

## Cisco Academy Support Center and Distance Education Course

Khondkar R. Islam  
Department of Applied IT  
Volgenau School of Engineering  
George Mason University  
Fairfax, Virginia, U.S.A.  
kislam2@gmu.edu

Louis R. D'Alessandro  
Department of Applied IT  
Volgenau School of Engineering  
George Mason University  
Fairfax, Virginia, U.S.A.  
ldalessa@gmu.edu

**Abstract-** Because of the enormous growth in Information Technology (IT) over the past 20 years, an abundance of job opportunity requirements for a variety of IT specialists in high technology corporations and the U. S. Federal Government is apparent and is continually growing. George Mason University (Mason), with over 33,000 students enrolled located in Northern Virginia, has become the focal point for educating IT professionals to fill this need. Recognizing this opportunity, in 2005, Mason became a Cisco Regional Academy not only because of prestige and recognition, but also to add value to the networking concentration of the undergraduate IT degree of the Department of Applied IT (AIT). Now, the Academy has 45 active Cisco Academies from Virginia, Maryland and Washington, DC areas. This year Cisco shared their upcoming Academy restructuring initiative with Mason, and asked whether the university is receptive to this transition in becoming a Cisco Academy Support Center (ASC) and Instructor Training Center (ITC). Mason has been successful in the role of a Regional Academy, and was positive toward Cisco's offer. This year, Mason has officially become an ASC that will serve 55 Cisco Academies in the State of Virginia and is in the process of becoming an ITC in May 2013. In this paper, we give a background of our partnership with Cisco Networking Academy, describe how we became a successful partner by blending Academy courses with AIT undergraduate degree curriculum and mentoring Local Academies, the transition process involved in becoming an ASC, and the added coverage and challenges Mason faces in the future. We also discuss the role of distance education (DE) on two important data communications courses of the undergraduate IT degree curriculum, because most of the materials of Cisco Certified Network Associate (CCNA) part I and II are taught in these courses.

**Keywords-** Cisco; Academy; networking; Mason; curriculum; education; support.

### I. INTRODUCTION

There has been tremendous growth in the IT job sector. This is particularly true for the Washington, DC metropolitan area. Mason is located in the high-tech Northern Virginia corridor, and its Department of Applied IT (AIT) is always busy updating its curriculum and courses to meet the challenging and changing demands of the industry, to enable its graduates secure good jobs and

move forward with a promising career. This is why the AIT department, during the summer of 2004, agreed to the proposition of the Cisco National Initiative Manager to sponsor a Cisco Regional Academy. Being part of the successful Engineering School, AIT department has to produce graduates with solid technical and hands-on skills to meet the stringent needs of the practical working environment. The department envisioned this to be an effective partnership that would enrich its curriculum and enhance its visibility to the high school, and two-year college transfer technical students. The School Dean saw this as an opportunity and was receptive to this collaboration, and extended his support with School resources, including a new full-time position to coordinate this Academy. An experienced networking professional with a long career in the telecommunications industry joined the AIT faculty to dedicate 50% of his time to create and manage Mason's Cisco Regional Academy. With a seasoned fellow networking instructor, the new instructor began formal instructor certification studies and coordinated the recruitment of Local Academies with the Area Cisco Academy Manager. Mason built a template and foundation for its Regional Academy with support from the Cisco Academy Training Center Manager [1].

At that time, the Bachelor of Science degree in Applied IT had about 900 students with about 200 annual graduates. During Academic Year 2011-2012, the program had about 1,200 students with over 300 graduates. A large percentage of the students select Networking and Telecommunications (NTEL) concentration curriculum, out of the five concentration areas of the degree program. Students are required to complete five courses from a list of courses in the concentration area of their choice. In NTEL, the second of the two networking courses of the degree program, Advanced Networking Principles (IT 445), is on the list. The first networking course is Data Communications and Networking Principles (IT 341), and is a core and required course of the degree program. Mason also has a thriving Cisco Local Academy primarily due to the alignment of these two networking courses with the Academy. At first, students were able to enroll to Mason's Local Academy on a voluntary basis, but that did not achieve positive results because from fall semester of 2007 to the fall semester of 2008, 89 students enrolled in

the Cisco networking curricula and only 41 completed the course.

