

Teaching Wireless Networks with GENI

why, and how

Fraida Fund
ffund@nyu.edu

19th GENI Engineering Conference



NYU

**POLYTECHNIC SCHOOL
OF ENGINEERING**

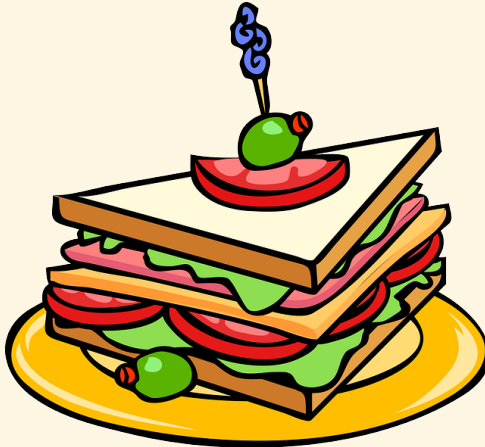
GENI WiMAX Classroom-as-a-Service

A **fully hosted** lab component to supplement classes in computer networks and wireless communications.

Tried and tested

Used with **5** student cohorts at **3** universities
(including over **180** students).

Educational philosophy



**Why include wireless in
your class?**

- ▶ The network is reliable.
- ▶ Latency is zero.
- ▶ Bandwidth is infinite.
- ▶ The network is secure.
- ▶ Topology doesn't change.
- ▶ There is one administrator.
- ▶ Transport cost is zero.
- ▶ The network is homogeneous.

- ▶ The world is flat.
- ▶ A radio's transmission area is circular.
- ▶ All radios have equal range.
- ▶ If I can hear you, you can hear me (symmetry).
- ▶ If I can hear you at all, I can hear you perfectly.
- ▶ Signal strength is a simple function of distance.
- ▶ The RF hardware is perfect.

Example

Must the same modulation and coding profile be used for **traffic from base station to mobile** as for traffic **from mobile to base station**? Explain your reasoning.

What's in the box?

Classroom-as-a-service

Offered as a **fully hosted** service

Menu

Module	Students
Introduction and Lab Orientation	159
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Mobility (Vertical Handover)	48
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RF Hardware	0

Your own course site

EE136 Spring 2014

FAQs

Updates

Grades

Schedule ▾

Lab Modules ▾

Forum

Log In/Out ▾

EE136 Spring 2014

This is the lab site for EE136, Computer Networks, at NYU Polytechnic School of Engineering in Spring 2014. In this lab, you'll run experiments to apply class concepts in a real wireless network setting.

Previous lab exercise

- Comments on how [Grades for Experiment Results](#) are calculated (in general)
- Answers to [Link Adaptation](#) -

Current lab exercise

- [QoS](#) (see [Schedule](#) of time slots)
- Due **Tuesday 3/11/2014, 11:59PM**
- Will be available starting **Wednesday 3/5 2014**

I have a question

- Check the [FAQs](#)
- Post it on the [Forum](#)

Your own course site

Wireless Communications

Home

About

Grades

Schedule ▾

Lab Modules ▾

Forum

Log In/Out ▾

CS445 Spring 2014

This is the site for CS445, Wireless Communications, at University of Thessaly department of Electrical and Computer Engineering in Spring 2014. In the lab of this course, you'll run experiments to apply class concepts in a real network setting.

What should I do first?

See the page 'About' to learn in detail about the course.

Next lab exercise

The next lab [Link Adaptation](#) will be on Friday 14/03/2014.

What should I don't forget?

The report of the lab [Introduction](#) should be sent attached with an e-mail to khoumas@gmail.com, before Friday 14/03/2014.



CMS access

The screenshot shows a CMS editor interface. At the top is a toolbar with various icons for text formatting (bold, italic, strikethrough, subscript, superscript, underline), lists, links, code, and alignment. Below the toolbar is a header area with the ID "#block-1_block.row.jumbotron". The main content area contains a section titled "EE136 Spring 2014" with a text block: "This is the lab site for [EE136](#), Computer Networks, at [NYU](#) Polytechnic School of Engineering in Spring 2014. In this lab, you'll run experiments to apply class concepts in a real wireless network setting." Below this is another header area with the ID "#block-2_block.row". The main content area is divided into three columns: "Previous lab exercise", "Current lab exercise", and "I have a question". Each column contains a list of links. At the bottom is a footer area with three buttons: "Save and Publish", "Save Draft", and "Return", along with a "View Live Page" link.

#block-1_block.row.jumbotron

EE136 Spring 2014

This is the lab site for [EE136](#), Computer Networks, at [NYU](#) Polytechnic School of Engineering in Spring 2014. In this lab, you'll run experiments to apply class concepts in a real wireless network setting.

#block-2_block.row

Previous lab exercise

- Comments on how [Grades for Experiment Results](#) are calculated (in general)
- Answers to [Link Adaptation - Experiment Results, Pre- and Post-Lab Question](#)
- Quiz explanation for [Link](#)

Current lab exercise

- [QoS](#) (see [Schedule](#) of time slots)
- Due **Tuesday 3/11/2014, 11:59PM**
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I have a question

- Check the [FAQs](#)
- Post it on the [Forum](#)

Save and Publish Save Draft Return View Live Page

Student account creation

Submit a **spreadsheet** with student names, emails, IDs, we create NYU WiMAX & iRODS accounts for them.

