

Transforming Vocational Education in Slovakia

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Abstract - This paper aims at presentation and sharing of experience and practice from Slovakia on how the Networking Academy program is working in Slovakia as part of the Vocational education system of the country. The authors present the example of the Cisco Networking Academy model - which over the past fourteen years proved to be successful worldwide and resulted in continuous growth of participating students and teachers, who are willing to follow and acquire the newest IT computer networking skills. On February 28th 2011, the Cisco Networking Academy has enrolled its 1 millionth concurrent student for the first time and 2011 is the year of the Academy Evolution process not only in Slovakia but globally.

I. INTRODUCTION

One of the objectives of a modern educational institution is to make sure that their graduates are not only able to apply ICT in their future jobs on the basis of the acquired ICT literacy but also that they are able to make use of these technologies as a tool and as an environment for the educational process itself. The current knowledge-based economy necessitates unprecedented flexibility of education, but also an effective offer of various options and solutions of knowledge acquisitions in various fields [6].

We live in an increasingly connected world, creating a global economy and a growing need for IT skills. 21st century jobs require 21st century skills, and for nearly 14 years Cisco has been leading the charge to impart these skills to the next generation of workers through Networking Academy program [1].

Global initiatives such as the Networking Academy program are significantly contributing to the formation of Vocational education systems in countries all over the world and Slovakia is not an exception.

II. BREF HISTORY OVERVIEW OF NEW EDUCATIONAL MODEL DEVELOPMENT

The history of the Cisco Networking Academy model and the description of how the Cisco Networking Academy operates are presented in this chapter.

'Network' has different meanings (network infrastructure and social network). The Cisco Networking Academy provides a new approach on how to think about this phase in an eLearning community so as to utilize the most from the networking phenomenon. Describing how the program was developed and operating worldwide we would like to highlight three key factors, which are considered to be the most sensitive elements of a successful learning model, which helps students to

discover new ways to learn, connect, share, collaborate and compete.

In 1993, the Cisco started to provide a cost-effective network infrastructure for schools in USA. However, it soon became obvious that schools also needed skilled network maintainers in order to effectively operate the network. Soon, however, another problem ensued: the school staff lacked time and resources. Eventually, it was found out that students themselves had a great interest in learning networking skills, and also that they sometimes even outperform the staff. This fact was the impulse that started the Networking Academy program.

In October 1997, Cisco officially announced the start of the Networking Academy initiative in 64 educational institutions in USA, and very soon, the program spread overseas. After more than 14 years of its existence, Networking Academy operates in more than 10 000 educational institution in over 165 countries [2] and nearly 4 million students participated in the program to date. From students in classrooms around the world accessing online activities, assessments and games to using their new IT and 21st century skills, to the 175,000 fans (and growing!) on Facebook, The global Networking Academy community leverages a cloud-based infrastructure to learn, collaborate and succeed in the 21st Century economy.

The program started to grow in Central and Eastern Europe [3] in parallel with the overseas and soon became even more dynamic concerning the number of participating institutions and students. The institutional framework of the network proved to be successful, institution either higher education or vocational schools found their education interest in joining the Cisco Networking community. The Cisco Networking Academy Program creates progressive opportunities for educational communities all over Europe. The program fosters local economic growth by developing and supporting technical education. The demand for a highly trained, technically perceptive workforce continues to grow with the increasing reliance on IP networks in everyday life, as well as the need for larger and more highly integrated network designs and implementations.

III. NETWORKING ACADEMY PROGRAM DESCRIPTION

The Networking Academy Program is an educational initiative that blends the e-learning web-based approach of providing centralized web access to curricula, lab exercises, exams, community features and other learning tools with instructor-led lessons, classroom instruction and hands-on labs. The Networking Academy can be implemented on secondary schools, technical schools,

colleges, universities and community-based organizations.

