Sensitive Buildings

Instructor: Rob Faludi

Plan for Today

- Introductions
- Syllabus Review
- Buildings and The Building
- Radio & ZigBee
- XBees, adaptors and terminal programs
- Equipment Available
- Readings & Assignments

Introduction

- Sensitive Buildings
  - Buildings
  - Networks
  - Mesh Networking
- Rob Faludi
  - Background
  - Motivations for this class

Introductions

- Name, graduation semester
- Projects from the last semester
- Desired superpower
- How you ended up in this class, hopes and plans

Syllabus Review

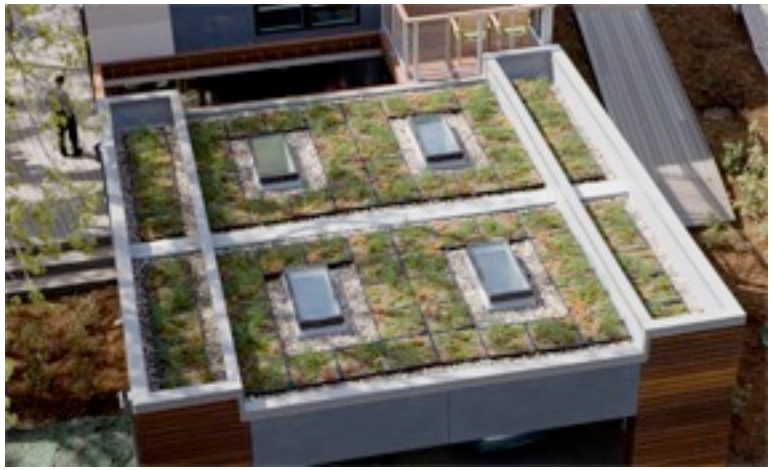
- Syllabus review
  - Class schedule
  - Assignments
  - Documentation
  - Grading
  - Office Hours
  - Projects
  - Time outside of class, example: Friday the 16th

