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# CISCO NETWORKING: USING SKYPE AND NETLAB+ FOR DISTANCE PRACTICAL LEARNING

Andrew Smith

*The Open University (UK)*  
Walton Hall, Milton Keynes, UK, MK7 6AA  
a.smith@open.ac.uk

Dr Nicholas Moss

*The Open University (UK)*  
Walton Hall, Milton Keynes, UK, MK7 6AA  
n.g.moss@open.ac.uk

## ABSTRACT

Delivering a 'hands on' ICT practical lesson online offers vocationally based courses an increased presence in a learning sphere otherwise dominated by remote learning, exercise and material based courses. This paper explores work within the UK Open University to deliver collaborative learning with Cisco Systems, the technological pitfalls and how these are being overcome by the use of Skype™, Messenger and Netlab+™.

## KEYWORDS

Skype, Cisco, Messenger, Vocational, Online, Netlab+

## 1. INTRODUCTION

Since late 2005 the UK Open University has been working in partnership with Cisco Systems and national partners in the UK to deliver the internationally recognised CCNA (Cisco Certified Networking Associate). The CCNA is considered in academic terms to be a vocationally relevant qualification which is recognised by the international ICT industry sector.

Offering distance learning for this specialist academic sector was a primary driver in the pursuit of this course development; conversely this was also the primary challenge which needed reconciliation for Cisco and the UK Open University.

The CCNA and its associated Cisco Networking Academy Programme is considered to be an international success story with Cisco Systems working with education partners from diverse communities, countries and educational strata delivering face to face learning. The UK Open University joined this programme to offer a blended distance learning experience. The curriculum whilst entirely e-learning in its delivery still relies on instructor centred practical pedagogies and continuous assessment of learning via computer based online assessment and practical exercises.

Traditionally, contact time was comparatively high on this programme (in relation to other ICT courses of similar technical aspect), with normal lab time directed by a specialist teacher exceeding 180 hours for the course entire.

To develop a model enabling integration of the CCNA into a distance learning model offered by the UK Open University, a comprehensive analysis of the learning programme was undertaken analysing how the two different models could be successfully combined. In brief this was accomplished by:

- Using the UK Open University model to offer learners tutorial support provided by accredited and experienced instructors from the Cisco Academy community.

- Meeting Cisco directives on practical teaching and online assessment of learners encouraged the modelling of Residential Schools to become a four day school per course model, offering the learner a total 24 hours contact with a teacher.
- Utilisation of the Cisco Packet Tracer™ application, which simulates the behaviour of a networked environment and offers learners an opportunity to practice equipment programming skills before accessing a live system.
- Utilisation of the Net Dev Group Netlab+™ system, offering learners the opportunity to access bookable live practical equipment upon which the course is vocationally focussed.

## **2. THE CHALLENGE OF PRACTICAL DELIVERY ON A DISTANCE LEARNING PROGRAMME**

At the UK Open University, learners attend residential schools once during some courses as well as attending tutorials; the rest of the learning experience is accomplished via the internet and through reading published materials. For learners on the CCNA course this introduces a constraint which could risk the learning experience and attainment of the learner.

With any learning experience, ‘misconceptions’ can easily be introduced by learners. Phone and email support will overcome many issues of learner misunderstanding, and often giving a simple reassurance is enough. However the learner who does not ask, may become confused or misinformed. The ideal solution for the learner is to attend additional practical sessions, seeing an experienced teacher demonstrating the skills required and the technology needed. This often enhances many hours of self-learning, potentially bringing understanding through legitimate peripheral participation in a community of practice (Lave and Wenger, 1991).

Cisco considers the CCNA to be at least 180 hours of practical teacher to learner contact. 24 hours of contact ensured the learners accessed an intense, defined learning experience. To compensate for the 156 hours difference, all learners are guided by their tutors to complete a range of labs on Packet Tracer™ or Netlab+™.

Logistically, administratively and financially getting learners to ad-hoc practical labs in centres across the UK, is infeasible. To this end, research was carried out into how an already available online system such as Netlab+™ might provide a solution. As Netlab+™ offers access to live equipment, it could be utilised in partnership with an online communication tool for synchronous text based conferencing (Simpson, 2002) in order to deliver additional practical sessions from the comfort of the learner(s) and teachers homes. This offers a ‘one:many’ experience, avoiding the logistical and administrative complexities and encouraging a learner centred experience.

## **3. WHAT IS NETLAB+™**

Netlab+™ is a system provided by a third party vendor (NDG), providing a ‘front end’ bookable interface, allowing learners and teachers to allocate one:one, solo, one:many and many:many time on an array of LAN and WAN switches, routers and firewalls.

