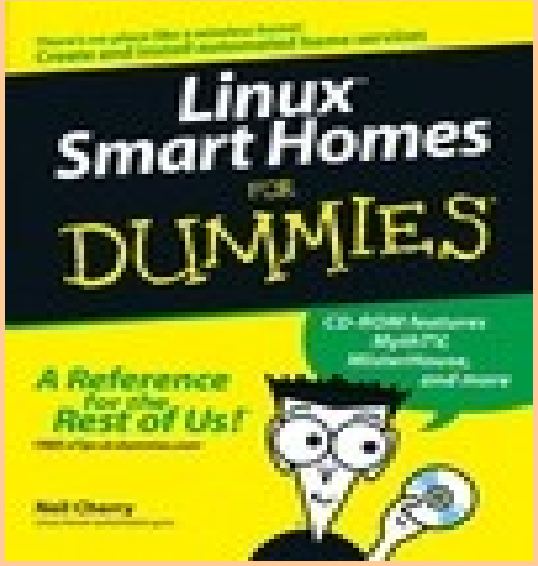
Presenting
Linux Home Automation



Disclaimer

- None of the opinions expressed on these pages are paid for. They are strictly my own and may not represent an endorsement of someone's project, product or service (unless otherwise stated so).

My Introduction

- Neil Cherry (ncherry@linuxha.com)
- New home for Linux HA http://www.linuxha.com/
- My blog: http://linuxha.blogspot.com/
- Author: Linux Smart Homes For Dummies - 2006
- Linux *HA* stands for Linux *Home Automation* not Linux *ha*!
- The term Linux HA could also mean High Availability

What is home automation (HA)?

- Home Automation (or Domotics) is automation specific to the requirements of private residences. It applies techniques for the comfort, security, entertainment and communications needs of it's residents. In simplest terms it is control and monitoring of devices and information.
  - Lighting and appliance control
  - Heating, ventilation and air conditioning (HVAC)
  - Energy/Resource management

What is HA?

- Security and access control (SAC)
  - Doors and windows control and monitoring
  - fire alarm (FA), fire, life, and safety (FLS)
  - CO alarm
  - Flood/Water Alarm
  - Thunderstorm/Tornado/Weather warning
- Communications (voice and data)
- Entertainment control
- Information processing

Home Automation Introduction

- Home automation, It often starts with holiday lights
- You don't need a computer for this
- A simple remote and some modules will do ...
- *... but where's the fun in that!*