Buildings

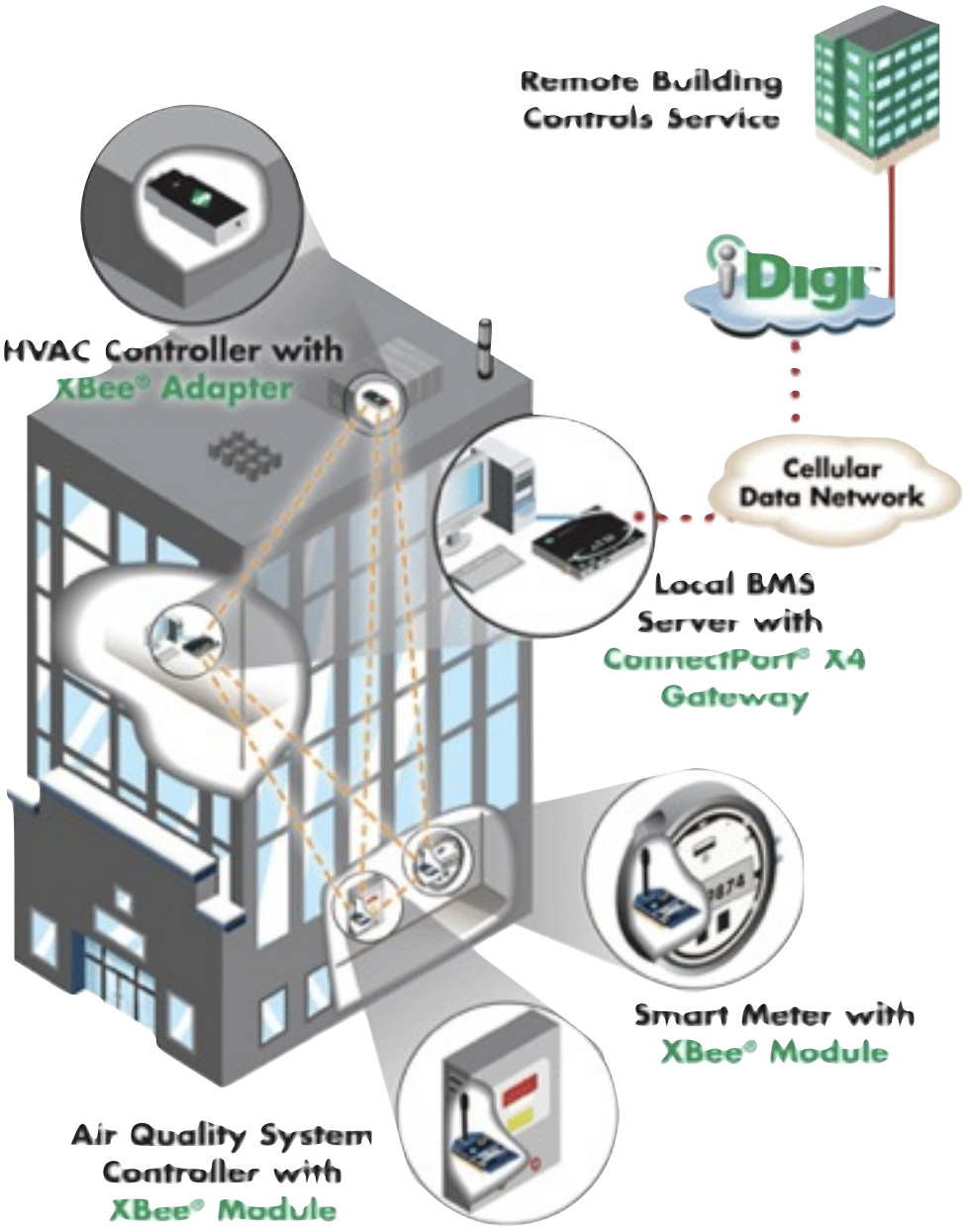
Blinkenlights: Berlin

Plug-in-Play: San Jose Civic Ctr, Rockwell Group

Wired Smart Home



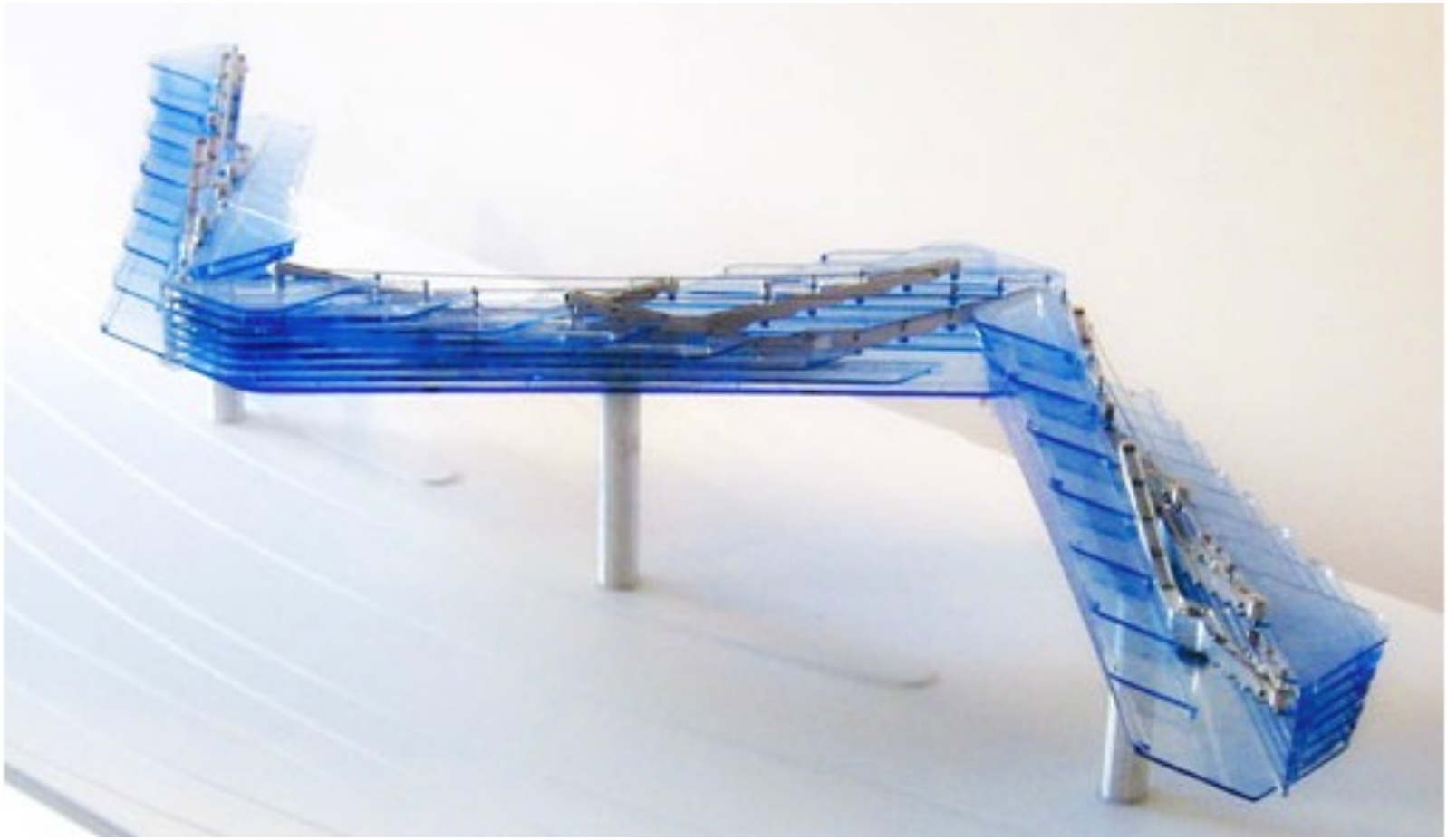
Digi Building Systems Management



Living City (breathing): Benjamin & Yang w/Faludi

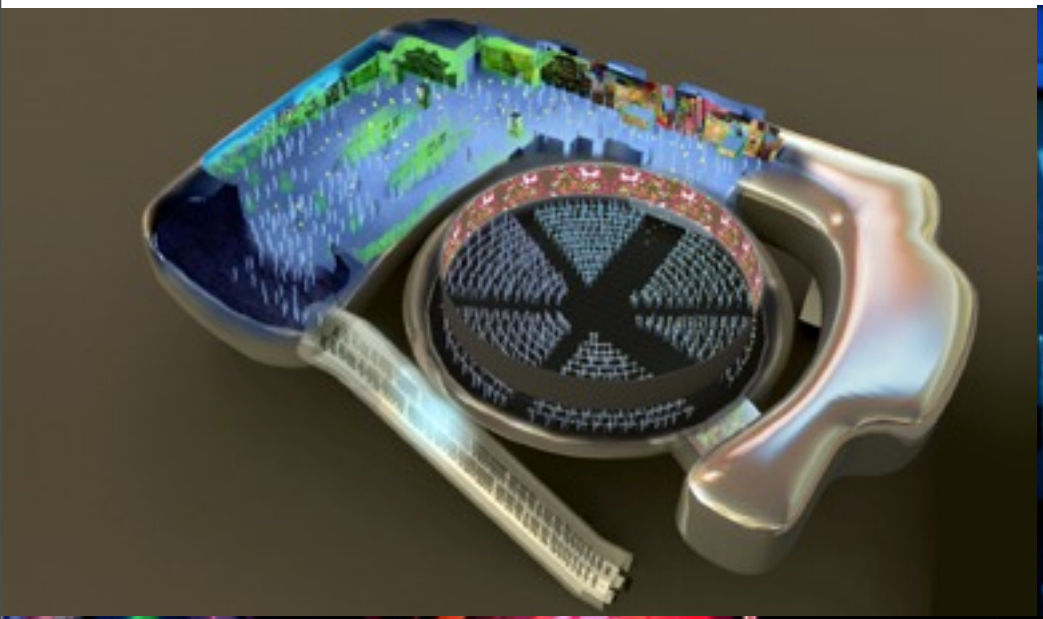
nafas (breathing): Adib Dada

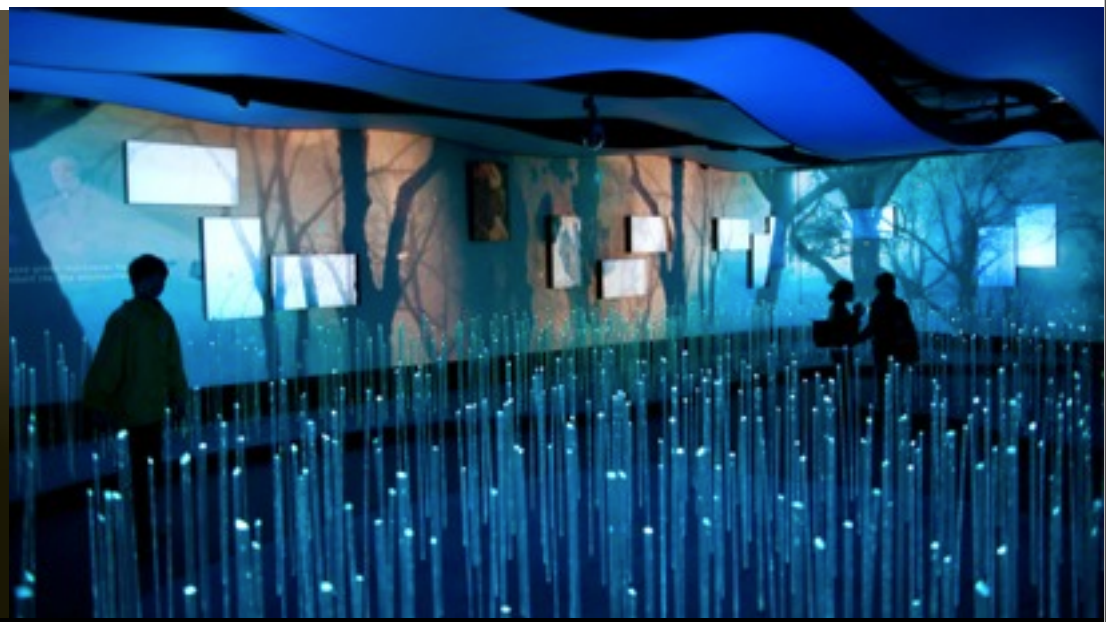
Adaptive Shading: Building Centre Trust, London



Schlossberg's Dream Cube

Dream Cube





Scholssberg on Design

- It is easy to fail when designing an interactive experience. Designers fail when they do not know the audience, integrate the threads of content and context, welcome the public properly, or make clear what the experience is and what the audience's role in it will be.

— Edwin Schlossberg

Bank of America Tower: 42nd St & 6th Ave

240 Central Park South

Columbus Circle

Central Park

...Marea, FedEx, shoe repair, Lenscrafters, wines, etc.

240 CPS by the Numbers

- 28 Stories
- Built in 1940
- full-time doorman
- 21 staff members
- 317 apartments
- 800 residents
- two buildings
- eight retail locations
- 6 elevators