This is supported by a range of technologies offering the learner access to a complex system. Netlab+™ provides an alternative to the in class practical experience as it offers the learner the opportunity to access ‘live’ resources (in contrast to ‘simulated’ resources in the Packet Tracer™ application). It adds an element of additional realism as many routed and switched LANs and WANs are administered from afar, so the chances of having physical contact with specific devices are low as described in the paper by Prieto-Blazquez (Prieto-Blazquez, Arnedo-Moreno and Herrera-Joancomartí 2008).

## 4. DELIVERING AN ONLINE PRACTICAL TUTORIAL

For online practical tutorials, getting the right communication tool and ensuring a learner can use it is fundamental. Although the internet offers many tools and many solutions, there are a range of technological and experiential barriers to immediately overcome.

- Unknown bandwidth of the learner's connection, preventing video based and some voice systems from reaching all learners
- The proprietary nature of some applications and their supporting protocols
- Technical inexperience of learners and familiarity with different communication tools
- Availability and cost of software used and Operating System in use by the learner
- Hardware specification of the learner's device
- Internet security and firewall attributes the learner's system

After consideration and experimentation the first solution to be trialled in the 2005 pilot and subsequent course presentations was the use of the Windows Live Messenger application. The perceived benefits this offers include:

- Widespread use of the Microsoft Windows operating system
- Alternative platforms via web sites and other operating systems
- An additional ability to share files, video chat and voice chat if the user's system supports this.

## 5. DELIVERY USING MESSENGER

The delivery of online sessions using Messenger was available to learners in the UK and the rest of Europe with additional participants in North Africa and Iraq (British forces).

From experience developed in each course presentation, the learner engagement is managed in three stages

1. Preparation activities
  - Booking the one:many session on Netlab+™ and advance advice of the session, date, time and the instructions on acquiring a Messenger account and client as well as checking all learners are able to access their already issued Netlab+™ account
  - Reminders of the session, reiterating instructions and indicating subject matter of session and first copy of session notes
2. The Online Session
3. Post-session storage and email of session chat logs, command entry logs and device configuration to all attendees as well as learners who could not participate.

With **stage one**, the booking of the Netlab+™ system, it was essential to ensure that the equipment was reserved for at least two hours in advance of the practical session and reserve (alternative) equipment was also booked in the eventuality of equipment failure. The Netlab+™ can become 'congested' at certain times of the day/week.

The practical session delivery in **stage two** normally lasts for 45 minutes and is focussed on one element of understanding in a required practical domain. Checking the equipment in advance is essential, with the teacher needing to be online at least an hour before to assess the technology. Learners usually appear online from twenty minutes beforehand, so it is essential to be online at this time to greet them and reassure them they are "in the right place", and share them with the group chat option in Messenger.

The activity becomes intense in the five minutes, before the official session start time. With the instructions sent to the learners, they will have the Netlab+™ device sessions tiled as well as the Messenger chat pane (See fig 1).

The teacher advises, informs and educates in the chat pane, and directs the learners to which window they are working in. If the teacher changes to another window, it is communicated to the learners in the chat pane (for those who may be using tabbed windows or a lower screen resolution). This methodology allows for open questioning from the teacher as well as questions from the learners. It is also possible to invite learners to try commands in different telnet sessions, thus promoting active feedback from other

learners as well as the teacher. With the online access, there is a level of privacy combined with community collaboration for all the learners. This encourages participation and reduces fear of failure. Once the session has concluded, the Messenger is left open for any questions, which may take five to ten minutes.

