

The following notes for the NET3012-IP Architectures and Solutions course reference the Nokia MPLS (p/n 3HE02276AA) and Nokia Services Architecture (p/n 3HE02277AA) courses from the Nokia Service Routing Certification Program curriculum. These are copyrighted products of Nokia.

Welcome!

NET3012 – IP Architectures and Solutions
(incorporating two key courses from Nokia's NRS II certification)

Course Professor: Michael Anderson

Lectures:

Wed	9 – 11am	Interactive Zoom session
Fri	11:30–12:30pm	Interactive Zoom session

Labs:

A1	Mon	12 – 2pm	Groupwork Zoom session
A2	Wed	2 – 4pm	Groupwork Zoom session
A3	Wed	4:30– 6:30pm	Groupwork Zoom session

My Contact Info:

Office hours: by email, or by Jitsi video at the following URL:
[https://meet.jit.si/ProfAndersonAnd\[first_name\]2021\[MON\]\[DD\]](https://meet.jit.si/ProfAndersonAnd[first_name]2021[MON][DD])

Email: Michael.Anderson@AlgonquinCollege.com

Course Objectives:

- ◆ To provide a solid understanding of IP *Services*, with an emphasis on MPLS and VPNs (L1, L2, L3).
- ◆ To increase your knowledge and skill of networking equipment, using Nokia and MikroTik equipment.
- ◆ To prepare you to complete your study of networking, by providing exposure to an alternative vendor's curriculum (Nokia NRS-II).

For additional info on this course, please see the official **course outline**, as posted on the course web site. We'll look at a few items, including scheduling, textbooks and other required resources, and marks allocation.

Course Prerequisite

You must obtain a passing grade in NET3008. All students not meeting this requirement will be withdrawn from the course.

What Does Industry Expect From You and Me???

Consider for a moment the feedback shown while waiting to start this lecture. Now consider this email exchange from Aug 2020:

Subject: Job Opportunity for a New grad

Date: Wed, 5 Aug 2020 19:29:36 +0000

From: [Name withheld] <xxxxx@cengn.ca>

To: Michael Anderson <Michael.Anderson@algonquincollege.com>

Good Afternoon Michael,

I got your name and email from [name withheld] a recent graduate from the BITNET program at Algonquin and Carleton currently employed at Centre of Excellence in Next Generation Networks – CENGN as a Cloud Infrastructure Engineer.

I am currently recruiting for a Site Reliability Engineer and looking for a candidate with a background in networking. I wanted to reach out to you and share the attached job description to see if you wanted to circulate it within your network or recommend any new grads that might be a good fit for CENGN.

Please feel free to reach out if you have any questions about CENGN or about the role. I'm also happy to chat with any interested applicants.

Regards,

[Name withheld]

Human Resources Specialist

Job Posting: Expected Skills and Qualifications

Candidate **Must** have:

- Expertise in UNIX/LINUX operating systems: RedHat, CentOS, Canonical Ubuntu, FreeBSD **and** other opensource distributions
- Experience working with IP, BGP, MPLS, and/or Segment Routing based networks
- Experience in network security **and operations** with firewalls, IPS/IDS, and encryption
- Experience with automating, configuring, **and** working with networking devices from various vendors including Cisco, Juniper, Nokia **and** whitebox equipment
- Experience in one or more of the following automation tools or languages: Python, Go, Terraform, Ansible
- Experience in **system design and operations** of highly available and distributed systems using containerization
- Experience in automation tools for modern application deployments (Docker, Kubernetes, infra-as-code, REST APIs)
- Experience in **system design and** operations in Public Cloud environments (AWS, Azure, and/or GCP)

Preferred Qualifications

- Experience **and** desire to develop expertise in virtualization technology like OpenStack (preferred), KVM
- Expertise in leveraging collaboration tools for agile inter **and** intra-team communication and incident response (Jira, Confluence, Git, Teams)
- Experience with **developing and operating** CI/CD pipelines **and** principles with tools such as Jenkins
- Experience working with **IPAM and DCIM** software (NetBox, RackTables)
- Experience with **deploying and maintaining** hardware in a datacenter environment (racking, cabling, power, cooling)
- Experience and/or **contribution** to Open Source technologies: Docker, Kubernetes, FD.io, Tungsten-Fabric, Cilium
- **Proven** problem-solving skills **and** root-cause analysis
- Participate in **and** evaluate proof-of-concepts for **emerging cloud technologies** to support CENGN cloud infrastructure
- Highly motivated to gain experience in R&D engineering/DevOps environments
- [Good judgement, communication skills, independence, adaptability]

