# Assessment Methods and Criteria for HET104/706

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LTS503 - Assessment, Evaluation and Support
Assignment 1

## I. INTRODUCTION

HET104/HET706 is a Unit taught within the Telecommunications Engineering course at Swinburne University. The aim of this Unit is to cover the material required to achieve the Cisco Certified Network Associate (CCNA) levels 1 and 2. Other Units within the Faculty teach the content for CCNA3/4 as well as Cisco Certified Network Professional (CCNP). This Unit could be considered to cover the concepts of basic Computer Network design and building a basic network using Cisco routers.

Assessment of this Unit takes the form of both Theoretical and Practical assessment - to be eligible to qualify at CCNA1/2 level students must not only understand the basic concepts of networking, but also be able to construct a real computer network using real equipment.

## II. PRACTICAL ASSESSMENT

In this report I will discuss the assessment of the practical component of the CCNA1/2 material. The key aspect here is that we assume that students commence the Unit with no knowledge of networking and are expected to become proficient in building simple networks using Cisco routers and switches.

The current form of practical assessment is done in the form of a Laboratory Exam which is sat at the end of semester. During this exam students are presented with details of a network which they must build and test.

The examination haa pass requirement of 100%, students must completely build all aspects of the network they are asked to build. This often raises the question of whether or not it is fair to ask students to achieve a mark of 100%. The examination is structured such that it is possible to build the required network in 15 minutes, if the student commits no errors. As this is an introductory subject, we expect students to make mistakes. Students are given 2 hours to complete the exam, this time allows them to detect and troubleshoot their mistakes in order to successfully complete the exam. The skill to troubleshoot and fix a network that is not functioning correctly is a necessary skill that is assessed here.

Finally, students are given two attempts to pass the practical exam. Passing the practical exam at the second attempt results in students achieving a mark of 50% of the available marks for the practical exam.

### A. Problems with the Current Assessment

The overall pass rate of students in the practical component of this Unit is approximately 70%. Obviously our teaching techniques in the practical component of this Unit can be improved. This semester the laboratory component of the CCNA1/2 Unit has been restructured in an attempt to improve these figures.

## III. PREPARING FOR THE LAB EXAM

It is assumed that students prepare for the practical examination through the laboratory work that they perform throughout the semester. Students are scheduled to complete 12 x 3 hour laboratory sessions throughout the semester, for a total of 36 hours of practical work building networks. Further, remote access to Cisco network equipment is provided via the NetLab system where students can reserve time on remote network equipment for network building purposes. During the semester students are also required to complete a Case Study/Project where a network must be built and report into the network construction must be written.

### A. Laboratory Sessions

Students are given pre-prepared experiments to complete during the laboratory sessions. Each laboratory exercise builds upon knowledge acquired in previous exercises such that the exercises completed in the final weeks require construction of networks similar in complexity to those required by the practical exam.

Yet students are still failing the exam in large numbers. Further investigation has revealed the following:

- Students typically complete lab exercises in small groups. This is good as students can potentially learn from each other as they all contribute to solving the problems at hand. This is also necessary as the lab equipment is both expensive and limited in number.
- Many groups often have a leader, one who sits at the equipment making all of the configuration changes while the other members often sit back observing the lab taking place. In this case what typically occurs is that the student doing the actual work normally passes the practical exam while the *observers* struggle.
- Too many times when students are faced with problems the instructors will *fix* the problem rather than use it as a means to guide (or observe) the students through a troubleshooting approach

The teaching technique is being adjusted to:

- Encourage students in groups to *share* the configuration load
- Instructors to concentrate on teaching troubleshooting techniques - required to pass the practical exam

## B. NetLab

NetLab allows students remote access such that they can practice their network building skills out of hours. Unfortunately, students do not appear to make great use of NetLab, even though this is probably their greatest asset in improving their ability to complete the practical exam.

## C. Project Work

Students are required to build a network and write a report on the process as part of their ongoing assessment. It is expected that this will provide further practice on the skills required to successfully complete the practical exam. The project gives groups the chance to acquire network building skills over a period of time.

