THAT Home Automation Topology

Project Progress Report

Chris Miller | Nick Viera

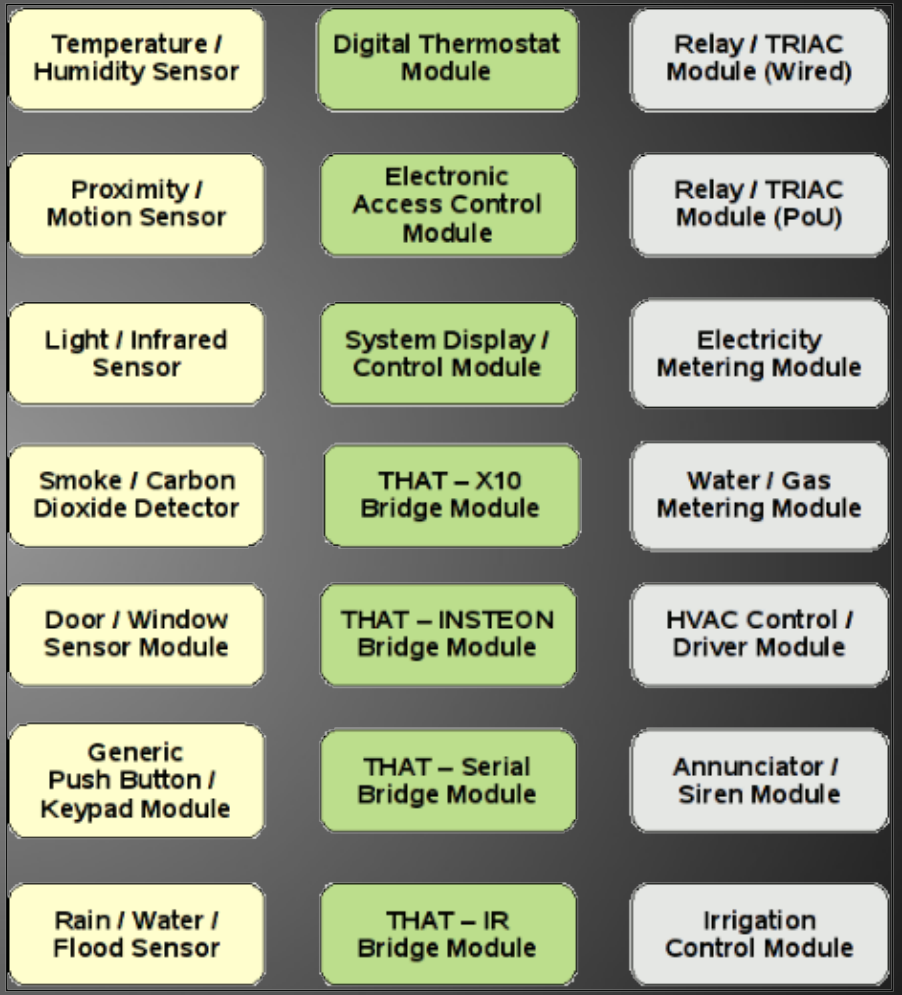
Advisors: Dr. Irwin | Dr. Malinowski

Introduction

THAT System describes a new, comprehensive, automation and control system targeted towards residential and light commercial buildings.

THAT System Design Goals

- Cost effective
- Modular and Scalable
- Emphasis on design integrity
- Form follows function
- Standardized communication using IP/Ethernet with PoE
- “Freemium” distribution model
- Not reliant on proprietary hardware or software



Project Organization

THAT System: A set of common hardware, firmware, software, and communication protocols being co-developed by Nick Viera and Chris Miller.

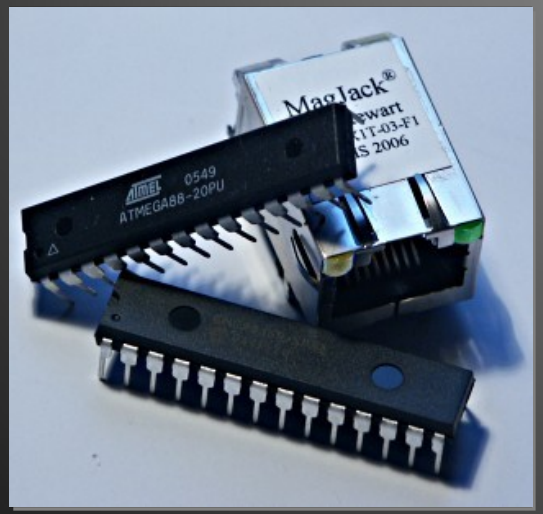
Digital Thermostat Module: An advanced, programmable, digital thermostat module for use with THAT System or stand-alone. Developed by Nick Viera.

