# Home Automation

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## Introduction

The Home Automation System is an embedded system that is capable of remotely controlling home appliances.

It uses the X10 Home Automation products to communicate with appliances and gives home users control through a centralized web interface.



**Fig.1 Altera DE2 microcontroller board**

## Hardware

The system is designed on the DE2 micro-controller board. The board's FPGA is used to implement a Cyclone II/f processor clocked at 100 MHz. Also, the following hardware from the board is used in this system:

- 8MB SDRAM

- 4MB FLASH

- USB: Interfaced with the X10 USB Transceiver

- Ethernet (DM9000A Controller)

## Design

There are two main components to the home automation system: the controller (DE2 board) and the X10 Home Automation products.

The controller is the main part of the system. It is connected via Ethernet to the Internet and hosts a web site for centralized control. On the other end, the controller is connected to the X10 USB Transceiver. Once a user initiates a command on the web site, the controller will relay the command to the transceiver.
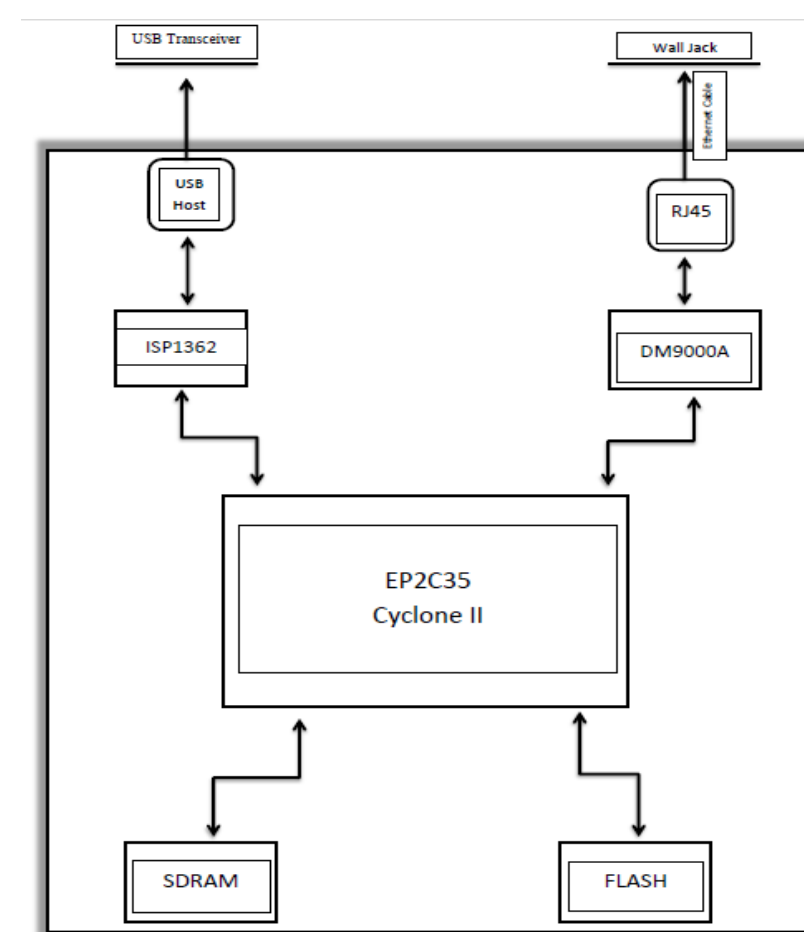


**Fig.2 Hardware diagram of the controller**

The X10 system consists of a USB RF Transceiver, a RF Base, and the appliance modules. Each appliance is first connected to an appliance module, which is connected to a wall socket along with the RF Base. Once the transceiver receives a command, it is relayed to the base. The base and other appliance modules then communicate with each other using the electrical circuitry of the house.



**Fig.3 Controller with the X10 system shown on the right**

## Software

The software on the board consists of a web server and a USB helper task. The two tasks communicate together using a message queue.

