Two main objectives

- **Future Networking Challenges**
  - What are the problems with existing networking and the Internet?
  - New/future applications?
  - Are we ready?
  - Challenges and issues

- **Research – Creative Thinking and Motivation**
  - Reading technical articles
  - Writing technical articles
  - Making technical presentations
Networking Challenges and Issues
Computing Devices and Networks

- Powerful PCs
- Cellular phones
  - Multi-functional devices
- Multi-core architectures
- Sensors and RFIDs
- MEMS and NEMS

- The Internet
- Cellular networks
- WiFi
- Wireless meshes
- Bluetooth, UWB, Zigbee
Applications

- WWW
- Cellular Telephony
- Amazon
- Travelocity
- Facebook
- Tweeter
- RSS
- ...

- Any where anytime
- Heterogeneous
- Mobile, pervasive
- Dynamic
- Uneven
Fading Distinctions

- **Servers and clients**
  - Distributed systems, P2P systems
  - Cost and time

- **Producers and consumers of information**
  - Users are producers as well as consumers of information
    - User with a cell phone camera
    - SMS, Blogs, Tweets, ..

- **Service providers and consumers**
  - Resources on user devices can be shared
    - Complementary resources

- **Resourceful and resource-poor entities**
  - Servers, desktops, laptops, mobile phones
  - Grid computing
  - Cyber foraging
New Paradigms

- Pervasive computing
  - *Smart environments*
- Embedded/Ubiquitous devices
- Sensor Systems
- RFIDs – active and passive
- MEMS and NEMS
- Software agents and services
  - *Proactive, Interactive, reactive*
- Coexistence
  - *LANs, WANs, Cellular, PANs, Radio*
Pervasive Computing and the Internet

- Many devices per person
  - Hundred to a thousand to one!!
  - Cell phones, PCs, PDAs, heart monitors, brain monitors...
  - Sensors
  - Embedded devices
  - RFIDs

- Move to service oriented architectures
  - Provide services
  - Access services
    - Not necessarily computers or devices

- Boundary between physical and virtual entities
  - Agents
  - Network and agent protocols
Push and Pull - Flow

- Water
- Electricity
- Gas
- Newspapers
- Radio Broadcast
- TV Broadcast
- SPAM
- Pop-up

- Human Communication
- Trains
- Road and air traffic
- telephony
- Supply/Demand flow
- E-mail
- FTP
- HTTP
The Debate [Anderson et al, IEEE Comp, April 2005]

- Internet Purists
  - Single Universal protocol – IP
  - Overlays are necessary evils
  - Architecture will remain in place for a long time – why change something that has been successful?

- Pluralists
  - IP is one of the components
  - Evolving architecture – union of existing overlays and protocols
  - Ability to support multiple coexisting overlays and protocols

- Providing flexibility – a challenge?

Hybrid Approach – centralized high speed architecture at the core and flexible (patch ups) at the edge.
Packet vs. Circuit

- Power, water, gas
- Telephony
- Internet
- Efficiency
- Resource utilization
- Services

Reachability
Heterogeneity
Reliability
Timeliness
Internet Protocol

- **Future users and applications**
  - *Demand predictability*
    - Availability of service
    - Timely delivery of data
  - *IP is not optimized to provide either?*

- **Best-effort, non-mission critical and non-realtime data communications**

- **Packet switching makes efficient use of bandwidth**
  - *Link utilization of core links of the Internet - 3 to 20%*
  - *Link utilization of long distance phone lines - 33%*
    - [Odlyzko and Coffman2001]
      - Power line efficiency -60-80%
Problems

- Existing mechanisms --?
  - Heterogeneity
  - Invisibility
  - Proactivity
  - Context-awareness
  - Security, Privacy
  - QoS
  - Energy
Facts

- Internet population - 2 billion
- PCs/servers – 1 Billion?
- Cell phone population – more than 3 billion
  - Increasing a much faster rate than Internet users
- Sensors /RFIDs – Trillions?
Research – Creative Thinking and Motivation
Research

- **What?**
  - *In-depth understanding of existing problems and possible solutions*
  - *Solutions to an existing problem*

- **Why?**
  - *New applications*
  - *Improve .... E.g., health*
  - *Business ... $\$*
  - *Degrees*

- **How?**
  - *Creative, motivated, persevere*
How?

- Understand ...
  - State of the art
    - Technologies
    - Ongoing work
- Recognize problems and solutions
  - Others’ contributions
  - Unresolved (useful) problems
  - Need to solve problems
  - Solutions that are already available
- Innovate
  - New solutions
Literature review

- Read research articles in related areas
  - Quality, Recent,
    - There is a lot of junk out there
    - Magazine articles
      - IEEE Computer, Communications, Internet, Pervasive Computing, Multimedia
    - Conference articles
      - ACMs SIGCOMM, Infocomm, Mobicom, Sensys,
      - IEEE PerCom, P2P, IPSN
    - Transactions
      - ACM/IEEE Networks, TMC,
Course Prerequisites

- CSE5311 Design and Analysis of Algorithms
- CSE5306 Distributed Systems
- CSE5344 Computer Networks I.
- Motivated
Course Information

- **Instructor:**
  - Mohan Kumar
  - 333 NH
  - Email: mkumar@uta.edu
  - Phone: (817) 272-3610

- **Class:**
  - Mon/Wed 4:00 to 5:20 PM
  - 311 WH

- **Office Hours:**
  - Mon/Wed - 2:30 to 4:00 PM.