A. Global Partnerships for an Educated ICT Workforce

Cisco Networking Academy partners with educational, nonprofit, business and government organizations, through a powerful public-private partnership model that makes it possible to accomplish together what would not be possible alone. Networking Academy and its partners work together to help students succeed during and after their studies. Cisco supports its educational partners with the following services:

- Internet access, Online curricula and materials at no cost to nonprofits
- Discounted networking equipment for hands-on labs
- Cost-recovery options for instructor training
- Innovative tools and resources to help students build professional ICT career pathways

Cisco has developed strategic collaborations with educational institutions, private sector, nonprofit organizations, and government agencies around the world. These relationships expand the professional opportunities of students and schools, and reach out to disadvantaged and at-risk populations.

B. Well-functioning Institutional Framework

Willingness to make things happen is the second critical element of any education development program. One of the main strengths of the Cisco Networking Academy is the motivation of the management and the instructors participating in program development. Human resources are committed because they share a common professional attitude that networking skills are important to raise competitiveness both in education and in economy. Cisco technology is not only subject of this learning environment but also used as the main tool of learning and communication, which shows that ICT is the core element of continuous personal and community development. Networking Academy members, managers, instructors, students use Cisco technology (emails, WebEx, Video-conferencing, Telepresence) when changing information. This kind of ‘learning by doing’ method is used all over the community, and helps all participants actively participate in a hidden lifelong learning process.

The Networking Academy program uses the “train-the-trainer” model of preparing qualified instructors for the individual courses.

C. Professional Learning Content – Networking Academy portfolio

Cisco as a networking company provides the eLearning environment and the digital content to be taught over the world. The Networking Academy Program is an

educational initiative that blends the e-learning web-based approach of providing centralized web access to curricula, lab exercises, exams, community features and other learning tools with instructor-led lessons, classroom instruction and hands-on labs. The Networking Academy can be implemented on secondary schools, technical schools, colleges, universities and community-based organizations.

The content taught in the Networking Academies is organized into so-called Curricula or Courses. Presently, the complete portfolio encompasses these courses:

- IT Essentials: PC Hardware and Software
- Cisco Certified Network Associate (CCNA), currently in two different versions: Discovery and Exploration (4 courses for each version)
- Cisco Certified Networking Professional (CCNP) (3 courses)
- CCNA Security course

D. Learning Management System (CAC - CISCO Academy Connection)

As the Academy program expanded, Cisco needed a learning management system to deliver curriculum, instruction, and assessment to Academies everywhere. The Cisco Academy Connection (CAC) is the centralized Learning Management System (LMS) website that provides the e-learning aspects of the studies in the Networking Academy. Access to this website is protected by the username and password that can be created only by instructors or other privileged persons within the system. Technically, it is a proprietary LMS created especially for the needs of Networking Academies, and its source codes or its installation package is not released to the public. The CAC provides centralized and controlled access to these learning tools:

- Classes, Curricula and Lab Books
- Exams and Gradebooks
- Special resources for students and instructors & Networking Academy Help Desk

Classes

In order for a student to attend training, he or she must be enrolled in a class in which the respective course is taught. A class is described by its name (can be arbitrary), course, duration, instructor and other supplementary data. After a class has been created, students can be enrolled into it.

Student enrolled into a class is given access to the respective curriculum, labs, exams and his personal gradebook that tracks his score in that class. The grades are given for taking the chapter (or so-called module) exams, the Final Exam, the Skills Exam and potentially for a number of other activities. An instructor has always the possibility to define his own custom scores in addition

to those already defined. The weight of individual scores as they sum up to the overall score can be redefined as well.

Classes and lectures can be delivered in two ways, either in-person or remotely, via a so-called Blended Distance Learning (BDL). The BDL approach combines the remote lectures with in-person training.

For each student, the CAC maintains a complete list of all classes attended by that student, together with the Gradebook for historical purposes. As a general rule, the curriculum is always available online as a web-based course; however, it is not downloadable for off-line storage to students.