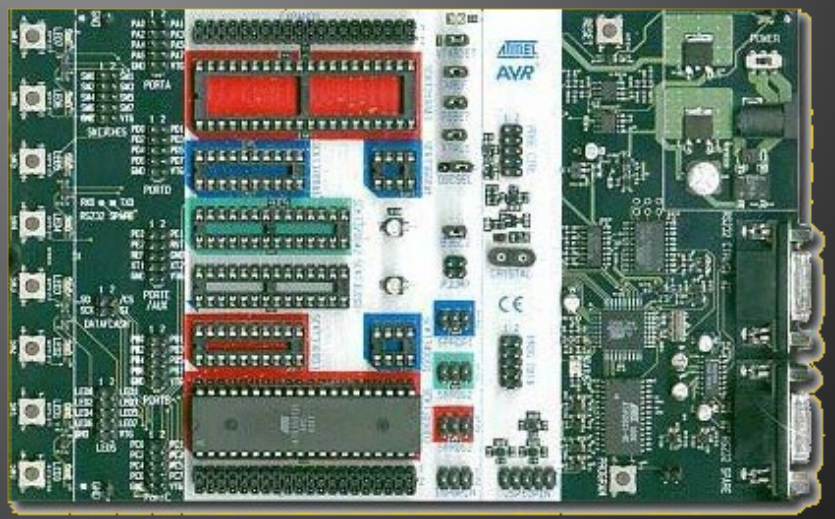
Electronic Access Module: An advanced, flexible entry and security system for use with THAT System or with additional UI module. Developed by Chris Miller.

Project Equipment

THAT (Common):

- Embedded Microcontroller [Atmel AVR platform]
- Microcontroller firmware [AVR assembly or C]
- Ethernet controller hardware [Microchip ENC28J60]
- TCP/UDP/IP stack [by Guido Socher and tuxgraphics.org]
- Onboard TCP Server functionality
- Power over Ethernet (PoE) regulator and controller
- THAT master control hardware [Computer]
- THAT master control software [Python]

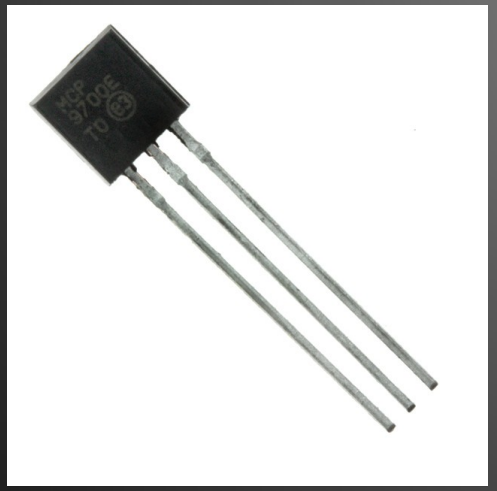


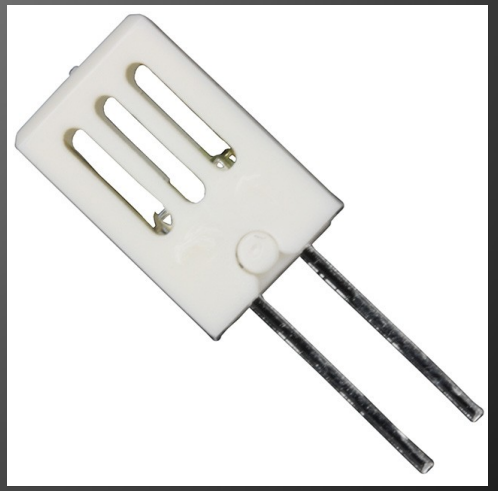


Project Equipment

Digital Thermostat Module:

- Backlit, grayscale 128x128 pixel LCD screen
- Six (6) pushbutton switches
- Five (5) LED indicators
- Infrared demodulator/receiver
- Four (4) HVAC-compatible relays
- Temperature Sensor (-40 – 125 °C)
- Humidity Sensor (10 – 95 %RH)

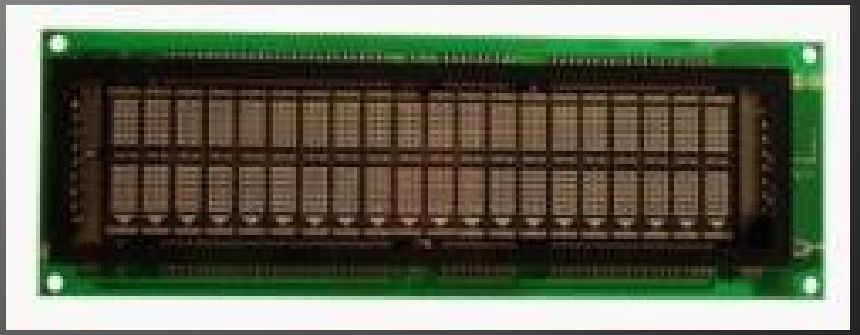




Project Equipment

Electronic Access Module:

- Two (2) electronic door strike compatible relays
- Vacuum Fluorescent Display (20x2 character)
- Wireless transceiver (2.4GHz)
- Ten (10) passcode pushbuttons
- One (1) doorbell pushbutton
- Three (3) LED indicators



Completed Work

THAT (Common):

- Initial module hierarchy
- Preliminary communication framework
- Simple TCP server and client software [using Python]
- Functional IP/Ethernet stack and embedded TCP server
- Functional “generic” THAT module prototype

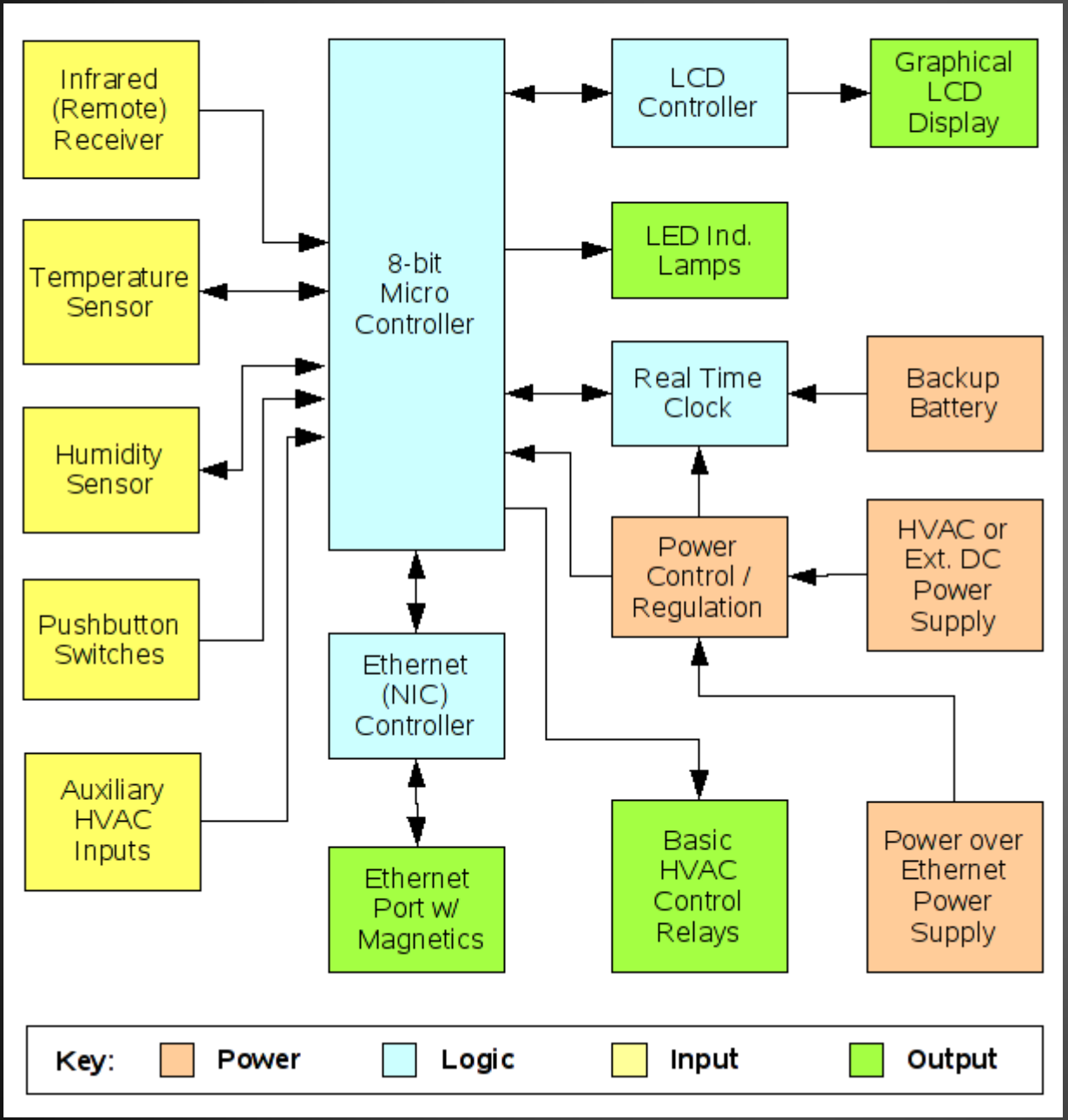
Digital Thermostat Module:

- Physical / UI design concept
- Hardware I/O map and initial components list

Electronic Access Module:

- Physical / UI design concept
- Hardware I/O map and initial components list

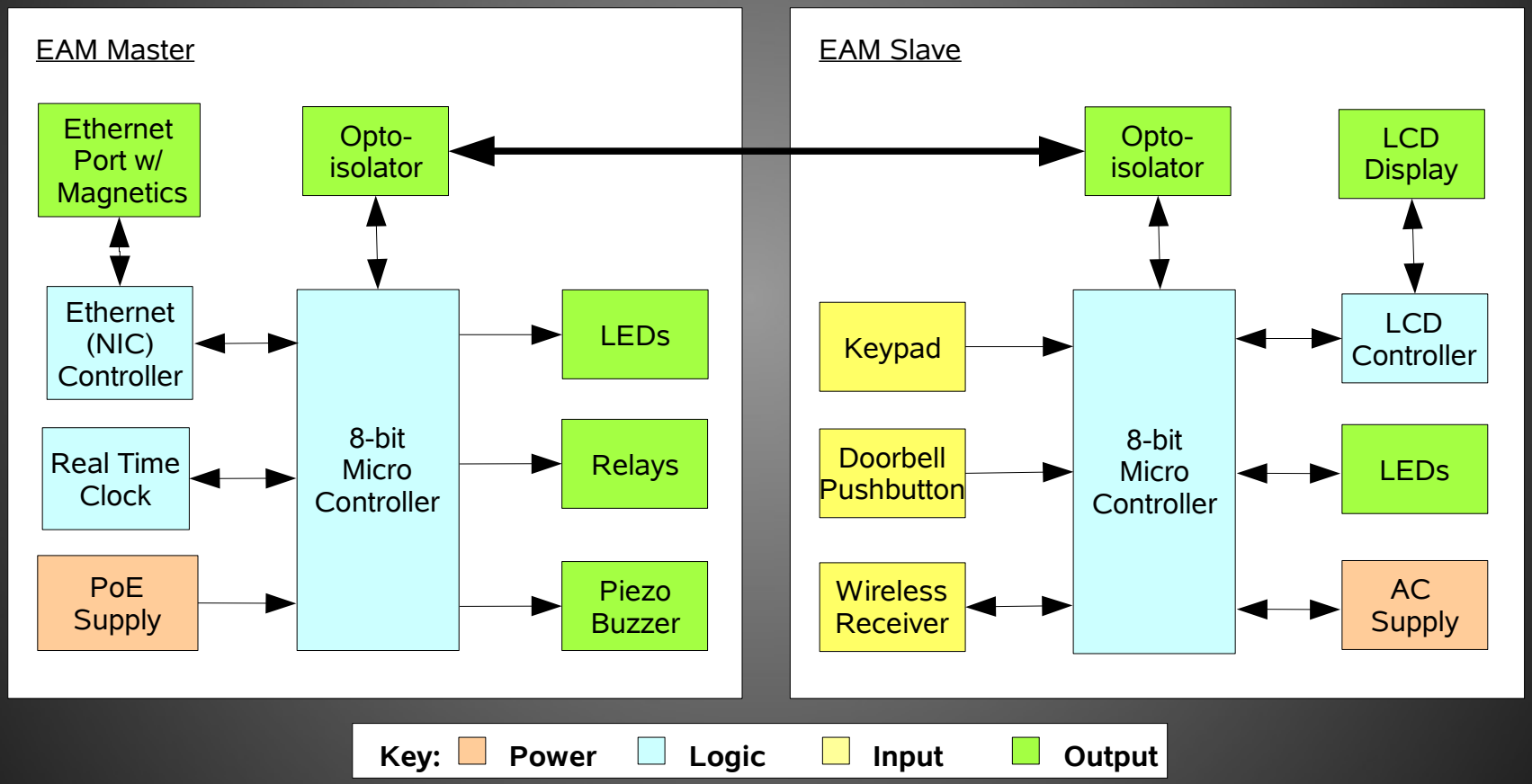
System Block Diagram



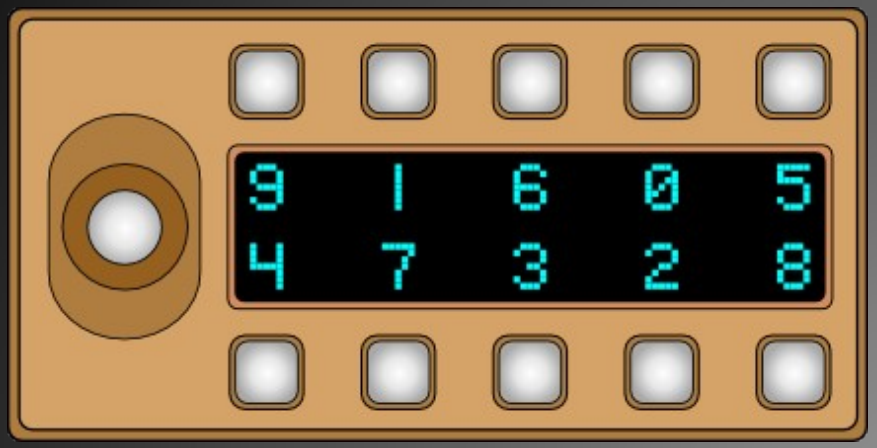
Digital Thermostat Module:

System Block Diagram

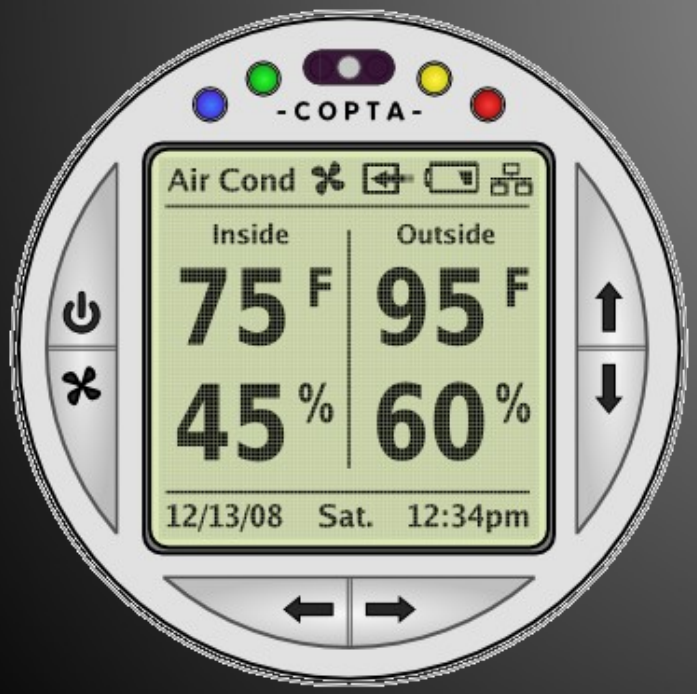
Electronic Access Module:



Completed Work

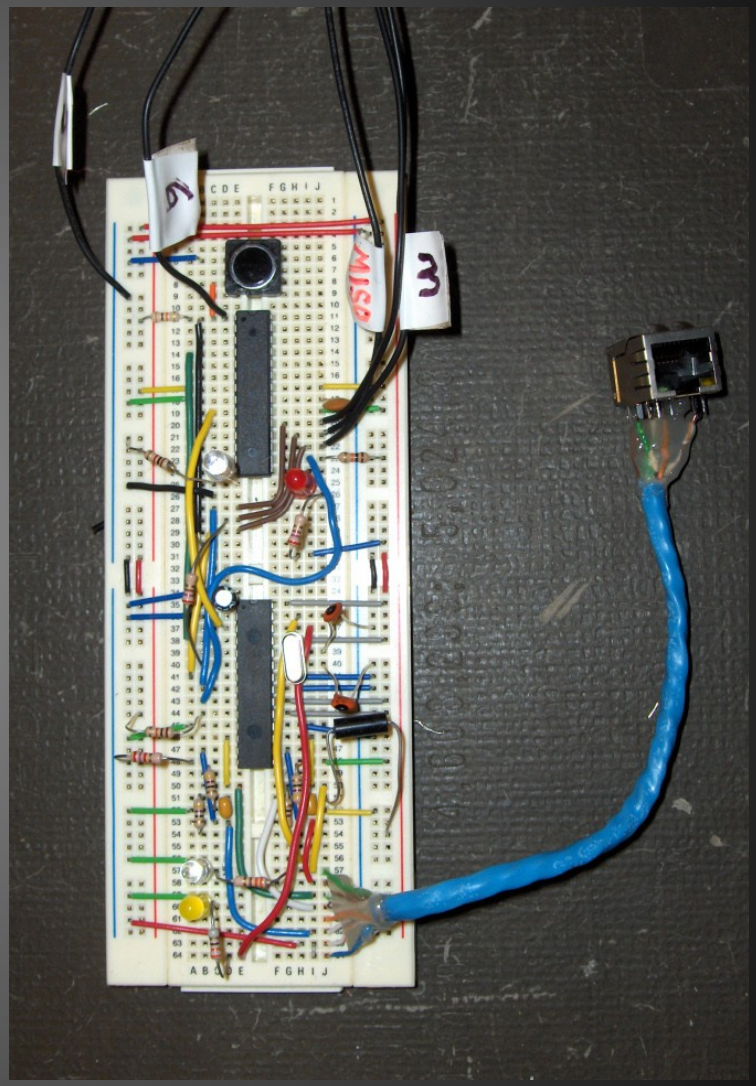


Electronic Access Module Design Concept



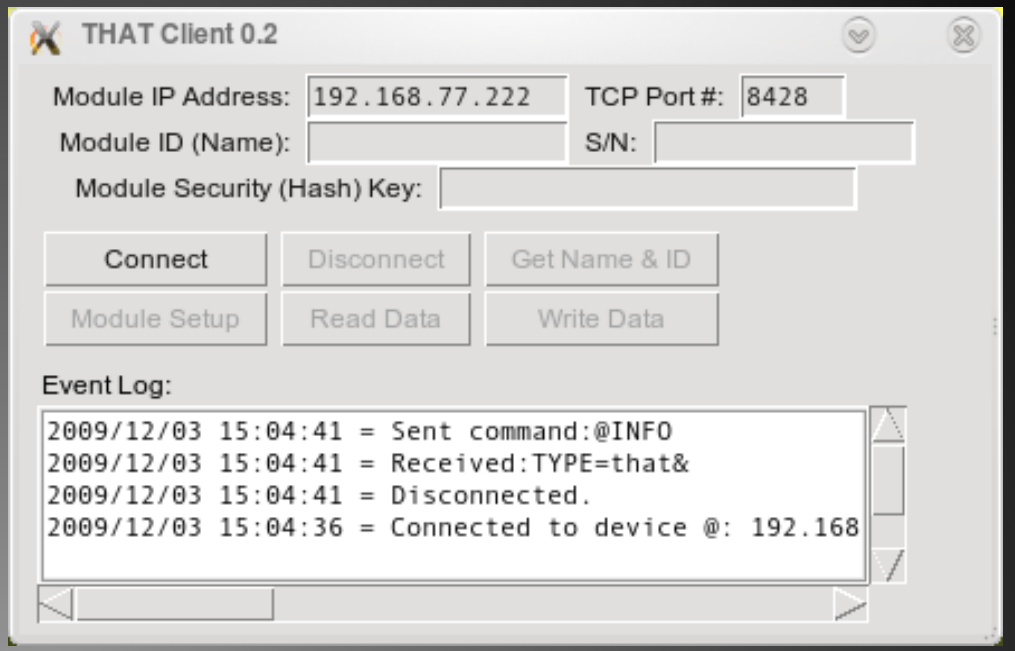
Digital Thermostat Module Design Concept

