

Networking Academy Connects Students to Opportunities in the IoE Economy



EXECUTIVE SUMMARY

Objectives

- Address broad issues related to employment and entrepreneurship; bridge global IT skills gap; empower students and educators

Strategy

- Program develops and owns content, offering it to partner institutions free of charge, with deep discounts on equipment and certifications

Solutions

- Cloud-based instruction, hands-on laboratory experience, interactive learning tools
- Cisco NetSpace – cloud-based platform that combines best-of-breed applications for teaching, learning, and collaboration
- Cisco Packet Tracer – customizable simulation platform allowing students to experiment with network behavior
- Instructor training, development, and collaboration
- Student assessments that enable ongoing course improvement

Impact

- Financial mobility for graduates
- Economic and societal benefits from more skilled workforce
- Improvements in science of education and e-learning

Background

In January 2014, Cisco released the results of an in-depth analysis of the economic benefits of the Internet of Everything (IoE) for the public sector. Cisco's model revealed that some \$4.6 trillion in "Value at Stake" would result from the adoption of IoE capabilities across 40 key public sector use cases over the next 10 years, including smart water, smart buildings, smart energy, smart parking, and more (<http://bit.ly/1aSGlzn>).

As a next phase of its analysis, Cisco engaged Cicero Group, a leading data-driven strategy consulting and research firm, to undertake a global study of IoE capabilities across these 40 use cases – how the best public sector organizations are "connecting the unconnected," as Cisco terms it. To that end, Cicero Group conducted interviews with dozens of leading public sector jurisdictions – federal, state, and local governments; healthcare organizations; educational institutions; and non-governmental organizations (NGOs) – to explore how these global leaders are leveraging IoE today.

The research examined real-world projects that are operational today, are being delivered at scale (or through pilots with obvious potential to scale), and that represent the cutting edge of public sector IoE readiness and maturity. The aim of the research was to understand what has changed in terms of the jurisdictions' people, processes, data, and things, and how other public sector organizations can learn from (and replicate) the trail blazed by these global IoE leaders. In many cases, these jurisdictions are Cisco customers; in others, they are not. The focus of these jurisdictional profiles, therefore, is not to tout Cisco's role in these organizations' success, but rather to document IoE excellence, how public sector entities are putting IoE into practice today, and to inform a roadmap for change that will enable the public sector to address pressing challenges on multiple fronts by drawing on best practices from around the globe.

About Cisco Networking Academy

The Cisco Networking Academy® program was formed in 1996 when George Ward of Cisco approached the San Francisco School District about a pilot program teaching networking to students at Thurgood Marshall Academic High School. Mr. Ward brought on Dennis Frezzo and other young teachers to achieve the vision of merging Cisco's knowledge of networking with new teachers' knowledge of education. The first courses were offered in 1997.

Networking Academy™ has since grown to more than 9000 academic institutions worldwide. With more than 20,000 instructors trained to teach Networking Academy courses, more than 1 million students were expected to take courses from the academy in 2014. Participating academic institutions provide teachers and deliver the training, while Cisco provides the curriculum and training materials free of charge.

A Networking Academy education focuses on developing ICT- and networking-related skillsets. Many students use the program to prepare for specific IT certifications such as Cisco CCNA®. Specific topic areas include network design, routing & switching, security, telephony, and cloud.

Alejandro Caballero is president of Universidad Tecnológica Emiliano Zapata (UTEZ) in Morelos, Mexico, which delivers the Networking Academy curriculum. A Cisco Certified Network Professional, he also holds a variety of additional specializations and certifications, and worked as an instructor at UTEZ before moving into administration. Mr. Caballero accepted appointments as academic secretary and director of information technology prior to becoming the president. He has been involved in the Academy from its inception in 2001, and assisted as it grew into both an Instructor Training Center and an Academy Support Center. Enrollment at his institution has grown rapidly – UTEZ expected 3400 students by September 2014.

Laura Quintana joined Cisco in 1999. As senior director of corporate affairs, Ms. Quintana is responsible for managing a global team and leading Corporate Social Responsibility field operations worldwide.

