Do Do This at Home

In Control?

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Goals and Constrains

• Control, not “automation”
  • Dynamic vs carefully planned
  • IP vs wired logic

• Learn by Doing

• Consumer Electronics
  • Designed for everyday use
  • Users as participants
  • Users as Designers

• Not annoy my family
  • At least, not more then needed

• Two-Way signaling
Don’t do This at Home
Preface

• The Jetsons is winning ➔ Alexa
• It’s not just about light but we learn from 0’s and 1’s
In The Beginning there was X10

- At least the beginning of the journey
- 1970’s – power line signaling
- Simply Turn Things on/off
- 16 Devices, 16 Houses (A-P) => 256 Devices
- Keyed on AC 60Hz powerline
- One way signaling
- Wild cards for all and for lights
X10 Evolves

- Computer interface (serial port)
  - Could listen as well as transmit
- Additional codes for querying
- Smart Home and others improved technology
- Motion detection and wireless

Challenges
- Unreliable signaling
- Slow signaling
- Limited Devices
Initial software

- Module on PC
  - Operations queue
  - Trigger and rules
    - Rules => Groups!
  - Serialization
- Multithreaded
  - Use of queues
  - And database
- Also explore programming paradigms
Initial Control Program

- Written in Visual Basic 6
- Oriented to X-10 challenges and hacks
- Database with scripting
- Serialized actions and simple rules/triggers
- Lessons
  - Automated scripts have limited utility
- Distinguished desired response vs reported state
- Trying to tame complexity
Chance to try language features

• Dynamic object creation
• Dynamic scripting in C# and VB and ..
• Rule Engine
• Database
  • Now with LINQ!
• Structure values for Action and State/Status
  • (oops)
  • Distinguish “intent” vs “state”
Improving X10 / CEBus

• Much smarter
• A special “turn on” for each device
• Automagical configuration
• Macro Language
• Structure Wiring
  • Powerline, coax and radio signaling
• TDS – Too Damn Smart
Other fancy protocols

• Protocols that embed their limits
  • IEEE-1394 / Firewire
  • Bluetooth (and now, Bluetooth Mesh)
  • Zigbee, Z-Wave
  • Thread? (So close but ...)

• Limitations
  • Separate physical facilities and distance limits
  • Impose policies
  • Need separate relaying
  • Presume scarcity
Other Protocol

• Lutron
  • Proprietary
  • Patented Feedback!

• Universal Power Line – UPB
  • Noble attempt
  • Still exists but niche
Smart Home Insteon

• In the spirit of X10 but better
  • Higher speed powerline
  • Fixed end point addresses – 24 bit
• Original business model – OEM
• Protocol by hardware people
  • Limited number of hops and echo required
  • Manual-inspired linking protocol
  • Buggy initial implementation with very slow work-around
• Did a very deep dive and built lots of tools
Embracing Insteon

• Generalized the program
  • Additional device type
• Lots of complex support
  • Didn’t realize how dumb protocol is
  • Had to program around hardware-designed protocols
• Deployed devices more widely
• Limited scale and devices
SmartThings

• Gateway to
  • Z-Wave
  • Zigbee etc..
  • And more

• Also
  • Apps and virtual devices
  • IFTTT
  • Alexa etc..
SmartThings

• Working around the rule engine
  • Wrote Groovy to program around
  • Support own http(s) protocols
  • Used IOTDB to work around OAuth

• Cloud First

• Zigbee/Z-Wave
  • Having to pair (and unpair) devices
  • Lots of hex codes
Coexisting

• My system
  • Controls On/Off
  • Controls Brightness
  • Color etc.. is “To Do”

• Coexist wit native apps
  • Control colors etc..
  • Option to change only some parameters
FiOS

• Upgrading to 150mbps forced me to cleanup Wi-Fi
  • Speed itself is not that important above threshold

• Ubiquiti
  • Managing access points
  • Robust coverage
  • Managing static addresses

• FiOS
  • Uses MOCA
  • STBs can use IP ... but not with my own DHCP Server!
Embracing the Web

• Web App V1
  • TypeScript Visual Studio
  • Presented floor map w/ editing
  • Turns out buttons are more useful
  • Event driven
  • Widgets ...

• (My) server side
  • http(s) listener
  • Act as a nexus for state reporting
  • Provides floor maps and device info
LIFX

• IP!!
  • Bulbs as the end point
  • Local and Cloud protocols
  • App

• Features
  • Discovered color temperature and more
  • Up to 1100 lumens, BR30, IR etc.
  • But not outdoor

• Teething problems
  • Onboarding issues
  • DHCP Issues
Resilience and NodeJS and npm

• Direct control from WebApp!
  • Remoes dependency on main system
  • CORS ➔ Need shim running on multiple machines (NodeJS)
  • Still report status to central module
  • Central module is still an option

• Improved programming skills w/Async

• IIS dispatch
  • Was C# /name
  • Now IISNode
Embracing NodeJS

- Scripting ➔ NodeJS
  - Nightlights
  - Keep-ons
- Visual Studio Code and TypeScript
- Plan to shift functions to NodeJS
  - Mañana
- Programming C# vs TypeScript
  - Flexibility of objects
  - Vs. Linc
Services

• IFTTT – scaling
• Alexa
• Google Home
• Apple Homekit
• DIY – HomeAssistant, OpenHab etc.
Hubitat

• Box vs. DIY Pi
• SmartThings emulation
  • Added “MakerAPI” for me!
  • Support for Hue, Yeelights, Nanoleaf Etc.
• Runs in my house
• Shifting my devices (a pain with Z-Wave)
More IP Devices

- *Discover on Aliexpress and elsewhere*
  - Sonoff – Alexa etc.
    - But can be reflashed with effort
  - 小米 (米家) / Ewelink
  - Shelly – simplest API
    - Also designed for reflashing
Supporting

• My own interfaces
  • Insteon
  • Lifx (using cloud but have local code in Node)
  • Shelly
• Via Hubitat
  • Nanoleaf
  • Yeelights
  • Hue
  • Zigbee and Z-Wave
• Native apps for full capabilities and on-boarding
IP Support

• Using Ubiquity Unifi
  • Managing naming and finding devices
  • Static Addresses when necessary
  • VLAN for guests
  • Port mapping and Dynamic DNS

• Issues
  • Fall-over isn’t working automatically
  • Dyn DNS support limited
  • No API (Exploring using Puppeteer)
Managing the networking
Lots of lessons and questions

• Need a peer internet
  • Network of networks is the wrong model
• Haven’t fully addresses trust/security issues
  • Inherently ambiguous
• Rules (IFTTT etc.) don’t scale and cannot be consistent
• Where is knowledge of scenes
• How do you I say “I want to read.
Beyond light

• Entertainment and ambiance
  • Music and smart speakers
  • Video and TV and home theater and the old STB
• Doorbells, cameras
• HVAC: Nest and thermostats and Rethinking HVAC
• Baby monitoring and all that
• Stepford Families and smart homes and cities
• Computing and Alexa and the Jetsons
Need more APIs

• To control more of the home capabilities
• But learn by doing
• Escaping silos ...
Notes

• Native vs. normalized

• What does on/off do?
• Where is a scene known?
• Rules vs. Groups
• Npm
• Nest

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