Curricula and Lab Books

The curriculum is the main self-contained source of information necessary to proficiently pass the course. As a general rule, the curriculum is always available online as a web-based course; however, it is not downloadable for off-line storage to students.

The curriculum is internally divided into modules (a self-contained single-topic lecture), and each module consists of variable count of chapters. The curriculum format is either a combination of HTML and Adobe Flash content, or in the newest versions the curricula are multimedia-rich. They make frequent use of video, graphics and audio content, animations, interactive activities and quizzes, all tailored to reinforce the student's knowledge.

Many concepts are further illustrated by a curriculum directly providing links to prepared Packet Tracer files. PT is the network simulation software created by Cisco and available for free to Networking Academy students and instructors. The PT allows to emulate network topologies from a predefined set of devices (routers, switches, access points, servers, etc.), to configure them almost in the same way as real Cisco devices are configured, and to observe the details and inner workings of networks in "slow-motion". The curricula are also equipped with indexes, built-in quizzes and glossaries. In conformance with Section 508 of the U.S. Rehabilitation Act of 1973, various curricula are also available in so-called accessible format for people with disabilities.

Currently, the default language for all curricula is English. The IT Essentials and CCNA curricula are also being translated to Arabic, French, Russian, Simplified Chinese and Spanish.

With each curriculum, a corresponding Lab Book is prepared that contains tasks and exercises to practice and reinforce the students' knowledge gained throughout the course. The Lab Book is usually provided in two forms: a Student Edition and the Instructor Edition including reference solutions of the tasks. Each module of a curriculum contains references to individual assignments in the corresponding Lab Book, thereby directly leading to practical activities required to master the topic.

The curricula and Lab Book contents are developed and maintained by Networking Academy Curriculum Development Team at Cisco. No direct external changes to the materials are possible; however, the instructors have a way how to suggest improvements using the Help Desk service. This way it is ensured that a curriculum is the same wherever it is taught. Also, the changes to the curriculum are tracked and controlled centrally.

Exams and Gradebooks

Almost every module in a curriculum has a corresponding exam associated with it that can be activated for students and graded after a student has taken it. The exams consist of around 20 questions each, displayed in a web form with selectable answers. The questions can be either Multiple Choice Single Answer (MCSA) or Multiple Choice Multiple Answer (MCMA). In the case of MCMA question, the correct number of answers is always indicated in the question. The scoring rules are fairly simple: a predefined count of points for each correct answer, zero points for each incorrect answer, and zero points for the whole question if more answers were selected than required. There are no negative points. Also, there are no answers written by students themselves. Besides the module exams, each course contains a so-called Final Exam that is significantly larger (around 50-60 questions) and covers the whole course. The Final Exam is one of required exams for passing the course. The types of questions and scoring rules are identical to module exams.

As a special requirement, each course contains a so-called Course Feedback which must be completed by each student. While in a form of an exam, it is not really an assessment of student but rather a questionnaire of how the students perceive the quality of study materials, learning environment and their instructor in particular. Results from the Course Feedback are anonymized and available to both Cisco and the instructor as a feedback about the quality of the delivered lectures.

All student exam grades earned during a course are stored in detail in the class gradebook. The gradebook also contains scores earned for the Skills Exam (a practical assignment solved as a part of final examination at the end of the class) and possibly other scores as well. The instructor can redefine the weight of each score present in the gradebook as it sums up to the resulting weighted score. Thereby an instructor is free to define what scores have a greater impact on the resulting score of each student.

The gradebook also provides a way to check on individual students' responses to an exam and to see the correct answer. Moreover, for each exam, a statistical breakdown of student success in each question can be generated, both for the particular class and for the Networking Academy world-wide. This provides a fine insight which questions appear to be problematic for majority of students, and vice versa.

Special resources for students and instructors

There is a multitude of resources available for instructors teaching a particular course or maintaining an academy. For majority of courses there are PowerPoint presentations prepared that highlight the key concepts and points in each module of a given curriculum. Instructors are free to use and change these presentations to suit their needs.

