to speed and access, intelligent O&M is crucial in campus network operations. For this, M.U.S.T. has deployed iMaster NCE-CampusInsight intelligent O&M platform. The platform uses big data analysis and machine learning algorithms. Its algorithms are always drawing on expert experience to evolve toward intelligent proactive O&M. With functions such as user journey, protocol playback, and application analysis, it implements real-time network status awareness, automatic fault locating within minutes, and real-time visualization of network-wide application experiences. The result is 80% better network-wide performance.

In addition to cloud classrooms, M.U.S.T. also uses the IdeaHub Board in its smart classrooms. The boards create a student-centered environment that integrates online and offline learning. In this way, the university eliminates the restrictions of time and space, and shares high-quality resources for better experience and higher efficiency.

Faster Digitalization, Promoting the Greater Bay Area

Currently, M.U.S.T. is upgrading its entire campus network, which involves building and refurbishing networks in 10 teaching and research buildings. In the future, all campus networks will be centrally managed using iMaster NCE. Plus, the smart campus will encompass safe campus, IOC, IoT, and Wi-Fi services.

M.U.S.T. is always looking to introduce innovative teaching models, increase its efficiency, and improve campus management. It is optimizing its ICT infrastructure using technologies like cloud computing, IoT, and AI. This helps the university maximize data value and business assets, building powerful applications for an integrated smart campus management system. In the coming years, M.U.S.T. will focus on building a smart, safe, and green campus.

Ultimately, the university cultivates talent for Macao and adjacent regions, promoting diverse and sustainable economic development as well as digital transformation. ▲



MCC Builds a New Benchmark for Intelligent Education in Northern Philippines with Digitalization

As a public university in the Philippines that continuously innovates its teaching modes, MCC has joined with Huawei to build smart classrooms to provide high-quality teaching services for teachers and students, accelerate the informatization construction of the College, and build a new model for intelligent education in Mabalacat.

In August 2022, students at the Mabalacat City College (MCC) in the Philippines (hereinafter referred to as "MCC") had a particular hybrid learning class. Unlike classes in the past, the teaching content was explicit at a glance on the smart screen, and the teacher in the classroom could communicate and interact smoothly with online students

throughout the entire class. Everyone immersed themselves in lively discussions and enjoyed the charm of smart teaching. As a public university in the Philippines that continuously innovates its teaching modes, MCC has joined with Huawei to build smart classrooms to provide high-quality teaching services for teachers and students,

accelerate the informatization construction of the College, and build a new model for intelligent education in Mabalacat.

Accelerating Digital Transformation and Upgrade of Education in the Post-Pandemic Era

Founded in 2008, MCC is a local college in Mabalacat, a key city in Central Luzon, the Philippines. It has four institutes with about 4000 students. In response to the impact of COVID-19 on education in recent years, MCC has capitalized on the opportunities presented by the technological revolution and industrial transformation. Through the upgrading of network facilities and teaching equipment has strengthened the development of smart classrooms, transcending traditional limitations of time and space to facilitate the dissemination of knowledge. This has enabled teachers and students to teach and learn anytime, anywhere.

In early 2020, MCC undertook a campus network optimization initiative and implemented a videoconferencing system to facilitate online teaching and ensure uninterrupted education. In the post-pandemic era, the global mainstream has shifted towards the "online + offline" hybrid teaching mode. As a result, both teachers and students have become increasingly reliant on high-quality networks and advanced terminal facilities. In response, the original infrastructure of the school needed to meet the comprehensive requirements of hybrid classrooms. In keeping with the trend of teaching mode transformation in colleges and universities, MCC aims to leverage ICTs to bolster smart classroom construction and improve the quality of digital education.

Building Flexible and Interactive Smart Classrooms with Huawei IdeaHub

MCC University opted for a smart classroom solution centered around Huawei IdeaHub to upgrade its ICT facilities. This innovative solution transcends physical boundaries, eliminates time and space restrictions, and enables smarter and more efficient hybrid learning.

Huawei IdeaHub is a crucial component of the smart classroom, integrating innovative applications such as interactive electronic whiteboard, convenient projection, and high-definition videoconferencing platform. It functions as a portal that bridges the gap between online students and offline classrooms. Integrating teaching hardware and software ecosystems seamlessly enhances collaboration, interaction, and engagement in hybrid learning. With immersive face-to-face discussions and real-time collaboration, teachers and students can create a lively teaching atmosphere that fosters focus and motivation.

One of the students in the Bachelor of Secondary Education, Major in English program, shared his experience regarding smart classrooms: "Huawei IdeaHub has enhanced our hybrid learning experience, making it more interactive. The electronic whiteboard enables teachers to write more effectively. At the same time, we, as students, can scan a code to download the writing content onto the online learning platform, allowing us to review it any time after class. Moreover, the HD videoconferencing platform creates a smart and panoramic remote interactive classroom, enabling online students to see and hear everything clearly in real-time."

A student affairs administrator of MCC



MCC University opted for a smart classroom solution centered around Huawei IdeaHub to upgrade its ICT facilities. Huawei IdeaHub is a crucial component of the smart classroom, integrating teaching hardware and software ecosystems seamlessly enhances collaboration, interaction, and engagement in hybrid learning. >>



emphasized that Huawei IdeaHub enhances course preparation efficiency and facilitates distance learning and communication. Both online and offline students can actively participate in the interaction and Q&A sessions, creating a more dynamic classroom atmosphere. As a result, students have become more engaged and focused during class sessions, allowing them to absorb the teaching content more efficiently.

Opening a New Era of Intelligent Education for Mabalacat

Today, MCC has implemented Huawei IdeaHub in its classrooms, serving more than 4000 teachers and students. By constructing smart classrooms, MCC has successfully deployed various advanced applications, including remote interactive teaching, high-quality education resource sharing, and active learning. By breaking through the limitations of traditional online platforms, MCC has shifted from a teacher-centered to a student-centered approach to teaching, resulting in significant improvements in both effectiveness and quality.

"Mabalacat currently has one college and one vocational school, both of which have faced challenges with hybrid learning experiences and low teaching quality due to limitations of traditional online platforms. However, the joint efforts of MCC and Huawei to establish smart classrooms have effectively

addressed these issues. Huawei IdeaHub integrates data and HD videoconferencing technologies into a single, smart device, enabling seamless online and offline communication between teachers and students, greatly enhancing the overall teaching experience." According to MCC President Michelle Aguilar-Ong, "MCC's smart classrooms have become a benchmark for smart teaching in Mabalacat's college education and have been widely adopted throughout the city. With major institutions shifting towards educational innovation and technological advancement, implementing digital education is a crucial step for Mabalacat towards accelerating the development of intelligent education and nurturing high-quality, comprehensive talent." ▲

Faculty Point of View

Mabalacat currently has one college and one vocational school, both of which have faced challenges with hybrid learning experiences and low teaching quality due to limitations of traditional online platforms. However, the joint efforts of MCC and Huawei to establish smart classrooms have effectively addressed these issues. Huawei IdeaHub integrates data and HD videoconferencing technologies into a single, smart device, enabling seamless online and offline communication between teachers and students, greatly enhancing the overall teaching experience.

— Michelle Aguilar-Ong, President of MCC

Mustaqbal University Makes Smart Classrooms a Reality Through Digital Transformation

This university knew that infrastructure — ICT infrastructure — is vital to uninterrupted education, especially so in the most challenging of times.

Mustaqbal University, a well-regarded private university in Saudi Arabia, is committed to setting the highest standards in higher education, providing the very best resources in the digital age, to better cater to its most important asset: its students. As such, the university has long prioritized infrastructure as key to the quality of education it can provide.

This has never been truer than during the pandemic. With the university putting the safety of students and teachers alike at the forefront of its endeavors, the executive team planned to adopt an upgraded communications platform to smooth the flow of knowledge and experience, overcoming

the considerable barriers unprecedented healthcare worries placed in the way.

Bridging Communication Gaps

Like every other educational institution around the world, the pandemic and its unique challenges were thrust upon Mustaqbal University unexpectedly, which had to rapidly work out how to prevent disruption to education while adhering to strict preventive measures in order to safeguard students and staff.

The aim was to use its existing e-learning platform to keep lines of communication with its students open, prioritizing ease-of-



"Through our partnership with Huawei we have built a cross university communication system, driving hybrid and multi-classroom teaching to a higher level. We look forward to promoting the partnership with Huawei, in order to explore more technologies and the latest solutions in the field of education."

—Dr. Mansour Ibrahim Alsaghier, Vice Rector for Educational Affairs at Mustaqbal University

use and creating genuine excitement in the classroom. And for this to happen, hybrid classrooms would be key. Indeed, Mustaqbal University has long developed partnerships with famous universities in and outside Saudi Arabia. Here, legacy collaboration technology has helped the university support research into new technologies, such as 3D printing, as well as foster communication between teachers and students around the world.

A Smart Classroom Solution Digitally Transforms the University

Building on this legacy infrastructure and in order to meet its upgraded needs, Mustaqbal partnered with Huawei, choosing Huawei's Smart Classroom Solution — running on the collaboration tool HUAWEI IdeaHub and a bidirectional collaboration platform — to transform traditional classrooms with hybrid and digital upgrades.

The Smart Classroom Solution supports the sharing of bidirectional audio, 4K images, and video, as well as coursework presentation and annotation, across multiple classrooms in real time. With IdeaHub as the interface, latency is minimal and projecting from computers and other devices is easy: reverse control technology allows presentations to be fully controlled through IdeaHub's screen. And, no matter where they are, students and teachers can easily join classes remotely through software clients.

IdeaHub Is a Bridge

The Smart Classroom Solution has other uses, too. It can connect newly qualified teachers with more experienced colleagues, for example, helping the former skill up fast. IdeaHub's interactive whiteboard allows simultaneous annotation, with any notes made easily shared over email or by scanning a Quick Response (QR) code.

"With nearly 30 years of experience and innovations, Huawei deploys state-of-the-art Information and Communications Technology (ICT) to deliver a next generation Smart Classroom Solution, calling on the latest audio and video innovations," commented Feras Alsarraj, Chief Technology Officer (CTO) for Huawei Enterprise in Saudi Arabia. "Huawei intelligent Education Solutions transcend physical boundaries, break time limits, and support onsite and online hybrid teaching and learning. Huawei is proud that Mustaqbal University is the first university in Saudi Arabia, indeed the wider Middle East, to fully adopt the End to End (E2E) Smart Classroom Solution."

Seizing Opportunities

Every digital journey is an intricate, delicate one. But Mustaqbal University has already taken significant steps toward implementing a digital education solution and is committed to being a clear leader, establishing strong digital goals and transforming itself into an agile institution that's fit to serve generations of new talent to come. ▲



Transforming Tunisia Into the ICT Talent Center and Innovation Hotbed of North Africa

By Hong Liang, Public Relations Director of the Huawei Mediterranean South Rep Office

On the basis of China-Africa cooperation, Huawei is developing a teacher and student talent ecosystem that calls upon the company's advantages in technologies, knowledge, and successful practices in the ICT field. The purpose is to improve the digital skills of teachers and students in colleges and universities, laying a solid foundation for Tunisia's talent development, ICT industry prosperity, and digital transformation.

In June 2022, Huawei won the "Prime Minister Medal of the Republic of Tunisia" at the Tunisia Investment Forum jointly held by the Ministry of Economy and Planning of Tunisia and the Foreign Investment Promotion Agency. At the award ceremony, Ms. Najla Bouden, Prime Minister of Tunisia, presented the award in person, expressing her gratitude for Huawei's contributions to talent development and the Information and Communications Technology (ICT) industry in Tunisia. She conveyed her hope that Huawei will increase investment in these fields to benefit both parties, ultimately promoting the digital development of wider Tunisian society.

Since the establishment of its Tunisia Office in 1999, Huawei has been actively enabling the digital development of the country, as well as cooperating with local governments and universities in talent ecosystem development, to help the country become a regional ICT talent center and innovation hotbed in North Africa. Over the past two decades, Huawei has partnered with 68 Tunisian universities to build ICT Academies, hosted the Seeds for the Future program, held competitions, and launched a startup support program in the country to provide technical and business support for promising local startups.



Huawei has been actively enabling the digital development of the country, as well as cooperating with local governments and universities in talent ecosystem development, to help Tunisia become a regional ICT talent center and innovation hotbed in North Africa. >>

Building ICT Academies to Cultivate Digital Talent

In recent years, the rapid digital development in North African countries such as Tunisia has driven increased demand for digital talent. However, due to the shortage of local education resources and an incomplete training system, digital talent development has been slow and there is a large talent gap as a result. According to the latest research report released by China Social Sciences Net, North Africa and most African countries face shortages in Research and Development (R&D), management, and skilled labor, all prerequisites if the digital economy is to grow. This is largely because the public education system has deficiencies in research and innovation, and young people don't have access to the latest digital skills and knowledge.

Against the backdrop of China-Africa cooperation, Huawei has developed a teacher and student talent ecosystem — based on its advantages in technologies, knowledge, and successful practices in the ICT field — to improve the digital skills of teachers and students in colleges and universities, laying a solid foundation for Tunisia's talent development, ICT industry prosperity, and digital transformation. One important initiative here is the cooperation with Tunisian universities to build Huawei ICT Academies.

Huawei ICT Academy is a global university-enterprise cooperation project. Its purpose is to share the latest ICT technologies and knowledge with college students and cultivate technical talent for the ICT industry chain and wider society. In Tunisia,

Huawei has built 68 ICT academies with local universities, training more than 8000 students. Capitalizing on Huawei's years of experience in talent cultivation in the ICT industry, local universities — such as Central Private University, Centre National des Technologies en Education, Ecole Nationale d'Ingénieurs de Carthage, and ENICarthage — have developed cutting-edge, standardized, and practical ICT course systems to seamlessly interconnect teaching with enterprise applications. In addition, activities such as the Huawei ICT Competition and Talent Alliance select top students for the local ICT industry and promote a virtuous cycle of talent development.

Building a Robust Talent Ecosystem and Creating More Career Choices

Huawei is actively building a robust ICT talent ecosystem in Tunisia. For example, Huawei has set up a regional French-language talent center and a Regional Service Resource Center (RSRC). Through activities such as its ICT Competition, Seeds for the Future program, and Tunisia Talent Day, Huawei has been promoting local talent cultivation and communication with the hope of making Tunisia a regional talent hotspot. These initiatives have created more employment and communication opportunities for young students, driving digital transformation in Tunisia.

Holding Competitions and Selecting Specialists

The annual Huawei ICT Competition

Over the past two decades, Huawei has partnered with 68 Tunisian universities to build ICT Academies, benefiting more than 8075 students. Since 2015, Huawei has hosted the Seeds for the Future program in Tunisia for eight years in a row, recruiting more than 140 students to training sessions and internships. Huawei also launched a startup support program in Tunisia to provide technical and business support for promising local startups.

aims to provide an international communication platform for global college students, as well as cultivate students' capabilities to use new technologies and platforms, attracting more students to join the Huawei ICT Academy.

The Huawei ICT Competition not only shines a light on top talent for the ICT industry in Tunisia, it also provides students with a competitive arena to demonstrate their capabilities. In the 6th Huawei ICT Competition, two Tunisian teams stood out from the national and regional competitions to advance to the Global Final, with one taking home second prize in the network track and the other third prize in the cloud track.

Seeds for the Future for Talent Exchange

Seeds for the Future is a public welfare program hosted by Huawei. Its aim is to share ICT knowledge with young students to enhance their interest in, and understanding of, the ICT industry. Starting in 2015, Huawei has hosted the Seeds for the Future program in Tunisia for eight years in a row, recruiting more than 140 students to training sessions and internships. Plus, in 2022, Huawei held the first Seeds for the Future alumni association of North Africa in Tunisia. More than 80 alumni from 21 African countries were invited to the event for exchange and communication.

Moncef Boukthir, Tunisia's Minister of Higher Education and Scientific Research, said that Huawei's choice to host the Seeds of the Future alumni conference in Tunisia was testament to Huawei's confidence in Tunisia's digital development and talent cultivation. Indeed, Tunisia strives to be the leading driver of cooperation between North Africa

and China, consistently tapping into the talent development potential of both parties.

Tunisia Talent Day Offers More Employment Opportunities for Local Young Students

Local governments in Tunisia have shown a strong commitment to digital transformation and are paying more and more attention to the training of digital talent. By organizing various digital talent projects in Tunisia, Huawei has further promoted the exchange of local ICT talent. For example, Huawei held the Tunisia Talent Day to strengthen cooperation with local academic and business communities and cultivate ICT professionals. So far, Huawei has signed cooperation agreements with 68 Tunisian universities to provide online courses for more than 8000 students. On top of this, more than 140 Tunisian students have been selected to join Huawei's Seeds for the Future program and internship programs, creating more ICT talent exchange and job opportunities for the country.

Education is key to a country's future. Huawei's talent development programs not only provide Tunisian college students with a platform to understand cutting-edge technologies and apply digital skills, but also help them become more competitive in the global job market. In the future, Huawei will continue to work with local universities, governments, and institutions to help Tunisia become a regional ICT talent center in North Africa, offer employment and growth opportunities for local young people, and accelerate ICT talent development and digital transformation in Tunisia. ▲

The Hague University of Applied Sciences: A Secure, Robust, and Future-Proof Wi-Fi 6 Network for a Dutch University

Ajoeb Elahi adds, "We ran four separate tests to see how the Wi-Fi works with the new devices. It went flawlessly, regardless if 20, 50, 150 or 468 devices were used. We've already had visits from several schools that want to see how it works."



Security, availability and a high capacity: that was what The Hague University of Applied Sciences (THUAS) wanted from the design of the ICT infrastructure in its gym hall. Here is how Huawei helped THUAS achieve their objectives.