- 100 balconies
- working fireplaces
- hydronic heat
- oil/natural gas boilers
- window air conditioning
- community indoor/outdoor area
- exercise room
- 16 washers & dryers in laundry room
- storage space for residents
- 40 bags of trash produced per day
- Mayer & Whittlesley, architects

Top Model

Jim Korein: Building Owner

Peter Julinszki: Building Engineer

Jordan Husney: Digi Solutions Architect

T3db0t Hayes (ITP ’10): Ventilation Systems Project

Carrie Schultz & Jason Andersen: Guest Architects

Dana Karwas: Guest Architect (tentative)

Jennifer Magnolfi: Guest Designer (tentative)

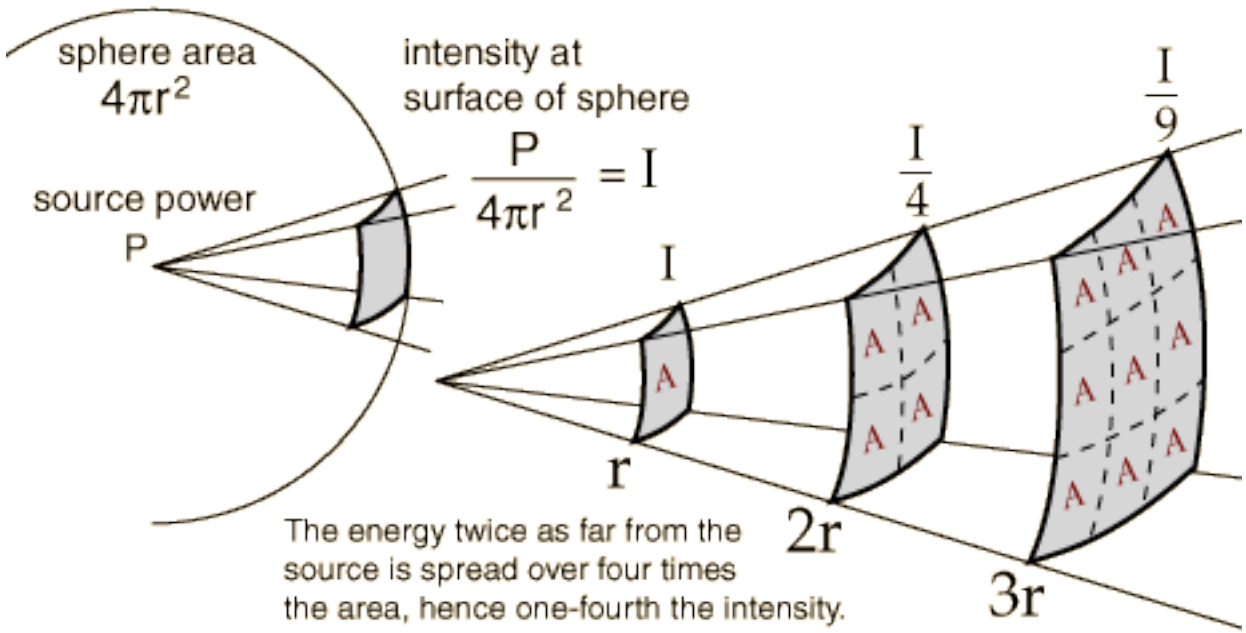
Radio Communications

- electromagnetic waves
- no medium required
- modulation

- Well-described mystery: “air waves” “wireless” “ethereal communication”

Inverse Square Law

- power needs increase exponentially with distance



ZigBee & 802.15.4

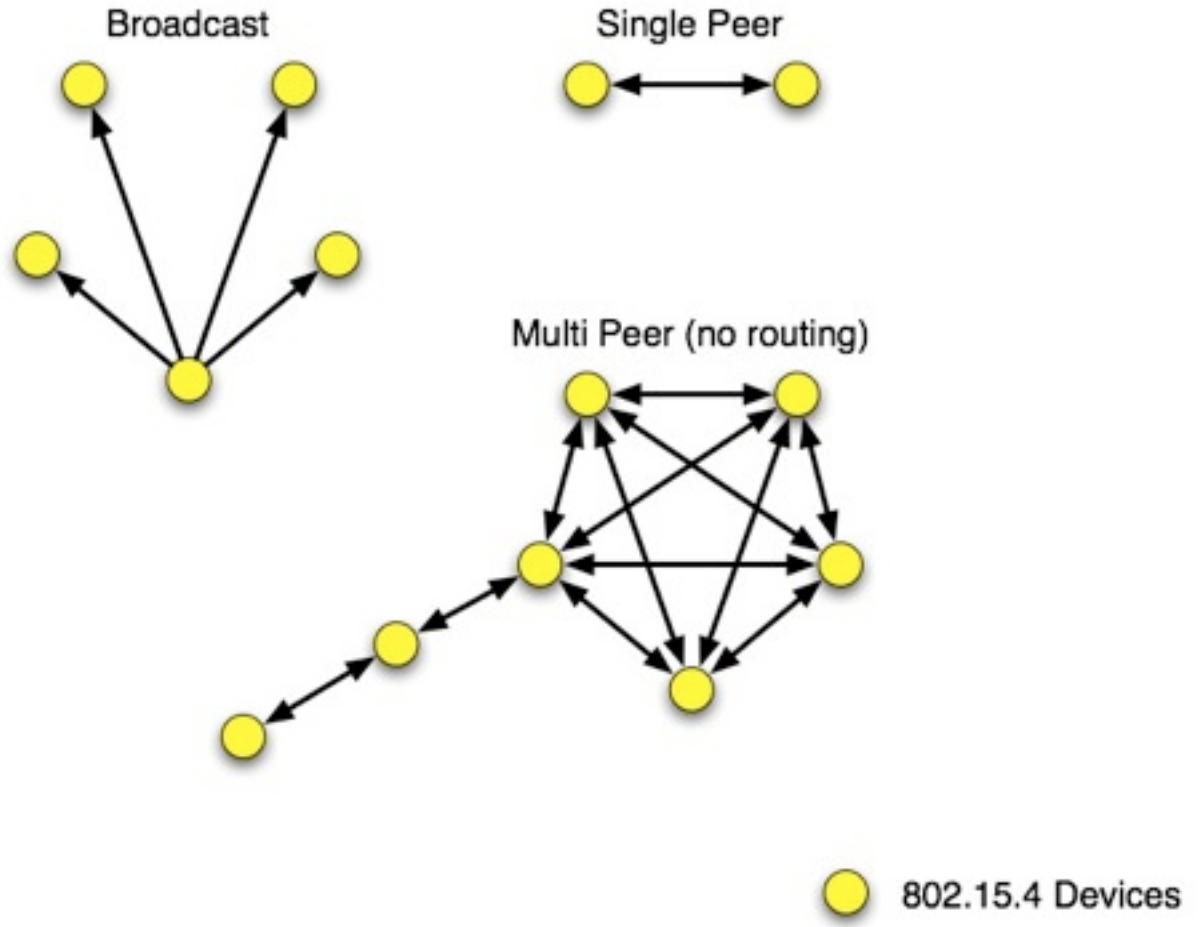
- ZigBee is built on top of the IEEE 802.15.4 protocol
- XBee radios can be purchased with or without ZigBee
- XBee 802.15.4 vs. ZNet 2.5 vs. ZB Pro vs. DigiMesh
- All ways are useful