Each course may have another tools associated with it. Particularly, for the new CCNA Discovery and Exploration courses, a CD/VMWare live image is prepared that contains an entire server operating system with various network services already preset and ready to use. This server image greatly simplifies the teaching of CCNA courses in academies that do not run their own network servers. Furthermore, as a part of CAC, there is a FTP repository of shared content. Using this repository, instructors may share their own presentations, lectures, lab assignments, skills-based assessments and any other relevant materials.

Both students and instructors have access to a section of CAC called Forums&Chat which contains a number of moderated discussion boards.

E. Course alignment with industrial certifications

The today's companies are very interested in having a common way to assess and measure the professional knowledge and skills of their employees. Industrial certification of persons provided by a disinterested third party is very often the choice.

Cisco has a complex system of industrial certifications for various network industry specializations and knowledge levels. While the Cisco certification portfolio is vast and diverse, the most requested certifications can be divided into three groups according to their complexity: the introductory Associate level, the advanced Professional level and the highest Expert level. Depending on the level and the specialization of the certification, it can consist of one or several certification exams that must be passed before the certificate is awarded. Each exam is a paid service, and the certificate itself expires after 3 years. In order to stay certified, the person must either recertify in the current level, or pass an exam that extends the certification to a new specialization or a higher level.

The contents of each course available in the Networking Academy are closely aligned to the respective Cisco industry certification, covering all knowledge areas necessary to pass the certification exam(s).

The most popular certifications of today are CCNA and CCNP that are completely covered by the CCNA and CCNP curricula. Currently, the CCNA certification can be obtained by passing one composite or two partial certification exams. The CCNP can be obtained by passing another three or four certification exams, depending on their scope.

The certification exams are provided by specialized testing centers that are completely independent of the Networking Academy program.

IV. ACADEMY EVOLUTION IN SLOVAKIA

Over the past 12 years, Cisco Networking Academy has grown to over 10,000 academies and more than 1,000,000, students to become the “world’s largest classroom”. Cisco Networking Academy must keep up with the times and prepare for the future generation of learners. The program is moving from a instructor training and support model to a global resource network made up of public and private sector organizations offering a variety of resources to academies, instructors and students.

The Academy Evolution process is a union of technology and program process enhancements designed to help academies thrive and students meet their goals. After over 14 years of global presence of the program, these huge changes within the program are expected to bring the community a new starting point where new roles and rules are defined.

This process also includes redefinition of the whole partner model. The old model consisting of Cisco, CATCs, RCNAs and LCNAs (Figure 1) is rapidly changing. These changes are needed as this model is very limited in possibilities for cooperation among the institutions and scalability.

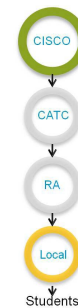


Figure 1. The old NetAcad partner model

The new NetAcad partner model (Figure 2.) is bringing new opportunities to the community. The most relevant expected benefits are: closer relationship between Cisco and Academies, specialized institutions, more effective and sustainable partnerships, recognition of increased community role.

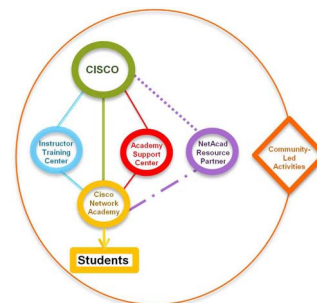


Figure 2. The new NetAcad partner model

The new partner model consists of the following subjects: Cisco, Academy Support Center, Instructor

Training Center, NetAcad Resource Partner and Cisco Network Academy. The roles of these subjects are defined as follows to support the idea of cooperation and community led activities.

Cisco

Cisco is expected to develop and deliver teaching and learning content, systems and tools and to monitor and manage quality.

Academy Support Center

The Academy Support Centers specializes and excels in supporting academy sustainability and excellence: onboarding, training administrators, critical communications and any other support required by Academies.