## II. PROGRESS

Since becoming a Cisco Regional Academy in 2005, and until becoming an Academy Support Center (ASC) in May 2012, Mason had 16 Local Academies in its jurisdiction that includes Arlington, Loudoun, Fairfax, Shenandoah, Warren, Prince William, and Frederick counties in Virginia, Howard University in Washington, DC, and Marymount University in Virginia. There were 14 Local Academies with Mason’s Regional Academy until the addition of two new Local Academies in 2012. They are Northern Virginia Community College System’s Manassas and Alexandria campuses. The growth in the Regional Academy has been supported by the demand for IT system engineers and design specialists with AS and BS degrees and industry certifications.

It was determined, at first, to offer the Cisco Networking course as a separate Mason Local Academy course where students could voluntarily enroll with the objective of becoming a CCNA [5]. However, due to low voluntary enrollment in the Local Academy because the students were burdened with other AIT courses, we blended considerable material of CCNA part I to the core IT 341 networking course content, and made compulsory enrollment of IT 341 students in Mason’s Local Academy Exploration Fundamentals course. This expanded the horizon for the students because they now had access to the powerful virtual network configuration software PacketTracer [2]. Here is a brief background on the reasons for the shift toward the virtual lab configuration exercises. Mason’s network lab is equipped with 40 workstations, and kits having two routers and one switch each with all the necessary cables. Four students share each kit. This lets the students build the network from scratch by configuring the routers and switch from the console port, and use straight-through and crossover cables for the interfaces. Due to the unanticipated demand of the BS in IT degree program, enrollment grew rapidly, which prompted the need for several sections of IT 341. Each class section has a capacity of 38 students, and to run simultaneous sections it was a toll on the network equipment. Students of each section had to configure the routers and switches, and save their configurations on a flash drive, because students of the next section would configure the equipment erasing the configuration of the previous class. The wear and tear of the equipment became apparent with the Cisco Internet Operating System (IOS) failing frequently. Unnecessary amount of time was spent to redundantly configure the network at the beginning of each lab, because the students already did the set-up configuration during their first lab session. Further time was spent to dismantle the network, and pack up the kit for

the next class. The instructors and teaching assistants were also spending a good amount of time trouble shooting equipment failures and reinstalling the IOS on routers and switches. The following photo of Fig. 1 depicts students configuring a router.



Figure 1: Students busy configuring a router

It was determined Cisco’s PacketTracer, a virtual client software application, could replace the use of actual hardware and could address the previously noted problems. The desktop software makes it possible to build complex networks by merely clicking and dragging components onto a desktop configuration as specified in the laboratory manual and then configuring each component using the Cisco’s command line interface (CLI) syntax. By making enrollment in the Local Academy Exploration Fundamentals course a part of the curriculum course, students could download and install this virtual network configuration software to work on their lab exercises, after completion of configuration exercises using physical equipment from the kit during the initial three lab sessions. The kits are still in use in the first three lab sessions because they give the students hands-on configuration opportunity in preparation for the real world environment. Fig. 2 depicts a typical PacketTracer desktop.

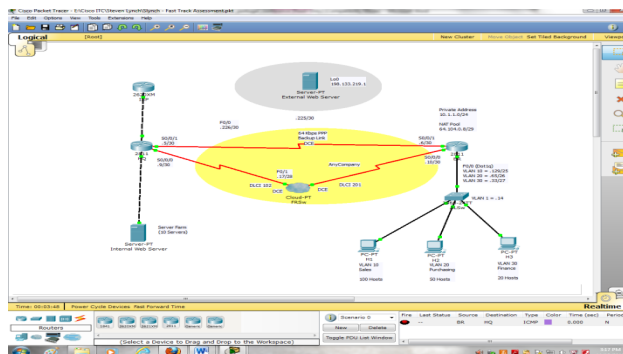


Figure 2: A virtual network of PacketTracer desktop

TABLE I. STUDENT TRAINING 2007-2008

Course	Semester	Students Enrollment at Start	Students Successfully Completed	Students % Successful	Students Incomplete
CCNA-1	Fall 2007	27	5	18.52	22
CCNA-2	Fall 2007	5	4	80.00	1
CCNA-3	Fall 2007	9	7	77.78	2
CCNA-4	Fall 2007	7	3	42.86	4
CCNA-3	Spring 2008	4	4	100.00	0
CCNA-4	Spring 2008	4	4	100.00	0
<b>Exploration</b>					
Network Fundamentals	Spring 2008	25	6	24.00	19
Routing Protocols & Concepts	Spring 2008	6	6	100.00	0
LAN Switching & Wireless	Spring 2008	1	1	100.00	0
Accessing the WAN	Spring 2008	1	1	100.00	0
Network Fundamentals	Fall 2008	25	2	8.00	23
<b>Totals</b>		<b>114</b>	<b>43</b>	<b>37.72 %</b>	<b>71</b>

