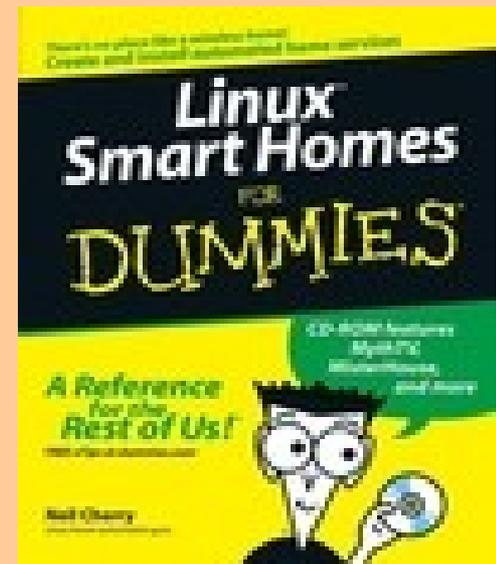
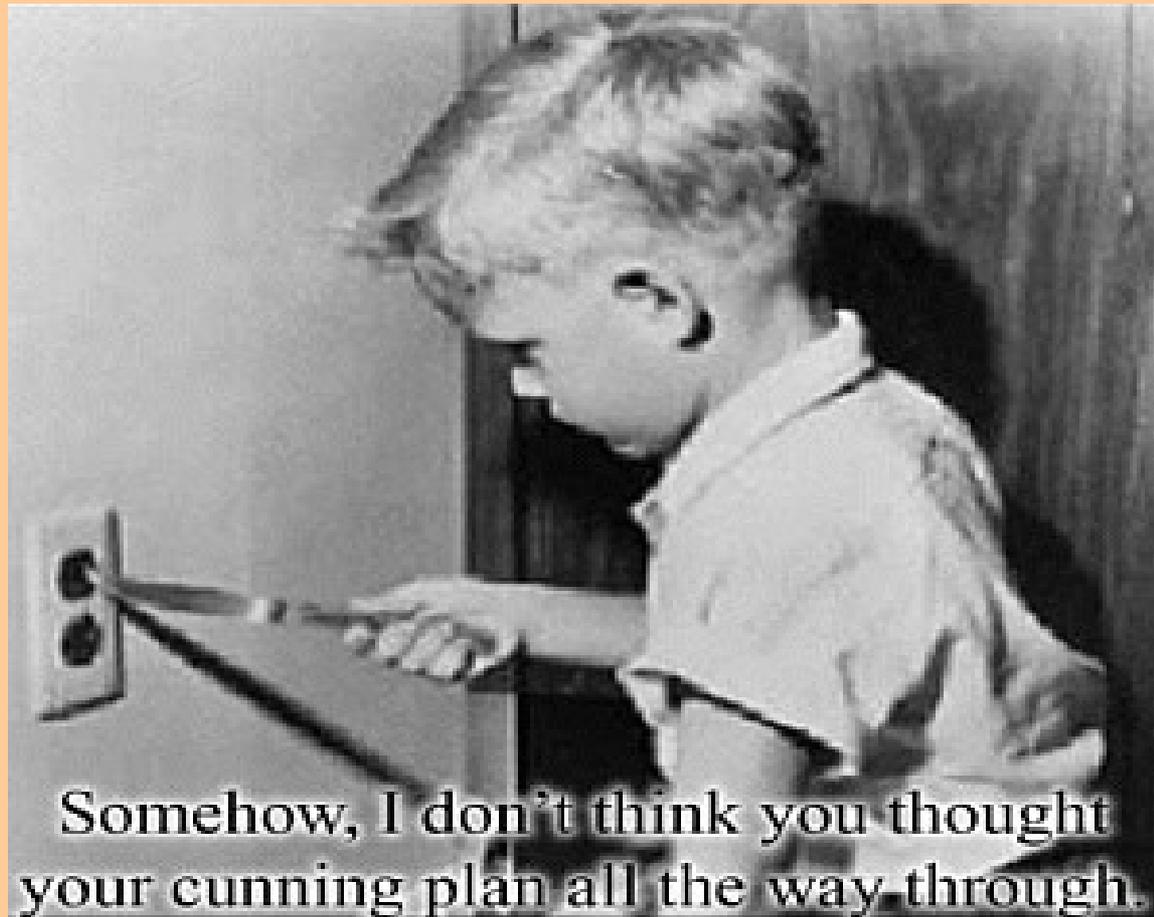


# Presenting Home Automation



# Safety



Somehow, I don't think you thought your cunning plan all the way through.

