Project Overview

- Project Overview means just that!
  - This is the “initial client concept” that must be refined via Requirement Analysis
  - Your Software Requirements Specification (SRS—a written artifact) must be complete
  - By definition the instructor is your client
    - Note: the written overview document takes precedence over this presentation

- Two project choices
  - Sensor Network (vehicle tracking)
  - Smart Home (temperature control)

Sensor Network

- Key entities
  - Sensor nodes
  - Supervisory system
  - Vehicles (small, medium, large)
- Two deployment configurations
  - Border Control
  - Area Monitoring
- Hardware must be simulated in software

Sensors & the Supervisory System

- Sensors
  - Battery operated (i.e., limited lifetime)
  - Subject to abuse (e.g., weather, tampering)
  - Transmit data at fixed time intervals
    - Data includes: location and sensor value
- Supervisory System
  - Receives all node data
    - Assumption: no lost or corrupted messages
    - Assumption: moved sensors have been compromised
  - Reports all tracking events
    - Vehicle size, location, and speed & direction (if moving)
**Border Control**

- Monitor a border for vehicle crossings
  - Report vehicle size, location, and speed & direction (if moving)
  - Report border crossing events
- Sensors are placed at uniform distances

**Area Monitoring**

- Monitor an area for vehicle movement
  - Report vehicle size, location, and speed & direction (if moving)
  - Report area entry & exit events
- Sensors are placed randomly within the area

**Smart Home**

- Key entities
  - Home occupants
  - Thermostats
  - Occupancy sensors
- Two configuration options
  - Heating (winter) vs. Cooling (summer)
  - Daytime vs. Nighttime (energy savings)
- Hardware must be simulated in software

**Smart Home Operation**

- Each (monitored) room has:
  - Thermostat
  - Occupancy sensor
- The HVAC system heats/cools all rooms uniformly
  - (i.e., constant temperature gain/loss per unit time)
- Individual rooms may cool-off or heat-up at different rates (e.g., cooking in the kitchen)
- Occupied rooms are given a **double** weighting in the heating/cooling calculations
Smart Home Configuration

- A smart home has one or more rooms
- Heating and Cooling modes are mutually exclusive
- Daytime/Nighttime modes depend upon preset time-of-day criteria
- Temperature set points and tolerance limits are user configurable

Smart Home Example

- Current options:
  - Heating on
  - Set point: 72°, tolerance ±3°

- Computed temperature value:
  - \((70*2+69+67+68+71*2+66)/(6+2) = 69\)
  - Within ±3°, no need to turn on the furnace