TABLE II. STUDENT TRAINING 2009-2012

Course	Semester	Students Enrollment at Start	Students Successfully Completed	Students % Successful	Students Incomplete
<b>Exploration</b>					
Network Fundamentals	Spring 2009	76	73	96.05	3
Routing Protocols & Concepts	Spring 2009	6	6	100.00	0
LAN Switching & Wireless	Summer 2009	1	1	100.00	0
Network Fundamentals	Summer 2009	19	19	100.00	0
Network Fundamentals	Fall 2009	85	82	96.47	3
Network Fundamentals	Spring 2010	100	93	93.00	7
Network Fundamentals	Fall 2010	113	110	97.35	3
Routing Protocols & Concepts	Fall 2010	13	10	76.92	3
Network Fundamentals	Spring 2011	120	120	100.00	0
Network Fundamentals	Summer 2011	25	25	100.00	0
Network Fundamentals	Fall 2011	120	120	100.00	0
Routing Protocols & Concepts	Fall 2011	19	19	100.00	0
LAN Switching & Wireless	Fall 2011	10	10	100.00	0
Network Fundamentals	Spring 2012	100	100	0.00	0
LAN Switching & Wireless	Spring 2012	4	0	0.00	4
WAN	Spring 2012	4	0	0.00	4
Routing Protocols & Concepts	Spring 2012	10	4	40.00	6
Network Fundamentals	Fall 2012	120	120	100.00	0
<b>Totals</b>		<b>945</b>	<b>912</b>	<b>96.5%</b>	<b>33</b>

Table 1 data makes it evident that voluntary student enrollment was low. Refer to Table 2 for the significant jump in enrollment numbers once this was made mandatory. The course completion success rate more than doubled, which is an indication that the students took the course seriously. This is because with students completing the Exploration Fundamentals segment [3], the Local Academy course completion became almost certain. The effect was quite similar with instructor training, because there was a direct relationship between student enrollment and number of instructors that needed training. After the

inception of the Regional Academy, many high school visits were made to meet the instructors of the Local Academies, and it was discovered that there was a need to train new instructors because many of the existing educators left or were leaving to work for the industry. During those visits, we noticed the lab equipment in the Local Academies were dated and needed replacement soon. The visits to the Local Academies helped Mason's Regional Academy [4] initiate a Local Academy Instructors Training Program.

TABLE III. INSTRUCTOR TRAINING 2007-2008

Course	Semester	Instructors Enrollment
Orientation for Instructors	Fall 2007 to Spring 2008	7
CCNA-1	Spring 2007	3
CCNA-1	Fall 2007	2
CCNA-1	Fall 2007	1
CCNA-1	Spring 2008	1
<b>Exploration</b>		
Network Fundamentals	Fall 2007	2
Routing Protocols & Concepts	Spring 2008	1
LAN Switching & Wireless	Spring 2008	2
Accessing the WAN	Spring 2008	2
<b>Discovery</b>		
Networking for Home and Small Business	Fall 2007	2
Networking at a Small-to-Medium or ISP	Spring 2008	2
Introducing Routing & Switching in the Enterprise	Fall 2008	2
Designing and Supporting Computer Networks	Fall 2008	0
<b>Totals</b>		<b>27</b>

TABLE IV. INSTRUCTOR TRAINING 2009-2012

Course	Semester	Instructors Enrollment at Start	Instructors Successfully Completed	Instructors % Successful	Instructors Incomplete
<b>Fast Track</b>					
IT 341	Spring 2009	4	4	100.00	0
IT 341	Spring 2010	5	5	100.00	0
IT 341	Spring 2011	2	2	100.00	0
IT 341	Summer 2011	2	2	100.00	0
IT 341	Summer 2012	2	2	100.00	0
Marymount	Summer 2011	1	1	100.00	0
<b>Exploration</b>					
Network Fundamentals	Fall 2007	5	5	100.00	0
Routing Protocols & Concepts	2008-2010	3	3	100.00	0
LAN Switching & Wireless	2008-2010	3	3	100.00	0
Accessing the WAN	2008-2010	3	3	100.00	0
<b>Discovery</b>					
Designing & Supporting Computer Networks	Fall 2008	1	0	0.00	1
<b>Totals</b>		<b>31</b>	<b>30</b>	<b>96.77%</b>	<b>1</b>

The Training Program also made recommendations to the school administrators for upgrading their lab equipment. Table 3 presents the data of Instructor Training Program for the spring 2007 to fall 2008 period. Table 4 results show there was a rise in the number of instructor training with increased enrollments, because it was necessary to have more qualified instructors at Mason to teach the Academy Program. To accomplish this, we set up Fast Track instructor courses for additional instructors and teaching assistants for the Regional Academy, and graduated all to support our IT 341 and IT 445 courses since the spring semester of 2009. CCNA

certification adds tremendous value to our graduates of AIT degree with NTEL concentration.