# 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](mailto:ncherry@linuxha.com))
- my web site: <http://www.linuxha.com/>
- Author: Linux Smart Homes For Dummies
- Linux *HA* stands for Linux *Home Automation* not Linux *ha*!
- The term Linux HA could also mean High Availability

# History

- 1950's Popular Science article
- 1970's Internet Coke machine
- 1978 BSR X10, CP290 RS232 transmitter, TW523.
- 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, Insteon, UPB & Z-Wave

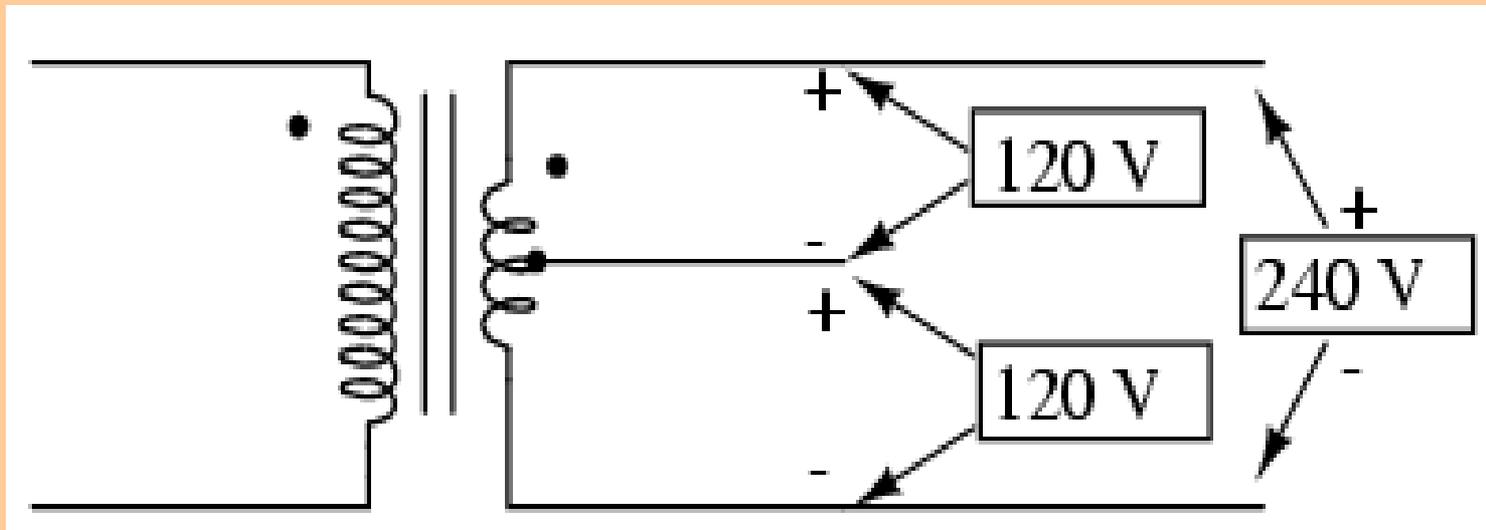
# What is home automation (HA)?

- 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.

