

# Collaborative Mesh Networking

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Instructor: Rob Faludi  
Week 4

# Glow-the-LED

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- Review lab results
  - discuss questions, problems, successes, learnings

# Readings

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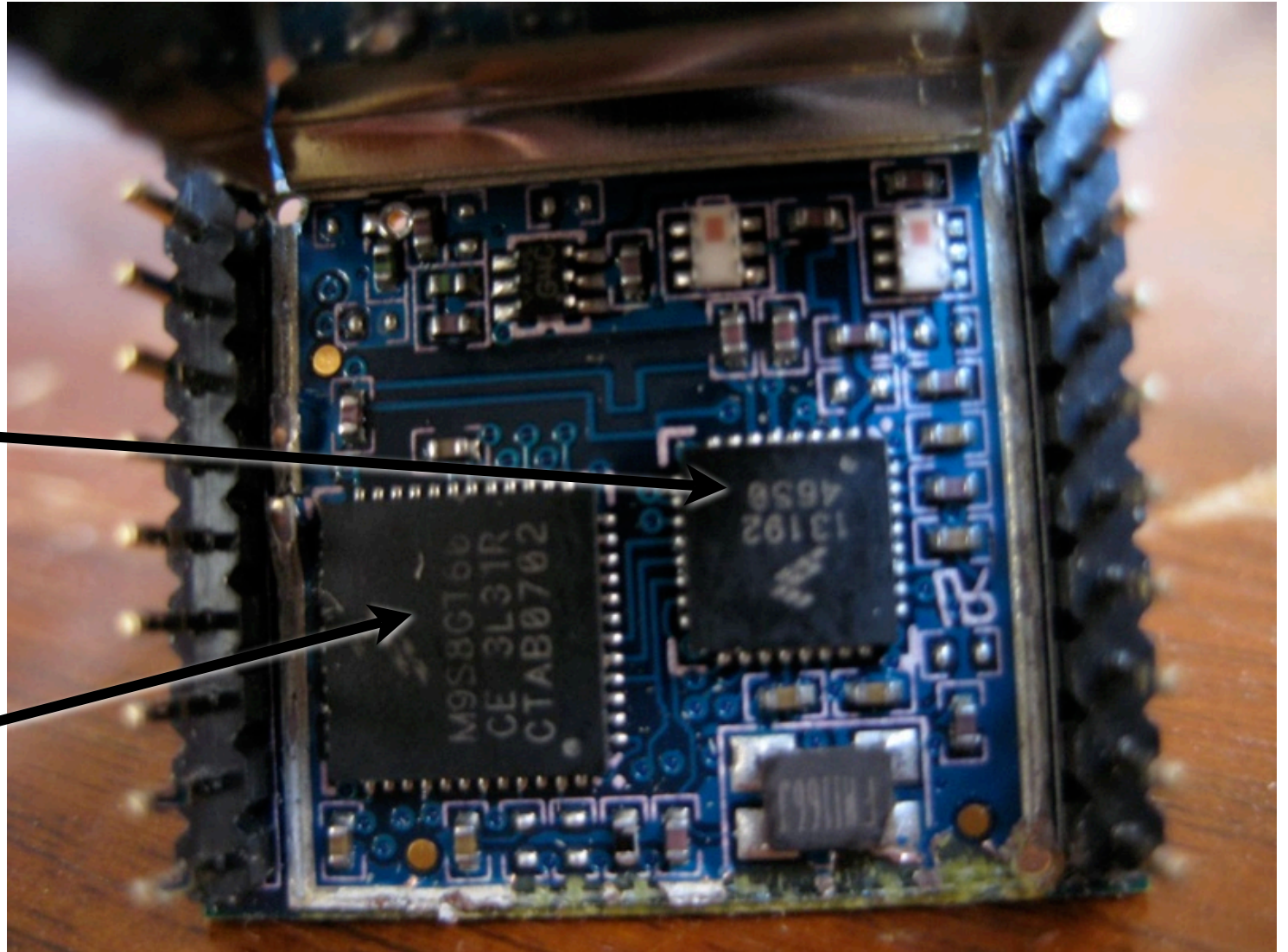
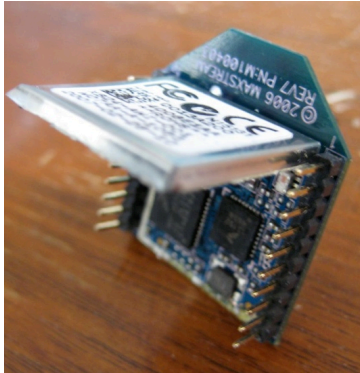
- Everything Everywhere: sensors and data in science
- Vehicle Warning System: near term utility
- Smart Dust: long term possibilities