Dennis Frezzo joined Cisco in 1998. As a senior manager in Corporate Affairs, he is responsible for leading the Simulation, Game, and Mobile Engineering (SGME) organization, creating educational resources for the Cisco Networking Academy program. Dr. Frezzo previously worked as an optical engineer and taught high school for four years at what became the first Networking Academy in 1997.

Objective

The academy provides critical technology education to help leverage and manage network technology infrastructure throughout the world, using that very network – via the cloud – to deliver the content. "We like to consider ourselves the world's largest classroom," commented Ms. Quintana. Furthermore, the academy teaches not just tech skills and certifications, but also entrepreneurial skills, and improves the curriculum continuously through a feedback loop between participants and Cisco.

Broadly, Networking Academy addresses big social issues – entrepreneurship and employment – and a global IT skills gap, while empowering individual students and educators.

Strategy

The Networking Academy is Cisco's flagship corporate social responsibility program. Cisco develops and owns the program's content and platforms, which are provided to partnered academic institutions free of charge. For-profit universities are charged a nominal cost-recovery fee. The Network Academy program is offered in about half of the community colleges in the United States, as well as in public schools globally, from secondary to university levels.

The program provides e-learning courses, Cisco Packet Tracer, helpdesk support, instructor teaching guides and professional development, certification discount vouchers, and equipment discounts to educational institutions worldwide – approximately \$200 million in value each year. When schools need to purchase equipment for hands-on experience, they receive significant discounts.

Mr. Caballero says that at his institution, a variety of public funding sources are leveraged to provide ongoing maintenance costs, primarily through the National Council of Science and Technology and the PROSOFT Fund.

Solution

Educational Structure

Networking Academy combines cloud-based instruction and a coordinated program of hands-on laboratory experience. Hardware kits containing switches and routers with IOS software are used for hands-on training modules. The real learning occurs through a host of interactive laboratory tools, which engage students. These tools include network and computer equipment, simulation software, WebEx video capabilities, Jabber collaboration software, and a social media platform that allows exchanges among students and instructors around the world. "Gamification" enhances the learning experience by offering games as optional learning platforms for further practice on real-world simulations. Three tracks of games have been released so far, including Aspire, an innovative educational game.

Curriculum

Networking Academy's content delivery has evolved over its 18 years of development into the current, primarily cloud-based curriculum available on the Cisco NetSpace™ platform – a highly interactive and engaging learning environment that combines best-of-breed cloud-based applications for teaching, learning, and collaboration.

The curriculum starts with an introductory IT Essentials course that teaches PC hardware and software repair. Students can then progress to the Cisco CCNA curriculum, which consists of four courses, each containing 70 hours of material that can be delivered via Networking Academy's specially designed e-learning curriculum, a highly interactive, hands-on experiential learning platform. Other

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offerings within the network professional curriculum include CCNA Security and Cisco CCNP®.

According to Mr. Caballero, all IT students at UTEZ go through the Cisco Networking Academy curriculum. “There are four subjects taught in the first, second, and third quarters, respectively,” said Mr. Caballero. Two other network technology courses are also taught: Convergent Networks (IP telephony, multi-layer switches, and networking design by hierarchy) and Security, which trains students on CCNA Security and prepares students for Cisco certification, if they desire.

According to Mr. Caballero, the UTEZ curriculum offers a variety of other certifications as well, and is being continually updated. Currently, students can earn certification in Cisco, Adobe, E-Carnegie, and Java. “The range of options gets broader all the time,” said Mr. Caballero.

Laboratories

Discounted lab equipment bundles (for hands-on lab experiences) are central to the NetAcad experience. These in-person hands-on labs are complemented by Network Academy’s simulation program Packet Tracer, a platform that allows students to experiment with network behavior through simulation, visualization, authoring, assessment, and collaboration capabilities.

Packet Tracer has a multiuser feature so users can communicate with others in the same local area network, or within TCP/IP socket connections over the Internet. The configurability of Packet Tracer allows instructors to customize courses directly for their own – or student – needs. Dr. Frezzo says this customization feature is tremendously beneficial because “content is taught by teachers at the local institutions, in their local languages, with their local cultural preferences,” giving students a quicker and more in-depth understanding of the material.