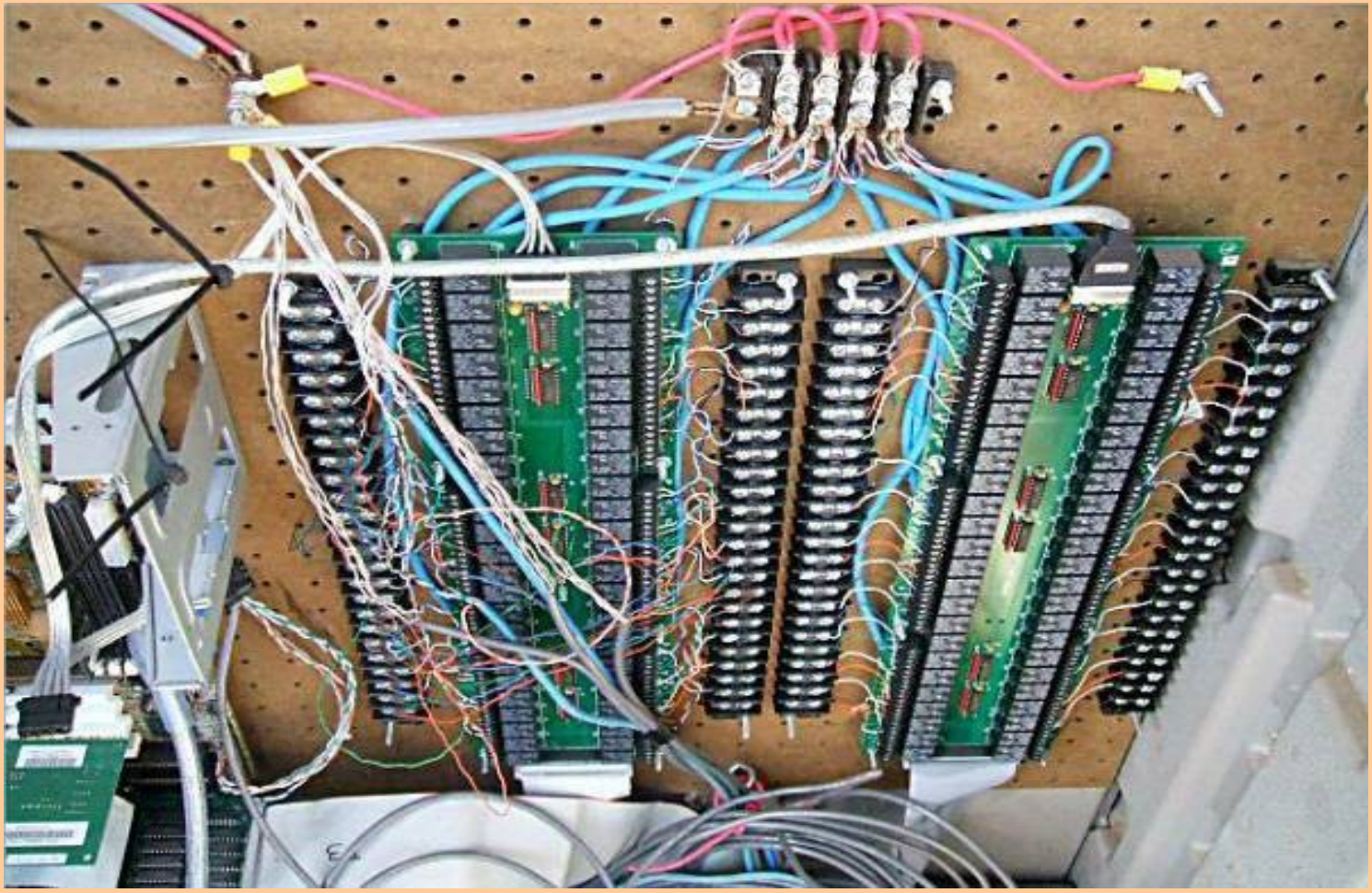
HA Introduction

- Typical hardware you'll start with:
  - Lamps modules
  - Computer interfaces
  - A desktop control is not a bad idea also
- You expand to control other appliances typically lights
- Has a very high 'Geek factor'
- Wild ideas begin to fill your head
- Reality sets in when gremlins strike
- SAF is ***very*** important!

HA gone overboard! ;-)

http://www.komar.org/

Christmas lighting from hell



History

- 1950's Popular Science article
- 1970's Internet Coke machine
- 1978 BSR X10, CP290 RS232 transmitter
- 1980's -Steve Ciarcia, Byte magazine
  - Jan 1980 – Computerize a Home
  - Apr - June 1985 – Home Run Control System
  - 1988 - HCS II, HCS DX, Spectrasense 2000
- 1990's – CM11A, CM17A, MR26A, CM19A
- 2000's - CM15A

HA

- With HA you control and monitor devices and information
- Sprinkler system
- monitor your email
- trigger things based on time, temperature, email or something else.
- Security
  - monitoring doors and windows
  - fire, smoke, water & CO

HA (continued)

- Entertainment
  - music
    - Juke box
    - Streaming
    - Podcasting
  - TV
    - live
    - recorded (VCR, DVR)
    - Streaming video
    - video casting (YouTube)
  - Radio

HA (continued)

- Weather
  - prediction
  - recorded history
  - current temperature, humidity, wind, barometric pressure, rain fall, sunshine.
  - phase of the moon
  - tides
  - Internet

What can you do with it?