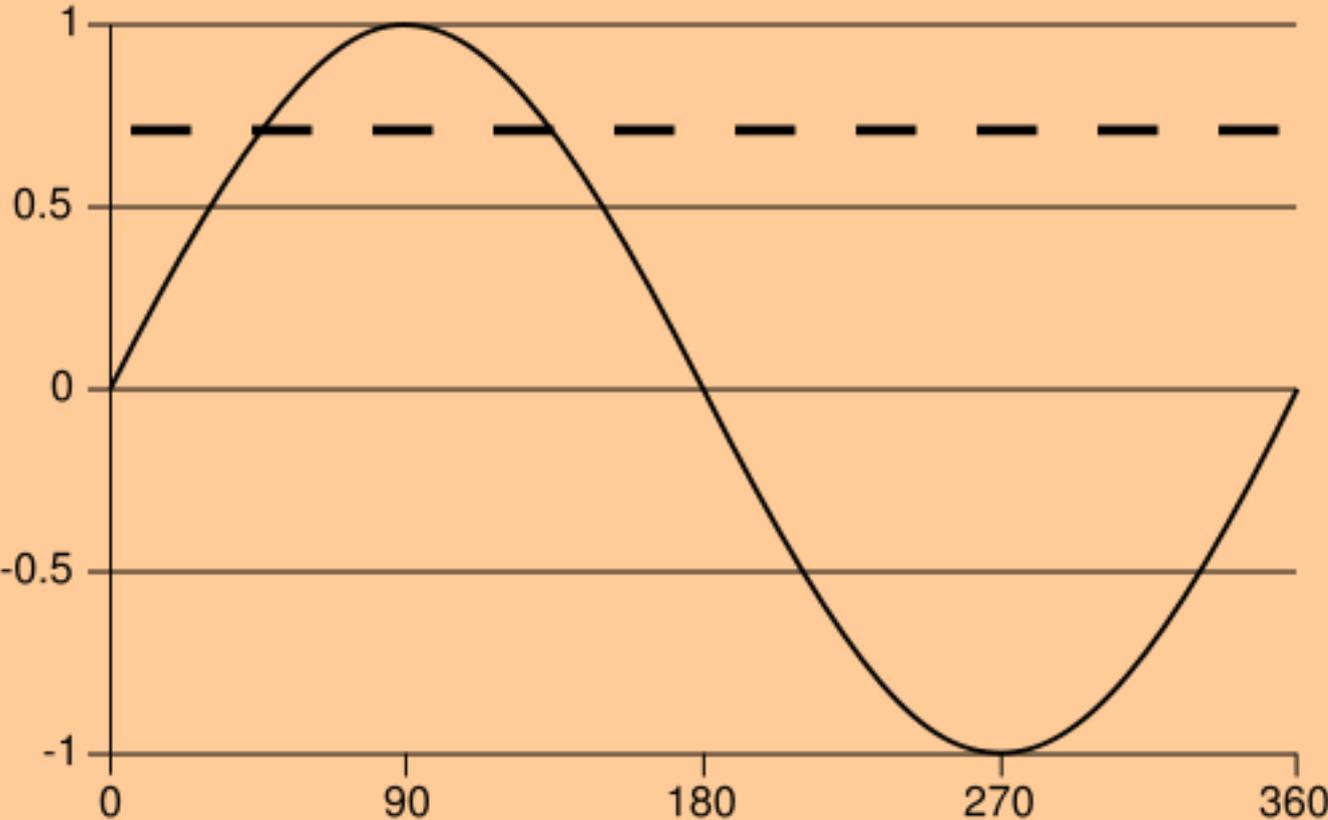
# Terms

- 120 (single phase)/220 (split phase)/Three Phase
- X10
- Insteon
- Misterhouse

# Split Phase

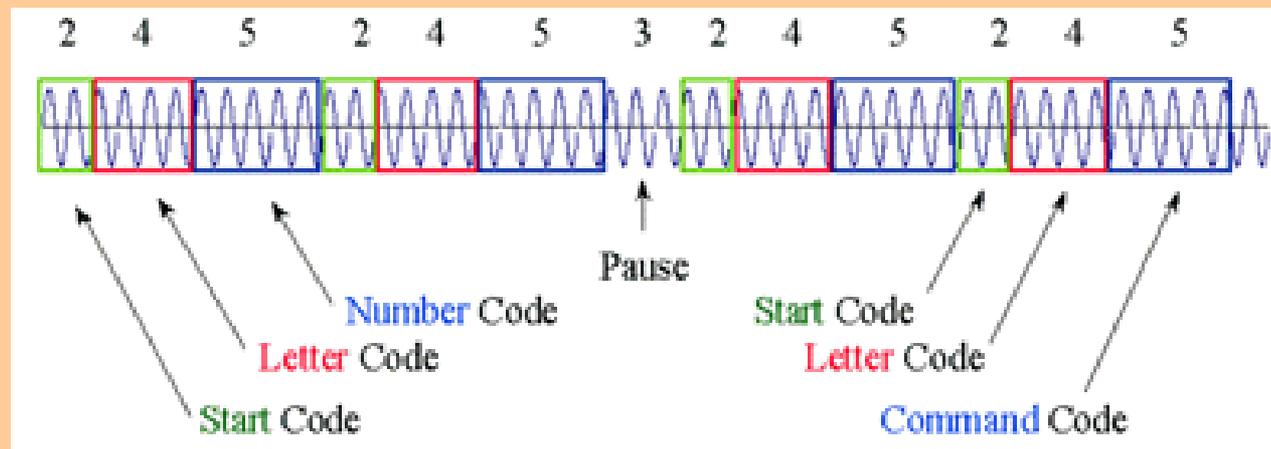


# 120v AC



# X10 Signals

- X10
- Insteon



# X10 Addressing



# Home Automation Introduction

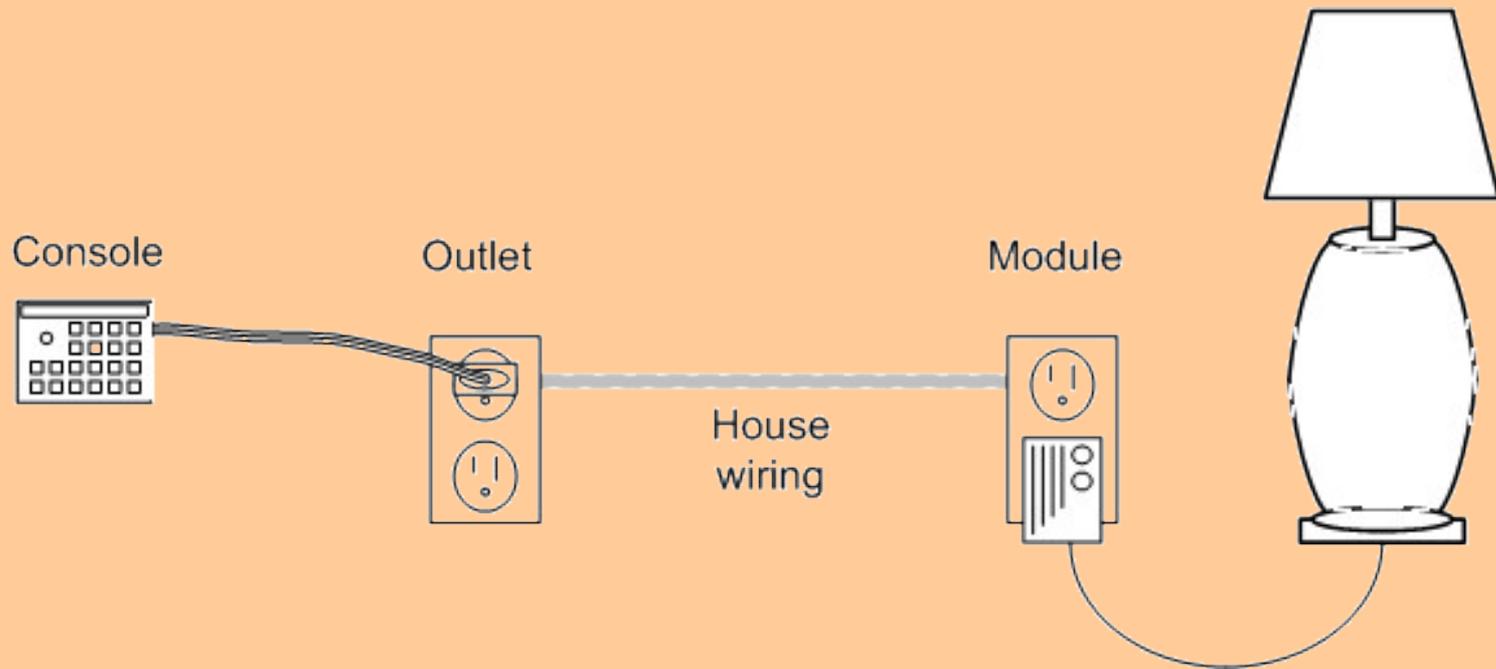
- Home automation,  
It often starts with  
holiday lights
- You don't need a  
computer for this
- A simple remote  
and some modules  
will do ...
- *... but where's the  
fun in that?!*



