Agenda

- Problem definitions
- Announcement, issues
- Directions and more logistics.
Problem Definition

• I want to:
  – build a widget
  – explore gizmos
  – program a thingamabob
  – design a doohickey
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• Widgets are too expensive for everyday users
• Thingamabobs use too much power to last a day
• Doohickeys are too large to carry in your pocket
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• Focus on user/customer needs:
  Functions, Size, Performance, Power, Cost
This Year’s Students’ Problem Statements

- Time management with peer group coordination
- Fair management of user time on shared computers
- Music playlist generation that is synced to different types of activities
- How to extend Moore’s Law beyond the apparent impending limits
- Extending mobile battery life, particularly with screens that hog power
- Means for better tracking of underground utility locations
Prior Years’ Students’ Problem Statements

- Finding out waiting time at a variety of restaurants
- Sharing web page settings (tabs) between computers
- More USB ports for laptops and USB ports that actually are plug-and-play
- Easier way to securely lock and unlock portable devices without passwords
- System for better recycling compliance (with incentives for turning in recyclables)
- Robo-maid (or at least Robo-mom): something to pick up after student or remind them that their room is a mess
- Traffic lights that actually respond to the flow of traffic
- A method to quickly store an idea for a song (e.g., wireless interface from guitar to computer)
Prior Years’ Students’ Problem Statements

• A way to power/recharge portable devices without wires/chargers
  – Or at least, a universal standard for charging interfaces
• A better way to secure/protect cars on campus, personal property in dorm
• A way to fold clothes/put them away (hire a maid?)
• A system to suggest what to eat based on what is on-hand
  – and keeps track of what food will be spoiled soon
• A smart parking system: where is nearby spot? what are restrictions?
• A single unified messaging platform for emails, calls, etc. to track responses needed (See Prof. Robbie Cohen in Howe School – she worked on this…)
• Simple inexpensive “people finder” for use in disasters (e.g., earthquakes)
• Better access to media stored in the Cloud while mobile (e.g., in car)
• Improved remote controls in multiple TV/entertainment system household built off existing remotes, rather than “universal” remote
• System to improve communications between nurses
• Headlight glare reduction techniques
• Repetitive manual completion of paper forms (e.g. at doctor) is tedious
• A means to stream and view digital media (e.g., TV and movies) over the internet
• A better way to create cybernetic arms and muscles (for the disabled, I assume)
• indoor GPS
Prior Years’ Students’ Problem Statements

• TV/entertainment system control without a remote (how about an iPhone app?)
• Early illness diagnosis before it gets serious
• A way to save a link to something found on-line to be retrieved later (not a bookmark)
• Better matchups between incoming college students and employers to help guide career/course choices
• Energy savings devices that turn themselves off when not in use
• A universal security token to replace keys, ID cards, passwords, lock combinations, etc.
• Improved tuning techniques for musical instruments (smaller than professional devices, more reliable than handheld)
• A means of synchronizing data and applications across multiple computers
• Flexible, reconfigurable aesthetically pleasing power distribution is large rooms
• A way of knowing in advance what the service time will be at a restaurant (or other service provider)
• Remote access to a laptop at various monitors
• Energy savings through smart houses/robots to track usage
• Method of tracking and controlling lighting through the house
• Method to organize and retrieve loose sets of notes (by day, topic, etc.)
Prior Years’ Students’ Problem Statements

• Cars that drive at low speeds in traffic automatically
• Means to call 911 automatically when a patient goes into cardiac arrest
• Means to monitor and control energy usage remotely
• Method to stir pot and maintain temperature over period of time
• A better user interface to control ancillary automobile functions (i.e., distractions)
• A digital universal key (to physical locks)
Prior Years’ Students’ Problem Statements