- Lights and appliances (direct, power line or wireless)
- TV, VCR, DVD, Tivo (IR)
- Tivo Series I, 2 & 3 (IP network)
- Monitor weather
- Temperature
- Thermostats
- Internet Information

Technology

- X10 (oldest)
- Insteon (newer, like X10 but also wireless)
- UPB (newer, like X10)
- Z-Wave (wireless)
- Direct IO (Digital and Analog)
- Networked (RS485, IP, IButton, SPI)
- Crestron
- Lutron-RA (Wireless)

PLC

- Trouble makers
  - Baby monitors
  - Jack extenders
  - Ethernet of power line
- Blackholes!
  - TV
  - Stereo
  - UPS
  - Computer switching power supply
  - Can be fixed with power line filters

Products

- PLC (X10, Insteon, UPB, KNX/EIB, Lonworks, CEBus)
- Wireless (X10, Insteon, Z-Wave, 900MHz)
- Networking (RS485, RS232, IP, wireless)
- Ibutton (1 Wire)
- Dlink streaming video server
- IP Camera

Computer Interfaces

- Not necessary (remotes and KeyLincs will do)
- Where's the fun in that?!
- Lots of different types

Wireless Access Points

- Insteon specific
- used to connect the 2 – 120v AC phases
- will not bridge X10!
- Newer APs used with the wireless remote.

Modules

- Lamp module
- Appliance module
- Digital output module (Sprinklers)
- Universal module (digital input)
- Wireless module

Wall Switches

- Some control loads
- Some only transmit a command
- some do both

KeypadLincs

- Some only send commands
- some can control one load (appliance control)
- the ones with a load can receive commands

KeypadLinc w/Dim

- Most do not control an electrical load
- Sends commands
- can send group commands.
- on/off
- dim/bright

Wall Outlets

- X10 Super Socket
- Insteon Outlet
- on/off

Wireless (X10)

- TM751
  - wireless controlled only!
- RR501
  - PLC and wireless controlled
- Key fob
- hand held
- In car remote

Phase coupler

- If you have 2 phases you need a phase coupler, signal amp or repeater
- Insteon has the wireless bridge (nice)
- UPB needs a coupler too!