So I reply:

Subject: Re: Job Opportunity for a New grad

Date: Fri, 7 Aug 2020 06:34:50 -0400

From: Michael Anderson <Michael.Anderson@AlgonquinCollege.com>

To: [Name withheld] <xxxxx@cengn.ca>

CC: [Name withheld] <xxxxx@cengn.ca>, [Name withheld] <[email withheld]>

Good morning [Name withheld],

I'd like to follow up on our exchange of emails on Wed about your position for a Site Reliability Engineer.

From the lists of required and preferred qualifications, I don't believe any grad from the BIT-NET program would meet all the requirements. (Maybe double check with any of your recent hires from the program, such as [Name withheld]?)

I do, however, have another person to suggest who is likely an excellent match for the position [... snip ...] I've cc'd [them] so that this email can serve as an e-introduction, and that you have one another's email addresses. I've also cc'd [Name withheld] in case there's any cross-over or interaction with [their] areas.

Please let me know if there's any way I can be of further assistance.

And the response was:

Subject: Re: Job Opportunity for a New grad

Date: Fri, 7 Aug 2020 13:21:57 +0000

From: Nicole Collett <nicole.collett@cengn.ca>

To: Michael Anderson <Michael.Anderson@AlgonquinCollege.com>

CC: [Name withheld] <xxxxxx@cengn.ca>, [Name withheld] <[email withheld]>, Moh [Surname withheld] <xxxxxx@cengn.ca>

Hi Michael,

I really appreciate you sending out the opportunity. From my discussion with the hiring manager Moh, who I've cc'd, a new grad from the program would be a good fit. It is my understanding that the program would provide the right foundation on the networking side and CENGN's training team and boot camp would help grow the right candidate into the role.

I look forward to [Name withheld's] application.

Thanks again for your help.

Hope you have a great weekend.

Translation:

No, we really expect graduates from the 4 yr BIT-NET program to have all those skills, or near enough that 2 weeks of training finishes everything off.

Take Aways:

Would you agree with:

"If you don't like hot weather, you shouldn't go live in Texas or Arizona"

and in the same manner

"If you don't like constantly learning new things, evolving your skills & knowledge, and diving really deep into networking, you shouldn't be in the BIT-NET program." ?

According to feedback from students (including the email shown initially), if you don't learn lots of networking now, when will you learn it?!?

... And MOST IMPORTANTLY ...

If you're still here, then it must mean you want to learn new technologies (MPLS and other tunnelling techniques), that you want to expand and build upon what you already know, and networking really turns your crank, and you want to **be prepared to fulfil and succeed in an employer's expectations.**

Adaptations due to Covid19

- All **lectures and labs are still synchronous**. The standard Lab policy for Algonquin ICT courses still applies: 3+ missed lab sessions = automatic F.
- There will be more emphasis on in-progress evaluations, and interaction during lectures and labs even though we're using Zoom. A portion of your final grade is based on your performance during lectures and labs. You **must have a GOOD, working microphone and speakers!**
- Lectures may evolve to a format closer to the Flipped Classroom: https://en.wikipedia.org/wiki/Flipped_classroom (Though what we did in NET2001 in W20 may have been interesting, it isn't really considered flipped classroom.)
- Weekly lab periods will *not* be recorded. Weekly lectures may or may not be recorded, depending on the class format. **Don't skip lectures, expecting to be able to just review the recording at a later date.**
- As of 12/Jan, Carleton has not finalized their processes & procedures & for e-proctoring. So the course outline and marks allocation aren't finalized either.
- You'll need the OS and network virtualization skills learned in F19 NET2008-DevOps and W20 NET2001-WAN. We'll extend those skills in lab exercises, and try to benefit from our knowledge of MikroTik. ... Apologies to those who missed either of those courses, but as per the previous page, the BIT-NET program has officially moved along to keep up-to-date.
- Your first assignment is due **this Friday @ 11:59pm**. There's some things we need to figure out pretty quickly in order for the semester to go smoothly.

