VirginiaTech
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BRADLEY DEPARTMENT
of ELECTRICAL & COMPUTER ENGINEERING

Final Project

Proposal
ECE 4564

Final Project
Teams

The final project is a team project. You should form teams of 3 or 4 people.

- Register your team with the instructors before class on Wed, 5 Nov
https://docs.google.com/a/vt.edu/forms/d/1902IB-ViBPlqgUVIqNGWpQt5unFKy8mMz1stqzQYHcg/viewform?usp=send_form

- After forming a team come up with a project idea
    - Your project idea should be big enough that all team members can make a significant contribution to the project
- If you cannot form a team, you will need to stay after class on Wed, 5 Nov and the instructors will assign *teams*
- If you cannot come up with a topic or idea, the instructors will assign a topic
    - The instructor assigned topics will be *challenging*

It's in your best interest to form teams yourselves, and then brainstorm for project ideas

Final Project
Proposal

For the final project you'll need to write a proposal that discusses the following items:

1. Concept of operations
2. System overview
   A. Description of system modules
   B. 3 testable requirements
   C. Use Case Diagram
3. Hardware list
4. GitHub Details
   • Team member's GitHub IDs
5. Project Schedule
   • Timeline with tasks and milestones
   • Specify the tasks each team member is working on

Final Project
Guidelines

What are we looking for in the final projects?

- The project is an opportunity for you to:
    1. Demonstrate your knowledge of network application concepts from class
    2. Be creative and design your own app
- Project Requirements
    1. Your app must have a significant network component
        - You cannot just add web or network capabilities to another idea
        - Your apps must be highly dependent on network communications for the app to work
    2. Your project should be a networked IoT app that where your Raspberry Pi is an integral part of the application you propose to build
    3. Projects should be challenging
        - For example, should be more complex than the assignments from this class

Final Project
What is a Network IoT Application?

Your project needs to incorporate and demonstrate at least one of the following:
- Real-time communication with physical objects
- Sharing of physical things on the Web
- Resource and location Discovery
- Ambient Information / Calm Technology
- Adaptive Interfaces
- Event Notification
- Context Awareness (user / time / location)

CONOPS is a high level description of a system's purpose, goals, and how users will interact with the system to achieve goals

- Your CONOPS statement should answer the following questions
  - What is my system doing?
  - What is the goal of my system? (i.e. What real-life challenge am I looking to address or solve?)
  - Why is this goal meaningful and important? (i.e. why should I pay for this?)
  - How will a user interact with my system?
  - How will my system achieve the stated goals? (i.e. What outcomes and impact, do you as designers, expect your system to have?)

The System Overview is a logical breakdown of your CONOPS into discreet pieces or modules, where you describe what each module does, and how it interacts with other modules

- Describe your system
  - What are the major pieces?
  - What is each piece supposed to do?
    - How will each piece accomplish its given task?
  - How do those pieces combine or couple?
    - For this project, many of the pieces should be coupled via a network (i.e. a custom socket protocol, HTTP, AMQP, or another protocol)
  - What programming language will you use to implement your proposal?
    - Python is the recommended implementation language and runtime since the network concepts in class were taught in Python.
    - If you intend to use another programming language, you must justify your choice and describe how your choice is necessary for the proposal and project to be successful.

A visual diagram of your system depicting the major pieces in the system, and how those pieces interact (i.e. couple) are _required_ for your proposal

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Drawing Diagrams

Here are some apps you can use to create a visual system diagram

Diagramming Software

- OmniGraffle
- Microsoft Visio
- Google Drawings
- Lucidchart
  (in VT Google Drive, click New -> More)
- LibreOffice Draw

Software that can draw shapes

- Microsoft Powerpoint
- Apple Keynote
- LibreOffice Impress

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Requirements form a set of statements that describe the user's needs and desires. Requirements statements describe what the software system should be, but not how it is to be constructed [1]

- We will be evaluating your requirements based on the following characteristics [2]:
    1. Your requirements should express what a product/application/system must do and how well it must operate. Every requirement should identify an operational function and its associated measures of effectiveness.
    2. Requirements must be unambiguous. Requirements should not be expressed using language that may be vague or unclear. A properly stated requirement should be written in a manner that leads to one, and only one, interpretation.
- When expressing requirements, many times the requirement uses the verb *must* to indicate that a feature is an essential requirement of a piece of software or larger system.