In UTEZ, says Mr. Caballero, “we have five labs – switching, routing, security, wireless, voice over IP – all based on Cisco servers.” He says that while technology partnerships are important in setting up initial infrastructure and training, “students can use any software from any manufacturer on a virtual machine.” Mr. Caballero’s school does not enter into outside contracts to maintain the technology. Labs are required to be self-sufficient and provide their own technical support through the school’s Academic Information Technology Office.

Instructors

Networking Academy requires each participating institution to commit an instructor. Cisco supports instructor development with multi-tiered and ongoing training, available at the local Academy, Instructor Training Centers (ITCs), and Academy Support Centers (ASCs). ASCs have the capacity to serve a number of local academies, providing instructor training and equipment support. Some instructors in the program teach several subjects and are not necessarily networking experts, so the academy not only provides training, but also a vibrant instructor ecosystem to support them. Mr. Caballero stresses that qualifying certified professors as part of the training process adds a great deal of meaning to the training, as it helps motivate students to pursue similar credentials. “The role of the professor is key

Collecting data in the assessments has also revolutionized Network Academy's ability to update and improve course content in real time, as curriculum developers see areas where students may need additional information or support.

to the program's success. The student realizes the importance of this training and certification because he sees that the instructor is certified," Mr. Caballero explained.

Mr. Caballero indicates that alumni often return to the school as instructors after years in industry jobs, keeping the training fresh with current, on-the-job techniques. "There are students who graduated from this university four or five years ago, who currently are professors," he said. "In other words, they went through the process as students, they got interested in the academic portion, and today they are among our professors."

Student Assessments

Accurate and ongoing assessment of each student's progress is also crucial to the education process. Networking Academy conducts 1 million student assessments per month. Performance is measured on a broad range of assignments, from chapter quizzes and final exams to hands-on simulations and labs. The psychometrically validated assessments provide student performance statistics that can be utilized by a student's institution to help assign student grades for the networking courses.

Collecting data in the assessments has also revolutionized Networking Academy's ability to update and improve course content in real time, as curriculum developers see areas where students may need additional information or support. An analysis of the data can show that a particular exam question is badly worded, for example, because students worldwide are answering incorrectly at a high rate. The value of these assessments extends even deeper, providing insight into the curriculum and the learning process. For example, an analyst can look at how students make their way through the curriculum and make adjustments to help people shorten their time to mastery. "We have incredible metrics on how our students are doing," says Dr. Frezzo. "We're always trying to do better. To me, this holistic approach to education is vital. We're really proud of the assessment piece."

Entrepreneurial Development

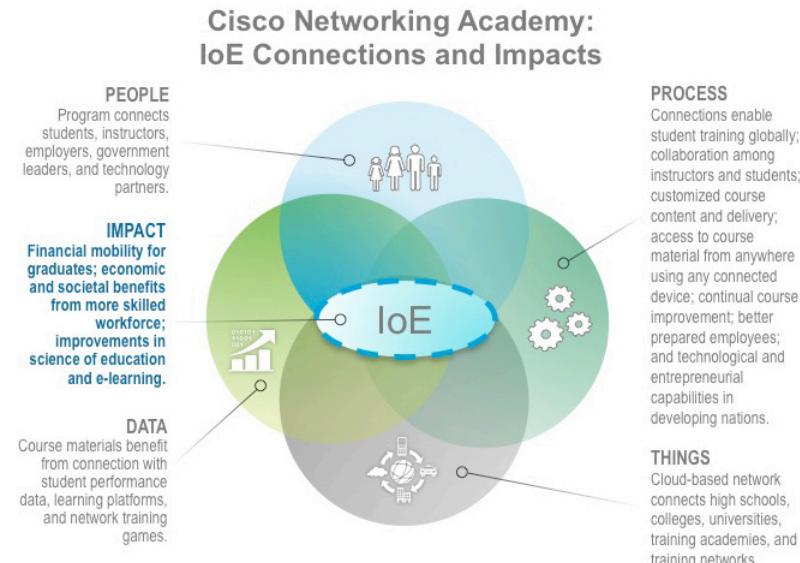
Entrepreneurial skills are critical to Networking Academy's curriculum, so students are not only better prepared with employable skills, but equipped to become the creators of new businesses. A recently released course on entrepreneurship has been built from actual case studies.