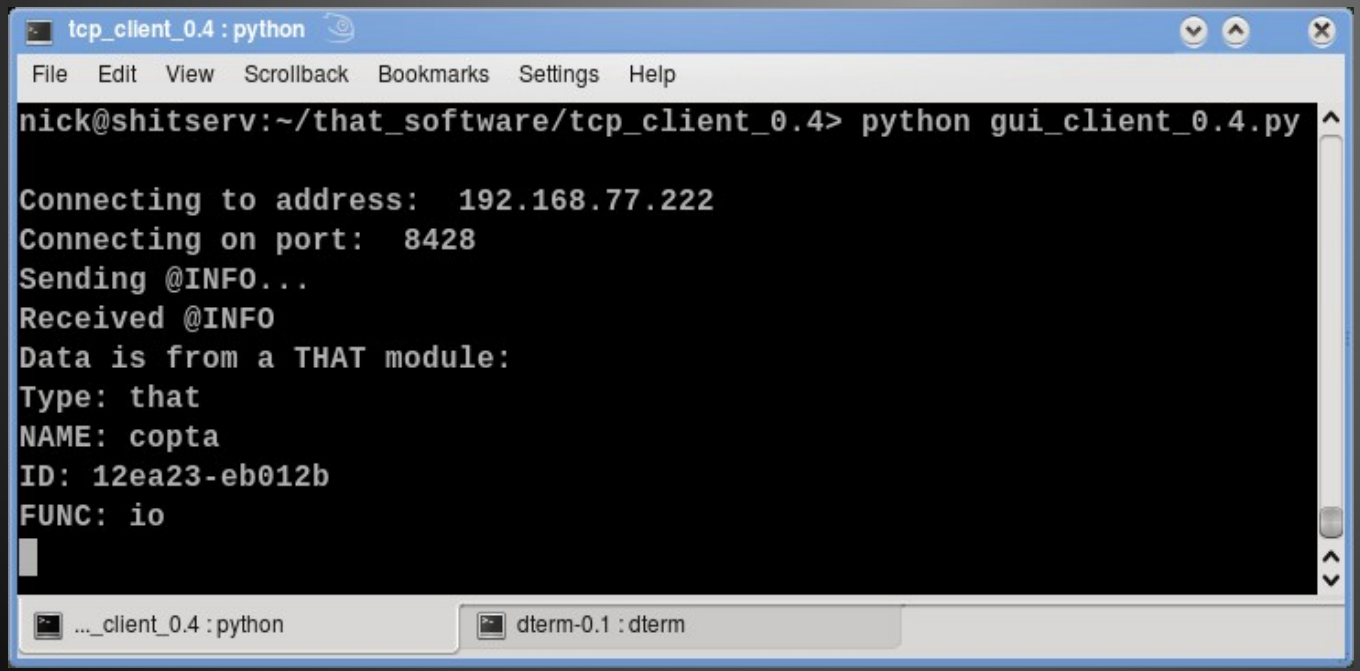
"Generic" THAT Module Prototype



Completed Work

THAT Client Software 0.2
Functional GUI (right)
and terminal interface
components





Future Tasks

- Finish THAT communication framework
- Order components for prototyping
- Built, test, and debug prototype modules
- Continue development of THAT master control software
- Design and manufacture printed circuit boards for modules
- Build actual modules on PCBs
- Finish all firmware
- Continued development of THAT software

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