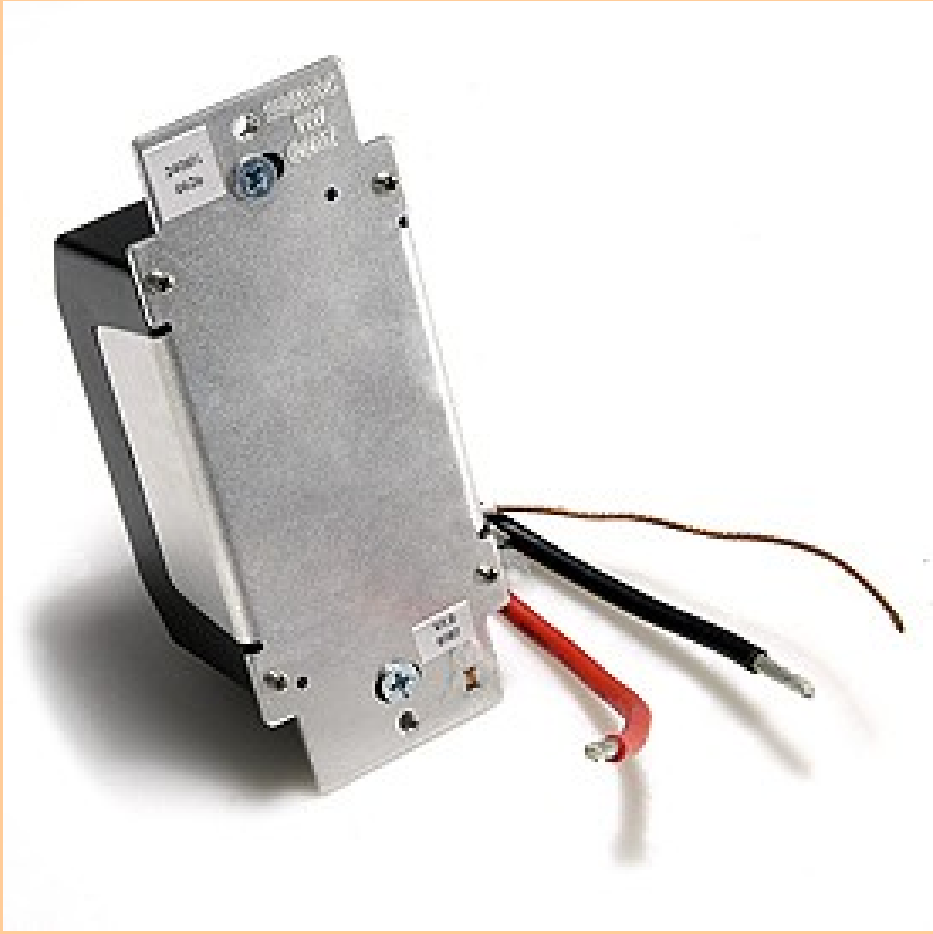


Table top controllers

- Ugly but useful
- Smarthome has a lot of useful features
- Mini console – 4 buttons (useful for testing)
- Console - 16 buttons (?)

Insteon Remote

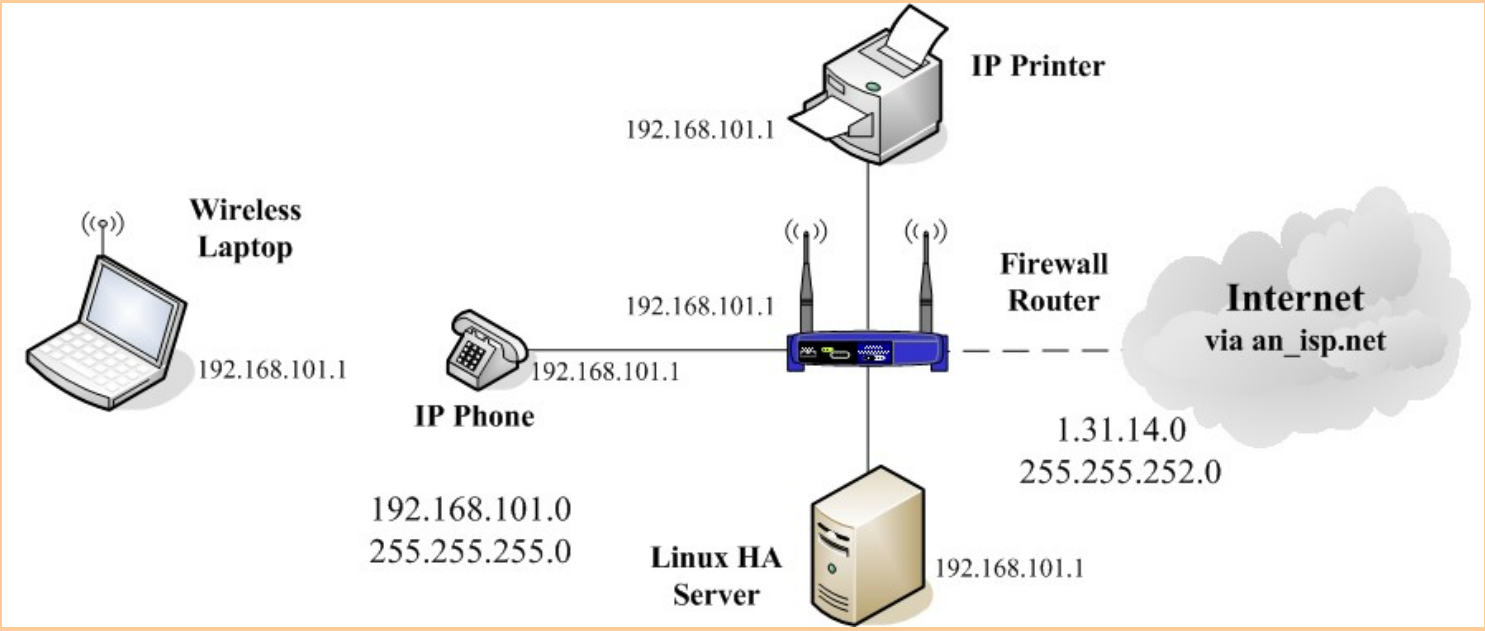
ADI Ocelot

- Independent controllet
- Uses the TW523
- Download your program to the Ocelot
- A very good IR interface
- Digital I/O
- RS232 Interface