"We anchor our focus on entrepreneurship relative to individuals with technology skills," says Ms Quintana. "We see that as our niche: technology-enabled entrepreneurial skills so that individuals can learn how to go about starting a business and leveraging their skills to charge for their services."

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Laura Quintana,
Cisco Senior Director of Corporate Affairs

Figure 1. Cisco Networking Academy: New and Better Connections.



Source: Cisco Consulting Services, 2014

Impact

The impact of Networking Academy is threefold. First, benefits accrue to individual graduates of the program in terms of financial mobility. Second, communities benefit from the economic and societal contributions of a more skilled and entrepreneurial workforce. Third, Networking Academy's analysis of student test data and performance has impacted the science and practice of education – especially an understanding of how to optimize e-learning.

Student and Institutional Benefits

Networking Academy currently trains 1 million students per year globally, and its graduates benefit from economic mobility. In exit surveys of students completing courses through Cisco CCNA4 or higher, 52 percent of respondents reported that participating in Networking Academy led to landing a new job; 72 percent obtained some type of job opportunity (a new job, a better-paying job, or increased responsibilities); and 92 percent attributed a job and/or additional education opportunity to their participation. Cisco Networking Academy has contributed to 1.2 million Cisco CCNA students obtaining a new job based on a post-stratification analysis of exit surveys from 2005 to 2013.

According to Mr. Caballero, “Every young person who has been certified in our program has been hired, either by a telecommunications firm or an information technology company.” UTEZ graduates’ success is quantifiable: Mr. Caballero estimates that a UTEZ graduate who is hired by either of those two types of companies can make at least 50 percent more than non-IT graduates or IT graduates who go to other types of employers. Their salaries are also higher

The program's success has also bolstered UTEZ's reputation as a university that builds careers, driving ever-increasing enrollment. "We have become a point of reference, a model institution in the way we're structured as well as in training and certification," Mr. Caballero explained. UTEZ has a powerful presence in supporting the Mexican government's initiative to improve Internet connectivity nationally, and was selected to operate the initiative for its home state of Morelos, in which 4637 public sites will be wired for free public Internet connectivity.

Societal Benefits

Next, Networking Academy broadly benefits society. In terms of hard cost savings, Networking Academy provides instructor training, e-learning licenses, and job training for students – all at no or reduced cost, saving governments and schools millions of dollars. In terms of value generated, Ms. Quintana explained, "We're helping to address an issue, a challenge in education – helping to prepare individuals with workforce-ready skills," she said. Citing the case of France, Ms Quintana said that a research firm hired to evaluate the program concluded that Networking Academy is, at a minimum, contributing 35 million euros a year in economic impact to France. The economic impact extends to French civil society as a whole in terms of faster re-integration for vocational students and the long-term unemployed; improved tax and national insurance contributions from quickly placed graduates; lowered costs to academic institutions; and higher salaries to graduates.

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Educational Benefits

Finally, in its nearly two decades of educating IT students, Cisco Networking Academy has made significant advancements in understanding what makes for successful e-learning content and delivery.

One key component of running a successful e-learning platform has been the high quality of the instructors. To facilitate their training, Networking Academy instructors collaborate with colleagues from around the world. "We have communities that the instructors can join," said Ms Quintana, "so if you are an instructor teaching CCNA in South Africa, you could be interacting with a community of another 10,000 instructors around the world who are also teaching CCNA. You can share best practices, share learning guides, share videos. The impact of that network alone is phenomenal from an educational perspective."

According to Dr. Frezzo, Networking Academy is unique because it doesn't just teach a subject – it has built a community. "Colleagues and friends of Networking Academy contribute to their communities in a lot of ways," said Dr. Frezzo. "Probably, humbly, we've helped interconnect them. They were going to do great things without us, but – thinking of the Internet of Everything slogan 'connecting the unconnected' – this program has given them a vehicle for their professional aspirations. A lot of instructors have been very innovative, building programs around Networking Academy to help people we at Cisco never by ourselves could have reached. That is what happens when you connect things."