It would be overwhelming for the students if IT 341 alone would cover most of the content of CCNA part I and II. This prompted us to develop the second networking course, which is better known as the Advanced Networking Principles (IT 445) course. This covers most of the lecture and lab materials of CCNA part II, and it is not a required class like IT 341 for the AIT majors, because this is one of the NTEL concentration courses that the students have the option to take. The students who

have interest with the networking career enroll in IT 445 because their goal is to become CCNA certified. Enrollment of IT 445 has been gradually growing since it was first offered in fall 2007. Due to popular demand, we have offered a second section of IT 445 in spring 2013, which is a distance education (DE) course.

### III. DISTANCE EDUCATION (DE)

There are two general categories of DE delivery methods: 1) *Asynchronous* and 2) *Synchronous*. With asynchronous, some instructors choose to record lectures that are stored in a server or prepare lessons as web pages. Students access the server at their convenience to retrieve the lectures. Home assignments, exams and other class materials are also uploaded to the server. Synchronous distance learning is similar to in-class sessions. This is because students attend online classes during the class time. They participate in lectures, view slide presentations and interact with the instructor and other students via the Internet. This creates an environment where the students feel they are attending a live classroom without having to actually go to a classroom. It is worth noting, video streaming is generally not mandatory since synchronous video with DE delivery has several tradeoffs and challenges [12]. High capacity network services are required for reliable video stream [13]. Further, audio and video are sometimes not synchronized which lead to confusion since lip movement and audio being heard is not always the same. Also, low video resolution that is required to conserve network capacity and small display screens of Learning Management Systems (LMS) and Synchronous Distance Education Tools (SDET) do not show clear view of facial expressions that enable better understanding, which is the main argument for video in the first place [14].

Research shows that problems arise when students do not get the opportunity to interact with the instructor and other students while they are in an asynchronous learning environment. Some students are confused about the assignments and course objectives, and feel frustrated and isolated. On the other hand, despite the challenges associated with synchronous education, it approximates face-to-face dialog and promotes a sense of community. Overall student outcomes also are better with synchronous education over asynchronous learning. This is because students are motivated since synchronous education makes the courses more engaging [12]. Characteristics of synchronous and asynchronous DE delivery are presented in Table 5.

DE LMS and SDET must offer a user-friendly graphical user interface, simple navigation options, and have enhanced security features to deter unauthorized access to the system and files. Course creation and

management has to be easy, and the system must support common file types. There has to be an option to reuse course contents so instructors are able to reuse contents in other sections of the same course or during another semester with minor modifications.

TABLE V. SYNCHRONOUS AND ASYNCHRONOUS DE DELIVERY [15]

Characteristics	Synchronous DE	Asynchronous DE
<b>Positive</b>	Increases psychological arousal	Increases cognitive participation
<b>Negative</b>	Does not increase cognitive participation	Personal participation is low

Early research suggests web users need to be provided with an effective usable environment because it drives substantial savings and achieves better performance. In academia, effective LMS and SDET need little instructor time to set up and manage the course, improving the learning experience of students. It is important for the LMS and SDET to be not cluttered with too many appealing design options as that may integrate with features in course design, which can be confusing for students and the instructor. Only features that meet course objectives and are relevant to a sound-learning environment for designing an effective course should be included in the LMS and SDET. Since usability is critical, the LMS and SDET must be easy-to-use and learn, and offer options that are easy-to-remember. Web usability requires having web pages that are easy-to-navigate and display information in an organized manner so users do not have to struggle to find what they are looking for. Pedagogical usability ensures users learn effectively and retain the skills and knowledge, and is integrated with technology usability, which is referred to ease-of-use and usefulness of the technology [16]. Students do not have a high degree of pedagogical usability when technology usability is poor.