The web server hosts a web site for centralized control. Through the web site, the user can request appliances to switch on or off. Once a request is made, the web server picks up the request and sends it to the USB helper.

The USB helper then analyzes the command, re-encodes it, and sends it on it's way to the X10 USB Transceiver. The transceiver then picks up the signal and sends it to the rest of the X10 system.

## Website

Through the website, a user can manage their appliances from a centralized location. The web site can be accessed from any web browser, which implies portability across many devices.

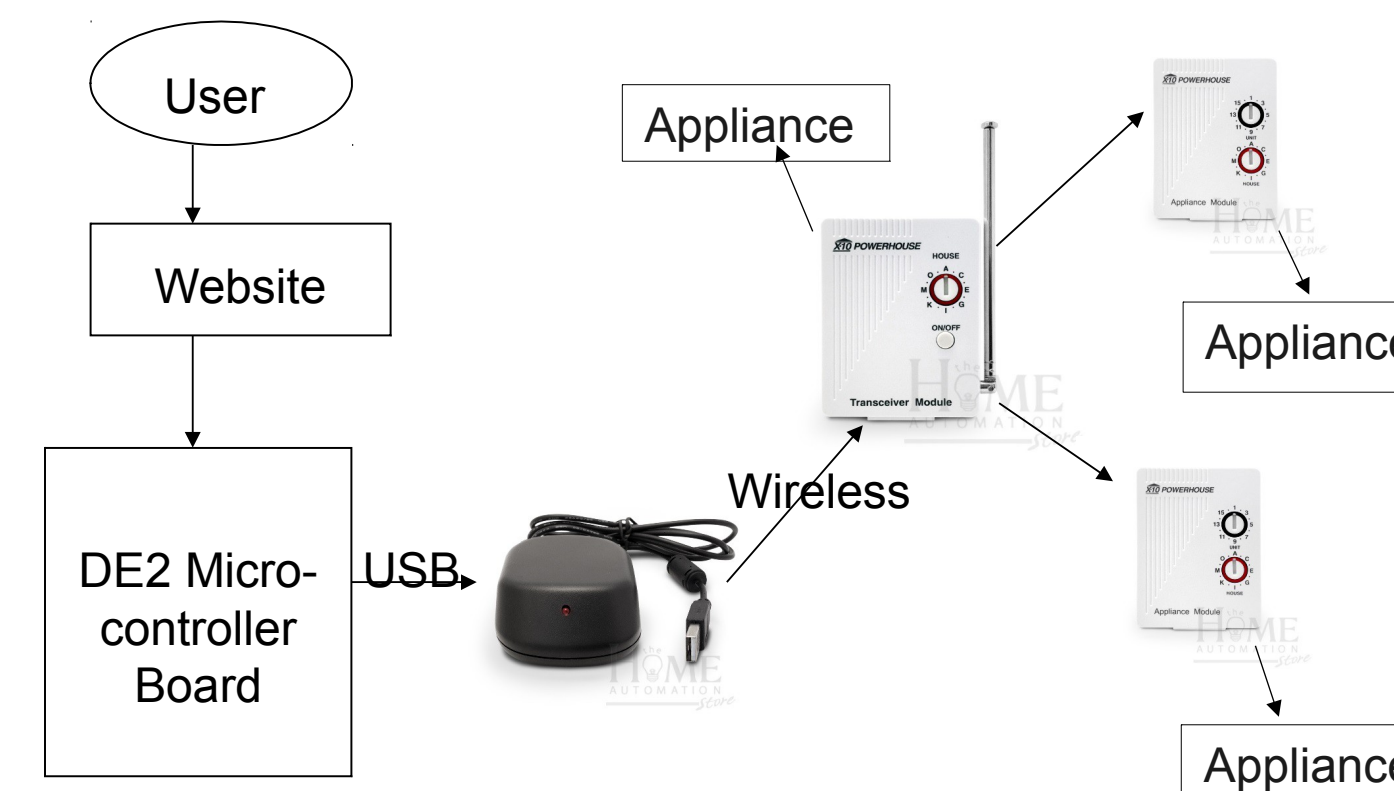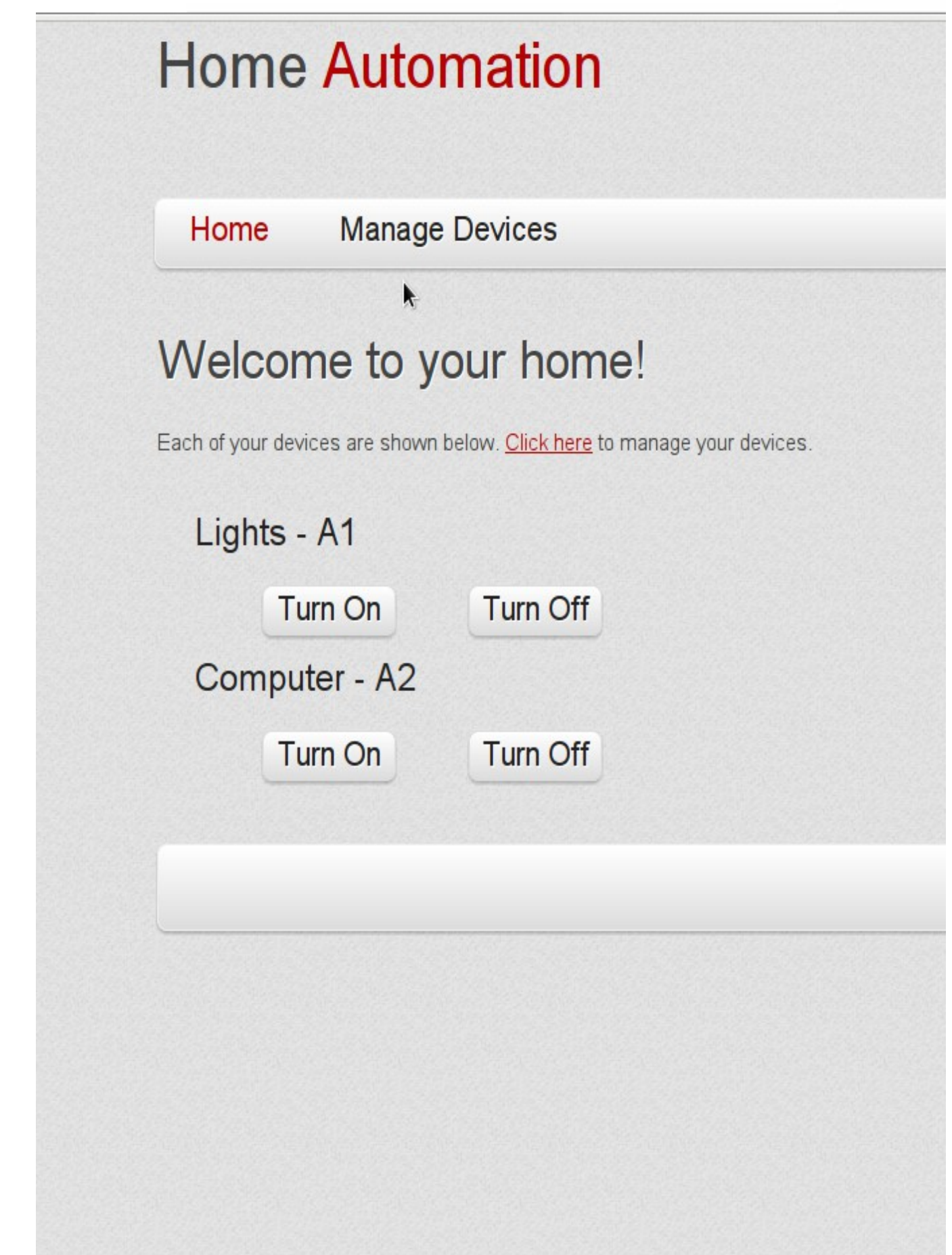A user can dynamically add or remove appliances, as well as turn them on or off through the web site.



**Fig.4 Home automation website**

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