Lessons Learned / Next Steps

“Every day we work to obtain more resources that would allow us to receive more students. With good management and efficient use of resources, we will be able to respond to the expectations of our students. This doesn’t keep me awake, but it keeps me busy.”

Alejandro Caballero,
President,
Universidad Tecnológica Emiliano Zapata

Mr. Caballero lists instructor certification, well-equipped labs, and mastery of English as key elements of UTEZ’s growth and success. He now devotes his time to increasing the capacity of the school to meet demand, and expects full enrollment of 3400 students by September 2014. “Every day we work to obtain more resources that would allow us to receive more students,” he said. “With good management and efficient use of resources, we will be able to respond to the expectations of our students. This doesn’t keep me awake, but it keeps me busy.”

Another important success factor for UTEZ is having a strong partner ecosystem. UTEZ has the trust of students and professors, support from the authorities and governments, and a broad alliance of IT vendors providing the Networking Academy’s infrastructure and labs. “We have never had an adverse scenario,” said Mr. Caballero. “Quite the opposite. Even though it is not easy, with efforts of all – contributors, partners, and employees – this university has been improving, growing, and becoming stronger.”

Cisco has come across occasional negative views of corporate involvement in education. “I think some academic institutions, or some government leaders, might suspect our intent,” said Ms. Quintana. “They think we are pushing vendor-based training.” Cisco has countered these concerns by educating institutional and governmental leaders that Networking Academy not only teaches how to support Cisco equipment, but IT in general in a vendor-neutral manner; students learn Internet protocol theory and standards.

According to Dr. Frezzo, the biggest challenge is staying current with independent educational institutions’ curriculum criteria and standards, and balancing the objectives of various participants. Ironically, Networking Academy’s ability to update and improve content and course delivery is so dynamic that it moves faster than the rest of the system. “There’s a tension, because educational institutions, for a good reason, have a diverse set of inertias. To ensure quality at local institutions, they have curriculum review boards, and you have to respect their processes. If you change the content too much, you risk invalidating the course approval across schools, or you don’t have enough data to prove whether the new assessment items are performing well.” Networking Academy also has to answer to Cisco and students. As Cisco, Networking Academy wants students to pass certifications. As an educational program, it needs to put students’ overall education first, and to prepare them for the next step, whether it be networking, entrepreneurship, or innovation.

Another challenge revolves around Networking Academy’s trial initiative to integrate games into the educational process. Because the games are released as optional learning materials to enhance abilities, Dr. Frezzo says the amount of pressure for students to be ready for certification and grades does not give them the time to take advantage of the resource. Dr. Frezzo says Networking Academy is experimenting with combining a truly game-like atmosphere that also allows for student assessment. “We’re really experimenting with learning the line between game practice and what we call formative assessment, which gives you a little feedback,”

As for next steps, Networking Academy is developing a set of courses ranging from completely online to in-person classes focused on the Internet of Everything, and training students for the Internet of Everything marketplace.

Dr. Frezzo said. He explains that the right balance is when the student realizes, “Oh, right. That was an assessment, but it was fun.”

As for next steps, Networking Academy is developing a set of courses ranging from completely online to in-person classes focused on the Internet of Everything, and training students for the Internet of Everything marketplace. “We want to continue to innovate and make sure that our curriculum is relevant, so this will continue to be a big investment area for us,” said Ms. Quintana. Even with the progress made, there is still a skills gap where supply is not meeting market demands. To address this, Networking Academy is working on employment initiatives that will connect students and employers in innovative ways, bringing together workplace needs with candidates’ skills.

Another area in development is improved performance assessment, with the goal of determining which job skills are truly transformative. Those skills can then be given more emphasis in the curriculum. “What you can do now with online assessment, online intelligent tutoring systems, online games – those capabilities are barely touched upon in education today,” Dr. Frezzo explained. “I think it will really grow in the next couple of years.”

More Information

For more information, please visit <http://www.netacad.com>



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