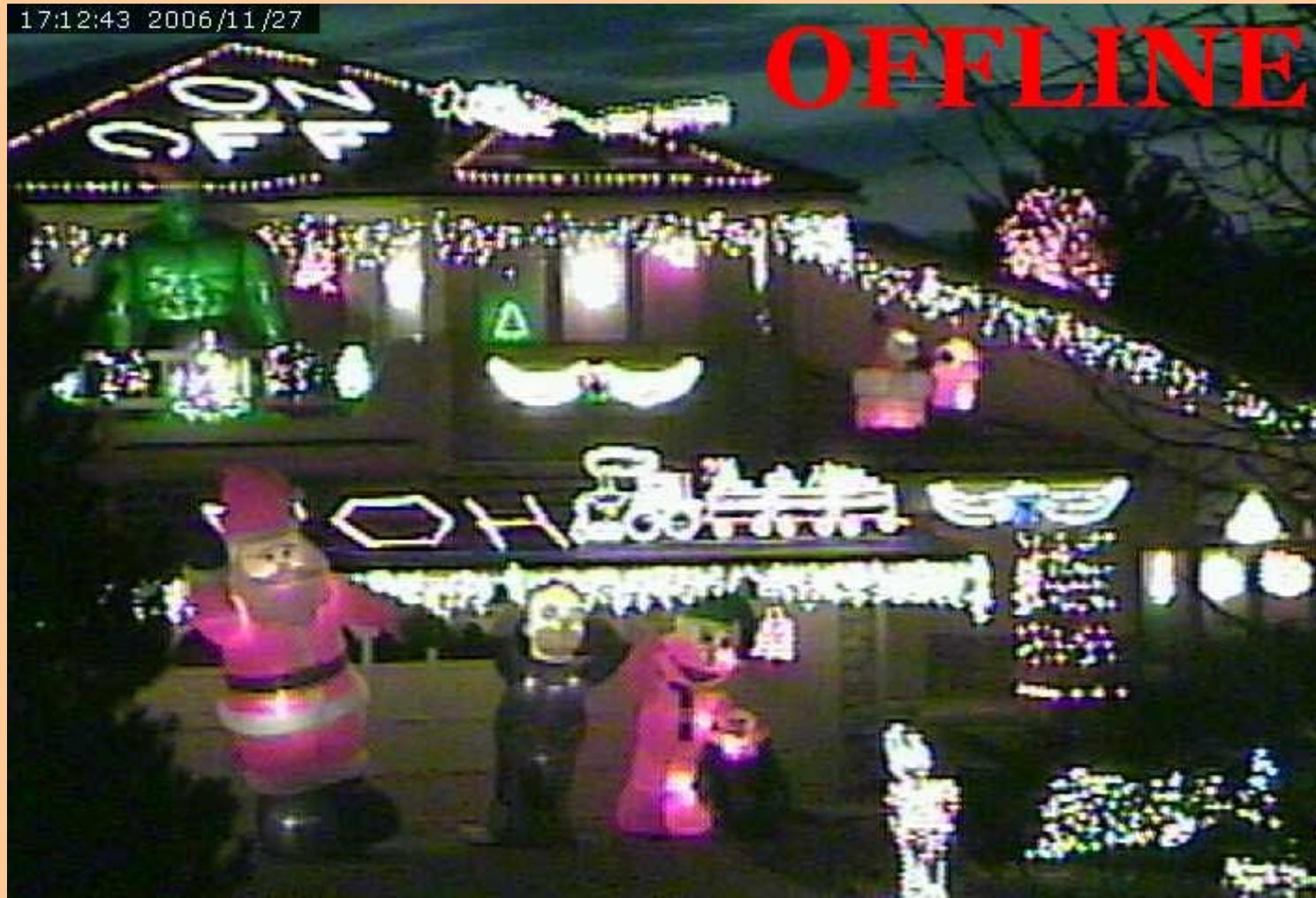
# HA Introduction

- 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!

