This project is part of an ECU Teaching Grant, 2013. Dr Peng Li, Mr Lee Toderick, Dept of Technology Systems, East Carolina University.

Hands-on Lab experiments in Undergraduate courses in Information Technology have several challenges. Foremost, Labs may take excessive time to grade and return to students. After beginning a subsequent Lab, it may be difficult for students to return to a previous Lab and correct mistakes. Finally, identical Labs may not be graded consistently among faculty. In surveying literature, it is apparent that there is no consistent, standard approach for assessment in e-learning.

These challenges were addressed by the creation of an automated grading and system for locally developed hands-on Lab experiments in ICTN 4200-4201 Intrusion Detection Technologies and ICTN 3540/3541 Network Environment III. In addition, ICTN4810/4811 Information Assurance Technologies has several contributing Lab experiments. The software grading system is called BroadReach Extended (© East Carolina University).

Our Information and Computer Technology Program prepares students for careers in computer networking, information technology, information security, and technical management. "Learning by doing" is vital for student success. Recently we have deployed remote, e-learning, hands-on labs for ICTN 3540 (supplemental) and ICTN 4200/1. The students can do these labs remotely, at any place, and at any time by the due date. Consequently, the students sometimes do not receive timely feedback because it is extremely time-consuming for the instructor to grade the hands-on exercises (an exercise can have up to 40 deliverables). In some labs, screenshots are submitted by the students as evidence of lab completion, which is neither an efficient nor a scalable solution. It should be noted that many professional training and education courses assess labs similar to that described above. The students usually do not have the opportunities to fix the mistakes they made in previous labs due to lack of timely feedback. By introducing the automatic grading scripts, the students receive immediate feedback after submitting the deliverables electronically and will be able to learn better through "trial and failure". Students can learn from the mistakes and resubmit the labs.

Using BroadReach Extended, we have been developing grading scripts for eight existing lab modules in two courses (ICTN 4200/4201 and ICTN 3540/3541), and have created a secure, centralized server to host the grading scripts, manage log files, and store grade results. A student completes the Lab exercise on a classroom or home computer/laptop with a class-provided VM (virtual machine), then opens a web page on the centralized server. The student clicks a 'Submit' hyperlink on a web browser to begin the feedback/grading script. Lab results are displayed immediately on the student web browser, and also logged on the centralized feedback/grading server. An optional mail module sends Lab results immediately to the instructor. An academic integrity system insures that only the computer connection assigned to that student is used by that student. The entire system is protected by IPSec, an encryption mechanism securing end-to-end connectivity between the student and the assessment server.

Students can review the feedback on their web browser, and correct mistakes. A graded Lab experiment may be resubmitted and re-graded for a higher score. The grading results can be used by the instructors for assessment purposes.

The ultimate goal of this project is to provide face-to-face (F2F) and distance education (DE) students with an efficient, scalable, Lab feedback and assessment system, accessible within a secure environment so students may evaluate their learning outcomes at any time, from any place, and at their own pace.