Situation

THUAS were in search of a secure and reliable Wi-Fi network for hosting digital tests and exams for up to 500 users. The university wanted its network to perform at full capacity during tests, to avoid infrastructure failures that would force students to retake their tests. They also needed a large, secure location: the gym hall.

Box out section

THUAS, established in 1987, is a university focused on global citizenship and helps empower students to change and improve the world they live in. The university takes pride in its international nature and global perspective. More than 25,000 students from over 140 countries are enrolled in a Bachelor, Master or post-graduate programme at one of the four sites and more than 1900 people work at the university. The THUAS consists of faculties, research groups and service departments and works closely with over 300 exchange partners from more than 50 countries, from Brazil and China to Australia, USA and several European countries.

The solution

With input from Wi-Fi network expert Whyless and AnyLinQ ICT Services, a Wi-Fi network based on THUAS's existing Huawei Wi-Fi environment was designed. Unfortunately, the access points that the school had in mind could no longer be delivered, therefore opting for the new Huawei Wi-Fi 6 solution. Given how new Wi-Fi 6 was, the university requested that the best should be done to minimise the risks: Wi-Fi 6 environments are still few and far between, and their switches are new too.

Ajoeb Elahi, a workplace specialist at THUAS shared, "I usually rather go with a proven technology, to be honest. Still, I understood that Wi-Fi 5 would be rendered obsolete soon, and I prefer to recommend innovations that are future-proof."

Maximum security during tests was the university's number one priority. This was achieved in various areas:

The gym hall is half-submerged, and resided in an insulated concrete basin. This kept the interference for the school to a minimum: the radio spectrum was contained within the gym hall.

Twenty access points were installed, twice as many as strictly necessary. Each access point covered a small area of the gym hall, and featured a directional response with a unique transmission channel.

Students from multiple degree programmes and years were seated at random throughout the gym hall to take different types of tests. So it was pointless to copy the work of



Students from multiple degree programmes and years were seated at random throughout the gym hall to take different types of tests. >>

Our Wi-Fi environment is unique: secure, redundant and reliable. We've run tests that show that we now have a future-proof Wi-Fi 6 environment that gives us a reliable setup for hosting digital tests.

someone sitting nearby.

The successful working model meant that at the start of the test, a laptop was placed on each desk, and hooked up to the access point in advance. They were taken to a secured area overnight for charging.

The university also wanted classes to continue with as little interruption as possible while the work was being carried out. One advantage was that the installation of the new network could be integrated as part of the scheduled renovations to the gym, which included the laying of a new floor and making some other modifications, helping reduce disruption. The high ceiling in the gym hall posed another challenge which was resolved with a cherry picker lift being brought in for installing the access points.

Result

Now, THUAS is the first university in the Netherlands with a high-density, Wi-Fi 6 environment ready for use at the start of the 2021-2022 academic year. The school's new network offers full reliability and maximum redundancy. The requirements stated a connectivity of 4MB per device; in the end the university got 6.4MB!

The installation was extremely successful. Gert Jan Helder, one of the project engineers on the project, who worked on the ICT infrastructure, the ICT cables, general infrastructure and the Wi-Fi 6 network infrastructure, shared, "The result is amazing. It works perfectly. The coverage is great, the performance is great. We set 468 laptops to generate 4MB

per device, which is far more than will ever be used during a test. Under normal conditions, this would never happen."

Ajoeb Elahi adds, "We ran four separate tests to see how the Wi-Fi works with the new devices. It went flawlessly, regardless if 20, 50, 150 or 468 devices were used. We've already had visits from several schools that want to see how it works."

Looking back, what are The Hague University of Applied Sciences' thoughts about the project?

Ben Landmeter, network administrator: "It's a brand-new technology that no other school in the Netherlands has, so we didn't have any examples of how it had been done elsewhere. We've been working with Huawei for years, and we wanted to continue our partnership. We're very pleased with how Huawei helped us."

Gert Jan Helder, project engineer: "The switch line, which connects computers and peripherals within a network, was completely new, even for Huawei. So we scheduled a technical session to investigate the possibilities of the switch line. I really enjoyed how we worked together."

Ajoeb Elahi, workplace specialist: "I was very happy with the support provided by Huawei. Being an early adopter meant that we received comprehensive support. That was a big part of the success. In December 2021 we ran an evaluation with the Digital Tests project group at THUAS, and they were full of praise for the new setup." ▲



Selfnet e.V. Leverages Wi-Fi 6 to Build High-Quality Wireless Campuses

Founded in 1999 and run entirely by student volunteers, Selfnet e.V. is a German non-profit student association that provides resources for knowledge transfer in the field of Information and Communications Technology (ICT).

Selfnet e.V. builds and maintains student dormitory networks, which are constructed entirely by students, for students. This not only gives students direct and high-speed access to the critical online learning resources, but also provides Selfnet with invaluable hands-on experience in operating a real-world network. And this is a marked change from how things are usually done, where traditional educational institutions keep campus network operations well out of students' hands.

As things stand, 20 of the dormitories

affiliated with the Selfnet network, located in southeastern Germany, offer wireless access, covering around 4000 students (roughly 55% of all Selfnet members), with an average of 3000 clients accessing the network at any one time.

Next-Generation All-Wireless Campus Network With Continuous Experience

Firstly, with the rapid growth of remote teaching and remote learning, a greater strain is placed on networks, requiring a

Huawei can quickly respond to Selfnet's customization requirements and helps Selfnet to solve problems in the actual scenario. In addition, Huawei's Technical Assistance Center (TAC) works 24/7 and can respond quickly within two hours to provide professional expert services. This is of great use for Selfnet, because -as just mentioned- Selfnet is run entirely by volunteers and most of the work is done in the late afternoon and evening. With Huawei's solution, Selfnet optimizes the Wi-Fi network to provide better services for its members. It also supports the growth of a new generation of ICT professionals, providing them with hands-on network experience.

continuous wireless experience. As for Selfnet, we must provide high-quality Wi-Fi coverage for dormitories and offices, as well as outdoor areas in some dormitories. Especially for the Stuttgart-Vaihingen campus, providing Wi-Fi for the entire outdoor area of the campus is a long-term goal to create an all-wireless campus with a continuous experience.

Secondly, we focus on data security and network reliability. We need encryption technologies to ensure data security in the network operation center and all access sites. We also need highly reliable networking architectures and technologies to ensure stable network operations.

The third problem is network O&M. Selfnet is run by volunteers, and most of the work starts in the late afternoon or evening. Therefore, centralized and efficient O&M mechanisms can greatly help Selfnet to handle the huge O&M workload and improve O&M efficiency.

Huawei Wi-Fi 6 to Build an All-Wireless High-Quality Campus Network

The Selfnet campus network has been gradually upgraded from Wi-Fi 5 to Wi-Fi 6. And with the launch of Huawei's Wi-Fi 6 products, Selfnet all-wireless campus strategy will be further accelerated. The AirEngine 6761 is Huawei's latest Wi-Fi 6 product, delivering the highest performance. It features multi-band advantages and innovative link algorithms, and enables ubiquitous gigabit access and ultra-low latency through multimedia intelligent

scheduling, AI roaming, and smart antennas. It also helps build an all-gigabit and all-wireless office network centered on user experience. This is in line with our wireless campus construction concept and helps to improve the students' wireless experience.

Huawei WAC features large capacity, high performance, and high reliability. In actual deployments, Selfnet adopts dual-link cold backup to ensure high availability of the Wi-Fi network, and Remote Authentication Dial-In User Service (RADIUS) in PPSK mode is configured to authenticate users. At the same time, Datagram Transport Layer Security (DTLS) is used to encrypt the link of all APs. These encryption measures ensure the security of critical data. Application of the Secure Shell (SSH) technology is a standard security measure and reduces the operating expense (OPEX).

Abstract

Huawei can quickly respond to Selfnet's customization requirements and helps Selfnet to solve problems in actual scenarios. In addition, Huawei's Technical Assistance Center (TAC) works around the clock and can respond within two hours to provide professional expert services. This is of great use to Selfnet, which carries out most of its work in the late afternoon and evening. With Huawei's solution, Selfnet can optimize the Wi-Fi network to provide better services for its members. It also supports the growth of a new generation of ICT professionals, providing them with hands-on network experience. ▲

UNISA Partners With Huawei to Build a Future-Proof Smart Campus

UNISA aspires to seize the opportunities presented by digital transformation. With a state-of-the-art campus, it can facilitate a high scientific research output and ensure more efficient course implementation. To this end, UNISA chose Huawei's CloudCampus Solution to digitalize every last one of its campuses.

The University of South Africa (UNISA), founded in 1873, is the largest distance and open learning institution in South Africa. Its main campus, Muckleneuk Campus, is situated in Pretoria, South Africa's administrative capital.

UNISA has over 400,000 students, including international students from more than 130 countries and regions worldwide. It is one of the few mega universities on the African continent.

UNISA offers a variety of certifications and



"To foster a digital workplace, we've worked with Huawei to upgrade and reconstruct our network infrastructure. Endeavoring to improve end-user experience, the University deployed Huawei technology to upgrade our wired and wireless network coverage across all campuses. This has significantly increased our efficiency in managing the network."

—*Mathabo Nakene-Mgingqi,
Vice Principal/Chief Information Officer at UNISA*

degrees from undergraduate to doctoral. It also provides vocational education and training (VET) and continuing education (CE) courses, which cover a broad range of disciplines across business, law, science, engineering, education, arts, and humanities. Furthermore, UNISA is renowned for its versatile teaching approaches and high-quality education. All this makes UNISA a globally-recognized pioneer in distance education.

Opportunities and Challenges for UNISA During Digital Transformation

UNISA boasts an open distance e-learning (ODeL) system, delivering a flexible online teaching and learning environment. Students can learn in their own time zones and interact with teachers and classmates using online learning platforms, or by means of email, call, or video links.

Since its establishment, UNISA has proposed the concept of "learner-centric" open education. Over the past century and a half, UNISA has continuously provided high-quality

tools for students and teachers. Using a recent example, it provided data services for students and academics to access UNISA's virtual education environment. However, as the faculty scales up and new campuses are constructed, it is laborious and time-consuming to centrally manage devices on and perform O&M for UNISA's live network.

Limited by the size of the network O&M team and their technical competency, the team chooses to purchase extra services during the O&M of massive existing systems and devices. This makes it difficult to deal with problems quickly and only pushes costs up. When it comes to teaching methods themselves, this time-honored university is figuring out ways to take their conventional teaching approaches and make them smart in a new era of intelligent learning.

Building an Open Smart Campus for Ground-Breaking Distance Learning

Huawei's CloudCampus Solution, as UNISA's chosen platform, draws on switches, routers, wireless access points (APs), and

its own network management platform to build a network featuring high speeds, solid reliability, and robust security. By deploying this solution, UNISA has fully upgraded its network infrastructure and constructed a powerful and easy-to-manage network that enables 24/7 stable Internet access. Full Wi-Fi 6 coverage is now available across over 30 campuses. This offers high bandwidth and concurrency as well as low latency, enabling teachers and students to quickly connect to the Internet anytime, anywhere.

Furthermore, iMaster NCE-CampusInsight — a campus network analyzer — is used for network O&M and management. This analyzer collects network data through telemetry in real time and adopts big data analytics and machine learning algorithms to learn network behaviors and identify fault patterns. In this way, devices on the live network can be effectively managed, preventing any waste of system resources.

All these enable a reliable network for UNISA's teaching, scientific research, and management, with the following stand-out benefits:

- **Full-coverage Wi-Fi 6**

More than 2500 APs are deployed throughout upwards of 30 campuses to build high-bandwidth, high-concurrency, and low-latency wireless networks. As such, teachers and students can enjoy high-quality wireless access anytime, anywhere. Thanks to full-coverage Wi-Fi 6, UNISA draws on the ODeL distance education platform to enable hybrid education — offline-online blended learning — by building online communities and high-tech remote classrooms.

- **Cloud-network synergy**

An intelligent, future-proof, integrated network architecture has taken shape, which features wired and wireless convergence, ultra-high performance, massive data throughput, and full-stack open network devices. All of these make it viable for the networks to continuously evolve and in turn for services to upgrade.

- **Centralized, efficient, and cost-effective O&M:**

A unified network management system (NMS) has been deployed to centrally manage network devices, including those that will be added in subsequent smart school campus solutions. This not only improves O&M efficiency, but also reduces OPEX (by approximately 80%) as well as costs for training or instructing technical personnel.

Looking Ahead for a Better Future

UNISA has been moving steadily towards digital teaching and administration, and is committed to improving the quality and effectiveness of its teaching and learning.

By partnering with Huawei, UNISA has meticulously planned its campus network, thoroughly analyzed its ICT requirements, and ultimately developed a viable smart school campus solution that is conducive to long-term development.

Looking ahead, Huawei will continue to work with UNISA to build a smarter campus with more efficient services that are secure and save energy. Together, we define tomorrow and innovate for a better future. ▲



UNISA aspires to seize the opportunities presented by digital transformation. With a state-of-the-art campus, it can facilitate a high scientific research output and ensure more efficient course implementation.>>

Historic Honduran University Revitalized with an SDN Campus Network

With nine campuses and a sizable student body, however, UNAH's professors and administration staff were still left facing diverse challenges.

Founded in 1847, the Universidad Nacional Autónoma de Honduras (UNAH) — the National Autonomous University of Honduras — is the oldest national public university in Honduras. It offers over 140 programs, from bachelor to doctorate levels, and is home to over 120,000 students and faculty members. Currently the largest and highest ranked university in the country, it's also one of the largest university systems in the whole of Central America.

Of UNAH's nine campuses, two — UNAH-Ciudad Universitaria (CU) located in Tegucigalpa, the country's capital, and UNAH-Valle de Sula (VS) in San Pedro Sula, a key industrial center — account for 80% of the student body.

Challenges and Requirements

Universities in Latin America seldom provide on-campus accommodation, and UNAH is no exception. With nine campuses and a sizable student body, however, UNAH's professors and administration staff were still left facing diverse challenges.

Each year, UNAH welcomes more and more students. With the UNAH-CU and UNAH-VS campuses providing best-in-class resources, in terms of both faculty and assets, the university's other seven campuses were left struggling to keep up. Indeed, more remote campuses even lacked resident professors, forcing faculty members to travel long hours



3D wireless network planning tool, AirEngine Wi-Fi 6, UNAH now has campus-wide wireless coverage with zero blind spots. Teachers and students alike enjoy high-quality network access at a baseline rate of 100 Mbit/s anywhere on campus.

between different campus branches.

Decision-makers on each campus faced another basic, serious challenge — communication. Using conventional videoconferencing on Personal Computers (PCs) lacked engagement, so the leadership often had to spend half their day or more traveling for monthly in-person meetings. This was time-consuming, expensive, and often unsafe.

Within campuses, Wi-Fi coverage was also inefficient and patchy, making it difficult for teachers to work on the go. And most Information and Communications Technology (ICT) devices on the legacy network were sourced from different vendors, following vastly different systems and standards. The university's ICT Operations and Maintenance (O&M) team had just 10 members, all located at UNAH-CU. As a result, managing devices across nine campuses was a very real struggle, and response times to issues at other branches was very slow.

Swirling amid all these challenges, cutting-edge technologies in networks, public clouds, online education, and interactive electronic classrooms were quickly becoming the norm around the world. Eager to keep up, UNAH began to look at ways to go digital, determined to become a pioneer in the digital overhaul of universities in Honduras and the wider Central American Higher Education Union, or Consejo Superior Universitario Centroamericano (CSUCA).

CloudCampus Solution: UNAH's Technology Breakthrough

As a first step on its digital transformation journey, UNAH looked to network connectivity as the foundation to success

and a basic requirement to support electronic classrooms, video security systems, and data center services.

The university selected Huawei as its digital transformation partner following AirEngine Wi-Fi 6 Proof of Concept (PoC) tests. Together, then, UNAH and Huawei set out to build a next generation digital campus network, deploying Huawei's CloudCampus Solution.

- **Full network coverage without blind spots: 3D wireless network planning and Wi-Fi 6**

Wi-Fi coverage is indispensable for campus digital transformation. But with 30 buildings at UNAH-CU alone, and 15 at UNAH-VS, this appeared to be quite the task, particularly as coverage was also necessary in key open areas like campus roads.

To plan full network coverage, UNAH used Huawei's cloud-based 3D wireless network planning tool, which is both highly efficient and adaptable to a variety of contexts. The tool simulates intuitive signals and roaming, optimizing full signal coverage for target areas while using the minimum number of wireless Access Points (APs), boosting cost-effectiveness.

UNAH also deployed Huawei's next generation AirEngine Wi-Fi 6 to ensure smooth coverage for terminals in high-density sites, along with several optimization solutions for areas with coverage holes.

Using the 3D wireless network planning tool and AirEngine Wi-Fi 6, UNAH now has campus-wide wireless coverage with zero blind spots. Teachers and students alike enjoy high-quality network access at a baseline rate of 100 Mbit/s anywhere on campus.



iMaster NCE-Campus also supports multi-tenant architecture and enables Software Defined Networking (SDN)-based network management. This means that all of UNAH's nine campuses have been created as sites on a single iMaster NCE-Campus platform. >>

• **Non-blocking network data transmission: from GE to 10 GE**

UNAH is a leader in public and private higher education and its core campus network is key to supporting not only its nine campuses, but also five telecenters and eight Learning Resource Centers in Distance Learning — Centros de Recursos de Aprendizaje de Educación a Distancia in Spanish, or CRAEDs. Thankfully, all are now equipped with Huawei's award-winning CloudEngine S12700E series switches.

CloudEngine S12700E offers the ultra-high performance and ultra-large capacity needed for non-blocking and lossless data transmission. The switches support heavy-traffic services, including multimedia teaching, remote teaching, online learning, and video and audio data.