To comply with the directives of leadership, all Colleges, Schools and Departments started offering at least one DE section of the live in-class sections of a course. We were in the forefront in implementing this initiative by offering two asynchronous DE sections of IT 341 alongside two live in-class sections. We hope to add synchronous lectures to these courses in the upcoming semesters. The Cisco Academy website [3] has been supplemental to the DE and in-class live sections, where students take online Exploration Fundamentals segment exams that are graded on a real-time basis and recorded in Blackboard (Bb) [6] *gradebook*. Bb is widely used as a LMS and SDET by many course sections university-wide as we do in our AIT department. The home assignments

and lab exercises are submitted online in Bb. Camtasia Studio [7] is used to video the lecture and lab session recordings, which are posted in Bb for students to view during their time of convenience. The *Discussion Board* of Bb is heavily used to make the DE class interactive. All lecture and lab assignment, and exam release and due dates are announced via the *Announcement* feature of Bb, and also communicated via Mason email system with the students. At present, students are required to come to campus for the midterm and final examinations, but we will implement online exams for the DE sections in fall 2013.

#### IV. TRANSITION TO ACADEMY SUPPORT CENTER (ASC)

This section covers a brief background of why Mason decided to become an ASC, and its roles and responsibilities as an ASC. It was envisioned by becoming an ASC, Mason would support 55 current Cisco Local Academies in the state of Virginia. As a Regional Academy, we were supporting only 16 Local Academies, now named Cisco Academies as changed by the Evolution Program. Our university is also a partner in the 4-VA Initiative that was initiated by our president and the presidents of James Madison University, University of Virginia, and Virginia Tech University. 4-VA was established in 2011 in response to the Governors' Higher Education Commission recommendations to find methods to collaborate to meet for higher quality and affordable education focusing on the Science, Technology, Engineering, and Mathematics (STEM) programs. Cisco Systems, Inc. is a solid partner in this program by providing its TelePresence Systems at many sites on the four university campuses. TelePresence will be used to achieve the goals to improve communications efficiency. This will enhance student success, sharing the delivery of course strategies to improve sharing course strategies to Virginia's economic development, and increasing each university's research competitiveness. During the transition period in becoming an ASC, we realized distance education at our proposed ASC will be improved by reaching out to the Cisco Academies' audio-visual facilities utilizing our TelePresence facilities where our agendas will include Academy teaching and technology updates, conduct seminars, share student's success stories and course experiences. If some Academies do not have audio-visual facilities, we planned to use WebEx [8] communications in a point-to-multipoint configuration. In May of 2012, we officially became a Cisco ASC, and to date we have 45 Cisco Academies throughout Virginia.

As a member of an ASC, Mason specializes and excels in preparing and enhancing the success and sustainability of the Network Academies in the Commonwealth of

Virginia. Our efforts have a positive effect on academy administrators, instructors, and students. We provide essential operational support to academies in a relevant format. Localized operational support is essential throughout an Academy's engagement starting with onboarding and throughout their lifecycle.

Our ASC provides Cisco Academies in a number of ways, including but not limited to the following major services:

- In-person visits for lectures, consultation and/or support.
- Remote consultation, troubleshooting and monitoring via telephone, email, and/or other technology.
- Access to training using TelePresence, webinars, and/or presentations.
- Access to ASC Information Portal.
- Invitation to an Annual Meeting to sharpen teaching skills and disseminate new customer programs.
- Support with continuation of Cisco Membership Agreement and the responsibilities described in the Agreement.

There are two required roles at an ASC: 1) Academy Support Center Contact (one required); and (2) Support Advisor (two required). A person can be both an Academy Support Center Contact and a Support Advisor, or two separate individuals can fulfill these roles. These ASC roles primarily interact with Academy Contacts and Academy Success Leads at Cisco Academies. They also interact with the following Cisco roles:

- Area Academy Manager (AAM)
- Cisco Quality Manager (CQM)
- Global Support Desk CSR

The ASC Contact is responsible for managing the annual membership. This is achieved by securing appropriate institution administrator to sign the online ASC membership. The individual is also responsible for updating the ASC profile, and ensure compliance with Cisco policies and minimum standards as outlined in the *Membership Guide*. Other roles are to develop the *Annual ASC Plan*, document any support focus areas, review feedback from Academies Mason supports, address plans to improve any unsatisfactory performance areas, and ensure services and support are marketed/advertised using technologies provided. Academies require support throughout their lifecycle. The type of support varies depending on the maturity of the Academy. The Support Advisors are knowledgeable about all areas of Academy operation. They are the channels that Cisco uses to ensure critical operational messages are received and understood by the Academies. Cisco provides ongoing educational

opportunities for Support Advisors to ensure ASCs have the information they need to be successful.