In Slovakia, the Technical university of Kosice, former RCNA, as the only one, has applied for this role and was successful. It is now providing support to the whole community in the country.

Instructor Training Center

These centers will specialize and excel in preparing and developing academy instructors by providing them trainings and instructor professional development opportunities.

There are three ITCs in Slovakia, starting their activities from September 2011. All these ITCs (Technical university of Kosice, University of Zilina and Slovak University of Technology) are former regional academies and are experienced in instructor trainings. All instructor trainers working there have successfully passed the Instructor trainer qualification process and are now eligible to train academy instructors.

NetAcad Resource Partner

Resource partners are expected to enable more contributions to academy success: equipment donations; internships; job placement; scholar-ships; council coordination and marketing support.

At this time, there are seven active resource partners in Slovakia providing services and support to NetAcad community in Slovakia. These partners are: Technical University of Kosice, Slovak University of Technology, GTEC Institute, Training Institute elfa, ALEF NULA, ADECCO, T-Systems Slovakia and Slovanet.

Cisco Network Academy

Academies teach students academy curriculum and 21st century skills to succeed in the global economy and on the job market.

There are about 70 academies in Slovakia, providing NetAcad courses to students at both the secondary school and university levels, and spread evenly in all regions of the country.

As mentioned in this paper, the main goal of all these changes is to provide the community a new model that reflects the global changes in education and the growing need for computer networking specialists. The process of

pilot testing of this new model was launched in Slovakia in September 2011. The feedback provided by this pilot testing will influence the global Academy Evolution process.

V. NETACAD IN SLOVAKIA

The NetAcad program has during its 12 years of presence in Slovakia achieved many milestones that the community can be proud of. Instructors and students have actively participated in a number of national and international events and activities and their success proves the quality of the program. The author would like to mention two important activities from the past period.

The former RCNA at the Technical University in Kosice, Slovakia (TUKE) belongs to leaders in implementation of new ICT and innovative methods into the educational process in Slovakia. This academy, as one of the first academies in the CEE & CIS region, has in July 2010 presented its Telepresence room and started its cooperation with National Lambda Rail (NLR), US research network, by connecting more than 60 US Telepresence rooms at universities and educational institutions with the Technical University in Kosice.

Discussions between the representatives of TUKE and network of US schools (K12) from the Paradise Valley Unified School District, Phoenix, Arizona⁴⁴ (PVSCHOOLS) during the summer 2010 resulted in a joint project. Starting on 4th September 2010, a pilot CCNA 1 Exploration course for ten participants from the PVSCHOOLS, teachers and technical staff from 5 US localities, via Telepresence was realized. The instructor of the course, Peter Fecilak (TUKE), has in cooperation with his colleagues from the RCNA TUKE prepared a unique teaching methodology for this course based on Telepresence considering the specific conditions of the course (nine hours of time difference, language barrier, missing blackboard in the Telepresence room – instead of which a computer with touchscreen – Tablet PC is used, etc...). The instructor has defined a time table for the course, system of presentations and exercises, internal communication for instructors and students, grading and other organizational aspects for the course.

For the further development and progress in the NetAcad program within the Academy Evolution process, partner cooperation, sharing experience and student and teacher mobility can be key. Networking technologies and unique study programs based on NetAcad are creating ideal environment for the student and teacher mobility among educational institutions that are part of NetAcad. The recently introduced National Scholarship program of the Slovak government provides the right opportunity, <http://www.scholarships.sk/en/>.

The Ministry of Education, Science, Research and Sport of the Slovak Republic approved new terms and conditions for providing financial support under the National Scholarship Programme for the Support of Mobility of students, PhD students, university teachers, researchers and artists: supports study and research stays

at universities and research organizations. It supports two-way mobility — of foreign scholarship holders to Slovakia as well as of Slovak scholarship holders abroad. Scholarships cover living costs related to the scholarship stay. Slovak scholarship applicants may also apply for a travel grant.