- A way to understand people speaking in other languages (in person)
- Expand eating habits to include friends’ preferences
- A method to save/monitor cell phone battery life
- More intelligent control of traffic lights
- Low-light display in vehicles, heads-up instrument display
- Easier way to exchange personal contact information
- A means of providing natural light (including on the side of building where there is no sunlight)
- A means of finding others in a group during crowded events
- A method of alerting user to how long they have been in shower
- A way to make social networks (including email) more secure/private
- A way to power portable devices while off the grid
- Affordable (networking) infrastructure for rural areas/3rd world countries
- Easier means to monitor carbohydrate consumption for children with Type 1 Diabetes
- Sustainable housing for victims of natural disaster
- Better card swipe systems (better access control systems)
- Underground wireless access
- A means of identifying what language a group of people are speaking to allow communications
- Less expensive/more flexible wireless communications system (particular for amateur radio use)
Prior Years’ Students’ Problem Statements

• “Eyes behind their head” for soldiers at the rear of a group
• Medication organization/reminder system for senior citizens
• Secure, digital wallet with all important information, resources readily available
• Energy efficient/low maintenance escalators
• Efficient method of converting physical book to electronic format
• Secure computer networking for the masses
• A remote/electronic pet sitter (watching, feeding, letting them out)
• A system to automatically set up/optimize an audio system for room acoustics
• A method to support better individual health
• System to provide navigation and directions inside large building
Prior Years’ Students’ Problem Statements

- Context-sensitive indication of waiting times (restaurant, theme park, etc.) and special events (e.g., sales)
- Automatic synchronization of multiple user databases (e.g., change of address)
- Battery life (time) indication on cellphones
- **Noise-cancelling headphones**
- **Non chemical mosquito control**
- Construction safety
- **Traffic control at merges onto highways**
- **Universal points reward card**
- Vital signs monitor for athletes during workouts
- Noise elimination system so students can sleep later
- Vision aids for the color impaired
- 3D video without 3D glasses
- A way to securely access networks without compromising user privacy
- Power sources for wireless devices
- Continuous solar power during a general power outage
- Real-time indication of muscle fiber damage during heavy exercise
- Recovering/avoiding lost time at mass transit kiosks
- Finding misplaced items
- Bridge safety monitoring
More of Prior Years’ Students’ Problem Statements

• Automatic wireless synchronization of digital camera with computer (Eye-Fi)
• Automated inspection of power transmission towers
• Selectively controlled access to a business or residence by visitors
• Software to budget/manage bills
• Easy-to-install whole house power backup equipment
• Missing keyboard on iPad and HP Slate
• Cleaning the water supply of heavy metals and other contaminants
• Method to control DUIs
• Way to find what clothes are in closet without going through them
• Mood sensitive environment
• Customer service with transfer of information between departments
• Smart refrigerator/pantry with knowledge of food that passed away
• Computer desks that provide better wire management
• Smarter traffic intersections that do a better job of knowing when to switch lights
• Simple to install water pressure booster
• Home theater sound system that is responsive to user location, phone calls, etc.
• Means to track off-site employees
• Better means to track finances
Still More of Prior Years’ Students’ Problem Statements

• A method of permanently wiping hard disk data when no longer used
• GPS navigation for motorcycles (with spoken directions, etc.)
• Method to track where golf balls went after they are hit
• A method to collect, store and manage program keys or serial numbers
• A smart washing machine to find wrong color items and set machine according to load
• A method to improve cell phone coverage
• A faster Stevens network during times of heavy usage
• A system to make guitars hold tuning longer
• An easier way to turn logging on and off in programs
• GPS enabled helmet/beacon for skiers/snowboarders
• A system to alert users if their favorite restaurant has a long wait
• User personalized motor vehicles (seat, mirror, radio stations, etc.)
• Simplified fare collection across multiple systems – a universal token?
A Few More of Our Prior Students’ Problems