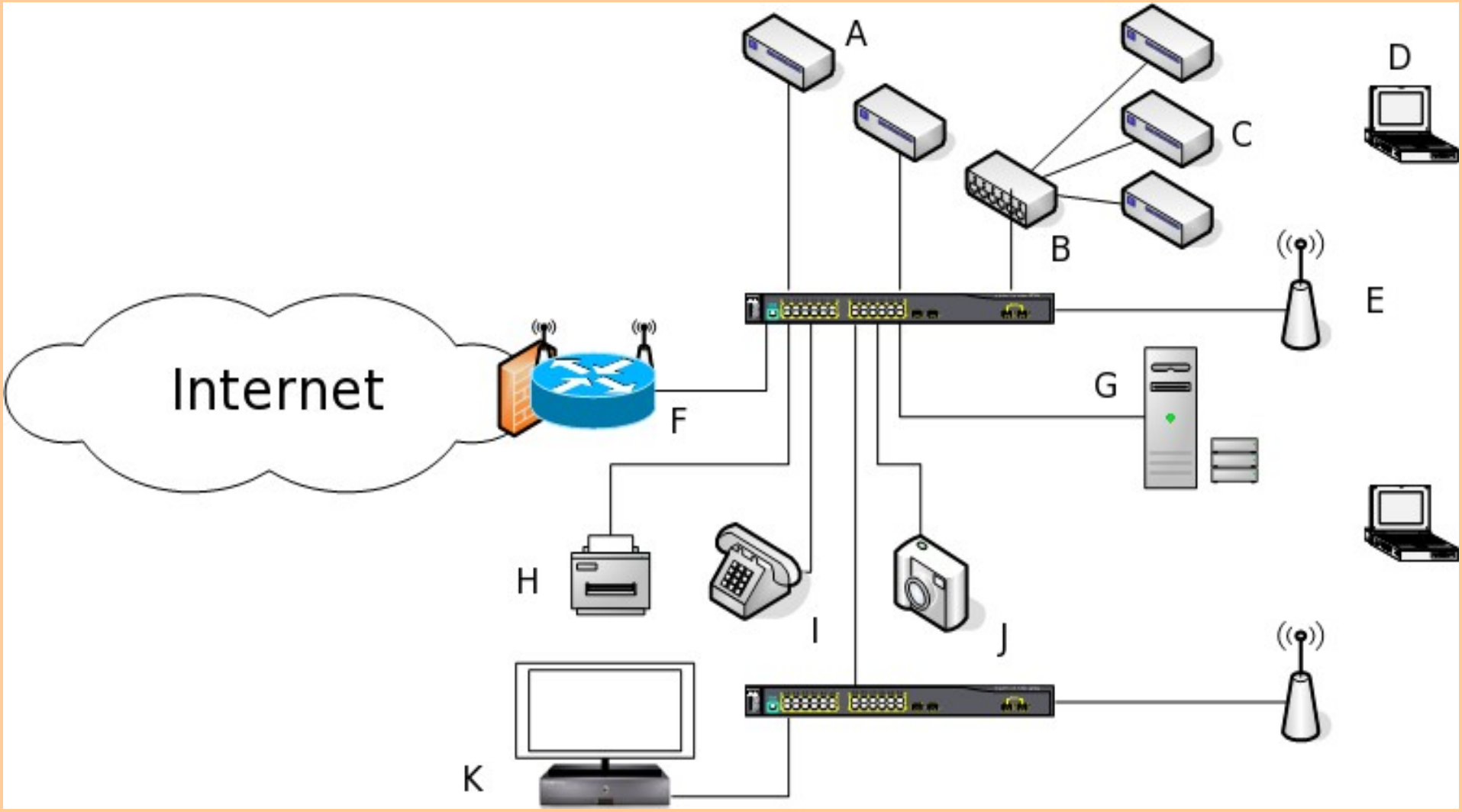
Linux Server

- The server can be anywhere from 66 Mhz up to a multi-core machine.
- Memory 32M – several Gigs
- headless or with several monitors.
- Virtual machine
- wired
- wireless
- multiple NICs

Networking


IP Printer
192.168.101.1
Wireless
Laptop
192.168.101.1
192.168.101.1
Firewall
Router
Internet
via an_isp.net
192.168.101.1
IP Phone
1.31.14.0
255.255.252.0
192.168.101.0
255.255.255.0
Linux HA
Server
192.168.101.1

Networking (continued)



Networking (continued)

- NAS (Network Area Storage)
- Printer sharing
- VOIP
- Most routing inside the home is static or default routing.
- Gaming machines

Going Green

A little home automation

A little home automation (cont.)