However project work suffers from:

- Group members not putting in personal effort
- Potential cheating

## D. Practical Examination

Some potential problems have also been discovered in the technique in which the practical exam is given. During assessment of students efforts, it has become obvious that students are not approaching the exam in the way a professional engineer would:

- Break the exam up into small tasks
- Complete one task
- Test that the task has been properly implemented
- Proceed to the next task until all tasks are completed

Instead, students appear to attempt to complete the exam in one sitting before testing whether the network works as expected. This leads to the following problems:

- If the network doesn't work, the student has no objective means of determining which of many the problem lies
- Much time is spent by students trying to solve a problem where there is none rather that the real problem

This leads us to believe that generic engineering skills are not being properly taught to the students. Similarly, it has also led us to believe that perhaps the examination instructions are poorly written, not encouraging students to complete the task in the proper manner.

## IV. New Assessment Technique

To this end, apart from attempting to better teach the material, we are also making an attempt to improve the actual assessment component by re-writing the practical exam. It is inappropriate to discard this basic method of assessment as this is a key component of the skills required by students who are to successfully complete this Unit.

The assessment process will remain as is:

- Students will be expected to build the network as required by the examination
- Assessors will check to see that the end result complies with all requirements
- Students receive a pass/fail mark

- A summary of reasons for failure are posted on Blackboard
- Students who fail are given a second attempt at passing the lab exam, if they succeed they are penalised half the available marks for the exam
  - Students pass first attempt - 20/20
  - Students pass second attempt - 10/20
  - Students fail - 0/20, failure to meet hurdle requirement

The setting of the assessment task will however be reviewed. The practical exam instructions should be re-written to better outline the appropriate steps students should take to achieve the final goal. In particular the exam paper will specifically set tasks for students to achieve at certain stages of the exam such that completing these tasks will test their implementation. It is hoped that by clarifying the steps that need to be taken during the exam we will be testing the students ability to complete the task as well as their troubleshooting skills. However I acknowledge that this means we are no longer assessing them on their knowledge of basic Engineering process.

## V. Assessment Criteria

The assessment criteria is straightforward. For the purposes of assessing if students are qualified in the practical component of this Unit, it is essential that they be able to perform all of the specified tasks. Assessors will examine the network that students have built. They will be required to check that all tasks assigned to the students have been completed correctly. This includes:

- Properly designing the network infrastructure
- Correctly configuring the network points on the devices
- Correctly configuring the network such that traffic properly traverses
- Implementing firewall rules that meet the stated security requirements

The exam is pitched at a first year level so qualified assessors can reliably assess the students work within 2-5 minutes.

## VI. Reflective Comments

The practical exam is seen as an important component of assessment for this Unit. As a technique it has its own stengths and weaknesses. These are outlined below.

## A. Strengths

Apart from the stated reasons for holding a practical exam for this Unit, this form of assessment has strengths which make it a good choice for one of the methods of student assessment.

*1) Validity:* The primary strength of the Practical Exam as an assessment technique is its validity. As a subject, the goals include preparing students to sit the Cisco CCNA1/2 certification and for students to be competent in designing and building simple computer networks using commodity network equipment. The design and theoretical aspects of the Unit are tested in the written exam, however the practical exam is ideal for testing that students have acquired the correct technical

skills to progress to the next level of their learning within the Cisco curriculum.

The practical exam requires students to demonstrate their proficiency in configuring the equipment in an exam environment. We also validly test their troubleshooting abilities by giving student adequate time to detect and correct any mistakes they make during the exam.

*2) Reliability:* As in the real world, the test of success is whether or not the network works, if students successfully complete all required tasks then the exam is passed, otherwise they fail. Due to the pass/fail nature of the exam there is no grey area during assessment and the tests are reliable.

*B. Weaknesses*

There are a few weaknesses to the practical exam which complicate the assessment process, these include:

*1) Student Numbers:* Equipment and space only exists to test 20-25 students in one sitting. As student numbers increase it is getting more difficult to schedule the Practical Exam. Also, multiple sittings allow for students who do the test first to inform subsequent students about the contents.

*2) Exam Resits:* Students who fail on the first attempt get a second attempt. This causes problems with scheduling which increase as student numbers increase. This problem is a subset of the previously mentioned problem.

*3) Time Constraints:* The time required to mark all students exams and prepare the room for the next group of students is high. It is difficult to obtain the resources necessary to assess the high numbers of lab exams in the restricted time frame available.