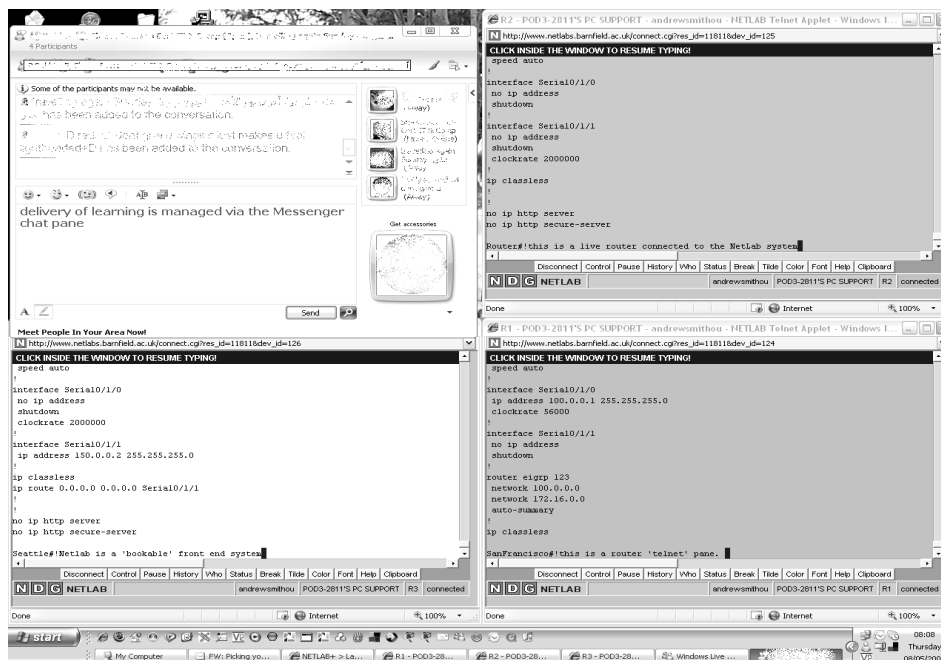


Figure 1: Messenger tiled with the Netlab+™ device sessions

**Stage three** must be carried out on immediate completion of the session. Using tools on Netlab+™ the commands typed as well as configurations saved can be retrieved for dissemination to all learners. Messenger includes a logging feature, therefore recording the text basis of every conversation, which is also disseminated. This allows learners to re-enact the session.

The logs and configurations can be delivered to all learners within twenty four hours of session completion; the benefit this offers to learners is:

- Those who could not attend are able to walk through the session
- It is an aide memoir to those who did attend
- The configuration files can be injected in other Netlab+™ Sessions, Packet Tracer™ and other live routers/switches extending the experience started in the online practical

This delivery mechanism worked well from late 2005 until 2007, with learners always offering positive anecdotal feedback. The sessions have been joined by other UK Open University academics, repeating the skills learnt to other learners.

## 6. DELIVERY USING SKYPE

Over the last two years Skype™ has increased its dominance in offering a text, video and telephony service. Unlike Messenger, it has taken some time to become established; with Messenger having the prior advantage of an earlier presence in the internet communication culture.

Skype™ is beginning to usurp Messenger, offering considerable advantage through its zero to low cost telephony model as well as its multiplatform nature. Skype™ has offered voice conference tools (limited to 24 users).

It has been considered that a distance learning course could run a series of practical sessions using audio-conferencing (Laurillard, 2002) these sessions would be open to all and may be attended by forty to fifty learners at any time, repeating sessions at different times/days, offering a personally convenient time.

Additionally, those who cannot access the technology or meet any of the times would be able to access a desktop captured recording of the session, containing the audio and visual experience.

In late 2007, Skype™ released the SkypeCast™ Beta. It is a real-time communication tool for a potential one:many audience with the option for private invitation-only conferences. With the ‘many’ being a virtual lecture hall of a size yet to be defined (and open to additional research), on a system which is platform independent.

In April 2008 a trial of this online learning opportunity using Skype™ was carried out, with fifteen participants from the UK Open University. The processes learnt from the use of Messenger were duplicated, with the emphasis on voice communication.

The trial was a success, with positive feedback from the participants.

Learner W ... "The tutorial was any average student's dream, as this course doesn't give enough contact with teachers ... I was able to see, and read and in my case I setup my own rig afterwards"

Learner M ... "Being able to watch and listen at the same time and to see first hand how the routers communicate with each other when configured correctly, and being able to go back later to play the saved file was and is of immense help"

Some immediate lessons have already been learnt from this experience which will be fed into the forthcoming July session. Namely:

- Some learners struggled with the different technology; Skype is less intuitive than Messenger and requires some active experience on the part of the participant, possibly by offering dry runs early in the course.
- The time management of SkypeCast™ is set to Central European Time thus was one hour askew of GMT. Whilst retrospectively obvious, it was a needless oversight.
- Once the conference starts, the teacher who is also the moderator must mute sound from all other participants otherwise the accumulated background noise can render the session untenable.
- The teacher must also be in a silent area as any background noise is broadcast to all.
- The session could benefit from a pre-prepared script to pace the quality of the recorded delivery.

## 7. CONCLUSION

The process of delivery is being refined and formalized. It is an intention to share this with all course tutors and encourage the collaborative delivery of sessions across all regions and student populations.

With additional Cisco courses in development, this is seen as an underpinning element of the course experience, with an advanced technical content. Working with learners on active equipment in online tutorials will promote the likelihood of learner success.

This is a work in progress, with the emphasis on developing the learners’ practical skills. Quoting feedback from a participating tutor ... “it offers me the opportunity to engage with the learners and I feel that I am teaching them something constructive”.

The development opportunities for this are manifold with many mediums, alternative courses and alternative practical skills open for exploration. The ideal is to use the experiences of the sessions to develop an environment and methodology for large scale delivery of practice based learning using audio conferencing on an open platform available to all learners on all technological platforms.

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