Misterhouse (MH)

http://www.misterhouse.net/

- MH is written entirely in Perl.
- It has a rather strange Object Oriented method of coding because MH writes some of it's Perl code at startup
- Very flexible because it's able to take advantage of the existing library of Perl Modules.
- Starting out is not terrible complex but some knowledge of Perl is required.
- Plenty of examples exist
- Mail lists are very friendly and supportive.

Misterhouse (MH)

- Control
  - X10
    - Appliance control
    - Sensor monitoring (Motion/PIR)
  - KNX/EIB
  - Direct I/O
  - 1-wire/IButton
  - Insteon
  - UPB
  - Z-Wave
  - IP

Misterhouse (MH)

- IR
  - transmit
  - receive
- Wireless remotes (non X10/Insteon)
- Macros
- Triggers

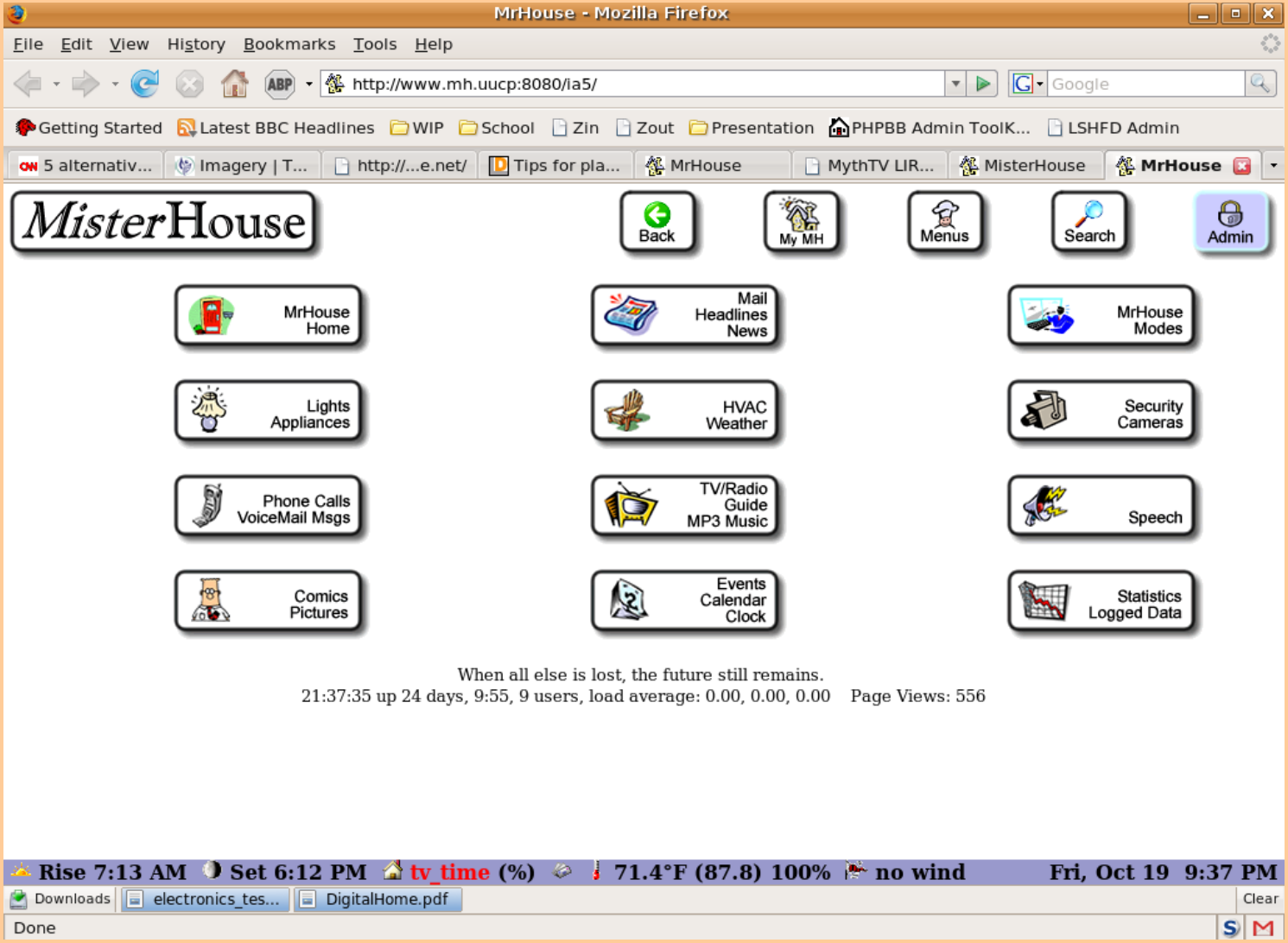
Misterhouse (MH)