Introductions

- (Re-)introduce myself, especially *Why do I teach?*
 - *Have great confidence in me, but don't trust me*
... Be sure to check it out for yourself!
 - *My focus is on learning, not on marks*
... This answers a lot of questions
 - *TL;DR = F (guaranteed)*
... I can guarantee you won't pass the course without reading the textbook
 - *I would like to know everything about everything, but I don't*
... Bring your work experience to the table and please share it during lectures.
- [Time permitting] Quick review of some past course evaluations (8th offering)

Bug Hunter Bonus

- Full credit for question, to 1st student to identify a mistake (email timestamp)
- Finding any email generated with the "From" or "Reply To" address resembling andersm@algonquin.brightspace.com because that address is incorrect and does *NOT* work!!!

Required Resources

- Course web site: <http://michaelanderson.ca/21W-NET3012-010/>
- Nokia Support account for remote access to lab equipment
- Required courseware (provided free, courtesy of Nokia):
 - ✓ Multi-Protocol Label Switching (MPLS) and Service Architecture (SA)
- Recommended textbook (Save \$\$, buy used from 4th yr BIT-NET students):
 - ✓ Alcatel-Lucent Network Routing Specialist II (NRS II) Self-Study Guide, by Glenn Warnock & Amin Nathoo, Wiley, 2011, ISBN: 978-0-470-94772-2 / 978-1-118-17813-3

Time Commitment

- Expect to spend *at least* 5 hrs/wk on this course *outside the regularly scheduled lectures and labs*. (See program flow chart.)
- *Never stay stuck on a problem* for longer than 20-30 mins; you can't afford it! Ask a classmate or email the Prof for some ideas & tips of where you should be able to find the answer.

Week 1: Assigned Readings & Lab work

One-time to get started

1. Create your **Nokia** Support account; **use your Algonquin email !!**
 - Similar to NET1002 where you registered on the Cisco Academy site
 - See next page for instructions & URLs
2. Get courseware from BrightSpace; unlock & "install" it so you can read it
3. Lab 1 Prelab: **Due Fri Jan 15 @ 11:59pm**
 - familiarize yourself with Nokia courses (MPLS, SA)
 - familiarize yourself with standard lab topology
 - familiarize yourself with layers of passwords required for remote access

Regular weekly items: Lab work and readings

4. Lab 1 **InLab**: Connect via VPN to Nokia lab equipment; extended goal: create interfaces and configure **full** static routing
5. Week 1 **Quiz**: **Due Sun Jan 17 @ 11:59pm** (available on BrightSpace)
6. Lab 1 **Post-lab**: book a MySRLab session; connect & use MySRLab
 - Can only accessing booking page if you've **created** your **Nokia account !!**
 - Due date is midnight before your week 2 lab session.
7. Lab 2 **Pre-lab**: Key aspect is OSPF review; due **before your next lab**.
8. Readings: Familiarize yourself with MPLS module 1; **due Wed Jan 20 @ 9am**
Reference: NRS-II: Ch 11, pages 473-513

Expect a quiz every week eg. at beginning of the lecture (don't be late!!)

Schedule for Regular Weekly Due Dates

Expect this every week

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	A1 Lab		In-class Q A2/A3 Lab			A1 post-lab due
		A2/A3 post lab due	In-class Q			

This schedule was designed to (hopefully) mesh with due dates for other courses. But due to scheduling changes in 2021, please let me know if this conflicts badly with any of your other courses.

Switching to remote learning: Max 18 logins per lab session, so **max 18 students per lab** (requirement due to a multitude of technical factors). Although I realize many of you will already have made commitments, there's no avoiding having **additional students switch to the Wed 4:30pm lab** (at least 6 but it would really be much better to have 8-9 switch).

Feedback from previous years: the Mon lab group is typically on the verge of being ahead of lectures; students find the labs more challenging, so that's a possible motivation to switch to a Wed lab group.

