

Welcome!

NET3011 – Advanced Network Switching

Course Professor: Michael Anderson

Lectures: Wed 3 – 4pm T230
Fri 10 – noon T230

Labs: Wed 8 – 11am T108
Fri 1 – 4pm T108

My Contact Info:

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... and at other times by appointment or email

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... **Your contact info???** Remind.com – @17WNET3011

<http://michaelanderson.ca/17W-NET3011-010/ContactInfo-17WNET3011.pdf>

Course Objectives

- ◆ To provide a solid understanding of L2 networking concepts, with a focus on technologies relevant to an enterprise campus
- ◆ To increase your knowledge and skill of networking equipment, using Cisco equipment.
- ◆ To prepare you to complete your study of networking, ie. NET4009 - Troubleshooting

For additional info on this course, please see the official **course outline**, as posted on the course web site. During the next few lectures, we'll look at a few items, including schedule (final week), textbooks, tests, marks allocation, and use of electronic devices in the classroom.

Q: In at most a few sentences and using the simplest possible language, what is the fundamental difference in the way routers and switches forward traffic?

Introductions

- Who am I; my background; my interest in teaching.
- 1. *"Have great confidence in me, but don't trust me"*
... Be sure to check it out for yourself!
- 2. *"My focus is on learning, not on marks"*
... This answers a lot of questions
- 3. *"TL;DR = F (guaranteed)"*
... I can guarantee that you won't pass the course without reading the textbook
- 4. *"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.
- ~~"Your educational objectives, personal learning plan(s), certification/accreditation goals, etc."~~ *Who are YOU? What are you doing here?* We'll talk briefly about learning styles, and the Evil of taking shortcuts.
- *How do you want to introduce yourself to me?* plus *Who is the boss?*

Required Resources

- Course web site: <http://www.michaelanderson.ca/17W-NET3011-010>
- Lab book: a bound book with non-removable pages
 - material from NET2000 especially important
 - some (helpful) overlap with NET3007–Security
- External HD or USB memory stick: for backups, etc.
- Required textbook: (get a hardcopy!)
 - ✓ Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide, by Froom and Frahim, Cisco Press, ISBN13: 978-1-58720-664-1
<http://www.ciscopress.com/content/images/9781587206641/samplepages/9781587206641.pdf>
- Recommended textbook (can access via Algonquin Safari-Proquest):
 - ✓ CCNP SWITCH 300-115, Official Certification Guide, by David Hucaby, Cisco Press, ISBN13: 978-1-58720-560-6

Week 1: Assigned Readings & Lab work

- Read Ch 1 in FLG (Foundation Learning Guide); due by Wed Jan 11
- "Surprise" Pop quiz on Ch 1 **next Wed @** beginning of lecture
- Read Ch 2 in FLG; due next Fri at 10am; expect a pop quiz
- Pre-lab: normally due **before your lab** period each week
- Lab 1 in-lab = a PT activity (complete & submit before end of lab)
- Lab 1 post-lab: due next Mon @ 11:59pm
- Lab 2 **pre-lab**: due **before** your next (i.e. 2nd) lab.

... See program flow chart for some info on time commitments

Expect this
every week

On Multitasking

Mar **2006**: <http://arstechnica.com/old/content/2006/03/6417.ars>

“The [cover story](#) in *Time* magazine this week, entitled 'Too Wired For Their Own Good?', condemns the youth of the nation as gadget-obsessed, perennially multitasking, social failures who can't really get into anything important or even relax.” **[But seriously, what is this crap? ... or is it crap?? Hmm. Maybe we need some more research results?]**

Mar **2007**: <http://arstechnica.com/old/content/2007/03/study-says-leave-the-multitasking-to-your-computer.ars>

“New research shows that, contrary to popular wisdom, the multi-tasking worker is actually a less efficient and less productive worker. ... The *NYT* then showed confirmation of these findings by Microsoft research scientist Eric Horvitz, who found that workers at the Redmond-based software company took an average of 15 minutes to return to the task they were working on after being interrupted by a phone call, e-mail, or instant message.”

Jun **2008**: <http://arstechnica.com/old/content/2008/06/the-boss-made-me-do-it-multitasking-still-inefficient.ars>

How about *you* read this one?

Aug **2009**: arstechnica.com/science/news/2009/08/multitaskers-beware-your-divided-attention-comes-at-a-price.ars

“A lot of the Ars readership would probably fit this description: TV on in the background, computer screen in front of them, and various windows—mail, chat, browser—vying for attention. Although most people find themselves multitasking, we're remarkably bad at it. ... The answer, according to a paper that will appear in the *Proceedings of the National Academies of Science* later this week, is that they may actually be worse; heavy multitaskers tended to be more readily distracted by extraneous information than their more focused peers.”

Jun 2010: www.nytimes.com/2010/06/07/technology/07brain.html?_r=1

“Scientists say juggling e-mail, phone calls and other incoming information can change how people think and behave. They say our ability to focus is being undermined by bursts of information.

These play to a primitive impulse to respond to immediate opportunities and threats. The stimulation provokes excitement — a [dopamine](#) squirt — that researchers say can be addictive. In its absence, people feel bored.

The resulting distractions can have deadly consequences, as when cellphone-wielding drivers and train engineers cause wrecks. And for millions of people like Mr. Campbell, these urges can inflict nicks and cuts on creativity and deep thought, interrupting work and family life.