CloudEngine S12700E is also equipped with a programmable chip that integrates the capabilities of a wireless Access Controller (AC), making it easy to manage APs and wireless user access. Wired and wireless networks are now fully integrated, with centralized service forwarding and device and policy management. And, of course, the need to deploy a standalone AC or use a dedicated AC card has been eliminated. In short, one CloudEngine S12700E centralizes device, user, and policy management, ultimately allowing UNAH to better control network deployment and reduce operating costs.

• **iMaster NCE-Campus: the intelligent brain of the core network, simplifying O&M**

Overseeing its legacy network, UNAH's Information Technology (IT) administrators were often found traveling between the university's nine campuses, even for mundane

routine maintenance tasks. This was time-consuming, labor-intensive, inefficient, and ultimately led to a poor user experience, with prolonged periods of downtime.

To radically overhaul this unsatisfactory status quo, UNAH deployed Huawei's next generation iMaster NCE-Campus — an Autonomous Driving Network (ADN) management and control system for campus networks — as the intelligent brain of the entire campus network. This platform centrally manages and controls network-wide resources, implements detailed management, and automates user policy provisioning.

iMaster NCE-Campus also supports multi-tenant architecture and enables Software Defined Networking (SDN)-based network management. This means that all of UNAH's nine campuses have been created as sites on a single iMaster NCE-Campus platform. With each site virtually isolated from the others, campus administrators can manage them individually based on rights and domains.

On traditional networks, administrators have to log in to individual devices to configure and inspect services. Now, with Huawei's management platform in place, UNAH's IT staff can easily complete network configurations and provision services remotely, online, and in mere minutes. They can also centrally monitor all devices on the entire network and easily perform O&M tasks, such as device inspection and one-click device upgrades. Overall, O&M is now far easier, more convenient, and more flexible.

"Thanks to this new platform, we can now provide more bandwidth, which allows

"On this occasion, we have made a strategic alliance with the Asian giant Huawei, which has given us unconditional support in all areas and with who we are directly linked in this alliance because it is a comprehensive solution. Our university students can really see this advancement."

*—Juan Carlos Soto,
Director of the Technology Convergence Project at CSUCA*

much smoother and faster communication with a lot less latency," UNAH's Network Manager noted. "We can also guarantee that our team can quickly resolve any type of failure, making us much more resilient."

For convenience, both faculty and students prefer to use wireless networks, making network security a key focus. iMaster NCE-Campus addresses this by providing multiple access authentication modes, such as portal, 802.1X, and Media Access Control (MAC) address authentication.

Specifically, students can use convenient, user-unaware portal authentication, where customized portal pages and bulletins can be pushed based on pre-set conditions. Meanwhile, 802.1X authentication, which is more secure, can be adopted for teaching terminals and faculty offices. And MAC address authentication is necessary to ensure network access security when it comes to dumb terminals and Internet of Things (IoT) endpoints. On top of all this, iMaster NCE-Campus can record network access accounts and terminal MAC addresses to ensure traceable user network access for even higher network security.

iMaster NCE-Campus also automates deployment across the network and quickly adjusts services. This transforms a traditional network with SDN, supporting centralized and visualized management, monitoring, and O&M across the network. Now, IT administrators can quickly locate and rectify faults, significantly improving the user experience.

SDN creates a highway for service transmission, from video security systems to electronic classrooms and data center services. This in turn lays a foundation for UNAH and Huawei to deploy a complete set of smart campus and safe campus solutions.

An Exemplary Digital Transformation Journey

By choosing Huawei's CloudCampus Solution, UNAH has effectively addressed many of its digitalization pain points. The university now enjoys better Internet access, improved teaching resources, and more efficient O&M, along with stronger support for future needs and network evolution over the next three to five years.

With this robust network foundation in place, UNAH and Huawei have enabled video security systems, electronic classrooms, and data center services, paving the way for a smart, safe campus.

"We have started the process of technological transformation in our universities and have initiated an important process for higher education in all our countries in CSUCA," said Juan Carlos Soto, Director of the Technology Convergence Project at CSUCA. "This is a project about more than just smart campuses: it is about the development of new technologies like telepresence systems, electronic classrooms, Wi-Fi 6, 5G, the cloud, and many other cutting-edge technologies that are being developed worldwide. On this occasion, we have made a strategic alliance with the Asian giant Huawei, which has given us unconditional support in all areas and with who we are directly linked in this alliance because it is a comprehensive solution. Our university students can really see this advancement."

Long-term education digitalization drives the transformation of campus networks of today and tomorrow. As the highest ranked university in Honduras, UNAH is not only the guiding body for national talent cultivation in public and private higher education; it is also the frontrunner in building next generation digital campuses and setting an example for network transformation across the CSUCA region. ▲



Shenzhen University: F5G All-Optical Campus Network Facilitates Smart Development

All-optical campus networks are becoming an important part of new infrastructure construction within education. The F5G-based all-optical campus solution used by Shenzhen University Lihu Campus covers all scenarios in the university campus. This includes smart classrooms, faculty offices, and student dormitories. The solution combines ICT with teaching practices to achieve intelligent education.

Since September 2022, the combination of 45,000 teachers and students attending Shenzhen University across the Yuehai and Lihu campuses have been freed from the 30-minute bus journey that takes them between campuses for class. This is because Shenzhen University has up-

graded teaching practices with 106 smart classrooms, where participants have access to cross-campus interconnection, virtual group discussion, and multi-screen interaction, all functions that have received high praise from teachers and students alike. According to the statistics of the university, 73

courses were offered in smart classrooms, benefiting nearly 3000 students in the last semester. 66.05% of the students believe that smart classrooms help improve their education.

Proper Plan of Futuristic ICT-Based Infrastructure

The cloud design and construction team combined ICT with teaching practices, building smart classrooms across faculties. The smooth implementation of smart applications can be put down to the well-planned and future-oriented ICT-based construction of infrastructure by Shenzhen University.

During China's 13th Five-Year Plan, the ICT-based construction of Shenzhen University saw rapid growth. Mr. Wang, Director of the Information Center of Shenzhen University, said, "In campus network management, the traditional campus network architecture has all sorts of shortcomings, like its multiple network layers, making fault locating and device maintenance difficult. It has many users with high requirements on bandwidth and performance, as well as numerous services and new systems, complicating management." Against this backdrop, the university

required a simple, high-speed, stable, and easy-to-maintain modern campus network. This is where the F5G all-optical solution came in.

Practices in Lihu Campus

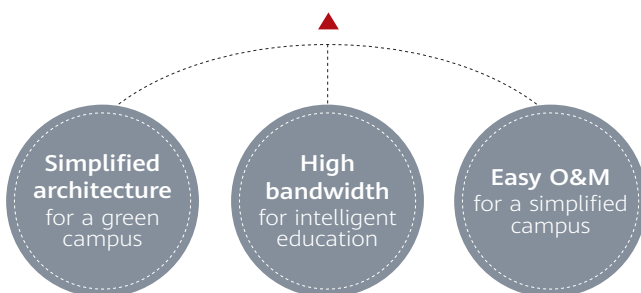
The F5G-based all-optical campus solution covers all scenarios across the Lihu campus, including smart classrooms, faculty offices, and student dormitories.

On the all-optical campus network, two central office (CO) optical line terminals (OLTs) were deployed in the equipment room to implement 1+1 redundancy backup, dual-uplink cascading, and dual-homing protection for backbone links. In addition, the campus network and the access part of the device network were integrated into one network, which is carried by the passive optical network (PON), simplifying the network structure. After the integration, the CO OLTs were connected to existing core switches through 10GE optical ports in the upstream direction. Optical network units (ONUs) support multiple specifications and can cover all campus scenarios. Different types of services are now transmitted through different service channels for service isolation. Finally, hard pipe isolation and encryption technologies were used to ensure service security.

Compared with traditional Ethernet, the F5G all-optical solution has the following advantages.

Simplified architecture for a green campus: The flattened two-layer architecture uses passive optical splitters instead of active aggregation switches, reducing the number of extra-low voltage (ELV) rooms by 80%. Because no air conditioner is required, safety hazards like electric shocks and fires have been curbed. With the all-optical campus network being green and energy-saving, energy consumption can be reduced by

Advantages of the F5G All-Optical Solution





All-optical networks have been regarded as operator-related technologies and are somewhat novel to the education industry. The deployment of all-optical campus networks has made a delayed entrance to the scene as a result.
>>

30% compared with traditional networks.

High bandwidth for intelligent education: The F5G all-optical solution supports a smooth network upgrade to 10G PON and 50G PON without re-cabling or platform switching. In addition, the solution meets the high-bandwidth backhaul requirements of Wi-Fi 6/5G and supports applications like multimedia and VR/AR teaching in smart campuses. Dynamic bandwidth assignment supports smooth interactions during class without latency, as well as high-definition (HD) recording of classes from student dormitories. Thanks to gigabit optical networks, fibers have been extended to information points like dormitories and desktops, fully enabling smart teaching and supporting concurrent online education for over 10,000 teachers and students.

Easy O&M for a simplified campus: The F5G all-optical campus network solution carries campus voice, data, and IoT services over one network, enabling the fast rollout of new services, improving O&M efficiency by 60%, and reducing network construction and maintenance costs. Various ONU models are provided, suiting all scenarios, including classrooms, offices, and dormitories. Besides this, ONUs support plug-and-play and hot-swapping, further simplifying deployment and O&M.

As Mr. Wang pointed out, as smart campus construction continues, various smart applications are increasingly dependent on campus networks. Featuring a large two-layer

architecture, the all-optical network solution will become more and more popular in university campus networking.

All-Optical Campus Networks Are Becoming the Key to New Infrastructure Construction in Education

Throughout the course of campus network construction, a new stage of building takes place around every 10 years. In 1995, university campus networks were initially constructed, followed by fast Ethernet in 2005 and wireless campus networks in 2015. Currently, the all-optical campus network is looking like the next big step in the constant journey forward.

All-optical networks have thus far been regarded as operator-related technologies and are somewhat novel to the education industry. The deployment of all-optical campus networks has made a delayed entrance to the scene as a result.

Fortunately, new infrastructure construction is gaining steam in education. In 2021, the Guiding Opinions on Promoting the Construction of New Education Infrastructure and Building a High-quality Education Support System was released, focusing on infrastructure networks. As described in the document, promoting the upgrade of the campus local area network (LAN) is critical to ensuring high-speed access to campus resources and applications. ▲

Minzu University of China Draws on Huawei Qiankun to Create a Smart Campus with Ultimate Experience

Nowadays, digital transformation has become key to improving the overall competitiveness of universities. Against this backdrop Minzu University of China (MUC) uses Huawei's CloudCampus Solution to build a smart education campus featuring multi-network convergence. This new network enables ultimate Internet access experience for teachers and students, and modernizes school governance systems and capabilities through digital and intelligent technologies.

In the intelligent era, digital transformation has become key to improving the overall competitiveness of universities. MUC has been accelerating its transformation to digital education in recent years. It uses next-generation information technologies — such as big data, IoT, and artificial intelligence (AI) — to promote in-depth integration of information technologies with school



MUC introduces intelligent technologies such as AI to analyze the campus network, builds scenario-specific network optimization capabilities based on the network analysis service of Huawei Qiankun, intelligently identifies wireless coverage scenarios, and performs automatic optimization.

affairs, as well as the integration of virtual and physical spaces. It aims to build a ubiquitous smart education campus that can be accessed from anywhere, and modernizes school governance systems and capabilities through digital and intelligent technologies.

Adhering to unified planning, resource integration, and system sharing, the smart education campus of MUC has been put into practice, delivering services such as smart campus, smart teaching, smart O&M, smart library, smart security, smart management, smart IT, and smart society. In this way, it helps to implement precision management and data sharing while avoiding separate construction. Throughout the process, MUC uses Huawei's CloudCampus Solution to build a smart education campus featuring multi-network convergence. In addition, MUC draws on Huawei Qiankun to transform network-centric O&M into user experience-centric O&M, meeting growing network requirements of teachers and students.

Multi-network Convergence, Consolidating the Foundation of Campus Networks

Constructing a smart education campus requires a solid

campus network infrastructure. To meet the integrated management requirements of various services — such as campus network, security protection, all-in-one card, teaching affairs, finance, and examination affairs — the Fengtai campus of MUC teamed up with Huawei to build an integrated network that carries wired, wireless, and IoT services, innovatively implementing multi-network convergence.

Scenario-Specific Network Optimization for Optimal Network Experience

The campus network covers multiple wireless coverage scenarios, such as office, smart classroom, auditorium, stadium, dormitory, and outdoor spaces. Due to heterogeneous terminals and fluctuating people flow, poor Internet access experience occurs from time to time. The causes and corresponding optimization measures vary, resulting in low efficiency of manual processing and network optimization.

MUC introduces intelligent technologies such as AI to analyze the campus network, builds scenario-specific network optimization capabilities based on the network analysis service of Huawei Qiankun, intelligently identifies



This improves the network bandwidth by 72% and reduces interferences by 79%, making the wireless network even faster and more stable. >>

wireless coverage scenarios, and performs automatic optimization.

This joint solution has provided network assurance for more than 10,000 teachers and students in the Fengtai campus of MUC. Since it was deployed half a year ago, no fault has been reported by students, the download speed in the dormitory area has risen more than three-fold, and no lag has occurred during video streaming.

Digital Map, Safeguarding High-quality Networks

MUC is continuously expanding its use of Huawei Qiankun to build intelligent O&M based on a digital map, through which the network health status and experience of users and applications in the smart education campus can be viewed. This helps to safeguard the network experience of teachers and students in the future.

- **Network health map:** visualizes the network health in real time, implements scenario-specific network evaluation and intelligent optimization, and uses AI technologies to resolve Wi-Fi experience issues from the dimensions of capacity, interference, roaming, and coverage. This improves the network bandwidth by 72% and reduces interferences by 79%, making the wireless network even faster and more

stable.

- **User experience map:** implements one-click search of network experience, and visualizes full-journey experience data such as historical access APs, Wi-Fi signal strength, download rate, and latency. In doing so, it locates causes of network exceptions for teachers and students in minutes, greatly improving troubleshooting efficiency.

- **Application experience map:** visualizes application experience in real time, detects network quality based on flows, quickly locates and rectifies faults, and proactively ensures preferential forwarding of core applications based on technologies such as intelligent traffic steering. In this way, it ensures experience of smart teaching applications.

Through continuous exploration and practice, the smart education campus of MUC effectively supports the digital management and operations of school construction, bringing ultimate Internet access experience to teachers and students. In the future, Huawei will work more closely with MUC to provide a more powerful digital connection foundation and high-quality network assurance for the smart education campus, making it easier to share high-quality education resources and accelerating intelligent education. ▲

The logo consists of three concentric teal circles. The text 'TECH 4 ALL' is centered within the innermost circle. 'TECH' is in a white sans-serif font, '4' is a red triangle, and 'ALL' is in a white sans-serif font.

TECH
4 ALL

A young child with a joyful expression is balancing a stack of books on their head. A white outline of a cloud with a downward-pointing arrow is superimposed over the books, symbolizing digital content or cloud storage. The background is a textured, light-colored wall.

Driving Equity & Quality in Education



Make learning more accessible and effective and provide training in digital skills so that everyone can fulfill their potential.

Building a Fully Connected, Intelligent World





Building Resilient Schools for Africa's Children

Today, educators are working to incorporate digital tools into their syllabus and prepare their students for their future in a workforce that increasingly requires online skills.

Before 2020, it would never have occurred to Meseret Tefera, an English teacher in Ethiopia's capital Addis Ababa, to use digital devices to teach her students. "We used our phones for preparation, not for teaching," she says. "When the pandemic came, we didn't know what to do. We didn't know how to use what were our personal devices for teaching purposes."

During the pandemic Tefera took a two-day course organized by UNESCO and Huawei. It expanded her horizons and trained her to teach her students using Telegram, a voice, video and messaging app that's very popular in Ethiopia.

Today, though schools are open, Tefera is

still using the app as a teaching tool for her class of 50-plus students. "After seeing such positive results, we decided to keep using it," she says. "We're still using it when students are absent from class or to summarize what we have done in class."

Tefera is just one of many African educators using digital technology to look to the future, drawing on digital resources to create a more modern and future-proofed education system.

Closing Africa's Education Gap

The digital divide is a major issue in Africa, with the continent lagging behind the global north when it comes to both



100

digital interactive resources, for grade 9 and 10 students in Ethiopia, Huawei has enabled global and local partners to develop STEAM curriculums.



3

countries

34

schools

Huawei helping to resolve the connection during the tricky “last mile” .

digital skills and access to bandwidth and technology. Only about 40% of the population have internet access. The global average is 66%. No African country scores more than five on the Digital Skills Gap Index. The global average is six.

This means that, in times of crisis like the pandemic or natural disasters, African students without access to digital technology progress less than their peers in the global north. The Technology-Enabled Open Schools for All (TeOSS) project, created by UNESCO and supported by Huawei, is designed to address this by enhancing the digital transformation of schools across three African countries: Ethiopia, Egypt and Ghana.

"The project aims to integrate digital learning platforms, curriculum-aligned digital content, teachers' digital competencies, and open schooling models," says Catherine Du, head of Huawei's TECH4ALL digital inclusion program. "It aims to create a new digital future for schooling."

Future-Proof Schools Through Digital Learning

During the pandemic, African educators used a range of different distance education techniques to try and bridge the educational gap caused by school closures. They used a whole assortment of tools from radio and TV to print and, where practical, online. Today, educators are working to incorporate digital tools into their syllabus and prepare their students for their future in a workforce that increasingly requires online skills.

The TeOSS project, which will run through 2024, aims to help teachers such as Tefera integrate digital learning into their classrooms. The project aims to provide high-quality digital learning resources and develop engaging Science, Technology, Engineering, Arts and Mathematics (STEAM) curriculum materials.