As a result of the Cisco Academy Evolution Program, Mason's former Regional Academy responsibilities are now being undertaken in our new status as an ASC. To become an ASC we were required to submit our application along with a Business Plan to Cisco for review. Approval was granted in May of 2012. In addition, Mason will become an Instructor Training Center (ITC) in May of 2013. This is important because we have a large number of students enrolled in the networking courses that require several teaching assistants (TAs) to assist the professors in the delivery of the courses. It would facilitate the process of training and proctoring exams for the TAs and our local Cisco academy instructors in becoming Cisco Networking Academy instructors on an on-going basis without having to depend on other ITCs. We plan to have three Instructors take Cisco's new rigorous Instructor Training Program. Instructor trainers are required to take a *pre-test* and two days of professional *in-person* training.

## V. RESEARCH

Since the inception of becoming a Regional Academy in 2005 we had a major obstacle in offering the Cisco CCNA courses into an academic university environment. Our first approach was to offer the Cisco courses as they stand to our academic accreditation committee. This effort was rejected based on the premise that the courses were of an apprentice hands-on experience more likely to be offered at a technical school level. To ameliorate this objection, we researched The Association of Technology, Management, and Applied Engineering [11] to compare the CCNA course material to their standards and found that the Cisco courses matched the standard IT components. With this knowledge, we decided to insert components of the Cisco courses into our IT341 and IT445 courses and academically enhance each by inserting essay exercises to ensure that the students were understanding the concepts.

Still to be researched, is the effect of the Evolution Program organizational structure change and the transition from the Academy Connection to NetSpace. Our initial observations and research, not documented, found that academies had the usual objections to change. The former Cisco Academy Training Center (CATC), Regional, and Local Academy structure appeared to be quite adequate in delivering the Cisco course material. The CATCs that were formerly financially supported by Cisco and Regional Centers found that they needed either to convert to an Instructor Training Center (ITC) charging a fee for training courses and/or an Academy Support Center (ASC) charging an annual support fee to Local Academies. Complicating this issue, is the competitive

aspect of former Regional Centers that converted to Academy Support Centers (ASC) are now in competition with each other to enroll academies to capture the annual fees. Each ASC is now charging fees as a business center to cover their costs.. Almost all Local Academies, now renamed Cisco Academies, never paid for support before and found this financially onerous. In addition, this expenditure was not forecast in their annual 2012 operational school budgets. This is resulting in the school system's administrations' seeking an ASC with the lowest fee.

The change from the Academy Connection to NetSpace concurrent with the Evolution Program is now being undertaken. Complications are prevalent in that both the Academy Connection and new NetSpace learning sites are operational at the same time with a phase out plan for the Academy Connection by mid year 2013. Instructors are now offering courses in both systems and learning how to use NetSpace.

The intended research to be accomplished will determine if these changes prove to enhance IT knowledge, and increase the number of students achieving Cisco Certifications resulting in successful exceptional challenging occupations and career promotional opportunities for them. The methodology to perform this research may use surveys, interviews, and a compilation of data and statistics.

## VI. CONCLUSION

In summary, our graduates receiving the BS in Applied Information Technology benefit from the School's adaptation to include most of the content of the Cisco Exploration course in our IT 341 and IT 445 courses. To satisfy the academic requirements of a university, our students are required to provide twelve technical essays for these two courses. Our students also receive strong courses in the study of IT wireless and Internet Protocol (IP) telephony. We are considering adding Cisco Certified Network Professional (CCNP) and network security content to our Master of Science degree program networking and security courses in the near future. A student who has completed the NTEL concentration can take the CCNA examination at our certification testing center. To promote certification, our School is a Pearson View Certification Testing Center where our students and faculty can take certification examinations at a much reduced fee. The ultimate goal of Mason is to prepare our students for careers in this most abundant IT job opportunity domain of Metropolitan Washington, DC. For an example of Virginia IT occupational opportunities refer to Table 6 [9, 10].

Table VI: VIRGINIA OCCUPATION PROJECTIONS [9, 10]

Virginia Occupation Projections	Employment		Average Annual Openings	Occupational Employment as of May 2009
	2008	2018		
Computer Support Specialists	19,115	23,302	948	18,840
Computer Systems Analysts	36,518	47,978	1,933	35,030
Network and Computer Systems Administrators	18,407	25,626	1,029	18,460
Network Systems and Data Communications Analysts	16,981	28,651	1,472	13,650
Computer and Information Systems Managers	12,726	16,179	552	12,320

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