CS575 Advanced Local Area Networks

Syllabus

Instructor: Alan Wu

Objectives

The sophistication of data communications and computer networks is growing rapidly. New technologies, standards, and systems are emerging each day to meet the requirements of new applications. It is essential for computer engineers and technical professionals to develop a solid foundation as well as state-of-the-art expertise in data communications and computer networks in order to face these challenges.

This course provides an in-depth understanding of the technologies and architecture of Local and Metropolitan Area networks. The network design approaches to meet specific communications requirements, the implementation of these network technologies to the various application environments, as well as the emerging technologies and standards of the future will be discussed extensively in class. Upon completion of this 3-credit course, you should learn:

- Why do we need LANs, MANs, and WANs and what is the difference between them
- Basic LAN architecture and the interconnection between LANs, WANs, and the Internet
- The difference between star, ring, bus and tree LAN topologies and how to determine which topology to choose in LAN design and implementation
- Review of different transmission media such as twisted pair wires, coaxial cables, and fiber optic cables and how to determine which media to choose in LAN design and implementation
- Review of the layered network architecture concept, the difference between the OSI Reference Model, TCP/IP protocol suite, and the IEEE 802 protocol layers
- What is Ethernet and what is the difference between 10Base5, 10Base2, and 10BaseT standards and technologies
- LAN interconnection using bridges and Spanning tree protocol
- Ethernet switches, Fast Ethernet, and the emerging technologies of Gigabit Ethernet, 10Gigabit Ethernet, and how to implement these technologies in different application environments
- The difference between FDDI and IEEE 802.5 token ring LAN
- What is Virtual LAN, why is it needed, and how to construct different VLANs
- What is the emerging technology of ATM and how does it support real-time and multimedia applications
- What is the difference between ATM and Gigabit Ethernet and how to determine which technology to implement in a variety of real-time and non-real-time application environments
- The latest internetworking technologies including routers, and TCP/IP protocols

Methodology and Course Format

Classes will be held in lecturing format including class discussions. Visual aid will be used for the presentation. A minimum of 30 contact hours is required for the semester. Some class materials are put on a Web site for you to access. This Web site is setup at URL http://briefcase.yahoo.com/riviernh at this time. I need your Yahoo ID to allow you to access the files. You need to get a Yahoo ID. It’s free.

Evaluation

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>35%</td>
</tr>
<tr>
<td>Projects/Research Papers/Study Reports/Assignments</td>
<td>35%</td>
</tr>
<tr>
<td>Exam on Research Papers/Assignments</td>
<td>5%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

References:

4. Seifert: Gigabit Ethernet 1998 Addison Wesley
7. Smith: Virtual LANs: Construction, Operation, Utilization 1997
12. Articles Published in IEEE and other Technical Journals as well as on the Web sites

Partial List of Excellent Reference Sources for Classes and Assignments
- IEEE Communications Magazine (technical journal)
- IEEE Journal on Selected Areas in Communications (technical journal)
- IEEE Network (technical journal)
- IEEE Spectrum (technical journal)
- IEEE Transactions on Communications (technical journal)
- Bell System Technical Journal (technical journal)
- Lightwave, The Journal of Fiber Optics (technical journal)
- Network Magazine (trade magazine -- OK for technical reference)
- Telecommunications (trade magazine -- OK for technical reference)
- Byte (trade magazine -- OK for technical reference)
- Network World (weekly newspaper -- not for technical reference)

Course Requirements

Students are required to pass all exams and complete all assignments. Exams will be based on the textbooks, lecture material, and handouts. All exams will be comprehensive (questions and answers), closed book and closed notes, and will be conducted in-class. See "Assignments" for detailed assignment requirements. Grades for all exams and assignments will not be determined by curves. Letter grades submitted to the Registrar’s Office will be based on the Rivier College grading system. The conversion from numerical grade to letter grade will be based on the following table:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Honor Points</th>
<th>Numerical Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
<td>92 – 100</td>
</tr>
<tr>
<td>AB</td>
<td>3.5</td>
<td>84 - 91</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>76 - 83</td>
</tr>
<tr>
<td>BC</td>
<td>2.5</td>
<td>68 - 75</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>60 - 67</td>
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<tr>
<td>F</td>
<td>0.0</td>
<td>Below 60</td>
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Assignment

Your assignment is to write a study report or a research paper. The purpose of writing the report/paper is for you to gain an in-depth understanding of a particular topic that you are interested, or the technical knowledge that you learned will benefit you for your work or for your career development. It also gives you an opportunity to learn how to do independent research work as well as how to write a technical report/paper.