802.15.4

- low power
- low bandwidth
- addressing
- affordable
- small
- standardized
- popular for DIY, easy to learn

802.15.4 Topologies

- single peer
- multi-peer
- broadcast



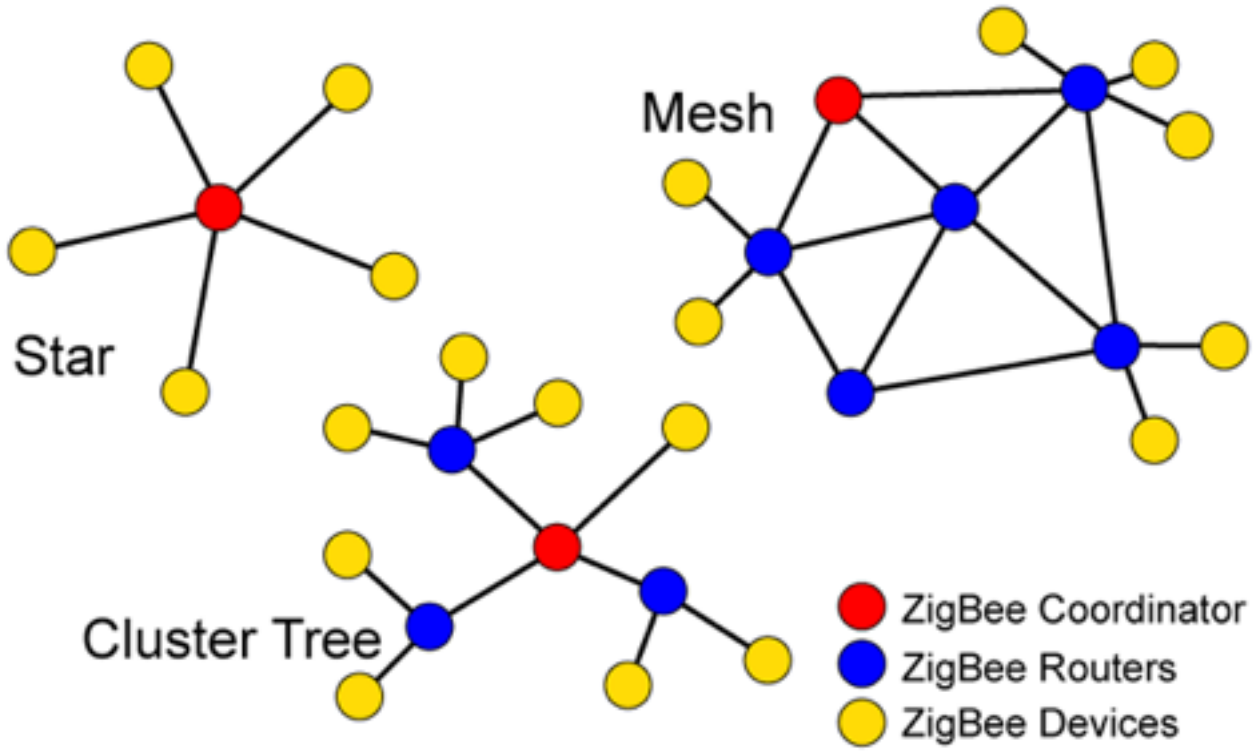
ZigBee

- routing
- self-healing mesh
- ad-hoc network creation

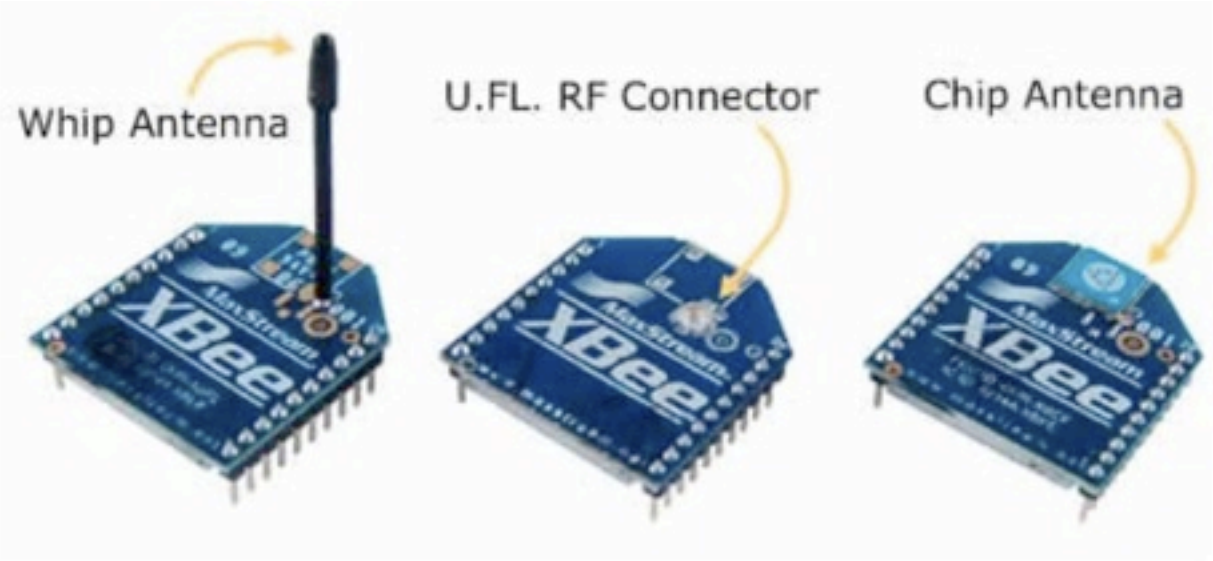
ZigBee™ Alliance

ZigBee Topologies

- peer
- star
- mesh
- routing

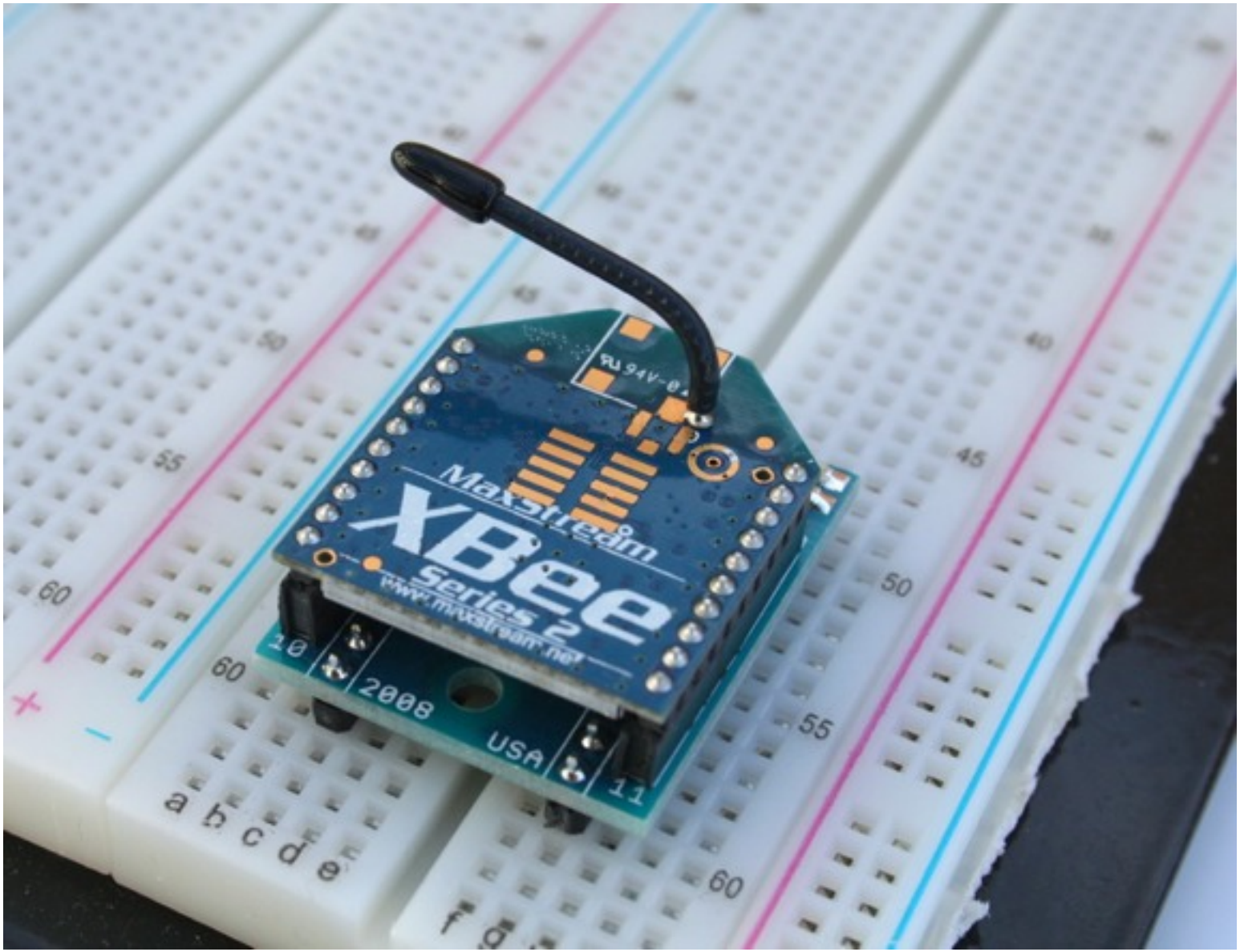


Antennas

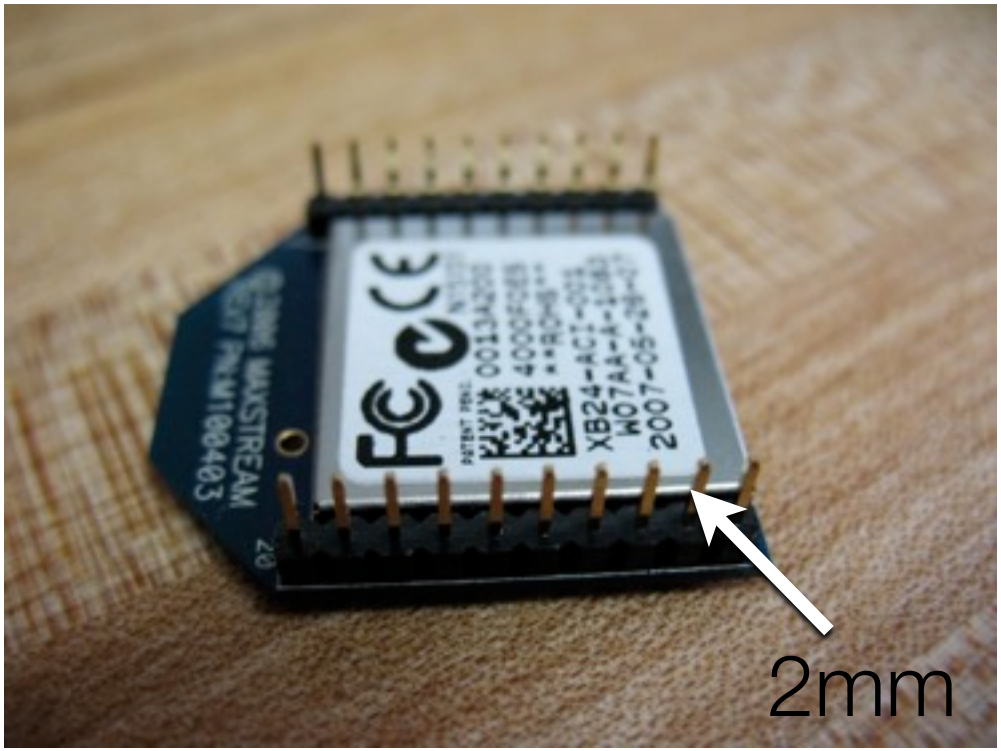


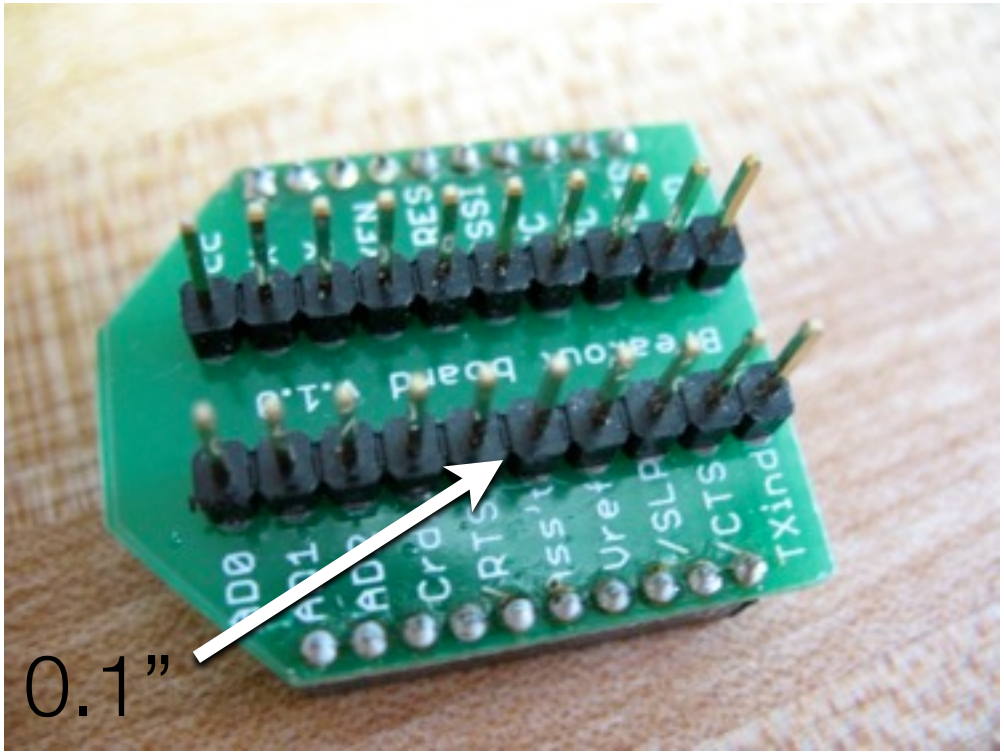
Chip Antenna on Pro

Breakout for Breadboards

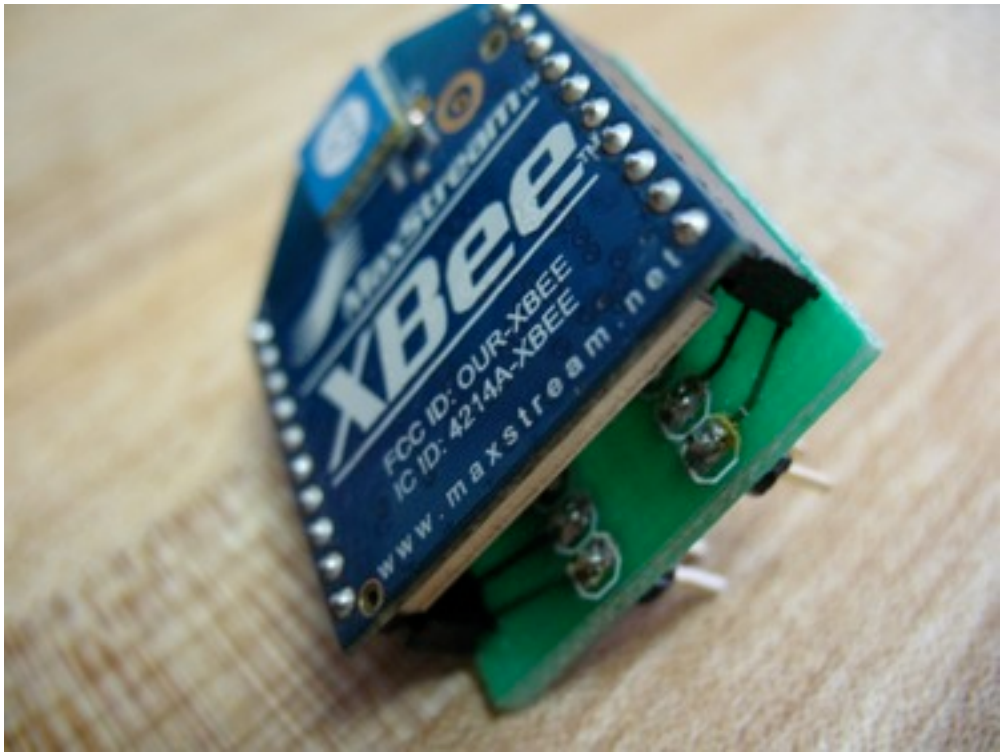


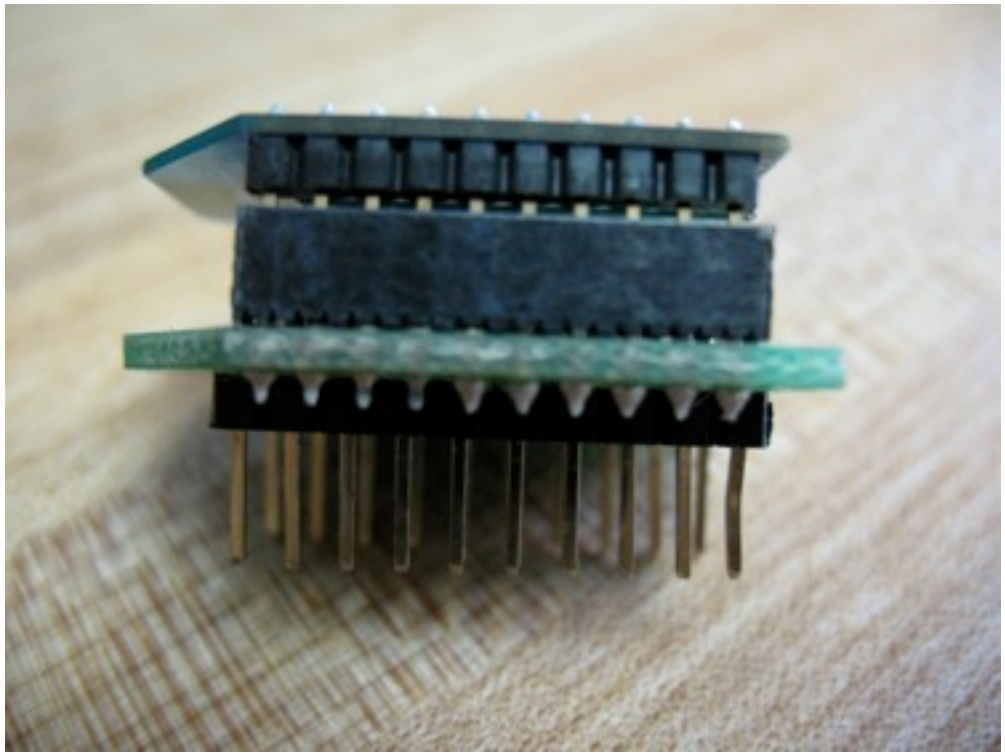
Breakout Boards for breadboarding



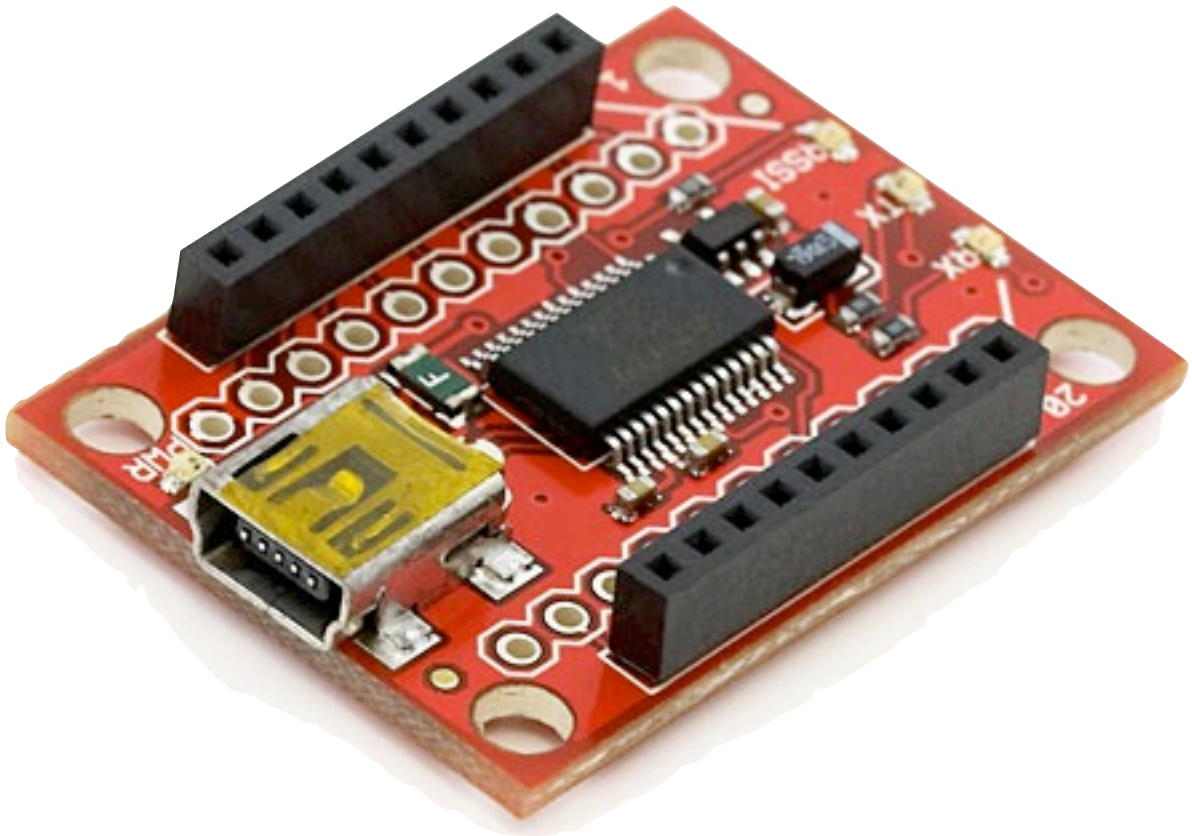


Soldering Breakout Boards: finished

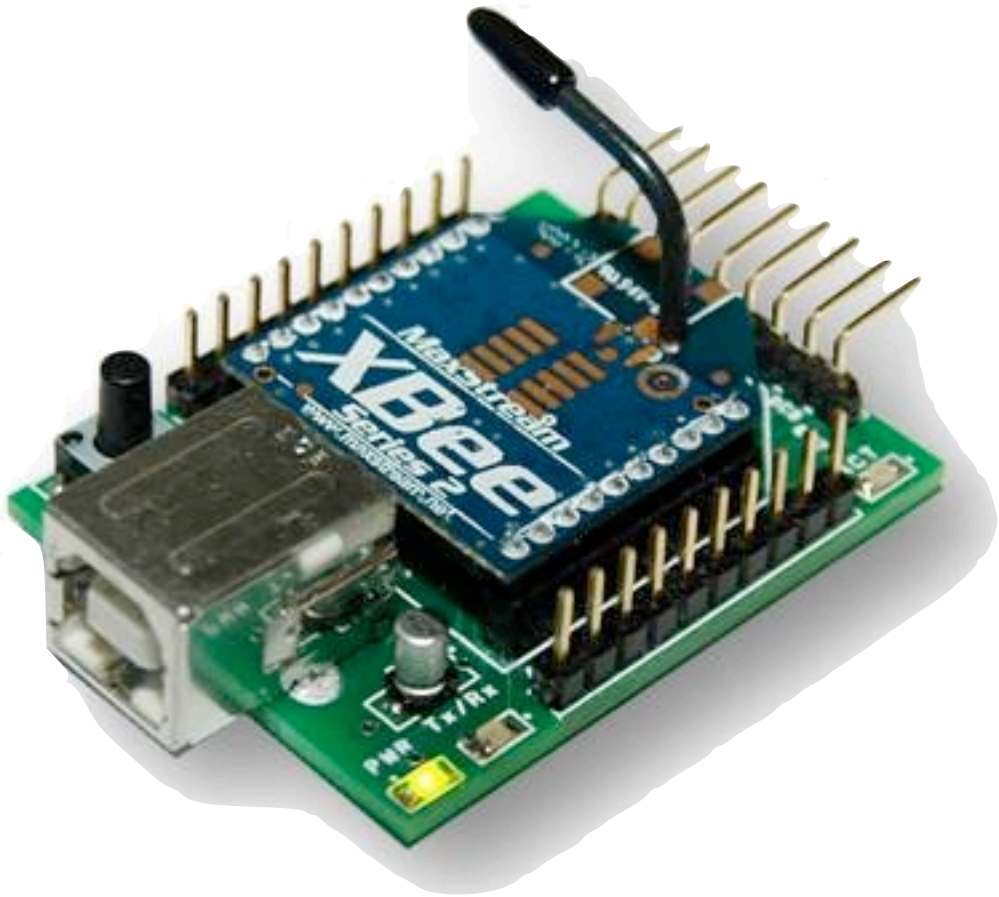




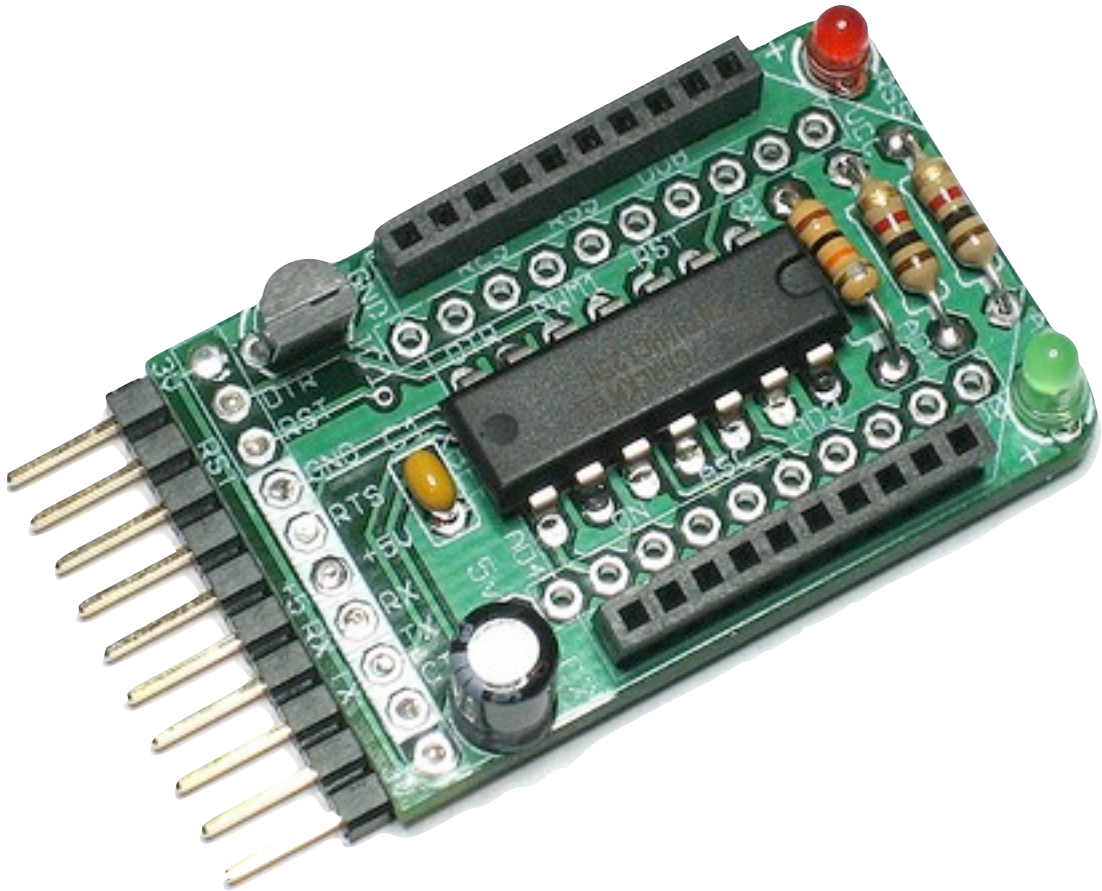
XBee Explorer from Sparkfun



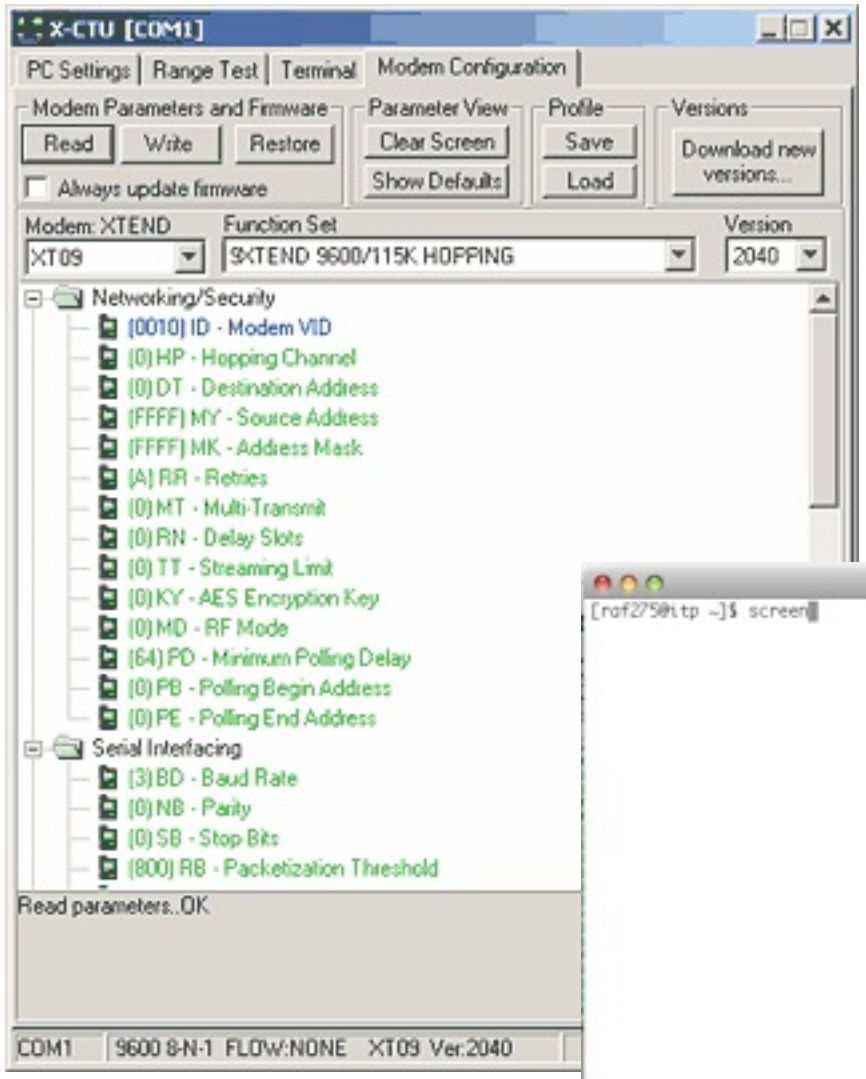
XBee Adapter from xbeeadapters.com



XBee Adapter kit from Adafruit



Serial Terminal Programs

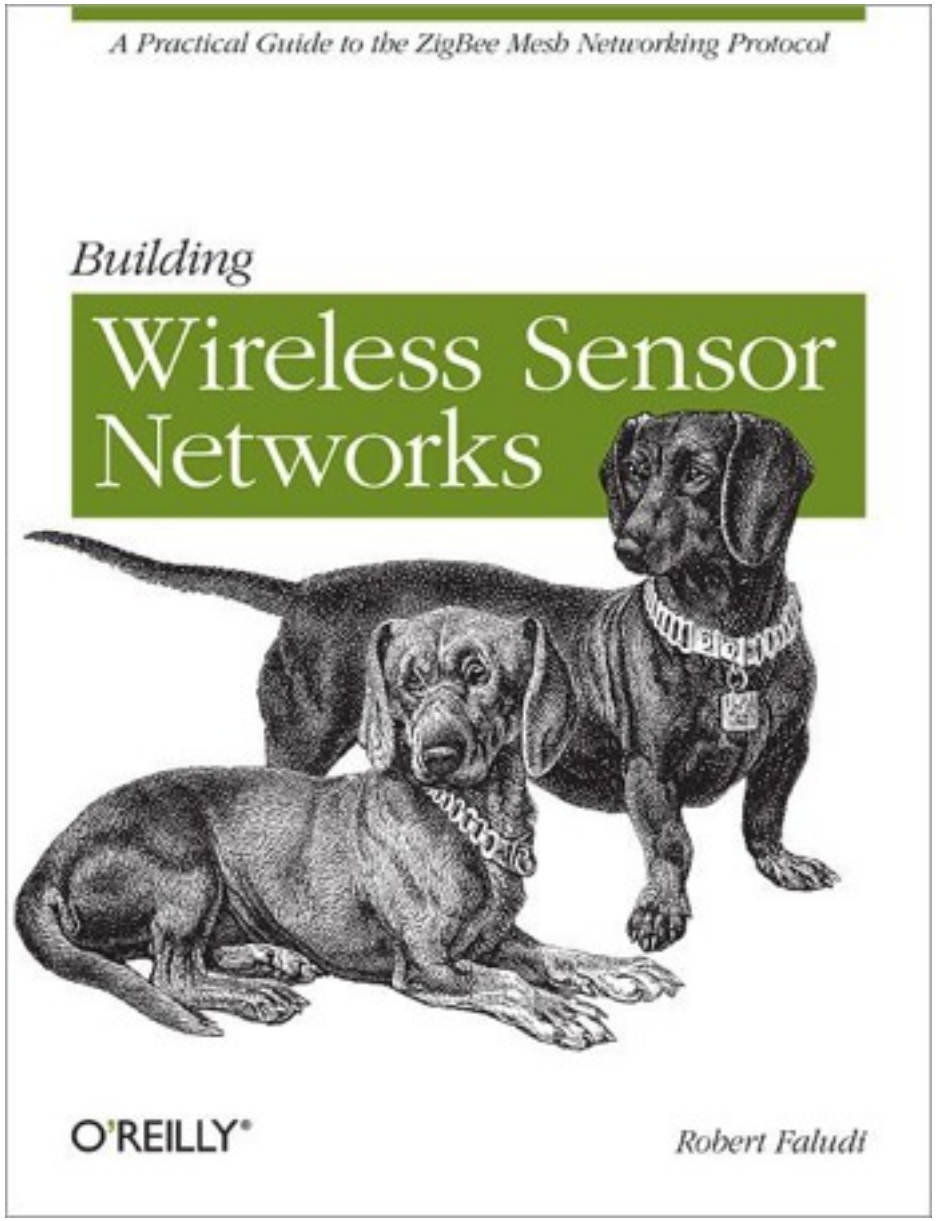


Serial Terminal Programs

- X-CTU: http://www.digi.com/support/productdetl.jsp?pid=3352&osvid=57&tp=4&s=316
- CoolTerm: http://freeware.the-meiers.org/