New Material: Course Overview

- Who is Alcatel-Lucent? – purchased by Nokia (completed in Feb 2016)
But you'll notice some references and URLs are still Alcatel-Lucent
- Material taken from Modules 0-1 of Nokia MPLS courseware:
 - Comparison of Cisco vs Nokia certification tracks
 - What *are* IP services? - A brief introduction
 - What *is* MPLS? - A brief introduction
 - What *is* a VPN, really? Difference between VEN (Encrypted) and VSN (Separate) [my terms!]
- How different is Nokia networking equipment?
 - Whirl-wind comparison of Cisco & Nokia CLI (in lab this week)

Getting Signed-up with Nokia

Just like you did in NET1002 for Cisco, you'll need a Support Account with Nokia. Here's some important information for signing up.

Slower way= <https://nokia.my.salesforce.com/sfc/p/58000000t8Dk/a/2M0000015pTs/0ouXH5rBIQy9i1Uerwm5BL0ydlqY.jsg5ITobL9Uvz0>

Quicker way =

- Navigate to <https://online.networks.nokia.com/>
look for the *New User?* link near the bottom
- you must **use your Algonquin email address!**
Phone number must include international calling code: 1 6137274723
- When you get to the step to Select Your Relationship with Nokia,
choose "Customer"

You will need this account in order to book lab sessions for your post-labs!

Access to Nokia Resources

1. Course Materials: – Download *courseware* from BrightSpace;
 - install using Adobe Reader DC with FileOpen plugin;
 - once per machine, enter credentials in the email from Nokia
2. Lab Access: Trio for remote access: Aventail VPN (always) plus either
 - A. *regular weekly lab access* **OR** B. *MyNetworkLab* access

MPLS and SA courseware access (Overview)

You should have received an email to your Algonquin account from learning.services@nokia.com It contains details instructions and links.