The potential topics for your report/paper are listed as follows:
- Use Fast and Gigabit Ethernet Technologies to build an Enterprise Network
  (Discuss Fast and Gigabit Ethernet technologies based on a survey of current vendor product information (e.g., Foundry, Cisco, and Extreme), compare their features and capabilities for the support of different applications, and how to use their Fast and Gigabit Ethernet technologies to build an Enterprise network)
- Gigabit Ethernet and 10Gigabit Ethernet Technologies for the integration of LAN/MAN/WAN
- ATM versus Gigabit Ethernet technologies
  - ATM, QoS, and multimedia applications
  - ATM traffic management and QoS
  - Gigabit Ethernet, QoS, and multimedia applications
  - ATM and LAN Emulation
  - Wireless LAN Technologies
  - Fiber Optic Technologies and High-speed LAN/MAN
The paper should consist of about 12 typed pages (single space with font size 12) plus illustrations, bibliography, and appendices (if necessary). A minimum of eight technical articles and/or books must be used as sources for your paper. Thirty percent of your reference material should be technical articles published within the past two years. The quality of references is an important part in deciding what grade you will get. Other universities may have similar topics assigned to their students as research paper assignments. Your paper will be rejected if these papers are used as your references.

You **must** submit a one-page outline and discuss it with me before you start writing the paper or start your project. If you need advice regarding the topic to select, the format of the paper, the contents of the paper, or reference material, you should discuss it with me. Discussing the same with classmates is also encouraged. The outline discussion process is very important, because, only through this process, I may help you to organize your paper, advise you on the contents of the paper, advise you on where to find references, and guide you to the right direction. Since training you to do independent research is one of the reasons for this assignment, you need to try your own effort first before you ask for any help.

There is no special format for the outline. Since you need to show me how your paper will be organized and what will be discussed in your paper, it will be easier for you to format your outline similar to the table of contents of a book. The outline will include the title of the paper, number of sections in the paper, the subtitle for each section, a few lines describing the what will be discussed in each section, and references found so far to be used for writing your paper.

Since this is a research paper written by you, you must understand everything you wrote in the paper. Since we don’t have time for every one of you to present your paper to the class and subject to my oral test, there will be a written test to your paper. The written test will be taken at the same time of your final exam.

**Class Schedule**

<table>
<thead>
<tr>
<th>SESSION</th>
<th>DATE</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9/7</td>
<td>Introduction to LAN Concepts and Review of LAN Transmission Media (Ch. 1, and Sec. 2.2)</td>
</tr>
<tr>
<td>2</td>
<td>9/14</td>
<td>LAN Topologies, Network Protocols, MAC Layer and LLC Layer Protocols (Sec. 4.1, 4.2, 4.4, Ch. 5 and Ch. 6)</td>
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<tr>
<td>4</td>
<td>9/28</td>
<td>LAN Interconnection and Bridge Protocols, Ethernet Switches, and Fast Ethernet (Sec. 5.4, 12.1, 12.2, 12.3, and Chapter 7) research assignment outline</td>
</tr>
<tr>
<td>6</td>
<td>10/19</td>
<td>Assignment outline due, Token Ring LAN and FDDI (Ch. 8)</td>
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<tr>
<td>7</td>
<td>10/26</td>
<td>Virtual LAN, ATM Technology (Ch. 11)</td>
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<td>8</td>
<td>11/2</td>
<td>ATM LAN and LAN Emulation (Ch. 11)</td>
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<td>11/9</td>
<td>No Class. Finish writing research paper Protocols over LAN (Ch. 13)</td>
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<td></td>
<td>11/23</td>
<td>No Class. Study for final exam and research paper written test</td>
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<td></td>
<td>11/30</td>
<td>No Class. Thanksgiving Holiday</td>
</tr>
<tr>
<td>10</td>
<td>12/7</td>
<td>Final exam (35%) and research paper written test (5%)</td>
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**Notes:**

1. Class will meet for 3 hours each session for a total of 10 sessions (30 contact hours)
2. Reading Assignment is assigned each week. Students are required to read related topics in the textbook before each class.