• Robotic lawn mower
• User-sensing TV sleep switch
• Integrated photographic image management system
• Web-enabled means of tracking Stevens Shuttle
• A better silent alert for cell phones
• *Theft/damage/vandalism monitoring system for motor vehicles; real-time monitoring and reporting, GPS tracking*
• Device to remind user to bring items with them/find items they have lost
• On-line lottery ticket purchasing
• Wireless “cabling” for meeting/class projection
• Means to sort recyclable material at the point-of-use
• System to alert driver to location of optimum parking spot (vehicle size, location)
• Electronic media filing/organizing system
• *Remote control proliferation*
• A method to notify students of packages at the post office
• Cars that recognize the drivers and adapt personal settings (e.g., mirrors, seats) to the driver
Still More Students’ Problems

- Central appliance status display/control
- Sustainable, clean, renewable energy source
- Space – the final frontier. How to store your stuff in the minimum amount of space.
- Synchronizing browser, application, desktop settings between multiple computers
- **Optimizing charging for portable devices while eliminating wall wart clutter**
- Optimizing server farm power usage and location
- Inaccurate battery power meters
- Automatic window closers for security and weather protection
- A device to counter the effects of someone else “straightening” a room
- A system to record guitar finger placement and timing
- Indexing information across several computer systems to allow easy synchronization
- User specific firing control for hand guns
- Better, more consistent Ethernet access at Stevens
- A method to detect/control propped-open doors
- A method to automatically catalog similar songs into playlists.
Still More Students’ Problems

• Proper soil moisture level for home gardens
• Walking through the city (navigating around tourists, homeless, vendors) (led to 2004-2005 project
• Couch-potatoes/computer desk-potatoes need remote lighting controls (led to 2006-2007 project)
• Over utilized USB/underutilized Centronics printer port
• House keys-finder
• Laundry status checking
• Recreational facilities status checking
• Shoes that don’t untie (double knot!)
• Cell phones that know when to give up looking for signals
• TV automatic loudness control
• On-campus mail tracking (like USPS registered mail)
• Parking spot location/street cleaner tracking
• Electronic filing of paper documents
• Electronic sorting of CD/DVD collections
• Environmental energy harvesting for portable devices
Yet More Students’ Problems

• How to minimize land use for solar energy systems as well as storing energy
• Keeping dirt, bugs, dust and other gunk off non-garaged car
• Laptop battery life optimizer in OS
• Automatic grass/shrub cutting
• Blocking undesirable sounds while not blocking desirable ones
• Internet TV viewing without a PC
• Urban parking assistant
• Cellular caller ID with name
• Controlling a runner’s or walkers stride to prevent overstride
• Remote home control from cellular phone or via Internet
• Course social networking tool to form groups
• Big brother for teenage drivers
• TV remote control with rich, yet simple interface
• Portable device power options
• How to wake up a student in the dark predawn winter hours (or early morning class)
• Cosmetic expiration date tracking/warning system
• SmartDrawers
• StarTrek Universal Translator
• Portable in-mall navigation system
• 5.1 surround sound for small rooms with <6 speakers (to avoid wiring problems)
• Higher quality/more I/O options for iPod
• IT data center environmental monitoring
Some More Students’ Problems

• Remembering songs heard in passing (e.g., in car)
• A cure for technology clutter - Universal Identifier/key/communicator/whatever device
• Keeping windows clean on high-rises without putting workers and/or pedestrians at risk
• StarTrek transporter – how to move things around building without elevator
• Automotive Heads-up display
• Dirty dish accountability tracking
• Time-of-day dog feeder and home lighting control
• Means to detect laser bomb detonators (from the people who brought you roadside IEDs)
• Means to play Internet digital media over conventional systems (e.g., TVs)
• Universal credit card to replace multiple cards
• Means to track owner and maintenance agreements on computer hardware
• Means to guide drivers backing up trailers (e.g., boat)
• Mass transit location/status tracking
• Where did I park my car in a large lot?
• Sidewalk and driveway snow removal method
• Finding your way around airports and train stations
• How to go boldly where no one has gone before, e.g., underwater
September 9 Deliverable:

Project_advisor_form.doc on Moodle

1. Forming a group to commit to an idea is the first priority
2. Finding an advisor (ECE, PEP, CS) to work with you is your next priority
3. A working project title is fine
4. A paragraph to a page description is sufficient at this stage
## Project Status

<table>
<thead>
<tr>
<th>Group #</th>
<th>Project</th>
<th>Team members</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>1</td>
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<td>3</td>
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</tbody>
</table>

http://personal.stevens.edu/~bmcnair/senior_design-14-15/groups.html
# Students Yet Not in Groups

<table>
<thead>
<tr>
<th>Kevin Barresi</th>
<th>Russell Hager</th>
<th>Joseph Powers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etan Bennett</td>
<td>Cameron Hill</td>
<td>Yujue Ren</td>
</tr>
<tr>
<td>Bryan Bonnet</td>
<td>Dylan Hutchison</td>
<td>Giancarlo Rico</td>
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<tr>
<td>Joseph Bova</td>
<td>Elisa Iribarne</td>
<td>Joao Paulo Rodrigues</td>
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<tr>
<td>Edward Bowlby III</td>
<td>Rong Lei</td>
<td>Jorge Rojas</td>
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<tr>
<td>Brian Cesar-Tondreau</td>
<td>Matthew Leslie</td>
<td>Joseph Romeo</td>
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<tr>
<td>Andy Chau</td>
<td>Jiaren Li</td>
<td>Shinji Sato</td>
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<tr>
<td>Eric Cherin</td>
<td>Xin Li</td>
<td>Yichao Shen</td>
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<tr>
<td>Thomas Chu</td>
<td>Xuntian Liu</td>
<td>Robert Skowronski</td>
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<tr>
<td>Dillon Connolly</td>
<td>Christina Magriples</td>
<td>Jeremy Steward</td>
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<tr>
<td>Christopher Corrado</td>
<td>Morisa Manzella</td>
<td>James Stys</td>
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<tr>
<td>Julian Cortes</td>
<td>Anthony Matos</td>
<td>Alexander Thieke</td>
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<td>Zhenjiu Dai</td>
<td>John Meagher</td>
<td>ShaQuill Thomas</td>
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<tr>
<td>Andrew Deutchman</td>
<td>Gamal Mohamed</td>
<td>Nicholas Villa</td>
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<tr>
<td>Andres Diaz-Borda</td>
<td>Sean Muligan</td>
<td>Brandon Wahl</td>
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<tr>
<td>Jared Dickman</td>
<td>Russell Nadler</td>
<td>Edward Watt</td>
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<tr>
<td>Luka Djapic</td>
<td>Gregg Nickels</td>
<td>Logan Weiss</td>
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<tr>
<td>Jeffrey Eitel</td>
<td>Nishant Panchal</td>
<td>Justin Williams</td>
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<tr>
<td>Gwenn Flores</td>
<td>Aniket Patel</td>
<td>Hefei Yang</td>
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<tr>
<td>Tyler Gabriel</td>
<td>Michael Paulauski</td>
<td>Zhou Zihe</td>
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<tr>
<td>Vincent Gasbarro</td>
<td>Robert Pinto</td>
<td>Julian Zuniga</td>
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<tr>
<td>Brian Ginebaugh</td>
<td>Jeff Ponnor</td>
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<tr>
<td>Alexander Gurski</td>
<td>Alexandru Popa</td>
<td></td>
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There is a typically a shortage of formed groups and a surplus of students without groups

• To address this need:
  – The Moodle shell for EE/CpE-423 has two discussion groups to connect students and groups:
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- To address this need:
  - The Moodle shell for EE/CpE-423 has two discussion groups to connect students and groups:
    - Post specific group needs, specific student skills, interests
    - Use this like you are looking for a job (employee)
Senior Design Tasks – Fall ‘14