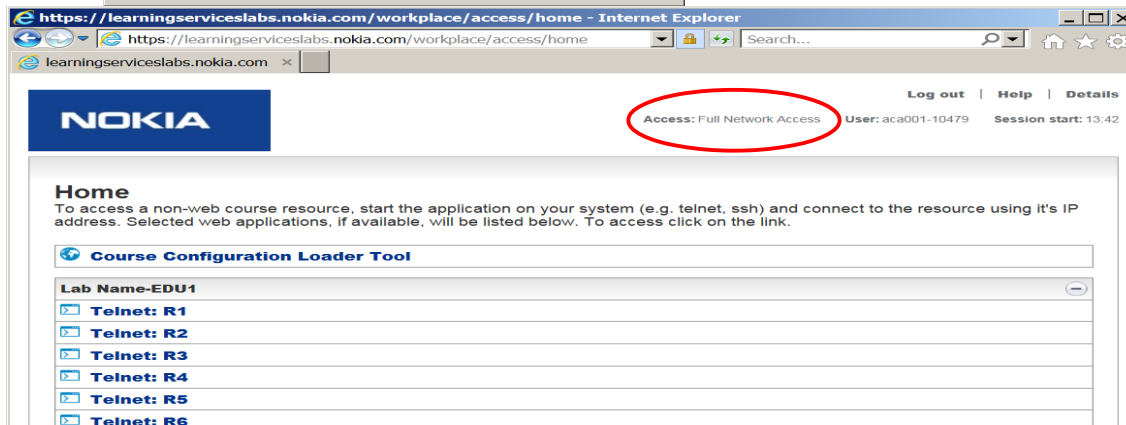
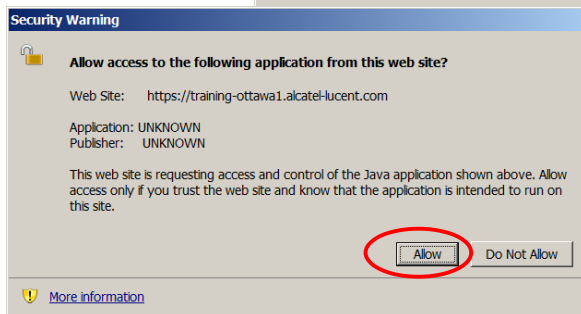
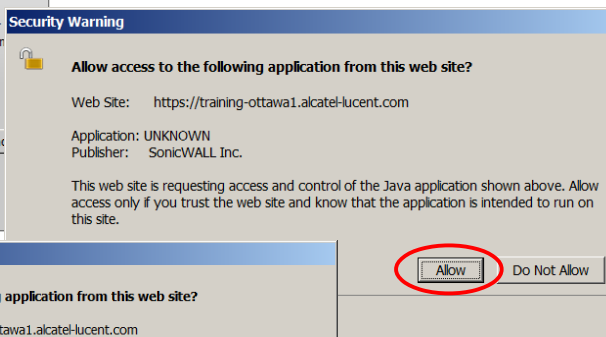
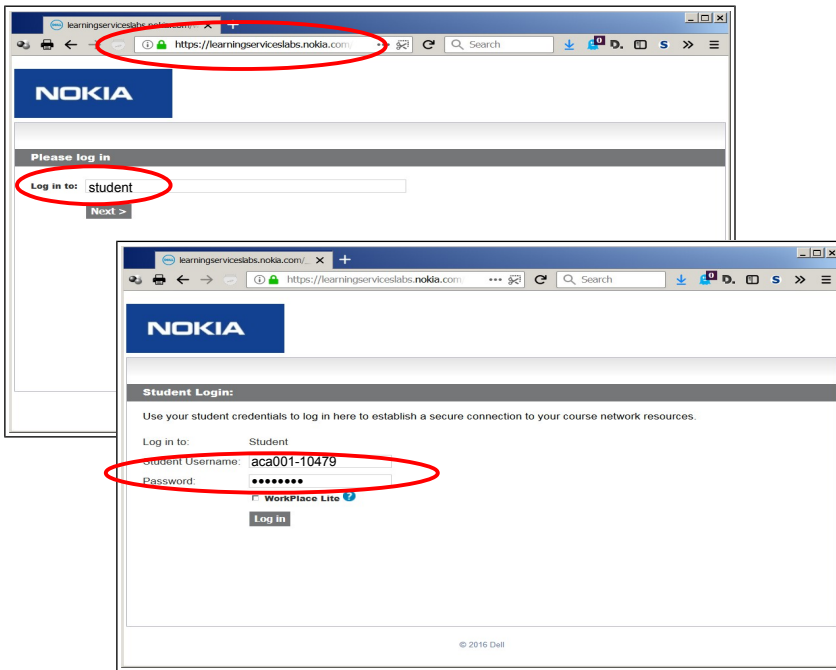
1. You'll need a machine running MS-Win or OS-X natively or in a VM. Unfortunately Linux is not supported.
2. Download & install the current version of Adobe's pdf reader ("Adobe Reader DC") <https://get.adobe.com/reader/>
3. Install the FileOpen plugin
<http://plugin.fileopen.com/all.aspx>
4. Open your downloaded copy of the MPLS and SA courseware. As a one-time action (on each device you use to access the courseware), enter the credentials provided in Nokia's email to you.
5. Note that you can print the courseware; many students have found that useful in a number of ways, including being able to make annotations more quickly as we go through the course notes.

Trio for remote access: Avenail VPN for regular lab access & MySRLab access

A. Regular weekly lab access:

(or <https://learningserviceslabs.nokia.com>
<https://training-ottawa1.alcatel-lucent.com>)

1. Browser-based VPN (must have activeX or Java!)
2. Log into service: **student** (or **training**)
3. Use **lab-access** credentials (BrightSpace)
4. Permit all requests to run (ActiveX or Java)
5. Launch Telnet sessions to your assigned routers.