While many people say multitasking makes them more productive, research shows otherwise. **Heavy multitaskers actually have more trouble focusing and shutting out irrelevant information, scientists say, and they experience more stress.** [bolding added]

And **scientists are discovering that even after the multitasking ends, fractured thinking and lack of focus persist.** In other words, this is also your brain *off* computers.” [bolding added]

Dec 2012: <http://www.theglobeandmail.com/life/parenting/back-to-school/laptops-in-class-lowers-students-grades-canadian-study/article13759430/>

“We really tried to make it pretty close to what actually happens in the lectures, we found that lo and behold, the students who multitasked performed much worse on the final test and those who were seated around peers who were multitasking also performed much worse on the final test,” said Sana.

“So you might not be multitasking but if you have a clear view of someone else who is multitasking, your performance is still going to be impaired.”

The students in the first experiment who were asked to multitask averaged 11% lower on their quiz. The students in the second experiment who were surrounded by laptops scored 17% lower.

More references

- On hypertext & comprehension: The Shallows, p. 127-128, 129, 130
- People can't even drive & text; what makes you think you can grapple with difficult new material & concepts and text at the same time? (30/Dec/2014)
<http://ottawacitizen.com/news/local-news/distracted-driving-why-we-suck-at-multitasking>

So, in summary:

- Multitasking sucks
- **NO laptop or cell phone use during lectures;**
no cell phone use during labs!
See Algonquin Directive "AA32".

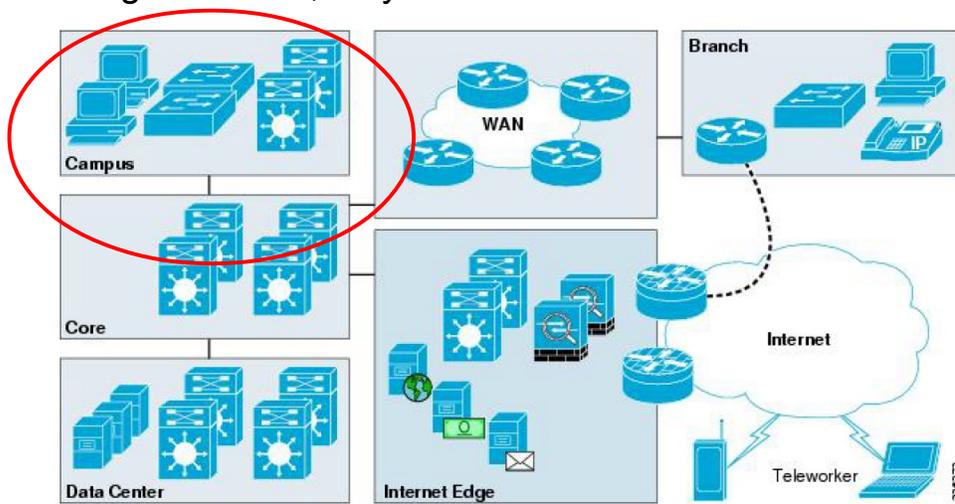
Summary Notes for Ch 1

The purpose of Chapter 1 is to define the area of focus for this course, then identify and review some essential concepts from previous courses.

- *In today's networks, LANs have been segmented into [two] distinct functional areas: data centers [bleeding-edge?] and campus networks [traditional hierarchical designs].* (p. 2)
- Unfortunately, the term "campus network" isn't defined until Ch 2.

What is the definition of "Campus Network"?

- In the diagram below, only **one** of the 7 areas is covered in this course!



"A campus network describes the portion of an enterprise infrastructure that interconnects end devices such as computers, laptops, and wireless access points to services such as intranet resources or the Internet." p. 9, FLG

(NB: Not identical to definition in previous version of textbook!)

What does "switching" mean when applied to other than Layer 2?

- Cisco uses the terms "Layer 3 switch" and "multilayer switching" extensively. This textbook is the first reference from Cisco where they admit that "Layer 3 switching" isn't much more than an outdated marketing term:
"Most modern switches can actually route traffic." (p. 3, 8 of FLG)
"MLS is becoming [has long been!] a legacy term due to the wide support. The most important aspect to MLS is recognizing that switches can route [packets] or switch frames at wire-rate speeds using specialized hardware."
- Other definitions (from p. 12-14 of previous version of textbook):
 - "Layer 3 switching is hardware-based routing."
 - "The packet forwarding in Layer 3 switches is handled by ASICs and other specialized circuitry."

Course Textbook

You can get a **free**, copy of the first three chapters by clicking "Sample Content" on:

<http://www.ciscopress.com/store/implementing-cisco-ip-switched-networks-switch-foundation-9781587206641>

... or use this direct link:

<http://www.ciscopress.com/content/images/9781587206641/samplepages/9781587206641.pdf>

Pre-Requisite Concepts

A solid understanding of all the concepts identified in the chapter is essential before proceeding into the course material!

- Hubs vs Switches wrt frame forwarding:
but note that hubs are still widely used in other technologies (Where??) and high-level network engineers often go to great lengths to convert switches into hubs!
- Managed (\$\$\$) vs unmanaged (\$) switches:
campus switches need to provide functionality for QoS, High Availability (HA), POE, specialized voice and WAP VLANs, enhanced DHCP, and security features.
- (Other topics --> you must read on your own!!)
- Ethernet frame format:
memorize this; we'll be extending it with VLAN (and MPLS) fields
- Basic switch operation (version 0.9)
 - **Need** to know difference between cut-through and store-and-forward
- (Other topics --> you must read on your own!!)
 - VLANs, STP, trunking, Link Aggregation, wire-speed forwarding

Frame Forwarding (Ver 0.9 = store-and-forward; "no VLANs")

1. Receive entire frame [input buffer]
2. Re-compute CRC
3. Discard frame if bad CRC; otherwise continue processing
4. Look in MAC address table for possible match [ignore VLANs for now]
 - if match, then select single egress port
 - else select flooding as egress method
5. Queue the frame on selected egress port(s) [output buffer(s)]