# Documentation

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- Blog or other publicly available record of your work
- email link to me: [robert.faludi@nyu.edu](mailto:robert.faludi@nyu.edu)

# XBee Inside



802.15.4



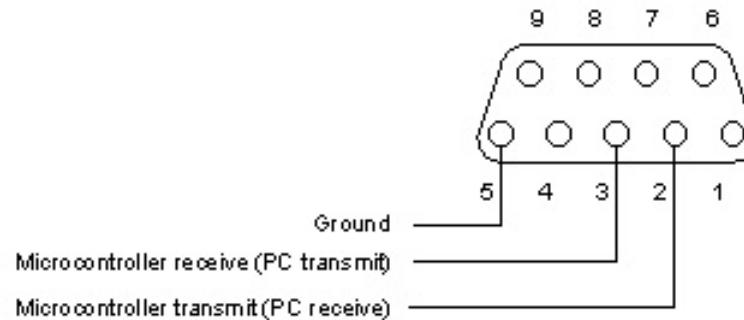
micro-  
controller



# Serial

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- Common Ground, TX, RX
- True logic: +5 Volts indicates a one, 0 Volts indicates a zero
- Inverted (RS-232): +12 Volts indicates a one, -12 Volts indicates a zero



- What are all the other pins for?

# Serial: What are all those pins?

Data Terminal Equipment (DTE)  
A "dumb" terminal



Female connector



## RS-232 Serial Communications (9-Pin)

*RS-232 was created for communications between a "dumb" terminal and an ordinary modem. Here's what all the pins were designed to do:*