The scale of the project is substantial. "In Ethiopia, the project benefits 12,000



The TeOSS project, which will run through 2024, aims to help teachers such as Tefera integrate digital learning into their classrooms. The project aims to provide high-quality digital learning resources and develop engaging Science, Technology, Engineering, Arts and Mathematics (STEAM) curriculum materials.

students and 250 educators from 24 selected pilot secondary schools. It boosts access to national education platforms and digital content for secondary schools all over the country," Du says. Huawei has enabled global and local partners to develop STEAM curricula that involve almost 100 digital interactive resources for grade 9 and 10 students across Ethiopia.

In Egypt, a National Distance Learning Centre is being built to support 950,000 teachers, while in Ghana, in addition to pilot schools, TeOSS is augmenting national education platforms for all students and educators nationwide.

Expanding Connectivity for Students and Teachers

Connectivity and access to devices are key to effective online learning and for Tefera's students, getting online is sometimes a problem. Devices are relatively easy to find, however; "Even if they didn't have their own smartphone, they could borrow a family member's one for class," she reports.

But internet access is a different story. "One of the challenges of digital teaching is getting the students online at the right time for class," she says. "Most of them have to jump through all sorts of hoops to connect in time, but despite their efforts they still end up joining late."

Getting teachers connected is also not necessarily easy. "Finding a stable network is very challenging," Tefera says. "I personally have Wi-Fi in my workplace. But for parents and for other schools I have seen there's a real networking challenge, with no working Wi-Fi."

Under TeOSS, Huawei is enhancing connectivity for 34 schools across three countries, helping to resolve connection issues during the tricky "last mile" – where there is internet coverage but no actual connection.

A New Vision of Education

Teachers' digital skills are essential to delivering the new vision of modern education, and, in Tefera's view, while students may be digital natives, teachers have historically lagged behind. "Students are great at using technology," she says. "More so than us teachers. We really aren't on the same wavelength."

That being said, training just one teacher provides trickle-down benefits to educators across the school. After her training, Tefera worked with colleagues to help develop their use of Telegram both for live voice lessons and for resource delivery and attendance monitoring.

Today, she is seeing how the benefits of online learning are accruing. "During COVID, some schools were just not able to continue tuition. We were using many platforms online," she says. "In most of Ethiopia where the schools closed, students forgot what they had already learned so it was really challenging for teachers when the students started back. When our school opened, the children were very happy and the parents asked us to continue with these digital platforms in addition to the classroom."

Continuity of education, Tefera says, is essential to success and can help future-proof countries against disruptions, including the likes of natural disasters and conflict. "It's very important that learning never stops," she says. "If children don't get learning they lose what they have already learned and get no new education. Even though the challenges are there, we have to work on our challenges and teach our students in all conditions so our children never stop learning." ▲

(Originally published on BBC, this article was modified for re-publication.)

The MoE of the UAE Partners With Huawei to Deliver Intelligent Education

Intelligent education is a national agenda of the UAE. The Ministry of Education of the UAE and Huawei have worked together to usher in a new era of intelligent education, starting with the 'School Campus and Wi-Fi Innovation Project'. Looking into the future, the UAE will continue to collaborate with Huawei to unlock more possibilities, improving innovative teaching and delivering intelligent education.



The major objective of the MoE School Campus and Wi-Fi Innovation Project was to achieve seamless connectivity with high speeds and reliability across upwards of 400 schools by upgrading existing Wi-Fi networks.

H. H. Sheikh Mohammed bin Rashid Al Maktoum — Vice President and Prime Minister of the United Arab Emirates (UAE) and the Ruler of Dubai — first launched the UAE Centennial Plan 2071 back in 2017, with the express aim of making the UAE one of the best countries in the world, in time for its centenary in 2071. Investment in the country's future generations, to prepare them with the skills and knowledge needed to face — and embrace — rapid change, stands as a key pillar of the Plan.

For the Ministry of Education (MoE), in order to achieve UAE Centennial 2071 — and the UAE Vision 2021 National Agenda, which emphasizes the development of a first-rate education system — investment in technology is vital. As such, this has been accepted as an important national approach across government. Accordingly, resources and key capabilities have been directed toward educational infrastructure, to enhance the Emirati School Model — under which all public and private schools following MoE systems share the same curriculum — and make it even more competitive on the global stage.

As COVID-19 has all too ably demonstrated, education systems must now be fit for purpose, to face the immense challenges and disruptions to learning that can arise. Indeed, in order to rapidly react to the pandemic — and continue to support the UAE's overall vision, to develop an

innovative education system and a globally competitive knowledge-based society — the MoE turned to an all-wireless network solution from Huawei, to quickly connect people and environments, ensuring the continuity of learning and achieving more streamlined, robust Information and Communications (ICT)-based services. And with the launch of the MoE School Campus and Wi-Fi Innovation Project — which covers over 400 schools — the intelligent education revolution is well underway.

Achieving Seamless Connectivity with a Huawei Solution

The major objective of the MoE School Campus and Wi-Fi Innovation Project was to achieve seamless connectivity in over 400 schools, by upgrading existing Wi-Fi networks to deliver higher speeds and increased reliability. Such an ambitious network lays a firm foundation for the digital transformation of the education system, in turn delivering a higher quality education experience that allows educators to incorporate new technology — such as Artificial Intelligence (AI), Augmented Reality (AR), and more — into their lessons.

Huawei's network solution also features software recognition, helping to implement control over the websites students visit and the software tools that they use. Given



In addition, each school within the network benefits from significantly improved wireless performance, with high-capacity switching, ultra-low latency, and zero packet loss during roaming. >>

the large number of schools involved and the inevitably high number of networked devices, simplified deployment was also a key focus, alongside improving Operations and Maintenance (O&M) efficiency and reducing O&M costs.

Huawei's customized approach to the project involved the coordinated deployment of several solutions, to create a robust and reliable centralized Wireless Local Area Network (WLAN) system that will be well positioned to meet growing future demand. Indeed, deploying upgraded switches and Access Points (APs), scalability is already built-in: high density Access Controllers (ACs) support up to 20,000 APs and 200,000 students. The initiative represents one of the biggest investment projects in the UAE's education sector since 2019.

How Huawei Adds Value

In addition to enhancing connectivity, Huawei's solution now allows the MoE to manage all 400 schools — and more — from a single platform, supporting a truly experience-centric network. In addition, each school within the network benefits from significantly improved wireless performance, with higher-capacity switching, ultra-low latency, and zero packet loss during roaming. And, with

simplified scalability, upgrading to next generation Wi-Fi technology is already supported.

The implementation of the project has helped to achieve a Wi-Fi experience that's available anytime and anywhere across education campuses, from classrooms and libraries to laboratories, gymnasiums, and more. This step on the road toward an intelligent education revolution will help schools to explore advanced, cutting-edge teaching methods: e-schoolbags, smart whiteboards, virtual classrooms, teaching through online interaction, and more.

"The improvement in the network experience has been quite obvious," explained Ehab Eid, Head of Information Technology (IT) Infrastructure for the MoE. "By deploying Huawei's APs and network solution, we have enhanced the quality of lessons. Now, our teachers can interact with students online — no matter where they are physically located — over high-resolution video, without suffering network interruptions or packet loss. This has definitely accelerated our intelligent education revolution and allows us to explore ever more creative teaching methods. I believe that we will have further opportunities to work with Huawei as we continue to pursue digital transformation in the future." ▲



Beijing 101 Middle School Huairou Campus Makes Huge Strides in Digital Transformation

Intelligent education has become a growing trend for education development and transformation, calling for a digital, smart, ICT-based, and network-driven teaching environment. Working with Huawei, Beijing 101 Middle School Huairou Campus built a smart education platform powered by the cloud and big data. In this way, it constructs a smart campus with full coverage of ICT-based applications, becoming a showcase for future education and a leader in smart teaching.

The Huairou district of Beijing is situated not far from China's Great Wall, in an area of outstanding natural beauty. In this picturesque district can be found the Huairou Campus of Beijing 101 Middle School, one of China's most prestigious middle schools. The mission of this Huairou Campus is to "promote

students' all-round development and lay a foundation for their lifelong happiness." With this, Beijing 101 Middle School Huairou Campus strives to further meet the needs of teachers and students through expansion projects and supplementary teaching resources. By doing so, it aims to create a favorable and comfortable teaching



Through integrating education with digital, Beijing 101 Middle School Huairou Campus has constructed a smart campus with full coverage of ICT-based applications, which can provide online learning and smart education services. This makes it easy for teachers to tutor students online for better learning results. >>

and learning environment, setting a new benchmark for education with smart and digital technologies.

Smart Campus, Network First

Intelligent education is a growing trend for education development and transformation. Previously, the Ministry of Education and five other ministries in China jointly issued the Guidelines on Promoting the Construction of New Education Facilities and Building a High-Quality Education Support System. This effectively creates a blueprint for focusing on new infrastructure systems in terms of information networks, platform systems, and smart campuses to improve school network quality. It also advocates offering high-speed, convenient, green, and secure network services for in-depth integration of information technology (IT) with education.

It is the youth who determine the strength of a nation. With an increasing emphasis on "pre-class learning" in current teaching scenarios, Beijing 101 Middle School Huairou Campus needs to provide a digital, smart, ICT-based, and network-driven teaching environment, as well as offer rich interactive applications and online resources. As such, it can build smart classrooms where students can play a proactive part.

In this process, it is necessary to build a fast and stable network environment to meet the new norm of online teaching, satisfy the high-bandwidth needs of teachers and students, and create cloud classrooms. Besides this, due to the wide deployment of terminal devices in the campus, the

office and teaching networks need to be independently deployed to avoid problems such as delayed and insufficient information transmission.

At the same time, campus security is also a top concern. As various videoconferencing devices emerge, a ubiquitous network is required for connections anywhere. In this way, widely scattered devices can centrally access such a network, ensuring the security of teachers and students.

Facing these challenges, Beijing 101 Middle School Huairou Campus has put forward requirements of high standards, high quality, and high speeds for networks since the early stage of network construction.

Diving into Education Scenarios for More Innovative "Internet + Huairou Education"

Leveraging Huawei's expertise and experience in digital technologies, smart applications, and skill enablement, Beijing 101 Middle School Huairou Campus builds a smart education platform powered by the cloud and big data. By applying digital technologies to education, it has constructed a smart campus with full coverage of ICT-based applications, becoming a demo site for future education and a leader in smart teaching.

First, network devices are deployed in a simplified manner, and multiple switch models for different scenarios are used. Among them, Huawei CloudEngine S5735-L series PoE switches are used in classrooms to connect to Wi-Fi 6 APs, cameras, and

teaching equipment, eliminating the need for local power supply and supporting plug-and-play. In addition, all-gigabit ports enable GE access in classrooms and 10GE core network construction. All of this helps ensure smooth real-time services such as livestreamed classes and online classes of in-demand teachers.

Second, the campus network design is optimized to ensure its reliability at the device, link, and network levels. Huawei CloudEngine S12700E core switches are deployed in the campus core equipment room. All key hardware of CloudEngine S12700E — such as main processing unit (MPU), switch fabric unit (SFU), centralized monitoring unit (CMU), power module, and fan module — works in redundancy mode to ensure 99.999% reliability and high-quality service bearing (such as online classes and Internet access).

Building a Full-Coverage and Full-Signal Smart Campus

The school and Huawei both agree on the importance of building a campus network with full coverage, in turn enabling practical and efficient smart campus applications. Based on this idea, the school introduces Huawei's Fully-Wireless Campus Network Solution. Integral to this solution, Huawei AirEngine 5760-51 APs are deployed in offices, AirEngine 6760-X1 APs are installed in high-density scenarios such as classrooms and auditoriums, and AirEngine6760R-51E APs are rolled out in outdoor scenarios. With these deployments, the school builds a fully-wireless campus network with full coverage and zero blind spots. This new network offers ubiquitous full-signal access, enabling the high-concurrency and high-bandwidth access requirements of teachers and students.

Thanks to this, the school can use practical applications with a download rate of 200 Mbit/s. In addition, Huawei Wi-Fi 6 APs come with industry-unique smart antennas, and offer audio and video quality assurance capabilities. As such, teachers and students can have immersive

teaching interactions and ultimate experience anytime and anywhere. According to one teacher: "After Huawei Wi-Fi 6 APs were deployed in the campus, full signal was available everywhere. In addition, multimedia courseware can be downloaded in minutes and videos can be played in real time without waiting for them to download. Better yet, we can log in to the app at any time for online learning and access to smart education services. This makes it easy for teachers to tutor students online for better learning results."

Promoting the Balanced Development of Education for the Future

As the education industry deepens integration of next-generation digital technologies such as big data, cloud computing, and artificial intelligence (AI), there is a growing trend to advance smart education and teaching with digital means. Against this backdrop, Beijing 101 Middle School Huairou Campus draws on Huawei's Wi-Fi 6 offerings to deliver high bandwidth, high availability, full-service support, and intelligent O&M, as well as to enable more convenient, flexible, and intelligent teaching modes. This plays a positive role in promoting the high-quality development of the education industry in Huairou District, Beijing.

China's 14th Five-Year Plan period (2021–2025) is an important period for the construction of Huairou Science City, as well as a critical period for the education reform and development of the Huairou district. In this process, Huawei stands ready to cooperate further with Beijing 101 Middle School Huairou Campus to proactively engage in education modernization, help develop Huairou into a science hub, better distribute education resources, improve the standard of education, and increase the supply of high-quality education resources. This, in turn, drives the converged development of city construction and education modernization, creating a new paradigm of collaborative development for regional education and science cities. ▲



Entering a New Digital Era for Scientific Research in Egypt

Founded in 1956, Egypt's National Research Centre (NRC) is part of the country's Ministry of Scientific Research. Indeed, it accounts for approximately 60% of all the Ministry's scientists and is the largest multidisciplinary research and development center in the country. As such, NRC already leads Egypt's scientific research — and its importance is only set to grow.

Digital transformation — rather the lack of it — has become an important factor in the research field, as elsewhere. As Mohamed Gamal, Manager of the Data Center at NRC, said: "NRC had dozens of equipment rooms, which were used to support the business work of more than 4000 researchers. But they were distributed in different locations, in 16 buildings across campus. To ensure the normal operations of these equipment

rooms, we had to shuttle between office buildings every day to perform equipment detection and Operations and Maintenance (O&M) tasks. Manual O&M like this, plus the scattered layout of the equipment rooms, severely restricted our O&M efficiency."

In this difficult and complex O&M environment, lacking a remote O&M platform, the team of 11 — with two dedicated to data center tasks — struggled to understand the overall running status of NRC's equipment

"We look forward to further cooperation with Huawei. It proves every day that it is a pioneer in the field, not only keeping pace, but setting trends with the latest technologies. This will facilitate and secure our transformation and, with Huawei, we have finally found what we were searching for: a solution, account team, and overall design that fulfills our exact needs. The Huawei Technical Assistance Center (TAC) and delivery team continues to provide support for any and every service we need."

*—Samah Aboul Fetoh,
NRC's Information Technology (IT) Manager*

rooms. Instead, the team was left performing onsite maintenance and troubleshooting by hand. With power supply and cooling systems so vital to stable and reliable operations, technical bottlenecks were beginning to blight NRC's important work. Indeed, it was not uncommon for multiple equipment faults to occur on the same day. With troubleshooting and repairs requiring up to two days to complete, the continuity of the center's scientific research was constantly under threat.

With the number of its research projects only growing, the center's service requirements were increasing too. Simply adding servers and storage devices to each of the scattered equipment rooms was not a viable option: besides, this approach simply wouldn't meet capacity expansion needs. Planning capacity expansion for its equipment rooms was therefore proving a key challenge, with NRC mindful that, moving forward, O&M couldn't be allowed to become too complex in the quest for maximum efficiency, post-expansion.

Government Backing

In recent years, the Egyptian government has placed its full weight behind digital transformation, launching the Digital Egypt program, an all-encompassing vision and plan that details the foundations for the transformation of Egypt into

a digital society. In this wholly supportive environment, NRC decided to take a lead and set about implementing policies that would drive Egypt's scientific research sector into the digital era.

NRC soon came to realize that the construction of a new, centralized data center could solve many of its problems, boosting O&M efficiency and improving reliability. Indeed, such a data center could become a showcase for Egypt's scientific community, cementing NRC's position of leadership and trailblazing the way for the future digital development and reform of Egyptian research.

Realistically speaking, most research institutions in Egypt aren't in a position to be able to invest either a large amount of physical space or labor costs to construct and maintain data centers. But Huawei's fully modular and pre-integrated FusionModule2000 Smart Modular Data Center stands out from other vendors' solutions. A next generation, smart modular data center solution — awarded the world's first "Uptime Tier IV Ready" certification — it integrates power, cooling, racks, cabling, and management systems. This means it can be quickly deployed in a relatively small space, and at an extremely competitive price-point. Samah Aboul Fetoh, NRC's Information Technology (IT) Manager, said: "Huawei is virtually the only vendor to offer a data center that requires such a small space. It's a unique offering, unmatched by any



We look forward to further cooperation with Huawei. It proves every day that it is a pioneer in the field, not only keeping pace, but setting trends with the latest technologies. >>

other provider." Now, NRC's new data center implements full-lifecycle management, with power supply, cooling, and O&M all managed remotely — and intelligently. The solution has effectively resolved the problems that were becoming of real concern with the legacy equipment in place, from poor O&M efficiency to unsatisfactory reliability, making it a true benchmark for Egypt's scientific community and the very first data center to be constructed among all members of the Ministry of Scientific Research.

Intelligent O&M Ensures Stability

NRC's new data center benefits from Huawei's NetEco, an intelligent management system that visualizes the operating status of the equipment room environment, cooling, power supply, and distribution subsystems. It implements proactive defense, rapid fault location, and proactive fault isolation, making O&M far simpler for the center's staff, lowering skill requirements and helping to ensure stable services.