- HyperTerm: Windows Start Menu, Accessories, Communication http://www.hilgraeve.com/hyperterminal/
- screen: Terminal program on the Mac (or Linux)
- plenty of others!
- settings: 9600 baud, 8 bits, no parity, one stop bit, no flow control

Supplies & Equipment

Building Wireless Sensor Networks



BWSN Basics Kit from Sparkfun

Free stuff

Current Transformer Clamps & Transmitter

Glance Display

Radio Thermostat CT30

Imagining Sensitive Buildings

Waiver Form

Date: _____

Student's Full Name: _____
Date of Birth: _____
Address: _____ Apt. _____
City: _____ State: _____ Zip Code: _____
Mobile: _____ Home: _____
Work: _____
Email:_____
Emergency Contact and Number: _____

LIABILITY WAIVER:
I, _____, a student enrolled in the Tisch Interactive Telecommunications Program (the "ITP Program") at New York University for the Fall 2011 Semester, hereby acknowledge and agree as follows:

1. I hereby acknowledge that I am voluntarily participating in the ITP Program and assume all risks and hazards which may occur as a result of such participation in the ITP Program relating to my presence in or about 240 Central Park South, New York, New York (the "Building").

2. I hereby release Central South Associates, L.L.C., and each of its affiliated and subsidiary corporations, partnerships, limited partnerships, limited liability companies, and other entities thereof as may now or hereafter exist, including nominees or trusts, and the members, shareholders, partners, directors, officers, employees and agents of any such person or entity (hereinafter referred to collectively as, "Indemnified Parties") from and against any and all causes of actions, claims, rights or demands which I or my heirs, executors, administrators, successors or assigns can or may have as a result of any losses, damages, expenses, illness, personal injury or death, which I or any person may suffer or sustain as a result of my participation in the ITP Program relating to my presence in or about the Building.

3. I do hereby agree to indemnify and hold harmless the Indemnified Parties from and against any and all loss, costs, claims, suits, damages and judgments (including attorney's fees and disbursements), however caused, including, but not limited to, those for property damage, illness, bodily injury, including death, arising out of or in connection with my participation in the ITP Program relating to my presence in or about the Building.

