

Resilient and Survivable Networking

The University of Kansas EECS 983

Spring 2008

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<http://www.ittc.ku.edu/~jpgs/courses/rsnets>

Resilient and Survivable Networking

AE.1 Administrivia

AE.1 Administrivia

AE.1.1 Prerequisites and description

AE.1.2 Instructor

AE.1.3 Grading and student expectations

AE.2 Ethics and academic integrity

AE.3 Course outline

Resilient and Survivable Networking

AE.1.1 Prerequisites and Description

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AE.1.2 Instructor and GTA information

AE.1.3 Grading and student expectations

AE.2 Ethics and academic integrity

AE.3 Course outline

AE.4 Preliminaries

Course Information

High-Level Schedule

- Lecture: 246 Nichols – Lawrence West Campus
 - Tue. 18:40 – 21:30
 - door unlocked until class begins
 - call +1 508 944 3067 if you are late and need to be let in
- 22 Jan. – 13 May
 - midterm exam plus final project presentation
 - 18 Mar. spring break

Course Information

Cancellation and Rescheduling

- Cancellation due to weather
 - official closings unlikely
 - follow media announcements
 - if I can't make it
 - email to you by 15:00
- Rescheduling due to my travel
 - I try *very hard* to avoid rescheduling class
 - project meetings & conferences sometimes interfere
 - this is the cost of an instructor who is active in research
 - rescheduled lectures will be time to be negotiated

Resilient and Survivable Networking

EECS 983 Prerequisites

- You *must* have networking background at least one of:
 - KU EECS 882 Mobile Wireless Networks
 - www.ittc.ku.edu/~jpgs/courses/mwnets
 - significant experience
 - you must convince me you are comfortable with 882 material
 - talk to me after class if you intend to invoke this option

Resilient and Survivable Networking

EECS 983 Course Description

Graduate research seminar that provides an overview of the emerging field of resilient, survivable, disruption-tolerant, and challenged networks. These networks aim to remain operational and provide an acceptable level of service in the face of a number of challenges including: natural faults of network components; failures due to misconfiguration or operational errors; attacks against the network hardware, software, or protocol infrastructure; large-scale natural disasters; unpredictably long delay paths either due to length (e.g. satellite and interplanetary) or as a result of episodic connectivity; weak and episodic connectivity and asymmetry of wireless channels; high-mobility of nodes and subnetworks; unusual traffic load (e.g. flash crowds). Multi-level solutions that span all protocol layers, planes, and parts of the network will be systemically and systematically covered. In addition to lectures, students read and present summaries of research papers and execute a project.

Prerequisites: EECS 563 or EECS 780

Resilient and Survivable Networking

AE.1.1 Instructor and GTA Information

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Instructor Information

Background

- Dr. James P.G. Sterbenz
 - current positions
 - Associate Professor, KU Lawrence, US
 - Visiting Professor of Computing, Lancaster University, UK
 - past research and management positions
 - UMass, BBN Technologies, GTE Laboratories, IBM Research
 - academic background
 - D.Sc, Washington University in St. Louis, 1991
 - research interests
 - survivable and resilient networking
 - autonomic, programmable, and active networks
 - mobile wireless networking
 - high-speed networking and system architecture

Instructor Information

Office Hours

- Wed. 16:00 – 18:00
 - unless advised otherwise due to meetings or travel
 - 125U Regents Center
- Tue. 15:00 – 17:00
- Or by appointment
 - email or call to arrange in advance
 - call before dropping in unless already on campus
 - Wed: typically on Edwards campus in afternoon
 - MTTF: typically in Lawrence if not travelling
 - 209 Nichols: research office (frequently)
 - 3036 Eaton: teaching office (occasionally)

Instructor Information

Contact: Email

- Contact information
 - email: *jjpgs@eecs.ku.edu* *only*
 - begin subject with "EECS983 - "
 - email to other addresses will likely be misfiltered and *unread*
 - email generally checked daily
 - email is *unreliable*; retry if no reply within 48 hours
 - email with *meaningful* subject lines
 - bad
 - Subject: Hi!*
 - Subject: regarding class*
 - good
 - Subject: EECS882 - need help understanding random waypoint*

Electronic Mail

Netiquette: Formatting

- Email was originally text-only with no formatting
 - many people still like it that way!
 - some people still use text only clients
 - increasing use of PDAs
 - not all clients are MS Outlook
- Unless pre negotiated with the recipient:
 - use plain text with no formatting
 - some email clients have formatting on by default
 - some misconfigured (MS-Exchange) servers format anyway
 - do not send email as HTML
 - do not embed images