The NRP, elfa, s.r.o., is in cooperation with the ASC at the Technical university of Kosice providing NetAcad community in countries that are eligible for this support help and assistance in searching for partner institutions in Slovakia, members of the NetAcad community for cooperation in the project.

VI. NETACAD IN NUMBERS

The Networking Academy during its more than 14 years of history has allowed many students to participate and graduate in the program and its courses. The Table I. below shows examples of current statistics from selected countries. Students represent a distinct count of students that were in a class in session within the past 12 months.

Country	Population	Active Students	Population Penetration
Czech Rep.	10 190 213	7 700	0,1997%
Hungary	9 976 062	4 645	0,1701%
Poland	38 441 588	18 381	0,1788%
Romania	21 904 551	11 338	0,2121%
Russia	138 739 892	5 831	0,0145%
Slovenia	2 000 092	372	0,0673%
Slovakia	5 477 038	5 093	0,3751%

Table I. Statistics from selected countries

Table II. shows the cumulative number of students that represents a distinct count of students that have participated in the program since inception and percentage change in the number of students in FY 12 compared to FY11.

Country	FY12	FY11	%
	Students since program inception	Students since program inception	
Slovakia	20 547	18 004	14,12
Romania	46 464	39 838	16,63
Czech Republic	20 346	16 299	24,83
Poland	68 719	57 966	18,55
Hungary	16 974	14 000	21,24
Slovenia	1 347	1 103	22,12
Russia	20 081	16 560	21,26

Table II. Cumulative number of students

More global key statistics:

- 1 million online assessments delivered monthly
- 100 million online assessments delivered to date
- 272,000 Facebook fans, and it is growing daily [4]

The presented numbers show that the popularity of the program is growing among the students and their number is higher and higher every year. This encourages the community to be more active and involved in the whole process of Academy Evolution as it is understandable that global education programs such as Networking Academy program can provide the vocational education system quality basics for the development of study programs both popular among students and welcomed by companies, potential employers.

VII. CONCLUSION

Cisco Networking Academy has become the blended learning project of choice for delivering networking-oriented courses in vocational and university IT education. Being one of a few ongoing and successful collaborations between business and the educational sector at such a large scale and, it also has the unique notion of being something that has a real impact and importance for students and their career aspirations. Overall, Cisco Networking Academy has managed to create an environment which motivates both the students and instructors to continuously improve and more knowledgeable on their joint learning journey.

From the perspective of Central & East Europe region the Networking Academy program plays very important role in the educating of IT specialists – Networking professionals for the future. In many countries of the region the program is recognized by governmental entities and integrated to the education system [6].

REFERENCES

- [1] Cisco Networking Academy Program, <http://www.cisco.com/go/netacad>
- [2] World's Largest Classroom Campaign, www.cisco.com/go/wlc
- [3] Jakab F., Czacharowska-Rybkowska A., Beni G., Kniewald K., Schwertel M.: A Passport to Opportunity – the Learning Model of the Cisco Networking Academy, Innovation in Learning Communities - EDEN 2009 Annual Conference 10-13 June 2009, Gdansk, Poland, 8pp (Book of abstracts), full version on CD (6p.), ISBN 978-963-87914-2-9
- [4] Facebook: www.facebook.com/cisconetworkingacademy
- [5] P. Paluch, M. Kubina, P. Segec: The networking academy program: Current state and future trends. 8th Int. Conference on Emerging eLearning Technologies and Applications, ICETA 2010 - Conference Proceedings, Stara Lesna, 28.-29.10.Kosice, elfa, s.r.o., pp. 383-388, ISBN 978-80-8086-166-7
- [6] F. Jakab: World's Largest Classroom. International Conference Interactive Collaborative Learning – ICL 2011, Piestany, Slovakia, ISBN 978-1-4577-1746-8, CD, 666-671pp., invited keynote