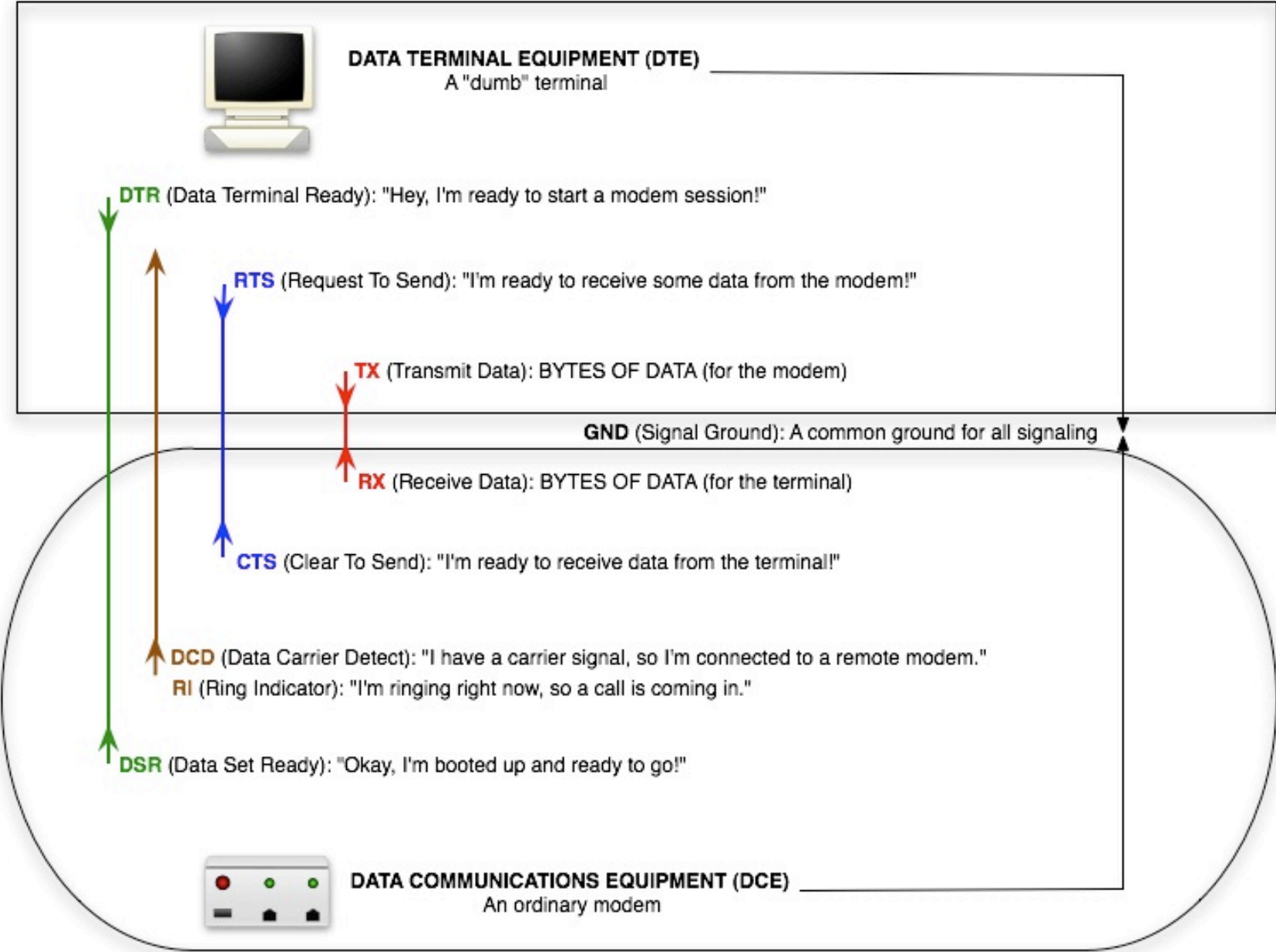
1. **DCD** (Data Carrier Detect): The modem turns this on when it has a carrier signal from another modem.
2. **RX** (Receive Data): Information sent *from the modem* to the dumb terminal
3. **TX** (Transmit Data): Information sent *to the modem* from the dumb terminal
4. **DTR** (Data Terminal Ready): The terminal turns this on when it's ready to use the modem.
5. **GND** (Signal Ground): A common ground for all signaling
6. **DSR** (Data Set Ready): The modem turns this on when it's ready to be used
7. **RTS** (Request To Send): The terminal turns this on when it's ready to receive data
8. **CTS** (Clear To Send): The modem turns this on when it is ready to receive data
9. **RI** (Ring Indicator): The modem turns this on when it is receiving a phone call

+15 Volts (logical 0 or false)  
-15 Volts (logical 1 or true)

Data Communications Equipment (DCE)  
An ordinary modem



# Serial: Managing Communications





# X-CTU

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- Features:
  - terminal
  - firmware
  - configuration
  - tests
- Demo: updating firmware