Electronic Mail

Netiquette: Content and Attachments

- Content issues
 - use meaningful subject lines
 - spellcheck (most modern clients do this)
 - *think* before you send
- Configure email client with your *name* in ISO-Latin
 - *Ima K.U. Student* <ima.k.u.student@ku.edu>
- Simple emails should not be sent as attachments
 - e.g. MS-Word document containing “where are you now?”
- Do not send very large attachments unless
 - receiver is able to handle them (broadband access)
 - small enough to pass relay & server limits (typ. <10 MB)

Electronic Mail

Netiquette: Professionalism

- Email is like conversation, writing, and attire
 - adapt style to context
 - academic and professional more formal than with friends
- Style
 - punctuate and spell check
 - judicious jargon and emoticons only to someone you know
 - plain text, no embedded images
- Avoid free email accounts
 - look unprofessional
 - frequently auto-append advertisements
 - construct meaningful signature no longer than 4 lines
- Proofread and *think before you send!*

Electronic Mail

Netiquette: Professionalism Examples

To: James Sterbenz <jpgs@eecs.ku.edu>
 From: Ima <cool_dude@stupidmail.com>
 Subject: need a job!!!

*i'm new at KU and really like it :-)
 i'm interested in **everything** and
 am bombing this email to all KU
 professors. i've stopped by your offic
 in Eaton but your never there!!! :-P
 do you even have office hours
 dude? LOL! Just tell me when I can
 dropby too learn what you do **ru**
there????!!*

*cu later,
 ima*

Get your free email at [Stupidmail.com!](http://Stupidmail.com)

Eat at Joe's: 1234 Mass. Lawrence, KS

To: James Sterbenz <jpgs@eecs.ku.edu>
 From: Ima Student <student@eecs.ku.edu>
 Subject: Interest in ResiliNets group

Dear Professor Sterbenz,

I am a new M.S. student in the EECS department with interests in networking. I have looked at your Web pages and read the SUMOWIN paper. I am very interested in this research and will come to the next ResiliNets group meeting on Friday. I would like to discuss the possibility of you becoming my advisor and want to understand if there are any funding opportunities.

Sincerely,
 Ima Student

 Ima Student EECS, Univ. of Kansas
 student@eecs.ku.edu +1 785 555 1212

Instructor Information

Contact: Phone

- Contact information
 - phone
 - Edwards office: +1 913 897 8538
 - Lawrence Nichols office: +1 785 864 7890
 - Lawrence Eaton office: +1 785 864 8846
 - only if *urgent* (consider Δ time) +1 508 944 3067
 - don't call me at home unless *emergency*
 - skype: *jpgsterbenz*
 - ok to use chat *judiciously* when email not appropriate
 - send meaningful introduction message!
 - don't use voice unless prearranged by chat
 - I frequently am not in a position to use headset/microphone
 - Web
 - <http://www.ittc.ku.edu/~jpgs>

Student Information

Contact and Background

- Brief Introductions around the room
- Photos to help me learn your names
- Roster information to be emailed from Web template
 - full name, nickname
 - email for class information list
 - preferred and mandatory *eeecs.ku.edu* address
 - phone numbers will only be used for urgent matters
 - prerequisite fulfillment: school, course, year, book
 - degree (BS, MS, PhD), major (IT, CS, CoE, EE), focus area, option if MS (course, project, thesis), advisor
 - personal machine for simulation labs an project?

Course Information

Correspondence to Class

- Course information and notes
 - <http://www.ittc.ku.edu/~jpgs/courses/rsnets>
 - notes for each lecture will be posted in PDF
 - link typically emailed the afternoon before class
 - you may not share the notes with anyone
 - navigate to subpage for Spring 2008 specific information
 - schedule and deadlines
 - <http://www.ittc.ku.edu/~jpgs/courses>
 - generic information
 - check *regularly* for updates
 - readings and assignments in schedule table in sub-page
 - “last updated” on bottom of page

Course Information

Correspondence to Class

- Class email list
 - all students are *required* by EECS to use *eeecs.ku.edu* email
 - I'm willing to use other email addresses...
 - ...but only if they are relatively reliable
 - many free email accounts are not!
 - if there are problems I'll change your entry to a *.ku.edu* address
 - check email regularly
 - check email every afternoon before class
- Telephone
 - I'll only phone you if *urgent*