Live monitoring



Logged in



This many users are logged in.
Last updated at 14:53

Running



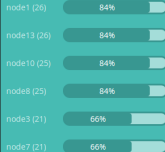
This many experiments are running.
Last updated at 14:53

Queued



This many experiments are waiting to run.
Last updated at 14:53

Resource Health



Successful Users

44

Users who successfully ran experiment, cumulative in time

18:45 19:00 19:15 19:30 19:45

Well done!

avaralis	18s ago
konstadel	41s ago
athgrigo	230s ago
alelefh	258s ago
gkalsoudis	341s ago
evevage	365s ago
evneradz	532s ago
grigoriou	553s ago
samaras	664s ago
hrhatzig	760s ago
hasahpal	770s ago
zervas	820s ago
nonas	973s ago
mmarkou	996s ago
koulalis	1079s ago

These are the last fifteen users to run a successful experiment.
Last updated at 14:53

Instant student feedback

QoS of Wireless Networks

Understanding Quality of Service

Network Support for QoS

Characteristics of Wireless

Networks

Lab Scenario

Pre-lab question

Run the experiment

Visualize in IRODS

Feedback survey

Post-lab question

Validate experiment results

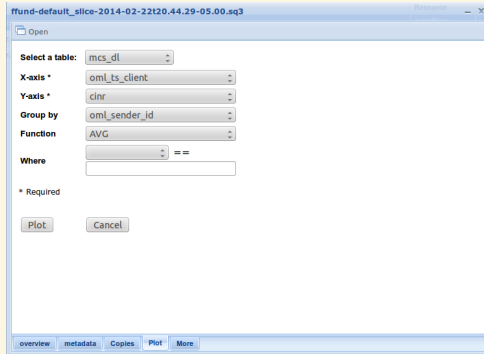
Quiz

Validate experiment results

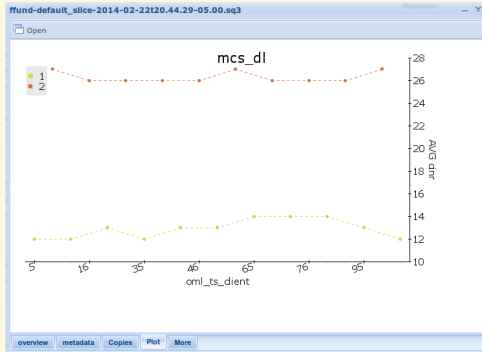
Your grade for this assessment is 100%.

Next: Quiz

Explore experiment results



Explore experiment results



Q&A forum

EE136 Spring 2014

Hello ffund (1,200 points) | My Updates | Logout

EE136 Spring 2014

Questions Unanswered Tags Users Ask a Question

Recent questions and answers

0
votes

1
answer

Quiz Question 3 help

answered 1 day ago by ffund (1,200 points)

lab3 quiz direct link mesh

0
votes

1
answer

Why is the answer to first question of the quiz part(a)?

answered Feb 27 by ffund (1,200 points)

0
votes

1
answer

Copy and paste to/from Putty [seen in feedback form]

answered Feb 27 by ffund (1,200 points)

putty

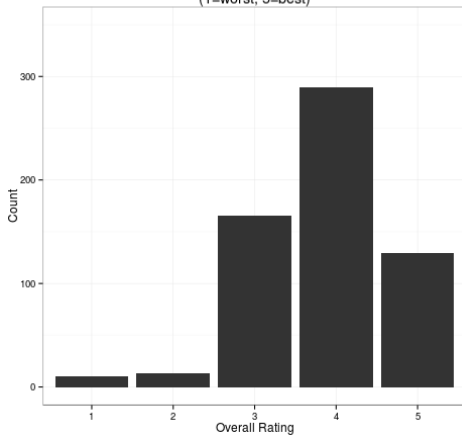
0
votes

1
answer

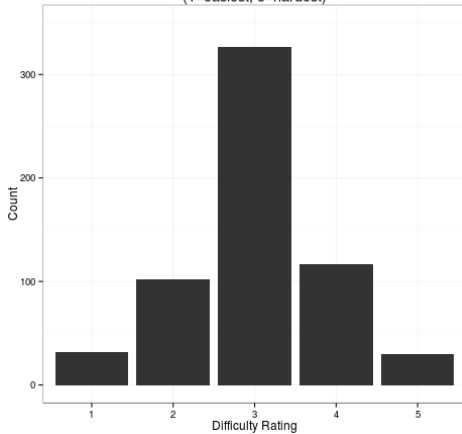
I don't understand what I got wrong in my Experiment Results [received via email]

Student feedback

How would you rate this lab overall?
(1=worst, 5=best)



How difficult was the lab exercise?
(1=easiest, 5=hardest)



"Very interesting to see with real data how a soft handover can be achieved via socket modification."

"Real time measurements give a better understanding of the wireless networks and how they work."

"The lab was very interesting since I had no experience with LINUX before ."

"I like that I am actually working with a real testbed and real cellular tech."

"I enjoyed being able to download and view the video upon lab completion."

GENI MOOC

Use GENI to educate the **Internet users**, not the
Internet creators.

No **programming** required.



FIND COURSES



GENI01: Internet and networking: a lab-based introduction *GENI*

YOU ARE REGISTERED FOR THIS COURSE GENI01

[VIEW COURSEWARE](#)



[overview](#)

[ABOUT THIS COURSE](#)



[Course Number](#)

GENI01