Student's Name (please print)_____

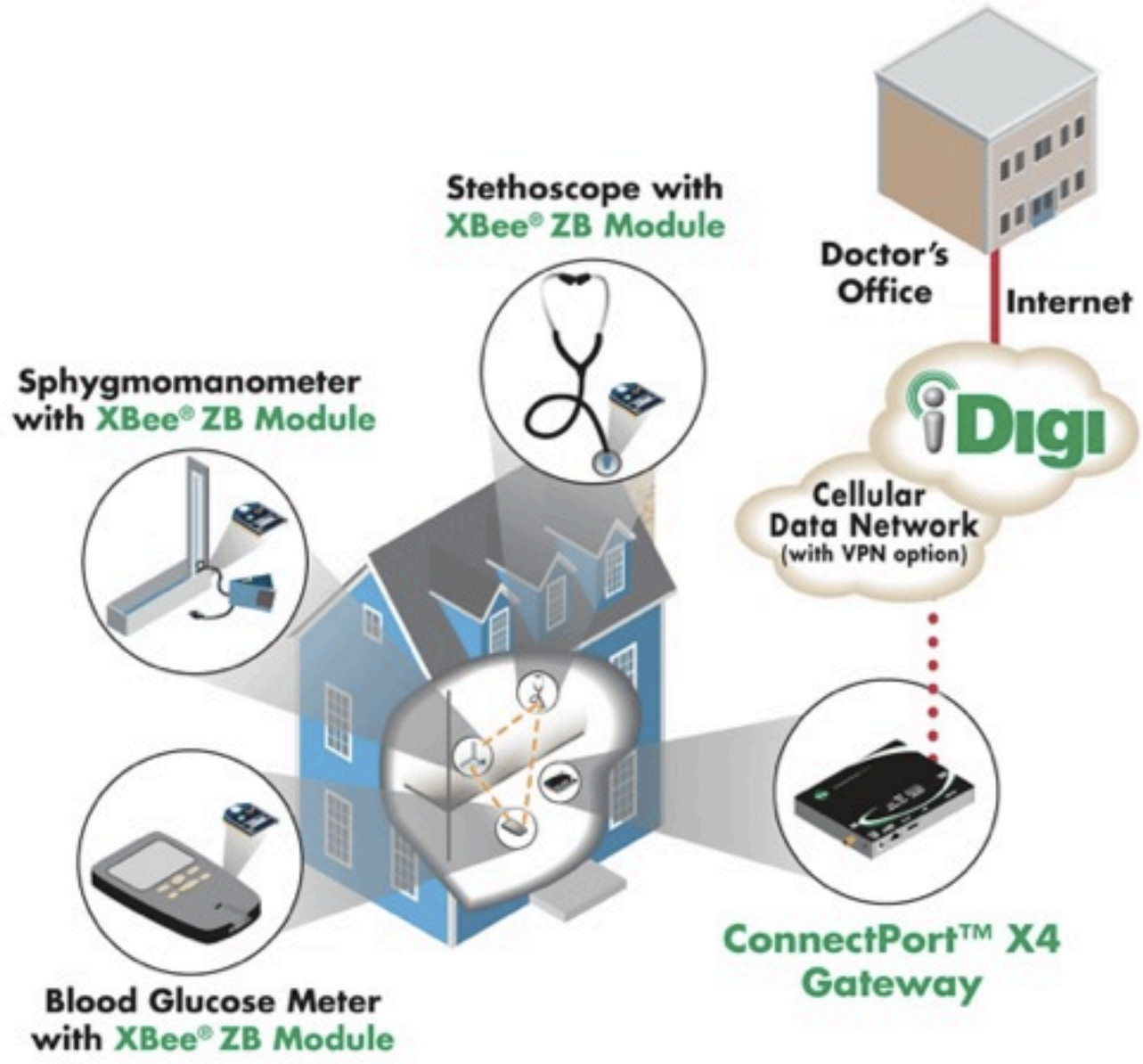
Student's Signature _____

Readings and Assignments

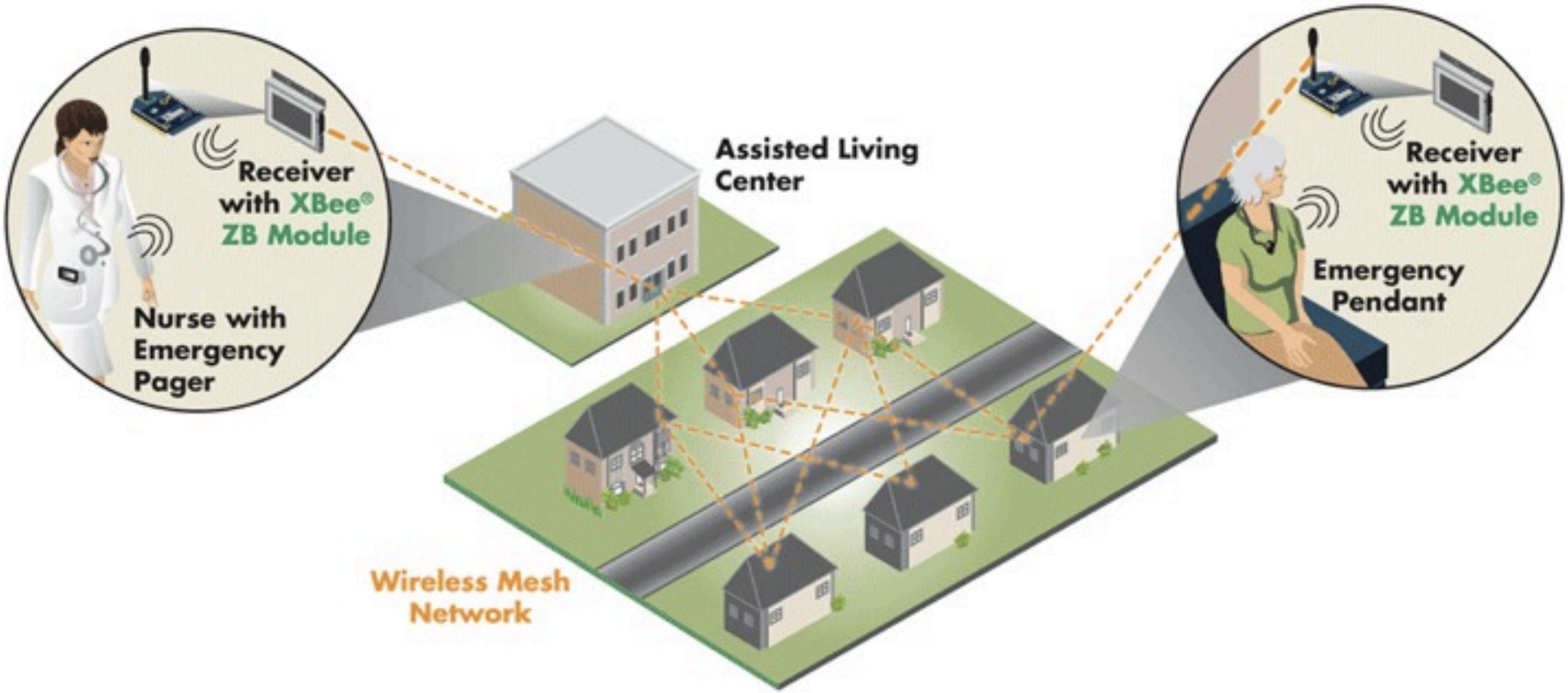
- Readings
  - Weiser, M. The Computer for the 21st Century: http://www.ubiq.com/hypertext/weiser/SciAmDraft3.html
  - There Will Come Soft Rains – Bradbury: http://faludi.com/classes/sociableobjects/readings/Bradbury_Soft_Rains_1950.pdf
- Assignments
  - Imagining Sensitive Buildings
  - Obtain two XBee ZB (series 2) radios and at least one XBee adapter
  - Pick a PAN ID now and document it: http://itp.nyu.edu/physcomp/Notes/XBeePANIDs