Resilient and Survivable Networking

AE.1.3 Grading and Student Expectations

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Course Information

Textbooks

- Required textbook
 - none
- Supplementary textbooks and monographs
 - provide alternative, in-depth, or background coverage
 - most will be on reserve in Spahr library
 - hopefully also on reserve in Edwards library later

Course Information

Reading and Discussions

- Required readings are essential and *mandatory*
 - 20% of the grade in this class is discussion of readings
 - this class is an interactive seminar, not a lecture series
- Reading *must* be done *before* corresponding class
 - you are doomed if you get behind on the reading
 - you are responsible for *all* required reading
 - may be on exam even if not covered in lecture!
 - significant part of your class participation grade

Course Information

Paper Presentations and Discussion Leadership

- Each student will chose a past failure scenario
 - research and present to class
- Each student will present background papers
 - relevant to chosen project topic

Course Information

Grades

- Grades: modified curve grouped by mode
 - based only on merit; *not* on:
 - employer reimbursement or lack thereof
 - immigration status or potential visa invalidation
 - probationary status at KU
 - qualitative meaning
 - A: excellent paper, contribution, and exam score
 - B: acceptable paper, contribution, and exam score
this is the basic expectation for a graduate student
 - C: slacking but know basic material and marginal paper
 - D: very poor performance on exam or paper
 - F: nonperformance on exams or paper
academic misconduct regardless of other grades

Course Information

Grade Contribution

- Relative grade contribution
 - 25% midterm exam
 - 20% participation in discussions
 - 20% paper presentation and discussion leadership
 - 35% project and report
 - maximum credit for *publishable* paper

Course Information

Exam Characteristics

- Closed book, no electronic devices
 - notify me *in advance* if you know you must miss
 - you will probably have to take the exam in advance
- Exams test *understanding of concepts*
 - not memorisation of facts that could be looked up
 - not focused on the ability to solve problems
 - this will be new to some of you!
- More exam information on
<http://www.ittc.ku.edu/~jpgs/courses/exams.html>

Course Information

Exam Questions

- Exams consist of two types of questions
 - sufficient space given to properly and fully answer
- Short answer example (several per page):
 - example question:
Compare the functionality of the link and transport layers.
- Long answer example (one per page):
 - example exam question:
Explain the difference between proactive and reactive MANET routing protocols. Explain the relative advantages of each one to the mobility of nodes. Name an example of each protocol.

Course Information

Exam Answers

- Answers must legibly fit in space provided
 - sufficient space given to properly and fully answer
 - be brief; points will be *deducted* for irrelevant information
 - and you will have a hard time finishing the exam
 - writing on back of page & deep into margins will be ignored

- Example question:

Compare the functionality of the link and transport layers

- example correct answer (1 minute to write):

Both the link and transport layer transfer data; the link layer hop-by-hop and the transport layer end-to-end.

- example poor answer (10 minutes to write):

The link layer is layer 2 in the OSI model, shown in the figure. Examples of link layer protocols include Ethernet, 802.11, SONET, and HDLC. 802.11 was developed in as a replacement for Ethernet, and thus has similar frame structure, shown in Figure 2. Note that 802.11 has more MAC address fields than Ethernet. The reason for the additional address fields has to do with the operation of the 802.11 MAC. Actually I really don't know the answer to this question, but I did memorise a bunch of stuff on some of these protocols, so I hope that if I write enough that I will get some credit for this question and that if I bomb you with information you will

Course Information

Term Project and Paper

- 35% of grade based on term project and report
- Purpose and scope:
 - research area of resilient networking in depth
 - technical in nature
 - should lead to paper that can be submitted for publication
 - may lead to MS thesis or PhD dissertation
 - will likely use an ns-2 simulation
 - alternative proposals will be entertained
 - gain technical writing and presentation experience
- More information on term projects later in class

Course Information

Project Schedule

- Tentative schedule
 - presentations 6, 13 May
 - paper due 13 May

Course Information

Sources of Literature: Library

- The Library
 - big building with books and paper journals: *use it!*
- Physically browsing is a wonderful way to brainstorm
 - Spahr Engineering Lib. TK numbers most relevant
 - Anschutz (science) Lib. QA and QC numbers most relevant
 - Edwards Library very small collection
- Online resources at www.ku.edu/libraries
 - selected journals
 - access to archived books and journals
 - interlibrary loan

<http://www.ittc.ku.edu/~jpgs/courses/source-cite.html>

Course Information

Sources of Literature: Web

- The Web
 - source for journal papers
 - ACM Digital Library, IEEE (subscription through library)
 - individual and project Web pages
 - source for information on research projects
 - source for other information
 - wikipedia: increadily useful as *launching point* to other work
 - rarely appropriate to cite wikipedia pages
 - non-refereed reports and information
 - compare to a street corner bulletin board: *use with care*
 - use Web citations *very* judiciously
 - reports with many URL refs will not get an acceptable grade!