A Redundancy Design and Physical Isolation

The Huawei Uninterruptible Power Supply (UPS) NRC now relies on has a modular redundant design, preventing any Single Point Of Failure (SPOF). In addition to the physical partition of the equipment room, each micro-module is configured with an independent access control system. Different services and modules are hierarchically graded to ensure the security of different scientific research services.

Flexible Capacity Expansion

With Huawei's fully modular design, prefabricated in the factory, each module is an independent, small data center. With the power supply able to be flexibly configured, based on service requirements, online capacity expansion — within just five minutes and without the need to power-off — is fully supported, slashing the initial investment required and effectively implementing a pay-as-you-grow model, a far preferable solution for any organization. Indeed, having initially built its new data center to connect all buildings across its own campus, NRC is now looking at a more ambitious plan: to construct a cloud platform that links research institutions nationwide.

"We look forward to further cooperation with Huawei. It proves every day that it is a pioneer in the field, not only keeping pace, but setting trends with the latest technologies." Samah About Fetoh said. She added: "Speaking as NRC's IT Manager in charge of digital transformation, we desperately needed to begin the digital transformation journey and own our own smart data center. This will facilitate and secure our transformation and, with Huawei, we have finally found what we were searching for: a solution, account team, and overall design that fulfills our exact needs. The reforms undertaken have ultimately brought many benefits and we have enjoyed full cooperation with Huawei during deployment. The Huawei Technical Assistance Center (TAC) and delivery team continues to provide support for any and every service we need." ▲



Ankabut: Education Cloud Paves the Way for Digital Talent Development

Ankabut partnered with Huawei to build an advanced education cloud in the UAE and the Middle East. The goal is to provide access services for universities and educational institutions, thereby strengthening the leading position of UAE in research and education in the Middle East. Ultimately, it will pave the way for digital advancement in the UAE's talent development.

Located at the eastern end of the Arabian Peninsula in the Middle East, the UAE became one of the world's richest nations when oil was found in the country in the 1960s. Fast forward to the 21st century, and the UAE has sought to diversify its economy and national industries. It has become a leader in the Gulf region in many fields, with cities such as Dubai and Abu Dhabi becoming trade, finance, and

logistics centers in the Middle East.

Building a World-Class Educational System

To maintain the UAE's rapid economic growth, its government has recognized the increasing importance of education and developing a strong talent pool.

Clearly, the country's diversified,

"Located at the eastern end of the Arabian Peninsula in the Middle East, the UAE became one of the world's richest nations when oil was found in the country in the 1960s. Fast forward to the 21st century, and the UAE has sought to diversify its economy and national industries. It has become a leader in the Gulf region in many fields, with cities such as Dubai and Abu Dhabi becoming trade, finance, and logistics centers in the Middle East."

—Fahem Al Nuaimi, CEO of Ankabut

knowledge-based economic strategy can only succeed with a strong educational system in place. With this in mind and in line with its Vision 2021 national strategy, the UAE government aims to transform the country into a leader in education. To this end, the UAE government has outlined action plans and proposed clear objectives for improving the educational infrastructure and advancing the digital transformation of the education sector. For example, a smart learning project was launched to deploy high-speed 4G networks in all public schools and equip all students with tablets — transforming classrooms into smart learning portals and creating a digital learning environment. An intelligent e-service portal was established to offer various electronic services to university faculty and students, including registration, certificate authentication, and license extensions. Slowly but surely, such applications of digital technologies are reshaping learning and scientific research methods nationwide.

ICT Infrastructure Could No Longer Meet the Needs of Education and Scientific Research

With demands for digital services increasing among students, teachers, and researchers, traditional ICT infrastructures were unable to keep up: a more solid digital

foundation was needed. Enter Ankabut, which provides a wide range of ICT services — including cloud services; network connection; IT infrastructure; equipment room and cabinet hosting and leasing; managed services; training services; and a range of other services for universities, research institutes, and vocational schools. Ankabut serves more than 35 educational institutions and 80 colleges, with its customers including the UAE's Ministry of Education and internationally top-ranked public research institution Khalifa University. By offering high-quality ICT services, Ankabut aims to empower the UAE as it seeks to become a regional leader in terms of education and scientific research.

Despite having multiple Data Centers (DCs) and being the number two ICT service provider in the Middle East and North Africa (MENA), Ankabut still found it hard to meet the fast-changing requirements of education and scientific research services.

In 2020, the vast increase in demand for online education caused by the COVID-19 pandemic posed even more severe challenges to Ankabut. In these circumstances, Ankabut's management realized that it was imperative to overhaul the existing technical architecture, management model, and business model of its networks, in order to upgrade them.

Through survey and analysis, Ankabut outlined some of the most urgent issues that had to be resolved. For example,

DC facilities were scattered in different universities, and unified management and allocation of ICT resources wasn't possible, resulting in high management costs and a lack of efficiency. The scattered architecture supported only basic resource leasing and couldn't provide high-quality computing, storage, network, and big data services. The architecture couldn't be upgraded to meet future demands. Simple business and pricing models and a lack of flexible and innovative ways of service provisioning led to low business competitiveness.

Turnaround: Cloud-based Digital Transformation Builds a Powerful Digital Base for the Education Industry

After careful analysis, Ankabut identified the root cause of these problems: the lack of flexibility in the existing technical architecture, which couldn't keep up with the rapidly changing needs of the industry. Through cloud-based digital transformation, all resources can be managed and applied in a unified resource pool, and the existing network and storage service capabilities can be improved to build a powerful digital foundation. In these circumstances, it would be possible for Ankabut to design flexible and innovative services and business and pricing models.

After determining the direction of cloud-based transformation, Ankabut began looking for a solution that could meet the new service needs of universities and scientific research institutions for computing power, storage performance, and big data enablement.

Ankabut also required that the solution have a leading technical architecture that supports flexible capacity expansion and upgrade, satisfying the needs of future development in the next five years. It was also critical for the solution to be compatible with original systems, be capable of unified allocation and application of IT resources, and support simple operations as well as centralized management of various services. What's more, it also needed to deliver various ways of service provisioning, supporting more flexible business models and pricing modes. After many rounds of comparison and testing to find a suitable solution, Ankabut finally chose to partner with Huawei.

This is where HUAWEI CLOUD Stack (HCS), a high-performance IT platform, came into play. Based on Atlas servers, ARM servers, and KunLun mission-critical servers, HCS provides more than 40 types of cloud services in nine categories — meeting the requirements for remote education, high-concurrency video streaming, high-performance computing, and big data enablement of customers from the education sector. The solution provides high-level, customized cloud services to meet Ankabut's requirements for bandwidth, computing power, storage, and service diversification — improving its service while enhancing its competitive strengths. The open architecture of HCS means it can manage resource pools from different vendors, protecting Ankabut's previous investments. HCS also features out-of-the-box cloud services and embedded Business Continuity (BC) and Disaster Recovery (DR) services, simplifying platform operations and management.



To satisfy Ankabut's demand for unified management of cloud services and traditional network leasing service, Huawei offered tailored cloud-and-network synergy based on Software-Defined Networking (SDN) to implement unified cloud and network management. >>

Cloud-based transformation has benefited Ankabut in many ways. For example, scattered resources are integrated for unified management, to better formulate operation strategies and reduce operational costs; and by innovating business models and providing more flexible services at more competitive prices, Ankabut has consolidated its leading position in the UAE and the Middle East.

To satisfy Ankabut's demand for unified management of cloud services and traditional network leasing service, Huawei offered tailored cloud-and-network synergy based on Software-Defined Networking (SDN) to implement unified cloud and network management. Huawei CloudFabric is an SDN solution that provides seamless connection within or between DCs for physical, virtual, or container-based workloads and applications. CloudFabric offers an intelligent, simplified, secure, and open digital network platform with ultra-high bandwidth to centrally manage services such as the leasing of equipment rooms, network bandwidth, and physical network ports.

Ankabut also deployed Huawei's high-end all-flash distributed storage product — OceanStor Dorado V6, which uses dedicated AI chips, FlashLink® intelligent algorithms and the Non-Volatile Memory Express (NVMe) architecture to provide 20 million Input/output Operations Per Second (IOPS) and a latency of only 0.1 ms, which is twice the performance of comparable storage products in the industry. The excellent storage and read/write capabilities of OceanStor Dorado V6 greatly improved the online teaching and learning experience for teachers and students in the UAE. The product also provides features such as snapshot and Copy Data Management (CDM). This means the solution can quickly create data copies without interrupting services — providing flexible data services for research institutes to facilitate their testing and analysis work.

Future: Consolidate Leadership and Pave the Way for Digital Talent Development in UAE

"This project represents one of the largest investments made in the UAE's education sector in 2019, and will strengthen the UAE's position as a regional leader in educational services," said Fahem Al Nuaimi, CEO of Ankabut.

Cloud-based transformation has benefited Ankabut in many ways. For example, scattered resources are integrated for unified management, to better formulate operation strategies and reduce operational costs; and by innovating business models and providing more flexible services at more competitive prices, Ankabut has consolidated its leading position in the UAE and the Middle East.

Meanwhile, educational and research institutions in the UAE also benefit from the educational cloud. Empowered by state-of-the-art cloud services from Ankabut, schools and research institutes can improve the quality and efficiency of teaching and research projects, helping the UAE become a world-class educational nation, as outlined in the Vision 2021 initiative. Al Nuaimi identified three key factors in the project's success: the digitalization of the education sector, the adoption of a future-oriented technical architecture, and the selection of the right partner. With these cornerstones in place, Ankabut is confident that the education cloud will provide a platform for the UAE's entire educational industry to go digital. ▲

HUAWEI Smart Classroom

Make learning smart, seamless, and accessible with HUAWEI IdeaHub

Multi-screen group learning | Online and offline learning | Unified O&M of endpoints



TÜV Rheinland Low Blue Light (Hardware Solution) Certification

TÜV Rheinland Eye Comfort Certification



Building a Fully Connected, Intelligent World





"Five Ones" Intelligent Education Solution for a Digital Education Community

By Huang Yu, Education Solution Expert of Huawei Enterprise Business

By adoption of ICTs, Huawei provides leading intelligent education solutions featuring One Screen, One Network, One Cloud, One Platform, and One Portal for education customers to drive digital transformation and the high-quality development of education.

"Five Ones" Intelligent Education Solution for a Digital Education Community



Education is becoming increasingly smart. Teaching, scientific research, campus management, and school services are undergoing profound changes:

Teaching and learning activities have shifted from using traditional blackboards to multimedia tools, from learning in a fixed location to now anytime, anywhere, and from one-way lecturing to more student-centric learning.

Scientific research needs to solve complex computing and analytics tasks and relies more on technologies like high-performance computing (HPC), high performance data analytics (HPDA), big data, and artificial intelligence.

Big data is now the basis of refined management and service decision-making. Administrators need to be abreast of key information regarding each service system in real time. In addition, there has been a gradual shift from decentralized to one-stop campus services to improve the experience of faculties and students.

Facing such profound changes in concept and form, the industry is actively exploring the in-depth integration of ICTs and education. Technologies such as knowledge graphs and big data make learning more personalized, while 5G and cloud enable hybrid learning more accessible. The demands of scientific research on computing power and storage are soaring. These successful practices have

stimulated the sector's interest in applying ICTs. However, new problems like scattered construction, repeated construction, data silos, and outdated ICT infrastructure, are also emerging, which severely restrict reform. How to better utilize ICTs to upgrade and innovate education models is an urgent challenge for every stakeholder in the industry.

Renovating Intelligent Education with ICTs

As a leading global ICT solutions provider, Huawei believes in people-oriented education. We are committed to integrating ICTs such as cloud computing, big data, and artificial intelligence into the entire education process in order to promote innovation in teaching, scientific research, management, and services. To be specific, Huawei's intelligent Education Solution uses advanced ICTs to offer intelligent interactions, connections, platforms, and applications to support customers in their digital transformation.

• Change the education concept and follow the national top-level design

During the process of digital transformation, education administrators need to make centralized plans and high-



One screen is the terminal interface for human-machine interaction. It is what a user sees when they use various display terminals, including PCs, tablets, conference terminals, smart blackboards, and LED large screens.

>>

level guidelines, and then implement them step by step. At the national level of China, policies such as the Mid- and Long-Term Development Plan for Education Informatization (2021-2035) and the 14th Five-Year Plan for Education Informatization set differentiated informatization goals for higher, vocational, basic, pre-school, and adult education. These policies coordinate the set-up of the informatization environment, including the network, cloud platform, contents, and informatization standards for education as well as corresponding policies and regulations. Universities and vocational colleges need to invest manpower, funding, and much more to plan informatization roadmaps according to their long-term plans. When it comes to basic education, primary and secondary schools normally are lack strong ICT capabilities. Therefore, education management departments need to take the lead in providing more platform and application support so that schools can focus on common ICT infrastructure construction.

Based on our ICT capabilities and industry understanding, Huawei proposes the concept of "digital education community". We look to utilize this to create all-scenario education resource connection and aggregation as well as all-dimensional openness and collaboration. The concept will help consolidate full-

cycle O&M and continuous evolution with advanced cloud, network, edge, and device technologies.

• **"Five Ones" intelligent education solution**

Huawei has built the "Five Ones" intelligent education technical architecture: one screen, one network, one cloud, one platform, and one portal.

One screen is the terminal interface for human-machine interaction represented by various display terminals, including PCs, tablets, digital, conference terminals, smart blackboards, and LED large screens. In different scenarios, there are matching intelligent interaction terminals for collecting and displaying information based on the requirements of each education subject. "One screen" is as important to intelligent education as a key is to a lock; it opens up the whole system to the user.

One network supported by new technologies and applications is needed to better drive the transformation of teaching, school management, and services. Nowadays networks are not only connected to mobile phones and computers, but also to IoT terminals and smart devices. Based on technologies such as 5G, optical network, and Wi-Fi 7, Huawei integrates wired, wireless, office, and IoT networks to connect campus networks, education MANs, education and research networks, and the Internet. This builds one secure, stable, and intelligent network, improving



As a leading global ICT solutions provider, Huawei believes in people-oriented education. We are committed to integrating ICTs such as cloud computing, big data, and artificial intelligence into the entire education process in order to promote innovation in teaching, scientific research, management, and services.
— Huang Yu, Education Solution Expert of Huawei Enterprise Business



the bearing capability of the service system as well as user experience.

Huawei builds one smart education cloud with centralized standards and services to integrate smart learning, teaching, scientific research, evaluation, management, and campus for an intelligent education environment where everyone can learn anytime and anywhere. In this way, the quality of teaching and learning can be greatly improved, and we can provide everyone with equal access to quality educational resources.

One platform is a public education digital platform that supports smart applications for teaching, scientific research, management, and services. It shares data across clouds, networks, devices, and systems, breaking data silos. This platform enables the agile innovation of education services and optimizes cloud-pipe-device synergy to connect physical and digital spaces for more intelligent educational data services and governance.

The campus intelligent operation center (IOC) and super app are built at one portal for centralized operation and management. It doubles as a one-stop display for teaching, scientific research, management, and services. Through IOC, school leaders can keep abreast of the status of the campus and carry out refined management, while logistics,

security, information and other departments can enjoy more centralized, automated, and intelligent operation. The super app builds a unified intelligent education portal to connect people, events, and things so that users can access various cloud applications conveniently through only one app. Universities can build a mobile campus portal based on the super app to provide mobile terminal services that can cover work, learning, and life, fulfilling the goal that anyone can learn anytime, anywhere.

Working with the Industry and Moving Forward with Intelligent Education

To date, Huawei has served more than 2800 education ministries, universities, and research institutes in over 120 countries and regions. Over 30 of the QS World University Rankings' top 100 universities have chosen Huawei as their partner for digital transformation.

Looking ahead, Huawei will continue to deeply engage with the education industry and flexibly integrate big data, artificial intelligence, and cloud with education scenarios to develop scenario-based solutions with partners and drive high-quality education development through digital transformation. ▲

High-Quality 10 Gbps Campus Network: The Foundation for Future Digital Education

By *Steven Zhao, Vice President of Huawei's Data Communication Product Line*

Digital campuses are urgently looking to deploy high-quality network coverage, improve network security, and achieve intelligent Operations and Maintenance (O&M). Huawei's Intelligent Higher Education Network Solution is a great fit to power all-scenario education, enable innovative teaching approaches, and upgrade education management. The future-proof solution lays a solid network bedrock and digital foundation for teaching and scientific research; and, ultimately, the digital transformation of the education industry.

Since the 1990s, education policies across the world turned their attention to education digitalization. New digital technologies have incredible potential to contribute to higher teaching quality. At the same time, digitalization can streamline educational resources beyond

time and space, enabling schools, regions, and even countries to share knowledge. The increased access to quality resources has helped in bridging the persistent digital and educational divide.

Indeed, many countries have recognized the importance of educational digitalization



In scenarios such as open offices, mobility, and office reconstruction, Huawei offers AirEngine Wi-Fi 6 APs with exclusive dynamic-zoom smart antennas that can flexibly switch between high-density and omnidirectional coverage modes. In this way, such an AP can intelligently adapt to different scenarios. APs of a single type are deployed centrally, simplifying network construction, and protecting investment.

and embarked on relevant projects. For example, the U.S. launched the National Educational Technology Plan, Australia initiated the Digital Education Revolution, and South Korea introduced the SMART — self-directed, motivated, adaptive, resource-enriched, and technology-embedded — strategy. Since 2022, China has also accelerated its educational digitalization.

The digital transformation of global education can be divided into three phases: basic informatization, digital campus, and future-oriented intelligent education.

In the first phase, countries deploy basic IT facilities and department applications.

In the second phase, schools are more concerned with people and services. They upgrade all necessary ICT facilities, such as wireless networks and supercomputing centers, to support rich online and offline teaching, campus management, and scientific research and analysis.