Digi Industrial Solutions

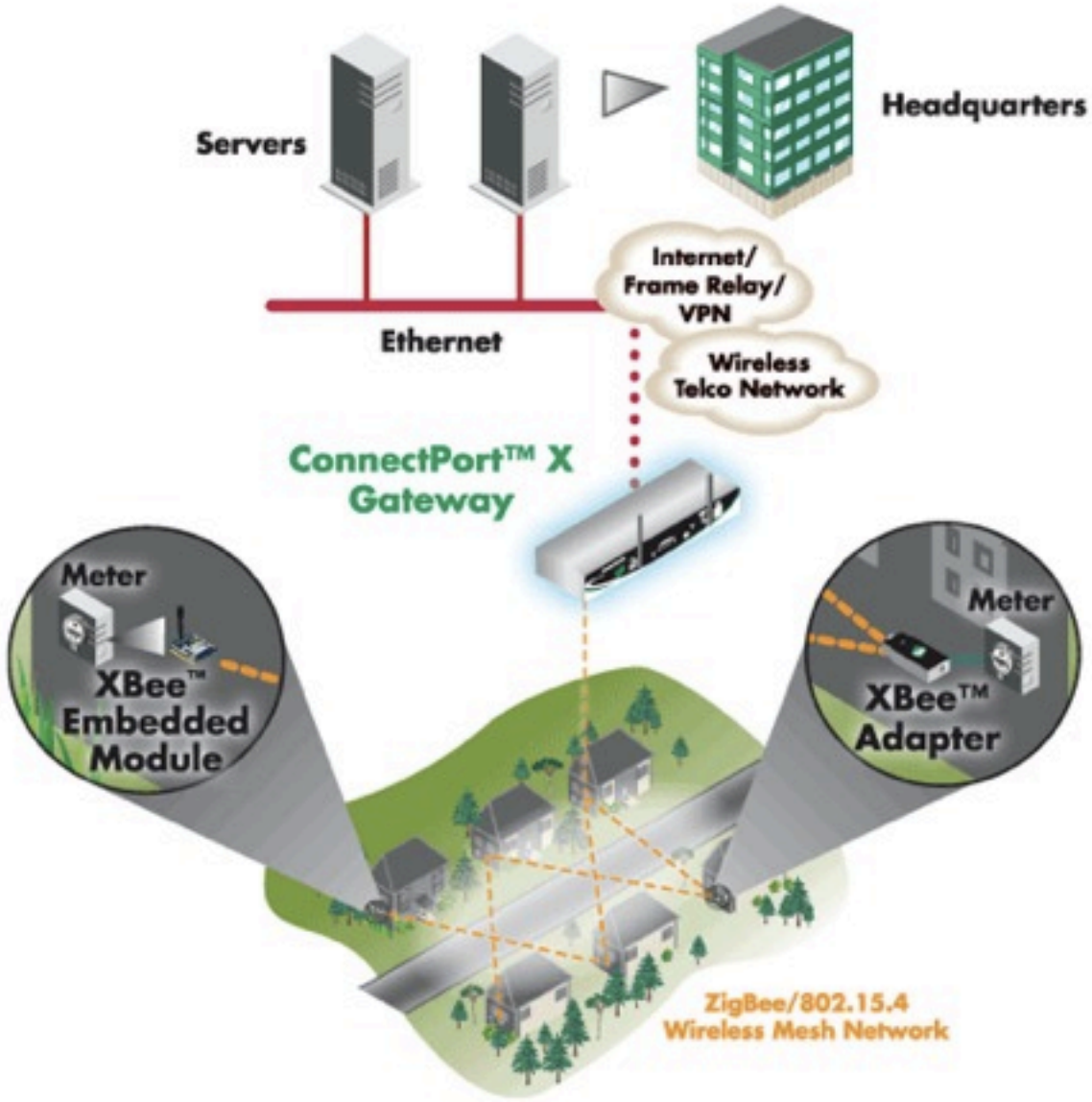
Home Health Care Monitoring Devices



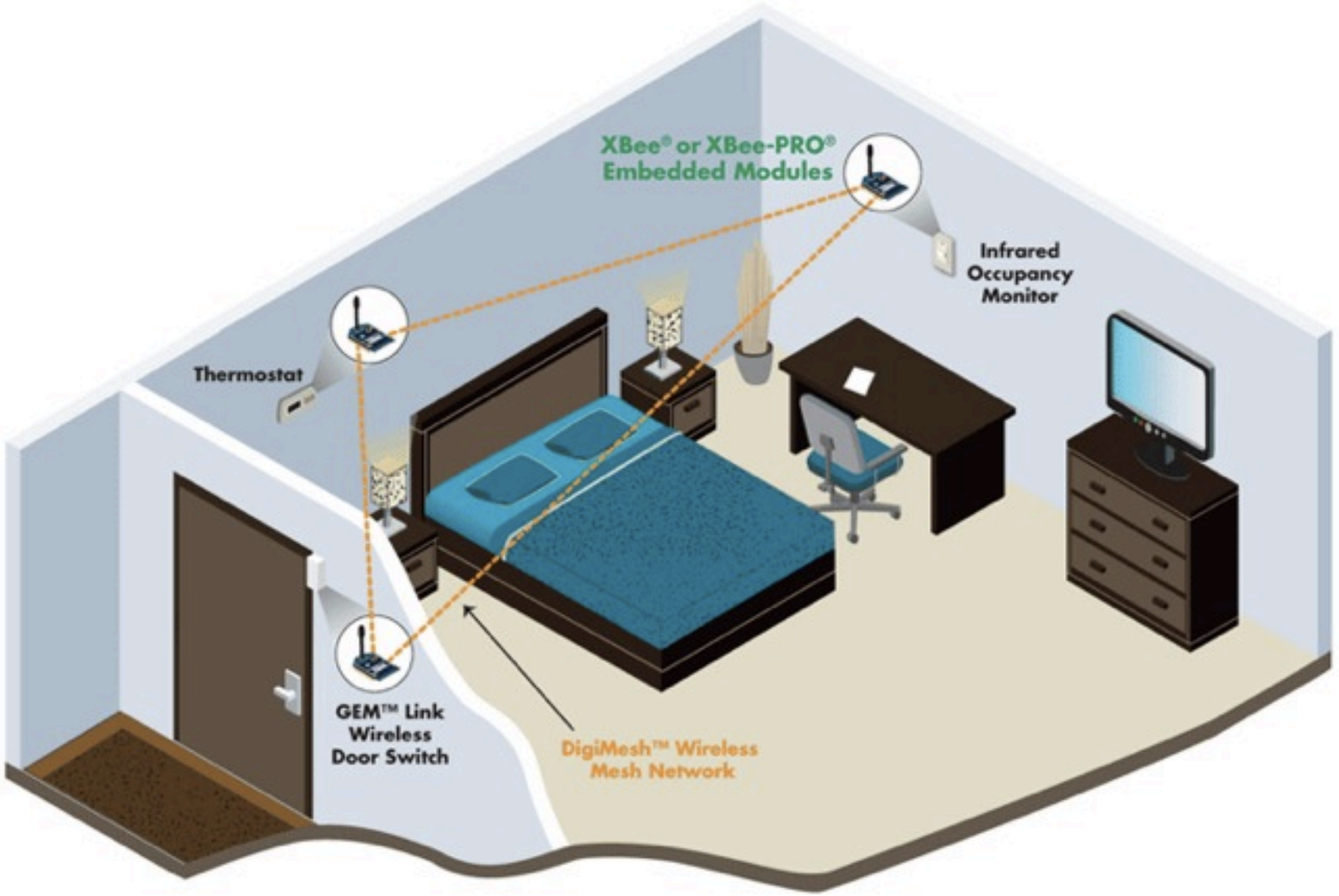
Emergency Call Systems



Monitoring Energy Consumption

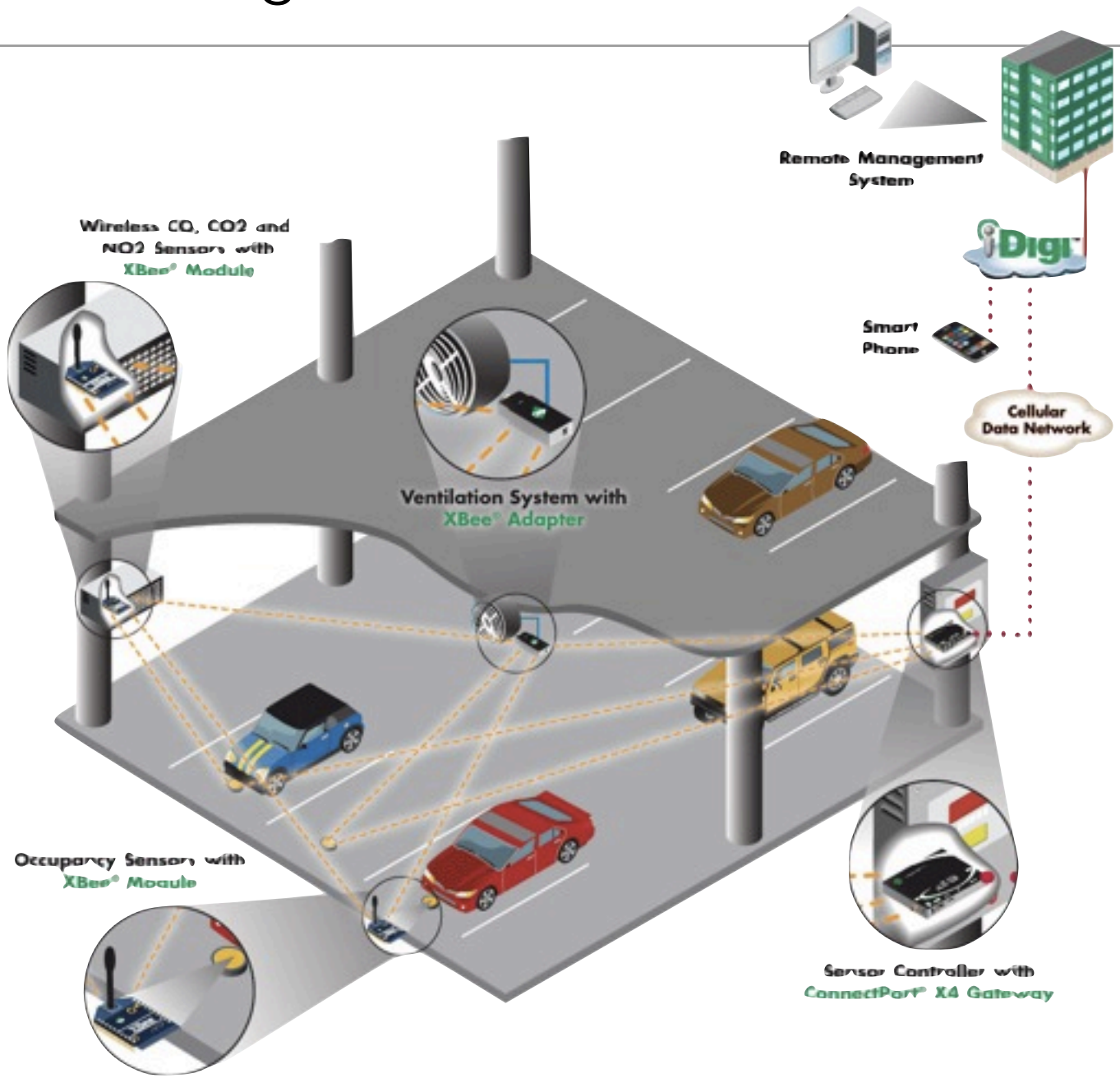


Reducing Hotel Energy Costs

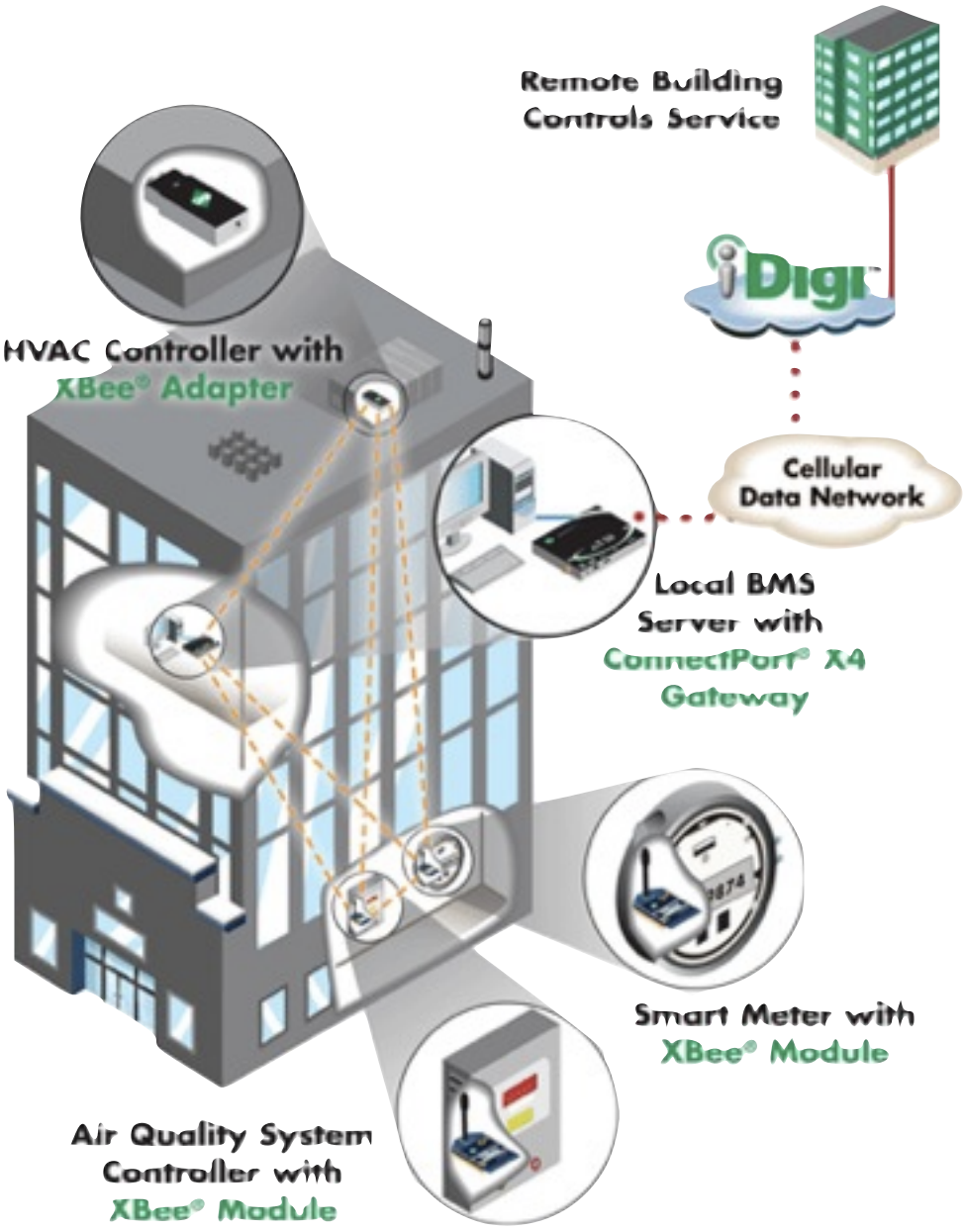


Cooking Oil Monitoring

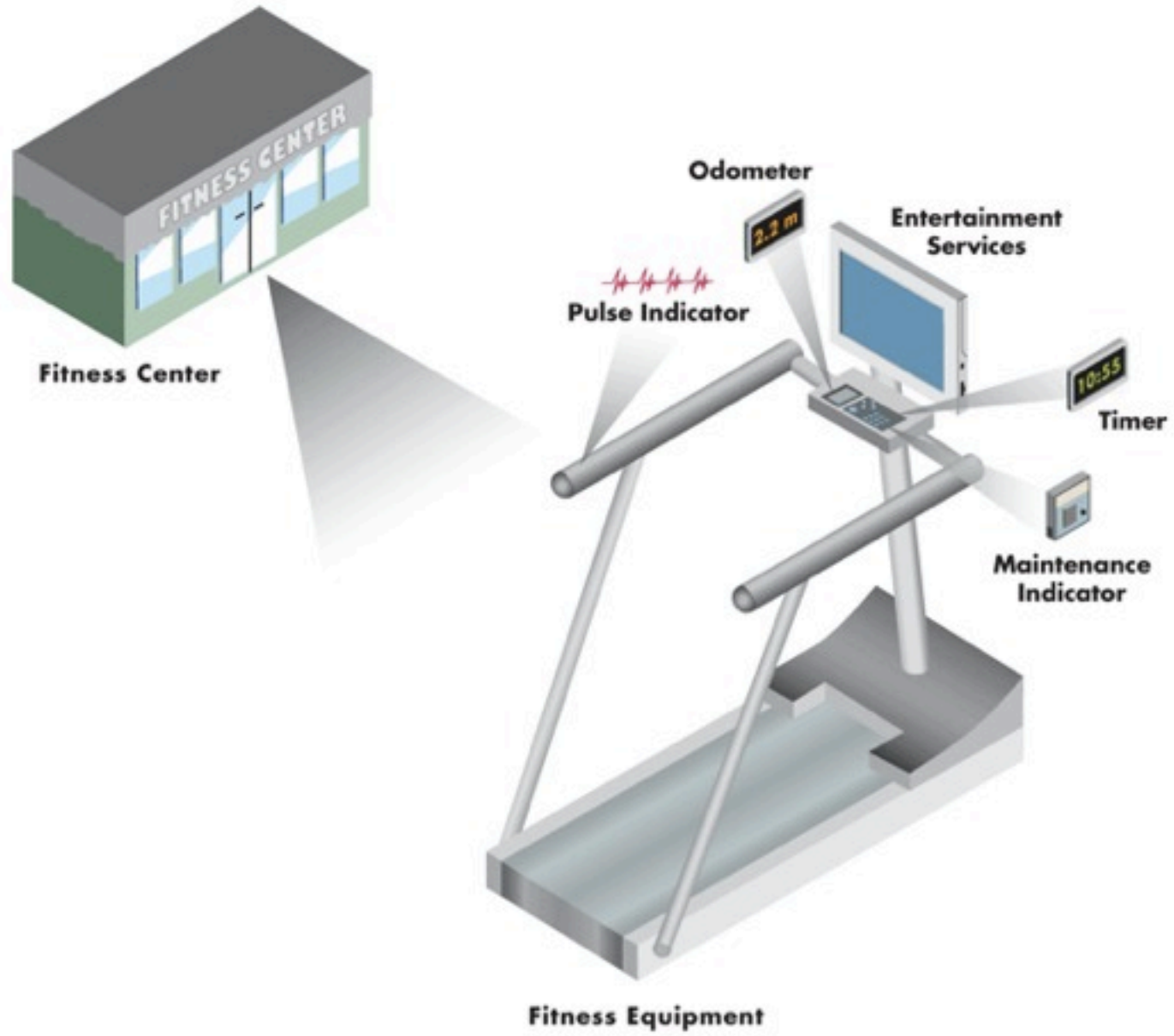
Automated Parking Structures



Building Systems Management



Fitness Centers



Restaurant Signage