# Simple X10 Setup (cont'd)

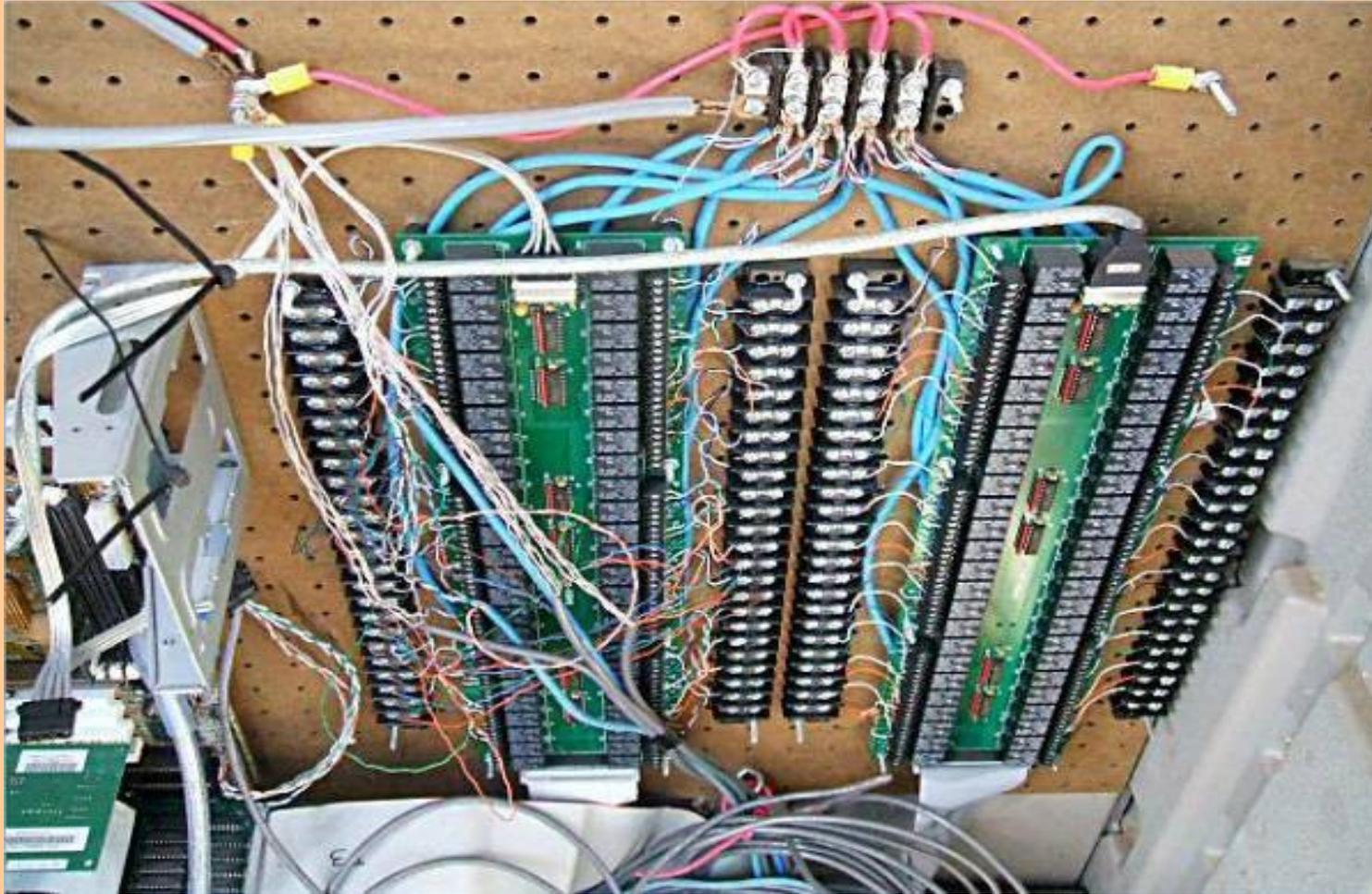


HA gone overboard! ;-)



<http://www.komar.org/>

# Christmas lighting from hell



# Misterhouse (MH)



<http://www.misterhouse.net/>

# Misterhouse (MH)

- 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
- Tables (.mht ->.mhp)

# 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

The screenshot shows a Mozilla Firefox browser window titled "MrHouse - Mozilla Firefox" with the address bar at "http://www.mh.uucp:8080/ia5/". The browser's menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar contains navigation icons and a search field with "Google". The browser's bookmark bar lists "Getting Started", "Latest BBC Headlines", "WIP", "School", "Zin", "Zout", "Presentation", "PHPBB Admin ToolK...", and "LSHFD Admin". The tab bar shows several tabs, with "MrHouse" selected. The main content area features the "MisterHouse" logo and a grid of navigation buttons: Back, My MH, Menu, Search, and Admin. Below these are 12 category buttons: MrHouse Home, Mail Headlines News, MrHouse Modes, Lights Appliances, HVAC Weather, Security Cameras, Phone Calls VoiceMail Msgs, TV/Radio Guide MP3 Music, Speech, Comics Pictures, Events Calendar Clock, and Statistics Logged Data. At the bottom, a status bar displays: "Rise 7:13 AM", "Set 6:12 PM", "tv\_time (%)", "71.4°F (87.8)", "100%", "no wind", and "Fri, Oct 19 9:37 PM". The taskbar at the very bottom shows "Downloads" with files "electronics\_tes..." and "DigitalHome.pdf", and system icons for "S" and "M".