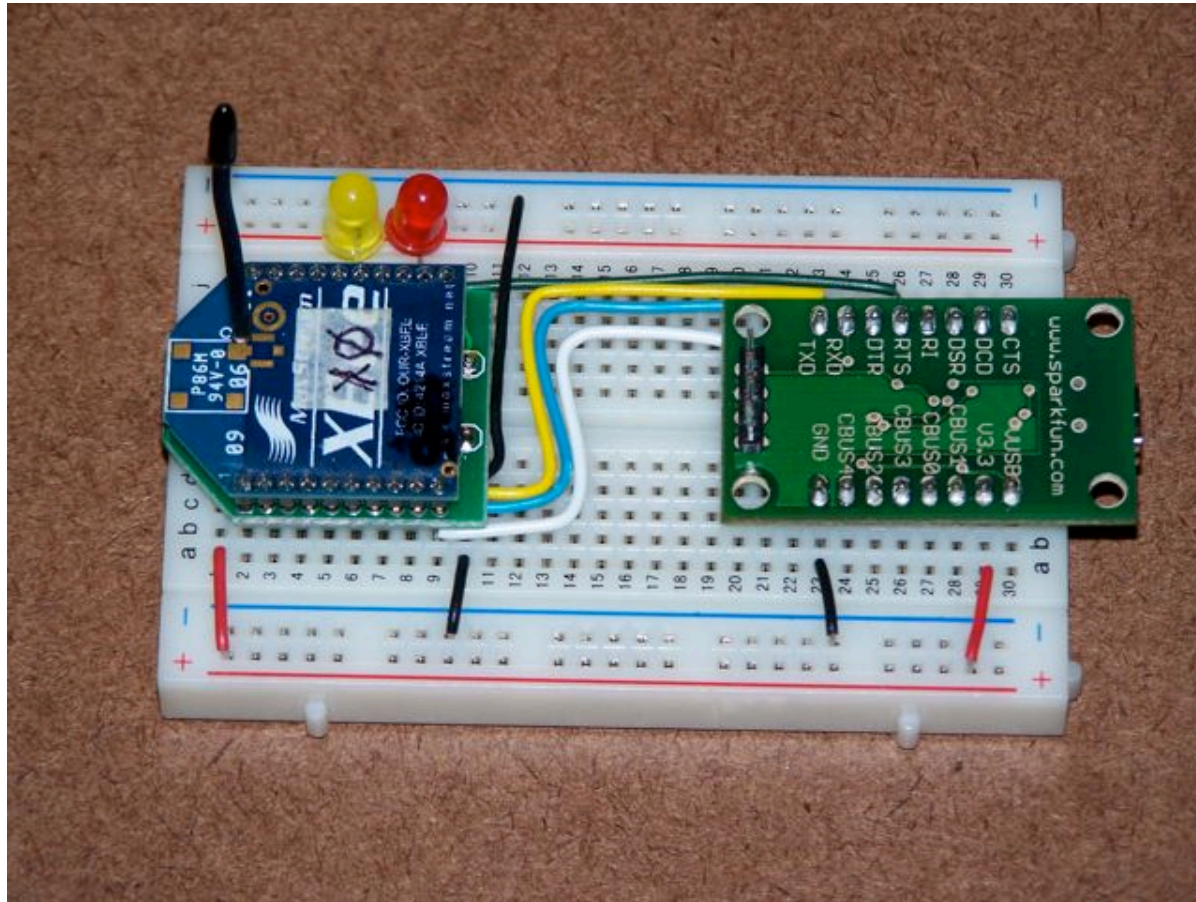
# Firmware Upload

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- X-CTU Program
- Special circuit, dongle or development board
- Firmware, command interface, test area, terminal all Windows-only

# Firmware Upload Board

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SparkFun part#PCB-FT232RL, wired to RX, TX, RTS, DTR, 3.3V, Gnd

# Protocols

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- Sending
- Flow control
- Call / response
- Broadcast
- Start / stop
- Checksums
- Collisions

# Assignment: Rock Paper Scissors

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- Steps:
  - setup XBee
  - randomly select R, P, S (0, 1 or 2)
  - indicate selection
  - send message to partner
  - read message from partner
  - compare received with selected (case statement)
  - indicate win or loss
  - repeat process (start button)

# Collaboration Groups

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- pairs

# Readings and Assignments

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- Readings

- Cooperative Artifacts: [http://rob.faludi.com/teaching/cmn/readings/Cooperative\\_Artefacts\\_2004.pdf](http://rob.faludi.com/teaching/cmn/readings/Cooperative_Artefacts_2004.pdf)
- How Management Teams Can Have a Good Fight: [http://rob.faludi.com/teaching/cmn/readings/How\\_Management\\_Teams\\_Can\\_Have\\_a\\_Good\\_Fight.pdf](http://rob.faludi.com/teaching/cmn/readings/How_Management_Teams_Can_Have_a_Good_Fight.pdf)

- Assignment

- Rock Paper Scissors



The Common Side-blotched Lizard (*Uta stansburiana*) exhibits a RPS pattern in its different mating strategies.