- Identify project
- Form group
- Select advisor
- Develop project proposal
- Publish project proposal
- Develop final design report
- Submit parts list, final design report
- Oral/slide presentations
- Effectiveness surveys
- Weekly status reports

8/26/14 - 12/2

Today
Stages in Development Cycle

- **Basic Research**
- **Applied Research**
- **Exploratory Development**
- **Advanced Development**
- **Prototype / Initial Product Development**
- **Refinement of Technology**
- **Application of Technology**
- **Final Product Development**

**Development of Technology**

**Proof of Feasibility of Technology**

**Refinement of Technology**

**Application of Technology**

**Suitable for Senior Design**

**Market Trials**

**Market Trials**
Constraints That Can (Should?) Be Relaxed For Prototype

- Physical size
  - Level of integration (VLSI vs. FPGA, μC, LSI/MSI, etc.)

- Implementation platform
  - simulating a Palm on a laptop,
  - simulating functions in software that would normally be in hardware, and vice versa

- Feature set
  - What is essential to demonstrate concept, vs. what could be imagined/assumed
  - What is known to be doable vs. what is to be demonstrated

- Performance
  - Speed, capacity, etc.

- Environmental constraints
  - Operating temperature range, shock, vibration, etc.

➤ Focus on key attributes of end design, not every detail
Now that you’ve (hopefully) formed a group…

• Weekly reports due Monday by Noon
  – Use ONLY the template provided to ensure consistent format:
  – Template is on Senior Design web site (below)
  – Team leader is responsible for submission of weekly report (electronically)**

  – **Group grade will be influenced by timeliness, completeness of reports**

http://www.ece.stevens-tech.edu/sd/material/weekly_report_template.doc
Now that you’ve formed a group...

- **Group Effectiveness Survey**
  - Use ONLY the template provided to ensure consistent format:
  - Template is on Senior Design web site (see below)
  - **EACH** group member must submit survey **EACH** week (electronically)
  - **Group grade** will be influenced by timeliness, completeness of reports
  - Individual grades will **NOT** be influenced by content of these reports
  - I encourage (but do not require) that you share content with your other team members
  - **DO NOT SEND EFFECTIVENESS REPORTS TO ADVISOR!!!** (unless I’m your advisor)
  - If your group has non-ECE members, do not include them in group effectiveness totals.
  - Check your arithmetic: \( \Sigma = 100 \)
Emailing submissions

Preferred way to send weekly submissions:

Send to bmcnair@stevens.edu (me)
??????@stevens.edu (TA)
Emailing submissions

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Send to bmcnair@stevens.edu (me)
???????@stevens.edu (TA)

The attached file name must indicate:
- course number (423 or SD is sufficient),
- group number (this will be supplied when group is formed),
- due date (Monday’s date), and
- what the attachment is (“weekly report” or “effectiveness survey”)

Failure to do so will probably result in uncredited submissions, which might influence group’s final grade
Potential projects for 2014-2015

• My favorites (I will advise)
  – Quadcopter – beyond stable hovering (year 3)
  – Multi-legged robot (Spiderbot)
  – iPad/iPhone app to communicate with mobility and speech-impaired patient

• Interdisciplinary senior design pilot (EE/CpE-423X, meeting jointly with BME423X, CE423X, and ME423X), with associated special section of TG-403 – all require permission of advisor to join and are subject to modification
  – Vibration Energy Harvesting
  – Structural Health Monitoring
  – Solar powered boat
  – HVAC system design
  – Pool monitoring system
  – Laser alignment tool for electricians
  – System to perform high resolution airborne imaging
  – System to prevent high resolution airborne imaging
  – Water and sustainability in El Salvador
  – ADA wheelchair platform design for inclined railway
Other Resources

• Circuit Cellar Magazine

• http://personal.stevens.edu/~bmcnair/senior_design-14-15/hw_sw.htm