In phase three, schools begin to look toward future-oriented intelligent education. They are eager to use new technologies such as big data, cloud, and digital twins to transform teaching and campus management models across learning, administration, data governance, campus services, and decision-making. Currently, many smart applications are already emerging, such as online classes, Virtual Reality (VR) teaching, and smart labs.

Transforming Digital Education Requires a High-Quality 10 Gbps Campus Network

Networks are at the core of digital campuses, serving as

the foundation that connects physical and digital spaces. They bridge online and offline educational activities, in-class and out-of-class tasks, and real and virtual content.

However, intelligent education faces a series of network construction and O&M challenges. For example, the ever-upgrading smart classrooms keep changing indoor information points. In addition, the existing bandwidth is insufficient for VR terminals and 4K online classrooms. In high-density user scenarios, such as auditoriums and libraries, current Wi-Fi capability is insufficient for high-concurrency and smooth access, failing to assure important online classroom services.

Considering these challenges, how can we build, operate, and maintain a network that connects numerous teachers and students, terminals, teaching equipment, and scientific research facilities?

As education goes digital, high-quality network foundations are crucial for digital campuses. In light of this, Huawei has launched the High-Quality 10 Gbps CloudCampus Solution to keep up with the digital education trend. The solution features technological innovations in transmission media, architecture, experience, O&M, and security. It uses an Ethernet all-optical technology system, which provides a ubiquitous 10 Gbps experience for teachers and students.

The High-Quality 10 Gbps CloudCampus Solution stands out for six unique features:

- **Feature 1: Ethernet all-optical deployment to room**

The solution routes optical fibers into classrooms and dormitories while deploying Remote Units (RUs) indoors



The campus network uses technologies like real-time traffic detection, AI application identification, and network slicing. >>

for expansion of 10 Gbps uplinks. This ensures sufficient indoor wired and wireless bandwidth and enables the expansion of indoor information points.

This new approach surpasses the weak transmission performance of traditional copper cables and prevents complex cabling. Ethernet network deployment is much more flexible, so the network architecture is simplified from three to two layers. Cables are routed once and do not need to be reconstructed for ten years. Plus, there is no need to configure or plan RUs, which are plug-and-play and work immediately after being powered on.

- **Feature 2: Simplified and converged bearing**

The VXLAN-based SDN virtualization network technology virtualizes the physical network into multiple Virtual Networks (VNs). These VNs can be dedicated to students, teachers, all-in-one access cards, security, and finance, respectively. All these VNs are centrally maintained by the information center.

Wireless Access Points (APs) — capable of Wi-Fi & Internet of Things (IoT) convergence — support multiple connection types, such as RFID, Bluetooth, and ZigBee. Finally, all functions can be flexibly loaded using IoT cards, meeting future IoT evolution requirements.

- **Feature 3: Ultra-high-speed network access**

Research shows that over 80% of terminals on campuses are wireless. At the same time, it's common to use online teaching, remote office, and online learning. As such, the solution deploys Wi-Fi APs that deliver full coverage, providing 10 Gbps wireless access anytime and anywhere.

- **Feature 4: Ultimate experience assurance**

The campus network uses technologies such as real-time traffic detection, AI application identification, and network slicing. These allow it to accurately identify key service traffic such as online classrooms, online exams, and real-time sports events. As a result, the network provides End-to-End (E2E) service traffic visualization and assurance, allowing users to enjoy the ultimate network experience with zero frame freezing for key services.

- **Feature 5: Simplified and intelligent O&M**

Huawei's solution offers intelligent O&M thanks to traffic collection, big data, and AI analysis technologies. Key capabilities include Wi-Fi signal optimization, service visualization, and network maintenance. The result is better network O&M and a lower workload for the information center.

- **Feature 6: Integrated network security**

Huawei's solution uses the real-time security upgrade detection and security services based on Software-as-a-Service (SaaS). As such, campus network security services are available on demand. Security defense is integrated across the network and security events are automatically handled from start to finish.

The High-Quality 10 Gbps Campus Network Powers Digital Education

Huawei's High-Quality 10 Gbps CloudCampus Solution is based on the Ethernet all-optical technology system. The solution provides a comprehensive, high-quality experience in classrooms, dormitories, libraries, auditoriums, stadiums, labs, and scientific research buildings. It also enables



Huawei is committed to becoming a key contributor to education informatization infrastructure. By integrating technologies with education scenarios, Huawei stands ready to provide a high-quality network foundation for the digital transformation of the education industry.
—Steven Zhao, Vice President of Huawei's Data Communication Product Line



a new education mode that supports more convenient learning, interactive classrooms, and education resource sharing.

- **Smart classrooms with a simplified network, bridging physical and digital spaces**

Smart Classroom 3.0 features about eight information points in each classroom, including a teaching PC, one to four high-density APs, two electronic whiteboards, one or two recording cameras, a console, an electronic class card, and other optional terminals.

In traditional classrooms, there is no switch. Instead, all information points are connected to the upper-layer devices at the Extra-Low Voltage (ELV) room of the building through copper cables, which is difficult to build and expensive to cable.

Instead, Huawei innovatively uses what we call an Ethernet all-optical "simplified architecture". An RU is deployed in each classroom to connect to all terminals, and all such RUs are then connected to the central switch in the ELV room of the building. This simplifies the complex three-layer architecture into a two-layer architecture. Plus, it takes just one week, instead of a month, to deploy the network.

Heilongjiang International University has already tried out Huawei's Ethernet all-optical "simplified architecture". It has

built a simplified, flexible, and ultra-fast fully-wireless campus network. Optical fibers are routed into rooms. The result is 80% fewer wired managed nodes, 74% less cabling, and 30% lower energy consumption. The Ethernet technology enables flexible and convenient configuration, while indoor optical fibers deliver sufficient bandwidth for future evolution.

- **Dormitories, auditoriums, and stadiums with fully-wireless access anytime, anywhere, offering the ultimate Internet access experience**

In high-density wireless scenarios — such as dormitories, lecture halls, auditoriums, stadiums, and libraries — hundreds of people may access the network at the same time. Typically, the communication bandwidth of a Wi-Fi channel decreases significantly as it needs to support more users.

Huawei's next-generation Wi-Fi 6/7 APs use cutting-edge technologies, such as dynamic-zoom smart antennas and Coordinated Spatial Reuse (CoSR) multi-AP collaboration, to provide up to 10 Gbps wireless bandwidth. They offer a concurrency rate that is 50% higher than the industry average and 20% wider coverage range.

Sipailou and Dingjiaqiao campuses of the Southeast University in China have deployed Huawei's AirEngine Wi-Fi 6 solution. With industry-leading smart antennas, APs



Campuses host everything from large-scale exams to important sports events. As such, key service assurance is a crucial task for campus network management. >>

can deliver always-on signals for users like searchlights, ensuring Wi-Fi signal coverage without blind spots. Dormitories always enjoy full signal strength, doubling download rates.

• **Libraries with cloud-based book counting**

Libraries store millions of books. As a result, books are often misplaced, and librarians face countless hours of repetitive tasks. The smart book counting robot uses Huawei Wi-Fi 6 and built-in RFID IoT cards to scan and count book locations at all times. Then, the wireless network matches books and their designated shelves in real time, automatically identifies misplaced books, and displays their locations for more efficient library operations.

In the University Town of Shenzhen, Huawei's AirEngine Wi-Fi 6 solution enables roaming handover within 10 ms and near-lossless roaming. The result is a stable and reliable data transmission link that integrates wireless and IoT processes between books and counting robots. This effectively prevents packet loss, incorrect transmission, and retransmission between robots and the system background, exponentially improving book management and counting efficiency.

• **Digital labs that connect "everything"**

College/University labs are important sites for both national research and talent training. Currently, there are about 600,000 labs in China. Despite their importance, many labs have poor risk mitigation and security systems. Digital technologies can easily improve lab security management.

Huawei's IoT-capable Wi-Fi 6 APs and edge computing gateways enable full IoT sensing. They support multiple IoT protocols, such as ZigBee, Bluetooth, and RFID. This allows for

convenient access by various lab terminals. It also supports the centralized acquisition, automatic collection, and backhaul of lab data, facilitating intelligent lab management.

In the Sunan Institute of Molecular Engineering of Peking University, this solution has enabled real-time risk awareness and emergency handling in seconds. It has also improved routine security management and reduced the risk of accidents, making security visible, manageable, and controllable.

• **The ultimate experience during exams, sports events, and other activities**

Campuses host everything from large-scale exams to important sports events. As such, key service assurance is a crucial task for campus network management. In these cases, the information center needs to identify key services and reduce the impact of non-key services, so they don't interfere with key services.

Huawei CloudEngine S8700 switches come with experience assurance cards, which ensure zero packet loss in video teaching for up to 10,000 students. In addition, the switches can preferentially guarantee important classroom and sports events, achieving zero packet loss and optimal application experience. At the same time, iMaster NCE enables intelligent O&M by using a digital map to display the status of all applications and user network journeys on campus. Faults can be located and demarcated in minutes, which improves the teaching experience and student satisfaction.

• **Network information center with AI-powered intelligent O&M, visualizing user experience in real time**

This solution has been deployed on the Fengtai campus of this university and provides network assurance for over 10,000 teachers and students.

Network O&M accounts for a large proportion of the information center's workload. As the network continues to expand, so does the number of O&M-related tasks. On average, each "Project 211" university in China has thousands of wired switches, tens of thousands of wireless APs, hundreds of thousands of information points along with hundreds of networked buildings and hundreds of thousands of Internet access terminals and IoT terminals. Even so, there are only dozens of O&M personnel.

Minzu University of China uses Huawei's iMaster NCE, which features AI-powered intelligent O&M technologies. It analyzes campus networks, builds scenario-specific network optimization capabilities, intelligently identifies wireless coverage scenarios, and performs automatic optimization. This solution has been deployed on the Fengtai campus of this university and provides network assurance for more than 10,000 teachers and students. In the past six months, no student has reported any fault, the download speed in dormitories has tripled, and there is no frame freezing when students stream online Blu-ray videos.

- **Research buildings with SaaS-based Qiankun Security CloudService, protecting every scientific research achievement**

Scientific research buildings face significant network security risks because they use various types of terminals, rich application systems, and complex and diversified service access. A network attack can lead to data leakage, viruses, and even network failures. In response, Huawei provides the SaaS-based Qiankun Security CloudService solution to help protect campus scientific research achievements.

In Anhui University, China, more than 50,000 terminals

are connected to the network. Compared with traditional tools, Huawei Qiankun Security CloudService has quadrupled the vulnerability identification rate, more than tripled the attack detection rate, and nearly doubled the automatic handling rate. The solution updates threat information in real time. It also accurately analyzes network security threats and automatically blocks attack sources, defending against attacks and reducing the burden on O&M personnel.

High-Quality 10 Gbps Campus Network Ideal for Smart Campuses

Huawei has built a high-quality 10 Gbps campus network based on the Ethernet all-optical technology system. The network provides capabilities such as Ethernet all-optical deployment to room, simplified converged bearer, ultra-high-speed network access, ultimate experience assurance, simplified and intelligent O&M, and integrated network security. These features streamline digital campus connections and bring smart campus construction to a new level.

Huawei's High-Quality 10 Gbps CloudCampus Solution has been deployed in more than 100 countries and regions, including more than 30 QS Top 100 universities worldwide and nine C9 universities and over 130 Double First-Class universities in China. All of them have chosen Huawei Datacom as their digital transformation partner.

Huawei is committed to becoming a key contributor to education informatization infrastructure. By integrating technologies with education scenarios, Huawei stands ready to provide a high-quality network foundation for the digital transformation of the education industry. ▲



Build a Green All-Optical Base for Intelligent Education With the Huawei FTTO Solution

By Gu Yunbo, President of the Huawei Optical Business Enterprise Domain

Education lies at the heart of national development. Countries around the world are therefore focused on achieving the digital transformation of education, making it an important development goal. Huawei's FTTO solution builds a unified bearer network that is fully connected, sensed, and intelligent for all teaching, management, and research services. This solution meets the construction and reconstruction requirements of campus networks in all kinds of scenarios and builds a green all-optical base for intelligent education.

Digital capabilities are increasingly being integrated into education at the same time as digital technologies such as cloud computing, big data, and Artificial Intelligence (AI) are emerging. This, in turn, is driving the education field to redefine what the learning experience, personalized teaching, and student development mean. Recent years have seen one country after another launch national digital development strategies to implement scientific, technological, and economic development. The aim is to promote digital transformation in the education field, so as not

to miss opportunities for future development.

The European Union (EU), Japan, Singapore, and China, for instance, have all formulated laws and action plans to drive infrastructure construction and the digital transformation of education, as well as provide high-speed, convenient, green, and secure network services. Indeed, intelligent education is gaining traction around the world, especially in terms of new education methods, education resource sharing, and going green and low carbon.

Accordingly, smart campuses are being constructed around the world for multiple

scenarios and services. This results in new teaching environments and methods that are highly demanding in terms of data collection and transmission. That's why networks — as the foundation of smart campus construction — need to provide higher rates and wider coverage, all while ensuring network security and environmental protection.

New smart teaching applications are transforming how teaching is carried out. As the resulting explosion in traffic cannot be carried on existing network bandwidth, network capacity needs to be expanded. In universities, smart classrooms and large-scale open online teaching have become commonplace. In the basic education field, a major area of focus is expanding the egress bandwidth of schools.

Along with the constant rollout of new services, such as remote education, digital libraries, and cloud-based teaching, there are more and more daily life scenarios on smart campuses. For example, a large number of IoT terminals — such as all-in-one card readers, smart water and electricity meters, water heaters, laundry machines, and charging piles — require the integration of network resources. The surge of applications and services places growing pressure on the coordination of resources such as equipment rooms, further taxing network deployment. Worse, provisioning network services becomes more complex and rolling out new services takes an unacceptably long time.

Due to complex networks and services, the fault rate of ring network storms is increasing. Given that traditional Operations and Maintenance (O&M) methods are unable to detect the experience of all users at all times, they simply cannot guarantee the network experience of teachers and students.

Using the Huawei FTTO Solution to Build a Green All-Optical Base for Smart Campuses

F5G — the fifth generation of fixed networks — uses optical fiber as the communications medium. F5G has several advantages, from ultra-high bandwidth and a guaranteed experience, to simplified O&M, making it a great fit for smart campus construction.

Harnessing F5G, the Huawei Fiber to the Office (FTTO) solution replaces aggregation switches with passive optical splitters in Extra-Low Voltage (ELV) rooms and other public areas. Fibers are extended to the network edge and connected to Optical Network Units (ONUs), which replace access switches and are deployed near service access points such as offices, dormitories, and classrooms. Compared with traditional campus network solutions, the F5G-based Huawei FTTO solution has a range of key advantages.

Simplified architecture and significant energy saving: In addition to low-carbon and eco-friendly fibers, an all-optical network uses a flat two-layer network structure and replaces active devices at the traditional aggregation layer with a passive Optical Distribution Network (ODN), overcoming the 100 m transmission distance limitation of copper cables. In addition, it cuts required ELV room space and cabling by 80%, while power consumption falls by 30%, enabling sustainable campus development.

Ultra-high bandwidth future-proof networks: The upstream and downstream bandwidth of all-optical networks can smoothly evolve from 2.5 Gbit/s to 10 Gbit/s or even 50 Gbit/s. A Dynamic Bandwidth Allocation (DBA) algorithm is used to dynamically adjust bandwidth to meet the varying requirements of smart classrooms and Virtual Reality (VR) and Augmented Reality (AR)-based immersive teaching applications. Integrated online and offline teaching provides teachers and students with a premium experience. In addition, fibers are corrosion-resistant and have a service life of up to 30 years. This means that, when it's time to upgrade network bandwidth, only boards or even just optical modules need to be replaced.

Smart and simple O&M means one person can manage an entire campus: An all-optical network integrates wired, wireless, Internet of Things (IoT), and 5G networks, implementing unified O&M and configuration delivery management on the Network Management System (NMS). And because ONUs are plug-and-play and hot-swappable, O&M is simplified, costs are reduced, and O&M efficiency improves by 60%.

High security and reliability provide dual protection for link data: Based on 10 Gigabit Symmetrical Passive



An all-optical network integrates wired, wireless, IoT, and 5G networks, implementing unified O&M and configuration delivery management on the NMS. >>

Optical Network (XGS-PON) and Gigabit Ethernet Passive Optical Network (GPON) technology, the Huawei FTTO solution uses a brand new, enhanced frame format and a more comprehensive encryption function. Common Ethernet frame format analysis software cannot capture or identify the frame format, let alone encapsulated packets. So, compared to an Ethernet access solution, the Huawei FTTO solution is more secure and reliable, making it suitable for various campus scenarios. In addition, hard pipe slicing technology can be used for network isolation, dividing a physical network into multiple physical-like networks. This technology supports multi-network integration and ensures hard isolation between multiple networks for dedicated use.

Long distance coverage brings equity in education: Class-D optical modules support an ultra-long transmission distance of 40 km, making them great for unified network construction of district and county education metro networks. Indeed, just one network covers all primary and secondary schools in a district or county. This is achieved through interconnection between schools and education bureaus, and by sharing resources between urban and rural schools, which ultimately reduces the construction and O&M costs of a single campus network. In addition, the Huawei FTTO solution allows high-quality teaching resources to be shared more widely, promoting equity in education.

Global Success Cases

Huawei's FTTO solution has seen significant uptake globally, ranging from primary and

secondary schools to vocational colleges and universities. In all of these settings, it is helping to enrich teaching modes, optimize teaching environments, and reinvent teaching concepts.

