Project Introduction

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The terms "home automation" and "building automation" are often used to describe a wide array of products and systems. These products aim to provide the user(s) with better, more-intelligent control over their environment as it relates to a home, building, or other indoor space. Unfortunately, most "automation" products are either inexpensive, simplistic, and severely limited in functionality, or they are very expensive, complex, and functionally chaotic.

THAT System

THAT Home Automation Topology, also known as THAT System, describes a new, comprehensive, IP/Ethernet-based home automation system developed by Nick Viera and Chris Miller. THAT System is designed to be as modular and economically feasible as possible, while retaining a rich, usable feature set. Possible modules to be designed for THAT System are shown in "THAT System Modules" below.

The morning of the first lab day dedicated to the development of THAT System was spent working on the function description of the system. The main goal was to make progress towards laying out specifications and a functional description of the Digital Thermostat Module (COPTA), which is the main focus of this lab project.

The primary design constraint for the COPTA module is that it adhere to the overall specifications laid out for all THAT System modules. A summary of these specifications are listed below.

Temperature / Humidity Sensor	Digital Thermostat Module	Relay / TRIAC Module (Wired)
Proximity / Motion Sensor	Electronic Access Control Module	Relay / TRIAC Module (PoU)
Light / Infrared Sensor	System Display / Control Module	Electricity Metering Module
Smoke / Carbon Dioxide Detector	THAT – X10 Bridge Module	Water / Gas Metering Module
Door / Window Sensor Module	THAT – INSTEON Bridge Module	HVAC Control / Driver Module
Generic Push Button / Keypad Module	THAT – Serial Bridge Module	Annunciator / Siren Module
Rain / Water / Flood Sensor	THAT – IR Bridge Module	Irrigation Control Module

Topology Definition

The overall goals and initial design specifications for the basic topology behind THAT System are listed below.

- Overall Goals
  - Modularity on the lowest-level that is feasible.
  - Standardization of hardware to the largest extent possible.
  - Standardization of communication to the largest extent possible.
  - Form follows function.
  - Design integrity takes precedence over design cost.
  - Open Source Software for most functionality
  - Open Hardware for most functionality
  - "Freemium" philosophy for advanced functionality

- Hardware Design Goals
  - Link Protocol: 10BASE-T, 100BASE-TX Ethernet
  - Transport Protocol: UDP (possibly TCP for some modules)
  - Data Jack: 8P8C Modular jack
  - External Power Jack: 2.1mm barrel jack
  - Primary Power Supply: IEEE 802.3 Power over Ethernet (PoE)
  - Secondary Power Supply: External 12-48 VDC, 9-30 VAC

Capstone Project Scope

The partial development of THAT System will be undertaken by Nick Viera for his Capstone Project. The Capstone Project is to be completed senior year to meet the requirements for graduation from the Electrical Engineering program at Bradley University; located in Peoria, Illinois.

Nick Viera's Capstone Project will be focused primarily on the design and implementation of a Digital Thermostat Module for THAT System. The Digital Thermostat Module design, also known as COPTA, will adhere to the topology of THAT System. Thus development of the COPTA module also involves further development and refinement of THAT System as a whole.

Lastly, Nick Viera will be working in collaboration with Chris Miller, who is also working as a co-developer of THAT System. Chris Miller will be developing an electronic entry module for his Capstone Project at Bradley University.