# MH .mht file

#	Type	Address	Name	Groups
#				
X10A,	01,	Holiday_Lights,	Holiday O,	
X10A,	01,	x01,	Holiday Test O,	
X10A,	01,	Backup_Lights,	Holiday O,	
X10A,	02,	x02,	Holiday Test O,	
X10A,	03,	x03,	Holiday Test O,	
X10A,	04,	x04,	Holiday Test O,	
X10A,	05,	x05,	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) { # 0100n 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) { # 010Iff was just
sent
  # Holiday lights
                                set $x01 OFF;
  Timer->new->set(1, sub { set $x02 OFF; });
  Timer->new->set(2, sub { set $x03 OFF; });
  Timer->new->set(3, sub { set $x04 OFF; });
  Timer->new->set(4, sub { set $x05 OFF; });
  run_after_delay 5, "print_log 'Ending delay test 1'";
}
```

# Macro code (Perl)

```
# LRicon is actually a LampLinc V2
# manually turned on - sends out E4EON ($LR_ON)
# manually turned off - sends out E4EOFF
# ($LR_OFF)
if(state_now $LR_ON) {
    Timer->new->set(1, sub{ $LRiLamp->set(ON)});
    Timer->new->set(1, sub{ $LRicon->set(ON)});
}
if(state_now $LR_OFF) {
    Timer->new->set(1, sub{ $LRiLamp->set(OFF)});
    Timer->new->set(1, sub{ $LRicon->set(OFF)});
}
```

# What can you do with it?

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

# The dream since 1985!



# Automating the Coffee Maker

- RFC2324 - HTCPCP
- RFC2325
- Simply task
- We turn on the coffee maker every morning at 5:30 AM
- ... or do we?



# When we make coffee ...

- we fill the maker with water
- we add a new filter
- we fill it with coffee
- we turn it on
- we let it brew
- Sometimes we set it up the night before with the timer so it goes off before we get up.

# Simple automation

- We can just add an appliance module and program the computer to turn on the coffee maker
- but we still have to setup the machine and make sure it's on
- this is no easier than setting the timer

# What we'd like it to do ...

- Fill the coffee maker with water
- turn on the machine
- brew the coffee
- turn off when there is no coffee
  
- *It would really be nice if it refilled water, coffee and filter as necessary.*
- *Reading my mind ould be a good idea too! ;-)*

# What we have to do ...

- Safely brew a pot of coffee
  - make sure the pot is on the burner
  - check the status of the pot (empty? full?)
  - Check the machine for water, fill as needed but not if there's a pot brewing
  - don't overfill the machine
  - turn off when empty or there's no pot (for  $n$  amount of time).

# What if devices could communicate?



# What if devices could communicate?

- If we had one standard device communications protocol it would be easier (CEBUS)
- Do you set your coffee pot and alarm clock for about the same time?
- If devices could communicate we could set our alarm in one place
- and have the coffee ready in another

# What if devices could communicate?

- and a little code:

```
if(time_now($Wake_Up - 0:20) &&  
  $Alarm_OK) {
```

```
  $CoffeePot->set(ON);
```

```
}
```

```
if(time_now($Wake_Up) && $Alarm_OK) {
```

```
  $AlarmClock->ramp(GENTLE);
```

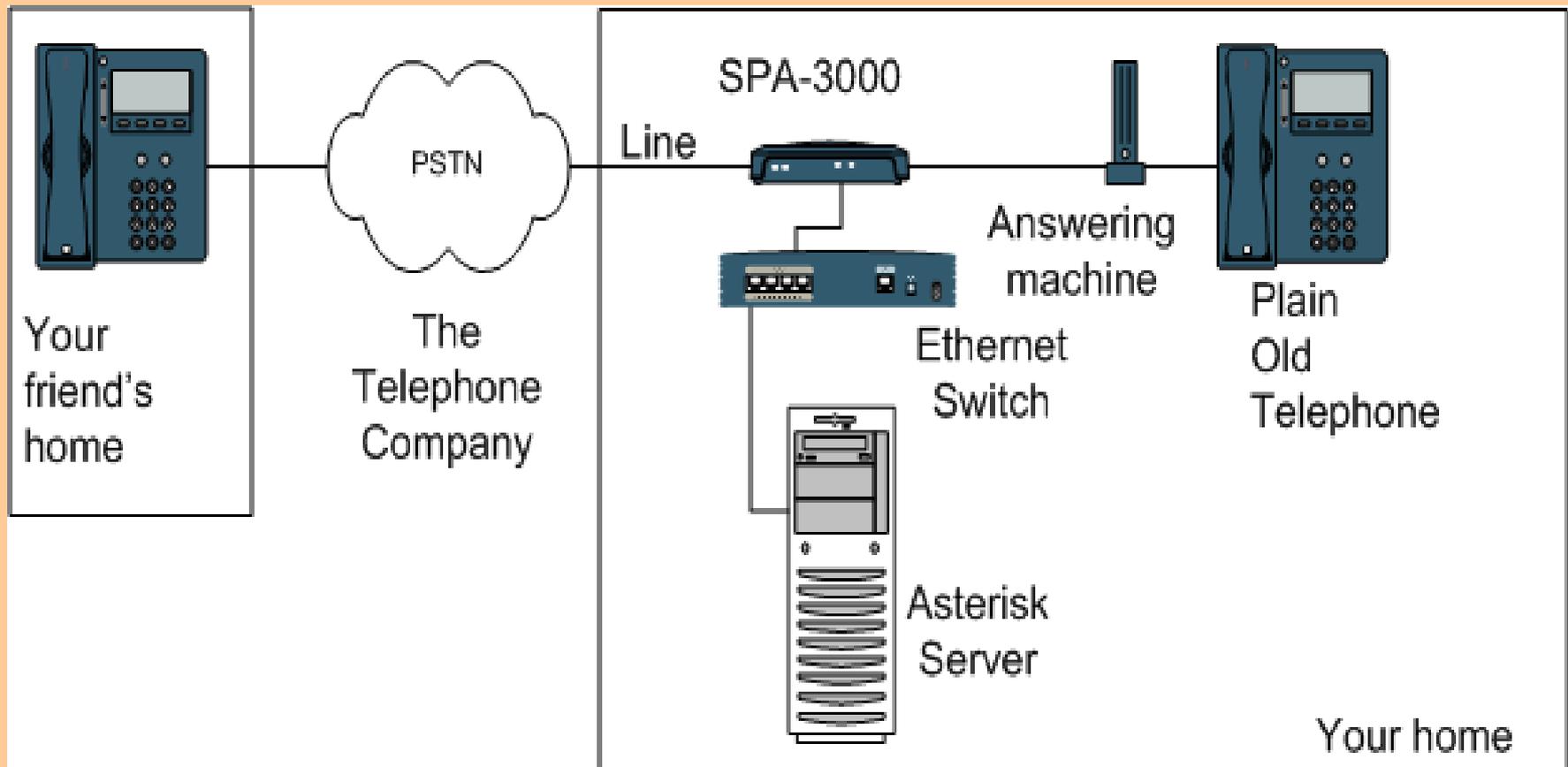
```
  $AlarmClock->set(ON);
```