The University of Canada in Egypt is a benchmark all-optical smart campus in Cairo: Invested in by Cape Breton University (located in Sydney, Nova Scotia, Canada), the University of Canada in Egypt is a high-end comprehensive private university that adopted the Huawei FTTO solution to deploy networks for its new campus in 2018. After carrying out a site survey, it found that the horizontal distance of the library exceeded 200 m. In a traditional solution, two ELV rooms would have been necessary on each floor. However, adopting the Huawei FTTO solution, less cabling was needed and the amount of ELV room space required was also drastically reduced, bringing down engineering costs. The university chose the Huawei FTTO solution to provide unified access for data, video, and voice services. Now, a stable campus network provides a premium user experience and is helping the university transform toward state-of-the-art teaching methods. Teachers and students enjoy smooth use of diverse Internet education applications at any time, wherever they are on campus.

CSU builds a smart campus network for teaching and scientific research: Central South University (CSU), a key university in Changsha, Hunan province, China, adopted an all-optical network solution in its old campus as early as 2014. In 2021, during network construction for the university's new campus as well as a network upgrade for its old location, CSU chose the Huawei FTTO solution to reconstruct its campus network, bringing with it significant upgrades, featuring wired and wireless

Huawei's FTTO solution has seen significant uptake globally, ranging from primary and secondary schools to vocational colleges and universities. In all of these settings, it is helping to enrich teaching modes, optimize teaching environments, and reinvent teaching concepts. In the future, Huawei will continue to work closely with partners to promote technical innovation and application implementation, ultimately unleashing more industry potential.
—Gu Yunbo, President of the Huawei Optical Business Enterprise Domain



convergence and full wireless coverage. The campus network supports more than 60,000 concurrent online users, bringing a premium experience to teaching and wider campus life. High bandwidth is enabling Ultra-High Definition (UHD) remote teaching for clinical trials in CSU's Xiangya School of Medicine. Moreover, because the FTTO solution is all-optical, it is not susceptible to electromagnetic interference or aging, ensuring high security and reliability of network applications in labs. The basic teaching network is deeply integrated with certain courses such as railway, medical care, and metal smelting, helping CSU build a smart campus that integrates teaching, scientific research, and management. To date, more than 50 key universities in China, such as Fudan University and Zhongnan University of Economics and Law, have opted for the Huawei FTTO solution.

Suqian's all-optical education metro network promotes equity in education: The government of the city of Suqian, located in China's Jiangsu province, planned to build a high-quality education metro network in 2021, to implement ICT-based education and achieve equal access to education, city-wide. After the all-optical education metro network was built, Class-D optical modules were used to implement ultra-long-haul transmission over 40 km, covering 21 more schools than the traditional solution and connecting 100% of schools in the city. Resources are centrally managed, with Optical Line Terminals (OLTs) deployed in the central equipment room. No ELV rooms are needed in branch schools. The entire network is

centrally managed and visualized, delivering 50% higher O&M efficiency. With the Huawei FTTO solution, the education metro network provides full-fiber access to the classroom and enables smooth evolution from 2.5G to 10G and 50G, helping to achieve the goal of equity in education across Suqian.

Constant Innovation for Intelligent Education

To better meet the needs of teachers and students, Huawei works with partners to build fiber broadband networks featuring 10G to the school and gigabit to the desktop, making innovative activities such as remote teaching, collaborative learning, and immersive learning achievable and convenient. Through technology and product innovation, the network quality of universities is being significantly improved. One network is used to carry all services in multiple campus scenarios, making smart campus construction more efficient and convenient. In addition, the Huawei FTTO solution supports the overall upgrade of campus network infrastructure and promotes state-of-the-art ICT-based education. In doing so, costs are reduced and efficiency is improved, as the organic integration of the Internet and education becomes a reality. In the future, Huawei will continue to work closely with partners to promote technical innovation and application implementation, ultimately unleashing more industry potential. ▲

Building a Robust HPDA Storage Base for Quality Education and Scientific Research

By Fan Jie, Director of Huawei Global Data Storage Marketing Solution Sales Dept

As the infrastructure and data flow requirements of scientific research change, there is a growing need for storage solutions that accommodate high-performance data analytics (HPDA). Huawei's HPDA storage solution optimizes computing, storage, and network resources based on the characteristics of teaching and scientific research services. This solution is cost-effective, fast, and easy to use, building a solid data base for scientific research centers in universities.

Informatization is boosting education development and has become an important factor in measuring the quality of education in a country. The informatization infrastructure of basic and higher education plays an important role in

transforming education ideas and concepts, promoting teaching and learning reform, and modernizing management methods. Universities rely on high-performance computing (HPC) platforms to promote digital transformation of education, and



With years of in-depth engagement in both the education and scientific research sectors, Huawei has launched a next-generation HPDA storage solution. Using the OceanStor Pacific distributed storage and parallel file system, this solution optimizes computing, storage, and network resources based on the characteristics of teaching and scientific research services. It is scenario-based, cost-effective, fast, and easy to use.
— Fan Jie, Director of Huawei Global Data Storage Marketing Solution Sales Dept



many have developed their own HPC platforms. Hybrid computing, on the other hand, requires a more robust and powerful storage base that supports HPDA scenarios.

From Decentralized to Intensive

In recent years, we have seen increasing investment in education infrastructure worldwide. For example, in 2018, the EU proposed the EuroHPC JU to coordinate resources between the EU and its member states. The EU plans to invest 1 billion euros from 2019 to 2026 to build a European HPC and big data system supported by world-class HPC and data infrastructure. By 2020, the figure had increased to 8 billion euros, aiming to drive the development of scientific computing and supercomputing-oriented interdisciplinary research within universities.

Looking back at China, in the past, universities built several small supercomputing platforms to meet the computing requirements of a single department or subject group. Since each faculty built their own independent platforms, computing resources were difficult to share, resulting in a low computing power utilization rate. There was a lack of dedicated equipment rooms, inadequate power supply assurance, and a high level of power consumption and

fault rates. More importantly, they lacked professional O&M employees. The skills of the existing O&M employees varied, and safety issues could easily be overlooked.

With the development of education informatization, these amongst other issues needed to be solved urgently. Therefore, the Ministry of Education of the People's Republic of China and a further six departments released the Guideline on Promoting the Construction of New Education Infrastructure and Building a High-quality Education Support System in July 2021, clearly stating that education should be data-driven with collaborative governance and proactive services. They stipulated that particular attention should be paid to the shared and intensive construction of intelligent infrastructure and high-performance scientific research equipment in universities to build an efficient, secure, and reliable education infrastructure system.

From "Computing-centric" to "Data-centric"

HPC depends on a considerable allocation of computing power as it is the engine that drives the digital transformation of society as a whole. It requires ample data, as the foundation for computing. With the development of the digital economy, the relationship between data and



HPDA scenarios in education and scientific research are changing the distributed storage architecture. Therefore, Huawei has been innovating products to meet emerging service requirements. >>

computing power is going to change.

In the past, computing power was the mainstay. During the last half century, data has been considered as only an auxiliary facility for computing power when it came to solving complex scientific and engineering problems. This has meant the industry put much more emphasis on how to improve computing power and the use of data fell to the sidelines.

But now, data has become the star of the show while computing power remains the accompaniment. Diversified computing power provides more abundant computing resource options for HPC. However, the evolution of storage power is finding it hard to catch up with the rapid growth of computing power. In this context, multiple heterogeneous computing powers are often closely centered around one data storage unit. HPC is evolving from computing-centric to data-centric, making scientific research more data-intensive. Applications for such scientific research models are characterized by a non-repetitive nature, high uncertainty, high dimensionality, and high computational complexity. In addition, the requirements for the underlying data infrastructure have changed fundamentally. Currently, scientific research is increasingly demanding data flow. As such, HPDA scenarios in education and scientific research face four challenges:

First, hybrid computing requires a more robust and powerful storage base that supports HPDA scenarios. Both the intelligent computing centers of scientific research institutions in universities and the supercomputing centers of governments

need to run different types of scientific research applications at the same time. HPC has bandwidth and OPS service load requirements in different processes, and so does HPDA. Traditional storage supports only a single load model, resulting in function silos where data from different processes must be migrated between different storage systems, affecting the efficiency of the entire process. Therefore, powerful HPDA data storage is required to support these hybrid workloads and reduce data bloat and migration.

Second, with the expansion of research topics, the sheer amount of data is soaring, which poses new challenges to equipment room space, power consumption, and storage costs. From petabyte to exabyte, data shows more value, and users also like to retain data for a longer time. Therefore, HPDA data storage must use technologies with high density, efficient redundancy, access frequency tiering, and deduplication and compression to reduce storage costs.

Third, in HPDA scenarios, different systems require different storage services. For example, gene sequencing demands diversified files, big data, and object services in different process phases, making efficient process data access challenging. Therefore, HPDA storage should improve the efficiency of multi-application collaborative analysis and promote cross-disciplinary convergence. One centralized system that supports multiple protocols for data exchange, reduces intermediate links, and manages and maintains resources centrally is required for agile service response.

Fourth, in scenarios like high-energy

Using the OceanStor Pacific distributed storage and parallel file system, this solution optimizes computing, storage, and network resources based on the characteristics of teaching and scientific research services. It is scenario-based, cost-effective, fast, and easy to use.

physics analysis, weather forecasting, and pharmaceutical research, massive data needs to be quickly analyzed and processed within a short period of time. This poses high requirements on the processing capability of the HPDA storage system.

Storage is now the most important part of HPDA solutions for education and scientific research. As HPC evolves to data-intensive HPDA, the industry needs a storage solution that supports hybrid loads, multi-protocol interoperability, and ultra-high-density design to cope with soaring HPDA workloads.

A Next-generation Storage Solution

With years of in-depth engagement in both the education and scientific research sectors, Huawei has launched a next-generation HPDA storage solution. Using the OceanStor Pacific distributed storage and parallel file system, this solution optimizes computing, storage, and network resources based on the characteristics of teaching and scientific research services. It is scenario-based, cost-effective, fast, and easy to use.

- **Cost-effective storage: Massive data storage for data surges**

OceanStor Pacific launched a series of ultra-high-density hardware that supports automatic data tiering across differing hardware, improving unit space capacity by 20% and greatly reducing storage costs in HPC scenarios. OceanStor Pacific supports 120 3.5-inch hard disk drives (HDDs) in a 5-U space, freeing up more than 60% of the available cabinet space and eliminating the burden of massive data storage.

- **Fast computing: Parallel client for next-generation distributed file system/data processing center (DPC)**

OceanStor Pacific is equipped with a next-generation distributed file system and DPC private client. Just one storage system can provide twice the bandwidth for large files and five times the input/output operations per second (IOPS) for small files. In addition, the file system supports multiple types of service loads to speed up computing power for all hybrid load scenarios, which not only meets common service requirements, but also allow enterprises to explore new services regarding technologies like big data and AI at ease.

- **Easy to use: One copy of migration-free data minimizes O&M complexity and improves system availability**

OceanStor Pacific can meet diversified computing power requirements, improve the efficiency of multi-application collaborative analysis and promote cross-disciplinary convergence. It offers a centralized system that supports multiple protocols for data exchange, reduces intermediate links, and manages and maintains resources centrally for agile service response.

The HPC platform of Shanghai Jiao Tong University uses Huawei OceanStor Pacific distributed storage with large and small I/O adaptive processing technology to intelligently layer data flows, reducing the computing workload from three months to four days.

HPDA scenarios in education and scientific research are changing the distributed storage architecture. Huawei Storage will continue to innovate hardware, software, algorithms, and architecture with higher reliability, availability, and usability to achieve optimal HPDA. ▲

Building a Solid Foundation for Smart Campuses With Huawei's Product Portfolios

By Liu Zhenhua, Director of Huawei's Smart Campus Marketing & Solution Sales Dept

In the future, higher-quality smart campuses will be built based on a solid ICT foundation. With profound insight into the demands and trends of the education industry, Huawei combines its own product portfolios with the strengths of partners to help customers in the education sector build smart campuses.

The education industry is burgeoning under digitalization. Students and faculties alike expect a smooth teaching and learning process, a swift administration process, and convenience in their day to day life. As the world advances at a galloping pace, more and more

schools have begun working on building 'smart campuses'.

In the global education field, Huawei focuses on the ICT foundation for intelligence and provides advanced education solutions for teaching, scientific research, life services, and administrative



Across the field of global education, Huawei focuses on ICT foundations and provides advanced education solutions for teaching, scientific research, day-to-day services, and administrative logistics based on smart campus product portfolios. These solutions help customers build smart campuses and promote the long-term, sustainable development of education.

— Liu Zhenhua, Director of Huawei's Smart Campus Marketing & Solution Sales Dept



logistics based on smart campus product portfolios. These solutions help customers build smart campuses and promote the long-term, sustainable development of education.

In key scenarios, Huawei combines partner capabilities with product portfolios, including the "converged campus network", "intelligent video perception", "intelligent office conference", "campus digital platform", and the "IoT edge", to help schools build multi-scenario applications like smart classrooms, practical teaching, smart office, smart R&D, video perception, asset management, and smart services.

Built upon a solid ICT foundation, the future smart campus will be seamlessly covered by high-quality networks to ensure everything is connected. It will link the teaching, scientific research, administrative, day-to-day, and communication functions of the school, supporting all-scenario link management.

Huawei's Product Portfolio Solutions Help Build a Next-generation Smart Campus

In the infancy of their smart campus construction, most universities do not have a clear blueprint, roadmap

or solution; rather, they have abstract ideas about what they would value if such a campus existed. Some colleges and universities attach great importance to teaching and scientific research, others focus on smart classrooms and distance learning. Still others put an emphasis on having state-of-the-art logistics services. Different universities have different visions for their own smart campus.

Huawei pins down exactly what a university wants and needs to do via professional site surveys. This allows Huawei to provide targeted top-level planning based on the characteristics, problems, and requirements of the institution. Huawei can leverage the comprehensive and flexible advantages of its product portfolios to design and deploy solutions in a modular way. It helps universities draw blueprints, establish the architecture, strengthen the foundation, build applications, and enable intelligence.

• Simplified office networks deliver smooth network experiences

Online, video-based teaching requires a definition of 1080p or higher resolution. Online learning experience requires a latency of less than 50 ms in many scenarios. Constant Internet disconnections lead to poor network experience and inevitably earns complaints from teachers and students alike.



According to estimation, the number of network management nodes in the campus can be slashed by 80%, and the energy consumption can be reduced by 30%. 25,000 kWh can be saved in a single building over the course of one year. This means a total saving of 750,000 kWh for a typical university campus with 30 buildings. >>

In academic settings, countless professors and pupils communicate with each other via the wireless network. This requires that each AP should connect to at least 50 terminals with a minimum of 4 Mbit/s bandwidth for video playback.

In dormitories, a typical dorm accommodates six students. Each student has two or three terminal devices, each of which requires at least 2 Mbit/s bandwidth to ensure online learning with no frame freezing. In one Hong Kong university, a large number of posts on the bulletin board system (BBS) involved complaints about poor online learning experiences.

Interactive learning becomes increasingly popular, while group teaching places high requirements on wireless networks. There is evidence showing when five smart screens are connected to the wireless network in the classroom at the same time, the pictures on the screens are not synchronized due to network freezing, which greatly compromises the teaching experience.

Huawei uses the simplified office network product portfolio to adapt to smart campus scenarios. The solution uses the IP+POL architecture, AirEngine series Wi-Fi 6, CloudEngine S series switches, OLT+ONU networking, and eSight/iMaster NCE, delivering 200 Mbit/s @ Anywhere all-wireless office network experiences and ensuring zero network freezing for 80-100 channels.

In order to achieve green, low carbon development, which has a direct impact on the annual development assessment and the operational costs of a university,

colleges are taking all possible measures to reduce the energy consumption of network devices, which amasses to millions of dollars every year. With the simplified office network product portfolio, the network architecture is reduced from three to two layers. The innovative ultra-remote power supply mode of PoE requires only the deployment of weak-current equipment rooms at the core layer, eliminating the need for a large amount of cabling and zero-line redeployment during network upgrades. Beyond this, the remote unit (RU) solution can better adapt to scattered buildings in a campus, which outperforms the traditional serial networking mode and is greener as well as energy-saving. According to estimation, the number of network management nodes in the campus can be slashed by 80%, and the energy consumption can be reduced 30%. 25,000 kWh of electricity can be saved for a single building in a year. This means a total saving of 750,000 kWh of electricity for a typical university campus with 30 buildings.

• **Intelligent office meetings address the challenge of interactive learning**

Currently, most colleges and universities have few smart classrooms that support interactive learning and online group discussion. As the intelligent era emerges, colleges and universities are hoping to have more smart classrooms for interactive learning and effective teaching.

From the teacher's point of view, traditional curriculum resources are limited, leading to difficult lesson preparation and underwhelming lecturing.

With the continuation of smart campus construction, digitalization is supporting and leading MUST's development, enabling and reconstructing its infrastructure and information systems and helping it grow into a world-renowned university.

From the student's point of view, the learning process is boring due to a low level of interaction between teachers and classmates. Watching LCD screens for a long time is also detrimental to the eyes. For class administrators, the current digitalization level of administration management is low, course quality and depth of learning evaluation is difficult, and manual class inspection costs are high. Beyond this, college administrators also have to deal with low levels of management intelligence, complex interfaces, and laborious device information collection. In online and offline hybrid learning, the switchover between teachers, the classroom, and online students is constant and complex. If the network is not smooth enough, the learning experience will be greatly compromised.

Based on its product portfolio solution, Huawei uses the smart tablet IdeaHub to empower classroom learning. Huawei has developed an innovative online and offline hybrid learning mode based on superior wireless networks, mainstream video services and teaching management systems from partners. This mode is capable of delivering a diversified, more interactive and flexible learning experience.

After the digital reconstruction of traditional classrooms, blackboards will be replaced with smartboards that can

be projected to big screens with high definition. The intelligent speaker tracking function of IdeaHub ensures that the online picture is always focused on the speaker during distance teaching, and is quickly switched to the panoramic view after a lecture is over.