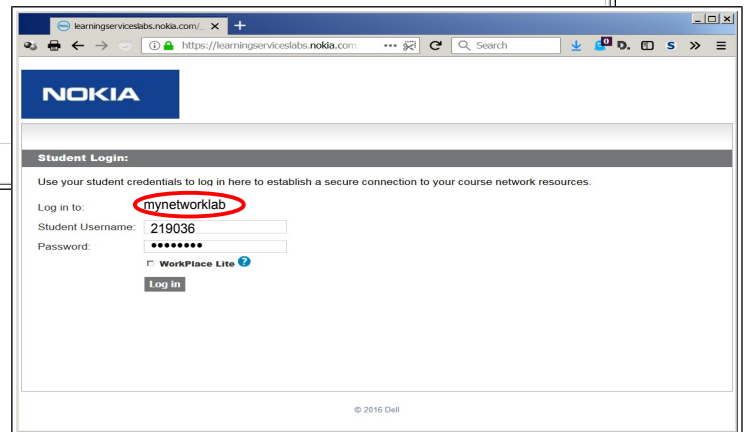
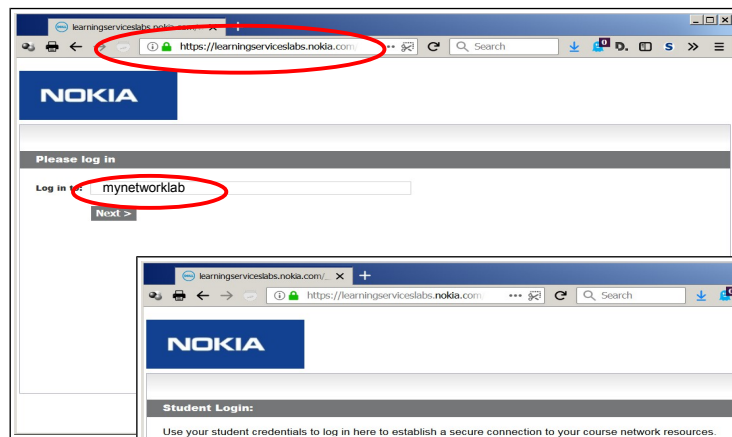
B. Booking extra practice (Live demo??)

1. Normal browser access to <https://src.alcatel-lucent.com/src/mynetworklab> if that expires, try: <https://ps-kb.alcatel-lucent.com/src/mynetworklab/>
(Re-confirmed 6/Jan/2021: no known "Nokia" URLs available.)
2. Login using your Nokia corporate web-site account (Algonquin email + chosen password)
3. In the section "My Unreserved Sessions", click Reserve Session.
4. Choose "**SRC – Scenario - Standard**" for the Lab Type; choose a time, then Submit
5. You should book a single 3-hr practice session each week (... You should have plenty of lab sessions but if you run out, please let me know and we should be able to get more sessions.)
6. There will be a post-lab exercise **every week!** There is are a **limited** number of lab sets available, so **do not expect** to get a booking if you leave it until the last minute! **Book ahead now for every week!**

Extra practice access:

(or <https://learningserviceslabs.nokia.com>
<https://training-ottawa1.alcatel-lucent.com>)

1. Browser-based VPN (must have activeX or Java!)
2. Log into service: **mynetworklab**
3. Use one-time **numeric** account + password (sent via email)
4. Permit all requests to allow Java VPN to run
5. Using the addressing chart supplied during Lab 1, launch multiple Telnet sessions to all the routers.





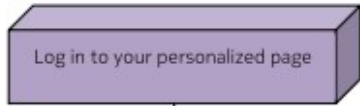
From MySRLab Getting Started Guide, ver 7.0.1 20/Dec/2016
(details on this page verified as current on 6/Jan/2021)

Nokia MySRLab Quick Start Guide
<https://src.alcatel-lucent.com/src/mynetworklab>
~~www.networks.nokia.com/src/mynetworklab~~

<https://learningserviceslabs.nokia.com>
<https://training-ottawa1.alcatel-lucent.com>
(e.g. use 32-bit version of Internet Explorer)

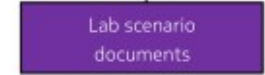
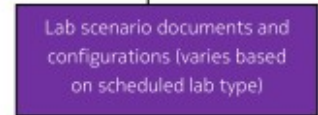
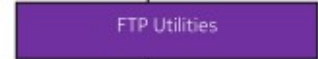
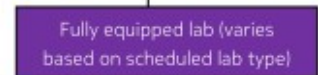
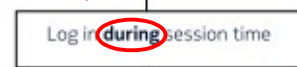


Login = Nokia support acct ID:
Alg email + chosen pswd



With one-time credentials emailed to you

MyNetworkLab fixed ID & password



1. Register for access at URL www.networks.nokia.com/src/mysrlab
2. Purchase Scenarios
3. Purchase Practice Sessions
4. Schedule Sessions
5. Connect to MySRLab Aventail Client site
 - Install Aventail Web Client software, first time access only
6. Login to MySRLab Aventail Client site and Personalized Page
 - Enter your Session ID and Session Password during lab practice session time
 - Enter your Personalized Page username and password outside of lab practice session time

Help and Support:

mynetworklab.support@nokia.com