Course Information

Class Participation

- 40% of grade is based on class participation
 - discussion of required readings
 - paper presentations
 - insightful questions to paper presentation and lectures
 - brownie points
 - find bug in lecture notes, good suggestion
 - email reminder with subject: "EECS983 - Brownie Point"
- This *is* an interactive seminar
 - everyone must participate in discussion
- Reminder: reading *before* class essential

Course Information

Etiquette

- Try to be on time
 - I understand that we are all commuting, but...
 - consistent late arrivals are disruptive
- No audible mobile phone or pagers
 - if it doesn't vibrate, turn it off!
- University does not tolerate class disruption

Resilient and Survivable Networking

AE.2 Ethics and Academic Integrity

AE.1 Administrivia

AE.2 Ethics and academic integrity

AE.3 Course outline

Academic Integrity and Plagiarism

Reading the Riot Act

- Apologies to those that already know this
 - ... especially who've heard it from me before
- Opportunity to learn for those who:
 - are inexperienced in writing
 - come from an environment or culture of tolerance
- Warning of the consequences
 - ignorance will not be an excuse
 - ask me if you have *any* question about this
- Applies to
 - copying homework and lab exercises
 - cheating on exams
 - plagiarism on term paper and presentation

Academic Integrity and Plagiarism

Referencing and Citations

- All sources *must* be properly referenced and cited
 - authors, “paper name”, *journal*, date, publisher, page–range
 - also URL if from obscure source (e.g. university tech reports)
 - see course Web page or for examples

James P.G. Sterbenz, Rajesh Krishnan, *et al.*,
 “Survivable Mobile Wireless Networks: Issues, Challenges, and Research Directions”,
Proceedings of the ACM Wireless Security Workshop (WiSE) 2002 at MobiCom,
 Atlanta GA, Sep. 2002, pp. 31–40.

- Cite whenever
 - work is related or ideas are used
 - text is quoted or paraphrased
 - diagrams are reproduced or incorporated (even if redrawn)

Academic Integrity and Plagiarism

Proper Quoting and Paraphrasing

- Quoting text or paraphrasing
 - “quotation marks” for sentence or less
 - blockquote for multiple sentences
- Beware of read-then-write in two windows
 - *never ever* cut-and-paste
 - take intermediate notes from which you write

Academic Integrity and Plagiarism

Excessive Quoting and Paraphrasing

- Quoting is *rarely* needed
 - example: quoting or paraphrasing definition or principle
- Sequence of quotes *doesn't* show understanding
 - not a shortcut to English writing skills
 - better to be in your *own* imperfect English
 - papers with excessive quotes will not receive decent grade
 - even if properly quoted

Academic Integrity and Plagiarism

Detection and Sanctions

- Plagiarism is remarkably easy for me to detect
 - inconsistent writing styles and language use
 - technical depth beyond the supposed author
 - inconsistent terminology
- Tools: Web makes both plagiarism & detection easier
 - google on suspicious phrases
 - turnitin automates and correlates searches; goes beyond Web
- Plagiarism will result in **F** for *course*
 - and possible further sanctions
 - it is highly unlikely that you will get away with it!
 - but students still try every semester; *you have been warned*

Academic Integrity and Plagiarism

Academic Integrity Quiz

- Homework this week: read
<http://www.ittc.ku.edu/~jpgs/courses/academic-integrity.html>
<http://www.ittc.ku.edu/~jpgs/courses/source-cite.html>
- You *must understand* this material
 - ask me if you have *any* question
 - goal is for new students to learn
- Next week: academic integrity quiz

Resilient and Survivable Networking

AE.3 Course Outline

AE.1 Administrivia

AE.2 Ethics and academic integrity

AE.3 Course outline

- I. Background and past failures
- II. Related disciplines
- III. Research topics