References:

1. R. Schmidt, "Software Requirements Management" in *Software Engineering*, Waltham, MA: Morgan Kaufmann, 2013, sec. 9.2. [Online] http://proquest.safaribooksonline.com/book/software-engineering-and-development/9780124077683
2. F. Tsui, O. Karam, B. Bernal, "Requirements Engineering" in *Essentials of Software* Engineering, 3rd ed. Burlington, MA: Jones & Bartlett, 2014, Sec 6.1. [Online] http://proquest.safaribooksonline.com/book/software-engineering-and-development/9781449691998

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In your proposal you must provide us with *at least 3 clearly defined and testable requirements*

- Your requirements will be used to grade your beta build demo and final project demo
- As part of the proposal grading process the instructors will let you know if your requirements are clear and testable
- The instructors may add or remove requirements based on your project description

Final Project: Section 2C
Use Cases

Use cases are a diagram which shows the users within your system, and what actions each actor in the system can take

- Use case diagrams are usually derived from requirements
- Not all 'actors' are humans, they could be other systems
- Use case diagrams assist software engineering figure out what software features and actions they need to support in their software architecture

Final Project: Section 3
Hardware List

Your report should provide a list of items that comprise the system you propose to build

- Your hardware list should include all physical items you need for the project
  - Be sure to include your Raspberry Pi kit items in your parts list
  - Include the quantity of items your project will use
- You can also use the part list to request other hardware items
  - e.g. Raspberry Pi GPIO extender boards
  - We will make every attempt to get you additional hardware you request.
    - Requesting the hardware does not guarantee you will get what you request.

We need to know all the team member's GitHub information

- Include a list with:
  1. Each team member's name
  2. Each team member's Virginia Tech PID
  3. Each team member's GitHub ID

Final Project: Section 5
Project Schedule

You need to come up with a schedule for how you will use the remaining weeks in the semester to complete your project. Your timeline should show:

1. A list of development tasks
   (e.g. Write foo module, test bar module)
2. Your schedule should include at least 2 milestones:
   1. Beta Build Demonstration (1 Dec)
   2. Final Demonstration (16 Dec)
3. For each development task, which team member(s) will be working on the task
4. Don't forget to include setup time, such as creating a new repository on GitHub
   - The maximum allowable setup time is 1 day

Final Project: Section 5
Project Schedule

You may wish to show your schedule as a Timeline or <u>Gantt Chart</u>. Here are some tools you can use to create a visual timeline or Gantt chart:

- You can manually draw a timeline or Gantt Chart using a <u>diagramming application (Slide 9)</u>
- You can create a grid in a spreadsheet that represents tasks as rows, and weeks as columns. You can then shade the cells to represent weeks working on a project to simulate a Gantt Chart.
- You can use a software planning tool to create a schedule, e.g.:
    - <u>GanttProject</u>
      Gantter for Google Drive
      [Open Google Drive, Click New -> More -> Connect More Apps, Search for Gantter]
    - <u>Omniplan</u>
    - Microsoft Project

Proposal Review Meeting

On Monday, 10 Nov., all of the teams must meet with the instructors. The instructors will review each team's proposal and provide guidance about how to ensure your proposal meets the final project requirements.

- Each meeting will be 5 minutes
- All team members should attend
  - Any team members who can not attend must e-mail the instructors and request an absence at least 24 hours before class time
- One member from each team should sign up the entire team for a meeting slot via the Scholar Sign-Up tool
- Meeting sign up opens on Scholar this Friday, 7 Nov @ 6:00

In Class Presentation

You will be 'pitching' your proposal idea and plan to your fellow classmates on Wednesday, 12 Nov. Your presentation should cover the following:

1. What idea is your team pursuing
    - What it is that you are trying to accomplish?
    - Why is this idea novel and worth pursuing?
2. Your team's approach to implementing the project (i.e. your system overview)
    - You should highlight the IoT net app patterns in your system
    - Discuss how you are leveraging your Raspberry Pi
3. Review your schedule for the project
    - Justify your selection of tasks
    - Identify the role of each team member

All proposal materials must be submitted through Scholar

- Only one (1) member of the team should submit the assignment to scholar
- Your proposal should be a single PDF file with your presentation
- Must be submitted to Scholar by Sunday, 9 Nov. @ 23:55

Final Project
Proposal Grading Guidelines

Category	Weight	Grading Criteria
General	15%	Does the proposal include a major IoT net app component and use the raspberry pi as an integral part of the system? (Slides 4-5)
CONOPS	15%	All CONOPS questions addressed (Slide 6)
System Overview	25%	System overview questions addressed (Slide 7), clear description of system modules, system diagram, testable requirements (Slides 9-10), use case diagrams (Slide 11)
Schedule	15%	Clear breakdown of tasks, sufficient work for all team members, schedule has required items (Slide 14)
Logistics	5%	Hardware list (Slide 12) and GitHub details (Slide 13) are provided
Presentation	25%	Have the requirements from Slide 16 been satisfied? Did the team speak to the audience? Did the team effectively use diagrams and other visuals to explain their implementation?