- Speech – TTS
- Listen – STT
- Weather
- News
- On this day, fortune etc.
- Comics
- TV Guide
- Home Layout

Misterhouse (MH)

- Grocery list
- Organizer/Calendar
- Stocks
- email
- Home Security
- custom Perl code
- custom web pages

Web Interface



MH .mht file

```
# Type    Address   Name              Groups
#
X10A,     01,       Holiday_Lights,   Holiday|O,
X10A,     O1,       xO1,              Holiday|Test|O,
X10A,     01,       Backup_Lights,    Holiday|O,
X10A,     O2,       xO2,              Holiday|Test|O,
X10A,     O3,       xO3,              Holiday|Test|O,
X10A,     O4,       xO4,              Holiday|Test|O,
X10A,     O5,       xO5,              Holiday|Test|O,
```

MH .mhp file

- MH generates this code from the .mht file:

```
$Holiday_Lights =  new X10_Appliance('01', );
$Holiday        =  new Group;
$Holiday        -> add($Holiday_Lights);
$O              =  new Group;
$O              -> add($Holiday_Lights);
```

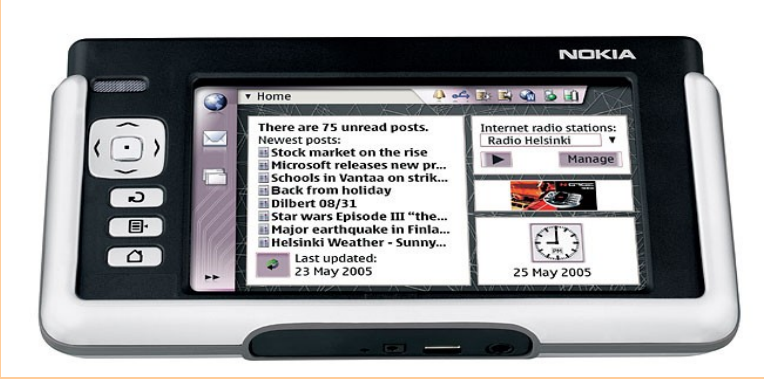
User code

```
# Need to add Christmas time here
# Actually any Holiday.

if(state_now $Holiday_LightsOn) { # O1OOn was just sent
    # Holiday lights
                          set $xO1 ON;
  Timer->new->set(1, sub {   set $xO2 ON; });
  Timer->new->set(2, sub {   set $xO3 ON; });
  Timer->new->set(3, sub {   set $xO4 ON; });
  Timer->new->set(4, sub {   set $xO5 ON; });

  run_after_delay 2, "print_log 'Ending delay test 1'";
}
```

User code (continued)

```
if(state_now $Holiday_LightsOff) { # O1OIff was just sent
  # Holiday lights
                        set $xO1 OFF;
  Timer->new->set(1, sub { set $xO2 OFF; });
  Timer->new->set(2, sub { set $xO3 OFF; });
  Timer->new->set(3, sub { set $xO4 OFF; });
  Timer->new->set(4, sub { set $xO5 OFF; });
  run_after_delay 5, "print_log 'Ending delay test 1'";
}
```

Touch Screens



IP Cameras

X10 Wireless Camera

WMS11B

NSLU2

D-Link DSM320