```
}
```

# NSLU w/Twonkyvison



# Asterisk (VoIP)



# Asterisk (VOIP)

- Very cool application, high geek factor
- build you own PBX at home
- soft DSPs (codecs) are problematic
- network traffic can cause problems
- with the proper board (more expensive hardware DSPs) it works properly.
- Simpler, cheap, wireless phones work just as well.
- Difficulties depend on complexity

# Asterisk (VoIP)

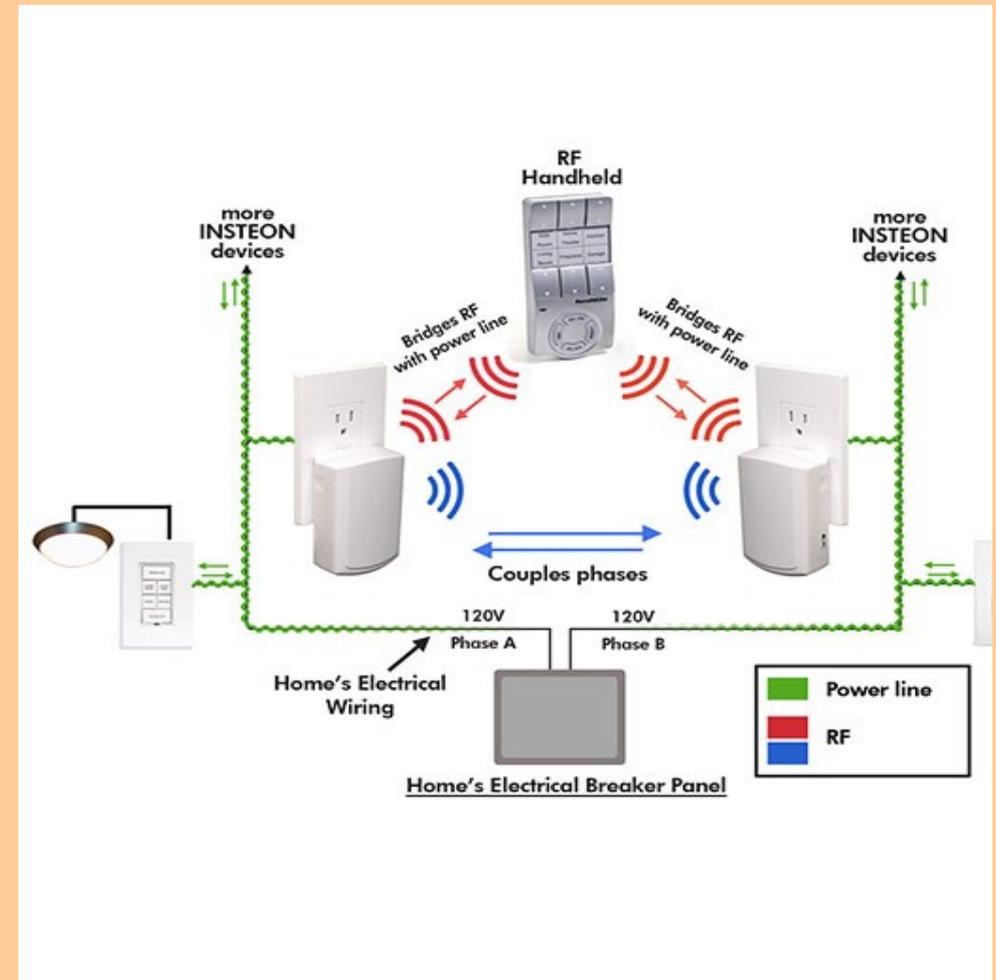
- Many type of cards can be used
- x100 is cheap but will eat up your CPU (interrupts @ 64K/s)
- More expensive cards work better
- IVR - Interactive Voice Response
- Can be integrated with MH (among other things)

# ELK M1 Gold



# Insteon Wireless AP and Remote

- Drawing is a bit mis-leading
- An Insteon module is either a PLC or wireless module (w/ exceptions)



# Mid-range Automation

- Elk products
  - ELK M1EZ8
  - ELM M1 Gold
- HCS II
- Ocelot
- Homevision
- OnQ

# Mid-range Automation

- HAI products <http://www.homeauto.com/>
  - Omni family – fire and alarm
  - Omni Lumina – control
  - Omni LT
  - Omni Pro II
  - Omni touch
  - Web Link
  - HAI control for Windows MCE
- JDS Stargate <http://www.jdstechtechnologies.com/>

# Linux

- x10d
- Heyu
- Misterhouse
- ECS
- cpuxad

# MS Windows

- Misterhouse <http://www.misterhouse.net/>
- X10's AHP (Active Home Pro)
- Homeseer
  - supports plug-ins
- Charmed Quark
- Smarthome Manager Essential Software
- Smarthome Manager Plus Software
- HouseLinc Desktop Software
- Mcontrol Software

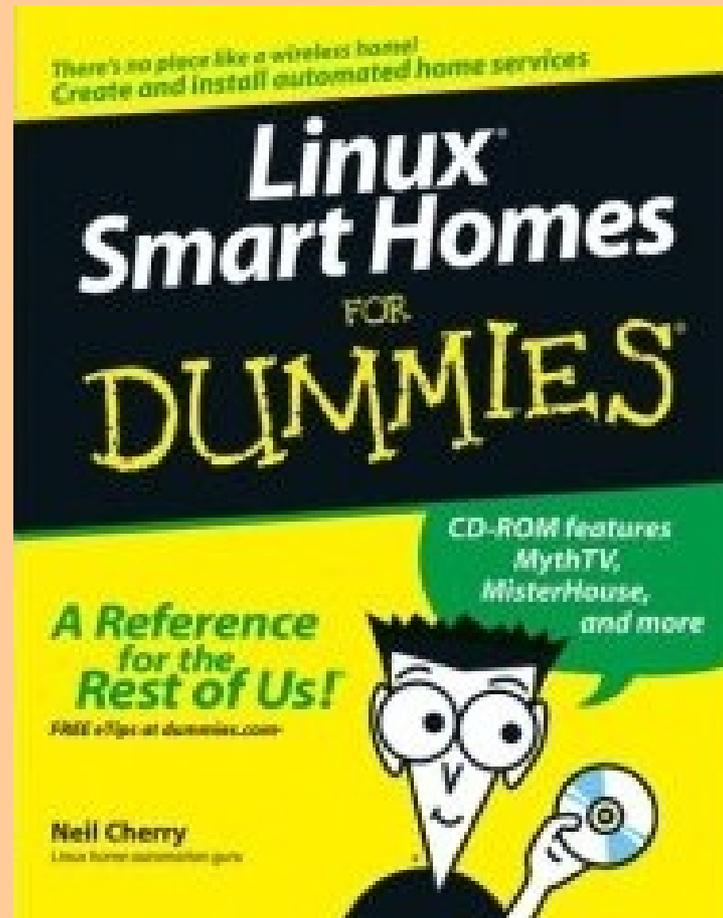
# MS Windows (cont.)

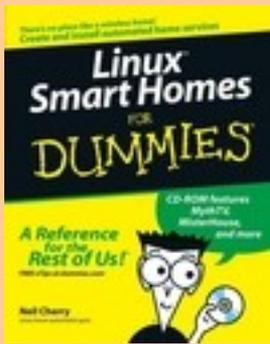
- Thinkessentials Software
- HAL 2000 Voice control
- Light Show Master
- Girder Pro
- Thinking Home
- Central Home Automation Director (CHAD)
- ECS
- cpuxad

# Apple Mac OS X

- Misterhouse <http://www.misterhouse.net/>
- Indigo  
<http://www.perceptiveautomation.com/indigo/index.html>
- Xtension <http://www.shed.com/> (OS X and Macs all the way back to Mac OS 7.5)

# Linux Smart Homes For Dummies





# Linux Smart Homes For Dummies

- Bringing The Future Home
- Connecting Multiple Computers w/o wires
- Entertaining Your Brain with a Little Help from Linux
- Keeping a Linux Eye on the Sky
- X10-ding Your Environment w/Home Automation
- Controlling and Securing Your Automation Network
- The Part of Tens

# Questions & Answers

- You can ask any questions here that you haven't asked so far.