• **Intelligent video perception safeguards smart campuses**

In campus perimeters, public areas, key entrances and exits, and indoor areas, traditional campus video awareness systems encounter issues including limited computing power, low algorithm accuracy, fixed software, and single functions. These systems cannot meet requirements for campus video linkage management.

Currently, most campus management work is still manual, and the false positive rate of video alarms is as high as 60%. Key labs and information security areas are frequently trespassed in, leading to all sorts of incidents. In areas with a high density of people, traffic congestion and parking is a constant problem.

Based on mature and advanced video, AI, and network technologies, Huawei has developed a product portfolio solution focused on video perception in campus scenarios. The solution consists of software-defined HWT cameras (X, M, C, and D series), HWT IVS1800/2800/3800 series video management platforms, CloudEngine S series



Smart campus construction not only improved teaching and scientific research management capabilities, but also standardized and optimized university management and service. >>

switches, IP+POL networks, and eSight/iMaster NCEs. It implements functions such as perimeter management, smart access, intelligent inspection, smart parking, asset management, firefighting linkage, and incident handling in campus management. The solution ensures accurate on-site data, timely problem detection, and efficient incident response to reduce risks significantly.

Combining New Technologies to Lead the Construction of Smart Campuses Through Top-level Design

The Macau University of Science and Technology (MUST) is the largest comprehensive research university in Macau, ranking 250–300th in the Times Higher Education World University Rankings 2022. Huawei and MUST jointly worked out a blueprint for smart campus construction by analyzing the current situation and process of campus management at the university. The blueprint has been implemented in several phases.

Based on actual campus scenarios, we started to build the smart campus service platform of MUST through top-level design, ensuring the platform can flexibly meet various service requirements. Based on the WeMust platform, MUST can accumulate technical capabilities across multiple fields to improve the smart campus management system. MUST had many smart campus construction scenarios. The overall planning involved fully connected ultra-broadband networks, smart classrooms and online interactive education, campus video

management capability improvement, campus energy consumption management and optimization, campus asset management, an ICT training platform, a campus-level AI computing center, and a smart campus operation center. The project covered numerous products and technologies, making integration arduous. With Huawei's product portfolio, including a campus video awareness system, simplified office networks, a smart office conference system, and a campus digital platform, the complex solution is modularized and prefabricated, meeting the overall planning and phased implementation requirements of the university.

With the continuation of smart campus construction, digitalization is supporting and leading MUST's development, enabling and reconstructing its infrastructure and information systems and helping it grow into a world-renowned university. Smart campus construction not only improved teaching and scientific research management capabilities, but also standardized and optimized university management and service, supporting the university's future development.

Through scenario-based solution design, Huawei's rich product resources are flexibly combined to support various industry application scenarios. In the smart campus field, Huawei's flexible scenario design and comprehensive set of products can meet any digital and intelligent construction requirements. Looking to the future, Huawei will continue to lay a solid foundation for the digital transformation of schools and colleges. ▲

Huawei Builds Digital, Interactive, Collaborative, and Intelligent Classrooms to Offer More Engaging Learning Experience

By Li Guangming, Marketing Director of Huawei Intelligent Collaboration Domain

To promote personalized, open, and ubiquitous learning, Huawei utilizes IdeaHub to develop a smart classroom solution. Huawei aims to use this tool to realize digital, interactive, collaborative, and intelligent teaching and learning.

Nations around the world are emphasizing digital development and transformation to make education more intelligent. The way we think about education is changing; we are amidst a movement advocating for personalized, learner-first education. This has naturally led to the digital classroom being in the spotlight.





IdeaHub utilizes hardware and software fashioned for the classroom including HD video conferencing, distributed conferencing, P2P projection, smart multi-window, smart whiteboard, collaborative projection, and multimedia to make lessons engaging for students. >>

Digital Transformation of Education Stimulates Smart Classroom Construction

In the era of the Internet, traditional classrooms simply are not equipped to keep up with modern teaching materials, nor can they adapt to new models of intelligent education. Dusty chalkboards, tedious lecturing, and one fixed location for lessons only hinder students and teachers alike, and suffer from the following issues:

- **Tedious teaching content**

Teaching is left to the teachers, who get to decide the entire contents of a lesson. Students don't have much space for participation, which makes it difficult to stimulate interest and initiative when it comes to their learning.

- **Poor interaction**

Students only passively receive knowledge, and there is little interaction between teachers and students.

- **Poor teaching results**

Teachers cannot take care of each individual student's learning progress. Students are unlikely to master a great deal of knowledge in a short period of time.

- **Uneven allocation of resources: Traditional**

classroom teaching resources are allocated differently, and education resources are unbalanced across different schools and regions.

IdeaHub Builds a Flexible and Interactive Smart Classroom

As traditional modes of teaching pass

on the baton to the next generation, smart classrooms have emerged to integrate various resources and multiple teaching tools for a high-quality learning experience. Huawei's smart classroom solution uses IdeaHub, an interactive large screen, to provide a user-friendly and intelligent space for teaching activities, enabling personalized, open, and ubiquitous learning. IdeaHub utilizes hardware and software fashioned for the classroom including HD video conferencing, distributed conferencing, P2P projection, smart multi-window, smart whiteboard, collaborative projection, and multimedia to make lessons engaging for students.

- **Digital teaching and learning**

IdeaHub is equipped with an electronic whiteboard that has 25-ms ultra-low writing latency. It offers a variety of multimedia functions, for example, students can save class notes conveniently by scanning the QR code on the screen, and teachers can play videos and show pictures. These multimedia tools explain concepts more vividly and across more learning styles, leading to much better comprehension in students.

- **Interactive teaching and learning**

Traditional lecturing is one-way and lacks interaction between teachers and students. With the interactive teaching function, IdeaHub enables students to participate in the class more proactively. They can use the interaction function on the screen to answer questions raised by teachers or hold group discussions, facilitating a raised interest in learning.



Huawei's smart classroom solution uses IdeaHub, an interactive large screen, to provide a user-friendly and intelligent interactive space for teaching activities, enabling personalized, open, and ubiquitous learning.

— Li Guangming, Marketing Director of Huawei Intelligent Collaboration Domain



- **Collaborative teaching and learning**

IdeaHub serves as a collaborative learning tool to help students better complete various group tasks. For example, students can use the multi-touch function to edit documents while also drawing pictures on the screen to include multiple students at once. This collaborative learning mode promotes communication and cooperation between students, which helps them complete tasks faster and work together better.

- **Intelligent teaching and learning**

IdeaHub also provides intelligent evaluation functions. For example, exam software can be used for classroom tests and quizzes so that teachers can gauge how students are doing and flexibly adjust lessons to fit student needs.

Mustaqbal University in Saudi Arabia Moves Towards Digital Transformation

Mustaqbal University is a well-known private university in Saudi Arabia. It has long touted infrastructure construction as the key to improving the quality of education in order to better serve teachers and students.

Wanting to upgrade its traditional ICT facilities, the university selected Huawei's smart classroom solution that

supports online and offline hybrid learning to meet its digital upgrade requirements. With this solution, Mustaqbal University has become the first university in Saudi Arabia and even the Middle East to fully adopt end-to-end smart classrooms. IdeaHub allows users to easily project presentations from a computer, mobile phone, or other terminal devices. IdeaHub's reverse control technology can be used to change slides and interact with the presentation. In addition, students and teachers can join classes remotely through clients regardless of their location.

The smart classroom solution also serves as a bridge between new and experienced teachers, helping new teachers quickly improve their teaching methods and skills.

With IdeaHub's interactive whiteboard, comments can be made during instruction and the notes recorded during discussion can be easily shared by email or through scanning the QR code.

In the midst of the digital wave, Mustaqbal University has taken a crucial step towards digital transformation. It is committed to becoming a pioneer in the digital transformation of universities and is expected to transform into a leading education institution that serves emerging talent for generations to come. ▲

Leverage the Strengths of the Portfolio

Build a solid foundation for digital education and help customers build high-level intelligent campuses.



Building a Fully Connected, Intelligent World





A New Blueprint for Intelligent Education

By *Chen Guangcheng, AI-CLUB.COM.CN*

Huawei proposes the "digital education community" to draw a new blueprint for intelligent education and promote sustainability within the sector.

A blackboard, a piece of chalk, and a lectern — when asked to think of a typical classroom, these things always spring to mind. Although full of memories from our youth, frankly speaking, such a classroom had obvious drawbacks

when it came to the quality and efficiency of teaching and learning.

Now, everything has changed: We have electronic screens and virtual teaching aids, interactive, flexible and diversified teaching methods, and shared teaching resources.



Intelligent education blurs the boundary between the physical and the virtual. It bridges gaps between educators, learners, and wider society. Anticipating this, Huawei proposes the concept of the "digital education community" to draw a new blueprint for intelligent education.

>>

With much more equal access to these new tools, teachers have been far better equipped to inspire students and encourage an enthusiasm for learning. The digital transformation of education has been assigned with great importance around the globe, and has become an important development strategy across nations.

Use Digital Technologies to Transform Education

In the report *Reimagining Our Futures Together: A new social contract for education* released by UNESCO in 2021, UNESCO highly recognized the significance of digital transformation in education. At the Transforming Education Summit held in September 2022, UNESCO made digital transformation of education one of its main five topics and pointed out that countries should strengthen investment in digital education to make the industry more inclusive, equitable, effective, and sustainable.

Education is the cement that binds the strong foundation to a nation. Many countries around the world have launched digital education strategies to drive transformation in the sector. This is not only a transformation of classrooms as mentioned above, but also a deeper, systematic transformation of concepts, education models, teaching processes, campus services, and governing. All these require the in-depth integration of

technologies and education scenarios.

To realize intelligent education, we need to address three challenges:

- How to aggregate all-scenario education resources to build an encyclopedic education resource service system and a modern education governance system.
- How to support all-round openness and collaboration and give full play to the respective advantages of governments, schools, enterprises, and wider society.
- How to achieve full-cycle O&M and continuous evolution to devise new services and scenarios for sustainable education informatization.

Intelligent education blurs the boundary between the physical and the virtual. It bridges gaps between educators, learners, and wider society. Anticipating this, Huawei proposes the concept of the "digital education community" to draw a new blueprint for intelligent education.

Digital Education Community, a New Benchmark for Education Digitalization

The digital education community aims to make the industry smarter through collaboration. It puts teachers and students at the focal point and takes advantage of intelligent teaching applications to improve the quality and experience of learning.

The digital education community changes the direction of digital transformation of

Aiming at integrating technologies, services, and industries, it is expected to be a model of higher education reform and urbanization across China. In addition to providing the core network system, Huawei has also opened over 400 APIs, laying the groundwork for the horizontal expansion of various smart services within the smart town.

education profoundly by addressing the three challenges mentioned above.

- In terms of aggregating all-scenario education resources, the digital education community breaks data silos and builds connected platforms for data and resource sharing. For example, most traditional education models make decisions based on purely quantitative information, like grades and attendance records, which has obvious flaws. Instead, the digital education community drives information aggregation, mining, analysis, and evaluation to make the most of data. Devices for teaching and scientific research are widely connected to facilitate digital education governance and help teachers personalize their teaching approaches to each student's aptitude, personality, and interests.

- In terms of all-round openness and collaboration, the digital education community is committed to collaborating with governments, schools, enterprises, and social organizations to promote the coordinated development of digital education. The digital education community pursues the joint promotion of digital transformation in education and research with all parties involved. It wishes to build a sound digital governance system and a win-win ecosystem to make theoretical and technological breakthroughs that benefit all who participate.

- Regarding full-cycle O&M and continuous evolution, the digital education community is committed to collaborative development, education management, and

business process reengineering. It utilizes a sound and interactive development system for data governance, intelligent technologies, and innovative digital education services and scenarios to build a intelligent education ecosystem as well as improve digital education quality and sustainability.

The iHarbour — intelligent Education Town in Xixian New Area in Xi'an, Shaanxi, is Huawei's first instance of the digital education community put to practice in China. It is a four-in-one body that combines "campus, town, industrial campus, and community". Aiming at integrating technologies, services, and industries, it is expected to be a model of higher education reform and urbanization across China. In addition to providing the core network system, Huawei also opened over 400 APIs, laying in the groundwork for the horizontal expansion of various smart services in the smart town. Through projects like this, Huawei promotes the popularization and in-depth development of various services and applications, meeting the requirements of production, education, and research.

"Five Ones" Intelligent Education Solution Lays a Solid Foundation for All-Scenario Education Intelligence

The digital education community has drawn up a new blueprint for digital transformation of education, a top-level design reference for intelligent education. To bring



The "one screen" is the point of entry for learners and teachers into intelligent education. Instead of face-to-face interaction, intelligent education is defined by human-machine interaction through these terminal interfaces. >>

the blueprint to life, Huawei has built the "Five Ones" technical architecture, that is, one screen, one network, one cloud, one platform, and one entrance. The architecture provides leading intelligent education solutions with ICTs as its backbone.

The advent of the electronic screen is one of the most significant advancements to come to the modern classroom. From multimedia classrooms to smart classrooms, various display and interaction terminals including PCs, tablets, electronic class cards, conference terminals, smart blackboards, and campus LED screens are reshaping the teaching and learning experience. The "one screen" is the terminal interface for human-machine interaction, and it is as important to intelligent education as the peripheral nerves are to the human brain. Mustaqbal University in Saudi Arabia chose Huawei's smart classroom solution to upgrade traditional classrooms, making way for their first term of hybrid learning.

Networks are the bedrock for the digital transformation of education. Huawei uses "one network" to integrate wired, wireless, office, and IoT networks as well as improve the bearing capability of service systems for smart campus construction. In Paraguay, Huawei helped the Ministry of Education and Sciences provide broadband access and wireless network coverage for over 3000 primary and secondary schools. This supports education resource sharing and narrows the gap between urban and rural

education nationwide. In Honduras, Huawei has built an intelligent next-generation digital campus network for the Universidad Nacional Autónoma de Honduras (National Autonomous University of Honduras). The network connects the university's nine campuses and provides wireless coverage so that teachers and students can access high-speed network services anytime, anywhere.

Cloud computing is the optimal tool for the intensive and large-scale development of intelligent education. Huawei builds one smart education cloud with centralized standards and services to integrate smart learning, teaching, scientific research, evaluation, management, and campus for an intelligent education environment where everyone can learn anytime and anywhere. Soochow University worked with Huawei to build a digital, mirrored, and intelligent Cloud University of the future. In the United Arab Emirates, Ankabut, an operating organization of national research and education network (NREN), joined Huawei to build an advanced education cloud in the United Arab Emirates and Middle East based on Huawei HCS full-stack hybrid cloud platform. The cloud provides access services for universities and education institutions, strengthening the country's position as a regional leader in scientific research and education. This is paving the way for digital advancement and talent development in the United Arab Emirates.

There is no doubt that intelligent education in the digital era qualitatively differs from education in the industrial era in terms of core concepts, architecture, teaching paradigms, content, and governance.

"One platform", that is, a public education digital platform, shares data across clouds, networks, devices, and systems. It supports intelligent education applications for teaching, scientific research, management, and services. Wuhan University of Technology uses Huawei's shared distributed storage, interconnected network (IP, RoCE, and RDMA), Kunpeng + x86 hybrid HPC base, and Kunpeng big data base and AI base to build a comprehensive scientific research platform. This platform integrates supercomputing, AI, and big data, greatly facilitating innovative scientific research. Shanghai Jiao Tong University and Huawei came together to build a high-performance computing platform. After years of development, this platform has become a leading university computing platform in China, decreasing the computing workload from three months to only four days, effectively supporting scientific research of the university and cloud-based practice of over 10,000 resident students.

The campus intelligent operation center (IOC) and super app are built at one entrance for centralized operation and management as well as a one-stop display for teaching, scientific research, management, and services, allowing users to access various cloud applications through one app. Macau University of Science and Technology has signed a strategic cooperation agreement with Huawei to promote smart campus construction. WeMust, a centralized smart campus service platform, is one of the highlights. It streamlines all data under the "one number, one source" rule and builds a data exchange middle platform to associate multiple "micro-applications" that

cover all services of the university. With only one app, teachers and students can have access to university resources and services anytime, anywhere.

Huawei Engages in Education Service Scenarios and Promotes High-Quality Education Development

It can be seen that Huawei does not focus on a single domain in the education industry. Both the "Five Ones" architecture and the "digital education community" concept represent Huawei's pursuit and efforts in integrating physical, social, and digital spaces to promote collaborative development.

Huawei has been working in the education industry for more than 10 years. Currently, Huawei has served over 2800 education ministries, universities, and research institutes across an excess of 120 countries and regions. Over 30 of the QS World University Rankings' top 100 universities have chosen Huawei as their partner for digital transformation. All these show the industry's recognition of Huawei's intelligent education concept, technology, products, ecosystem and services.

There is no doubt that intelligent education in the digital era is qualitatively different from education in the industrial era in terms of core concepts, architecture, teaching paradigms, content, and governance. Digital education transformation needs broad participation, openness and sharing among all stakeholders. Huawei will keep engaging in the education industry to promote innovative and high-quality education development. ▲



DIGITAL TRANSFORMATION STORIES



Industry digitalization is advancing quickly. Huawei works with global customers and partners to discuss the urgent needs and challenges of industry digital transformation. We help industries match the right technologies with specific business scenarios to create new value together. Here are some inspiring stories about the digital journeys of our customers and partners.

NEW VALUE TOGETHER



Data Storage Innovation Accelerates Scientific Research & Education High-Performance Data Analysis Applications

Huawei **OceanStor Pacific** Scale-Out Storage



Always efficient
Multi-protocol interworking



Always on
Multi-level system reliability assurance



Always cost-effective
High Density hardware



Learn More

267 Fortune Global 500 companies choose Huawei create New Value Together



Huawei integrates industry and new ICT technologies,
together with clients & partners accelerating digital transformation

Building a Fully Connected, Intelligent World