- **Course site:**
  - [http://crystal.uta.edu/~kumar/cse6349_09FLSTAN](http://crystal.uta.edu/~kumar/cse6349_09FLSTAN)

- **GTA:** TBA
Papers

Literature Survey

- Be focussed
  - IEEE, ACM, Elsevier and Wiley …
  - IEEEexplore, ACM Digital Library, Science Direct, scholar.google.com

- Visit only reputed sites – universities, research labs
  - Google is not always good,

- Read, title, abstract, intro/conclusion and then paper

- Identify what is of interest,
  - Critical reading, fast reading
Your Paper

- Writing a story
- Sell your idea
- Keep the reader interested
- State your problems and solutions upfront
- Do not claim too much in the abs and intro
- Demonstrate the validity of your solutions
General Problems

- Citations and references
- References, Bibliography
- Contributions of authors of papers,
  - Be clear about your contribution
  - Acknowledge others’ work
    - Liberal
  - Criticism
    - Subtle, do not use harsh words
    - Do not criticize for the sake of criticizing
      - You should know what solution is
General

- **Writing and Organization**
  - *In general* good, but needs lot of improvement
  - *Focus*
  - *Long sentences*
  - *Short paras*
  - *Maths*
  - *Spelling, Grammar*
  - *its --- it’s*
  - *Use of ‘the’*
General

- Simple and clear presentation
  - Complex problem
- Reader’s point of view
  - Interest, flow, nontrivial
- Sell your product but don’t go overboard
  - Introduction, Conclusion
  - Not everywhere
General

- Flow from Section to Section
- Flow from para to para
- Introduction – intro to work as well as rest of the paper
Technical

- State the problem/issue upfront
- Abstract
  - Should be intelligible to a CSE person
- Background – clearly differentiate your work with those of others.
  - Here, differentiate between work A and Work B.
Assessment

- Presentations and Discussions: 30%
- Debate: 30%
- Group Project: 40%
Presentations and Discussions

- 8-10 Research Papers will be assigned to the class.
- Each student will be required to complete a thorough review, evaluate and critique at least 4 of these papers.
- Students will be given a chance to give their preference, but the assignment of papers will be made by the instructor.
- The 10 research papers will be posted on the first day of classes.
- Paper assignments will be completed by August 31, 2009.
Each Paper presentation

- **Two Presenters**
  - Read the paper (and related material) thoroughly
  - Jointly prepare PPT slides and a report
  - Present the paper on the scheduled day
  - Submit the report at most two weeks after the presentation

- **Critic**
  - Reads the paper (and related material) thoroughly
  - Identify flaws in the work reported
  - Must be prepared with several pertinent questions

- **Scribe**
  - Reads the paper (and related material) thoroughly
  - Scribes the proceedings and submits report at most one week after the presentation
Presentation and Report

- What is the problem?
- Background to the problem
  - Example scenario if possible
- Available solutions to the problem
- What is unique about the authors' solution/methods
  - Main ideas, concepts
- Methodologies used
- Results reported
- Critical evaluation of the work reported in the paper
- Presentation is for 50 minutes, followed by 20 minutes questions
Additions to the Report

- Incorporate responses to questions raised by the critique and the audience
- The report should be 6-8 pages.
- More instructions will be provided
Critic

- Evaluate work presented critically
- Read background material
- Read papers with alternative solutions
- Prepare appropriate questions
- Critique objectively
Scribe

- Must have good understanding of the topic of discussion
- Record proceedings
- Prepare a comprehensive report
  - The topic of discussion and its importance
  - Presentation summary
  - Objective summary of questions and responses
    - Note: this is a record of the opinion of the entire class, not your own.
Audience

- Browse through the paper before hand
- Prepare questions
- Ask questions
- Grade the presenters objectively
- Justify your grade
  - *Grading sheet will be provided*
  - *All students except the 2 presenters, the critic and the scribe*
  - *You have to be present*
  - *You will be grading the presenters*
    - *your grade reports will be graded too.*
Grading

- Presentation and Report (60 %)
- Reports from classmates (20 %)
- Reports for others’ presentations (20%)
Debate

- A topic of current interest
- 2 teams (for and against)
  - 3-4 members per team
Project

- **Group projects**
  - 3-4 members per team

- **Simulations**
  - NS2

- **Implementations**
  - PDAs/Sensors