





IPv6 For Home Networks

james woodyatt <jhw@apple.com>
At NANOG 49 San Francisco, June 13-16 2010

“The first duty of a **revolutionary** is to get away with it.”

—Abbie Hoffman

AirPort Express



Multi-purpose **appliance**

- 802.11 access point, USB printer server, iTunes speaker driver.
- Miniature and low-cost.
- Dual-stack IPv4/**IPv6 link-local**.

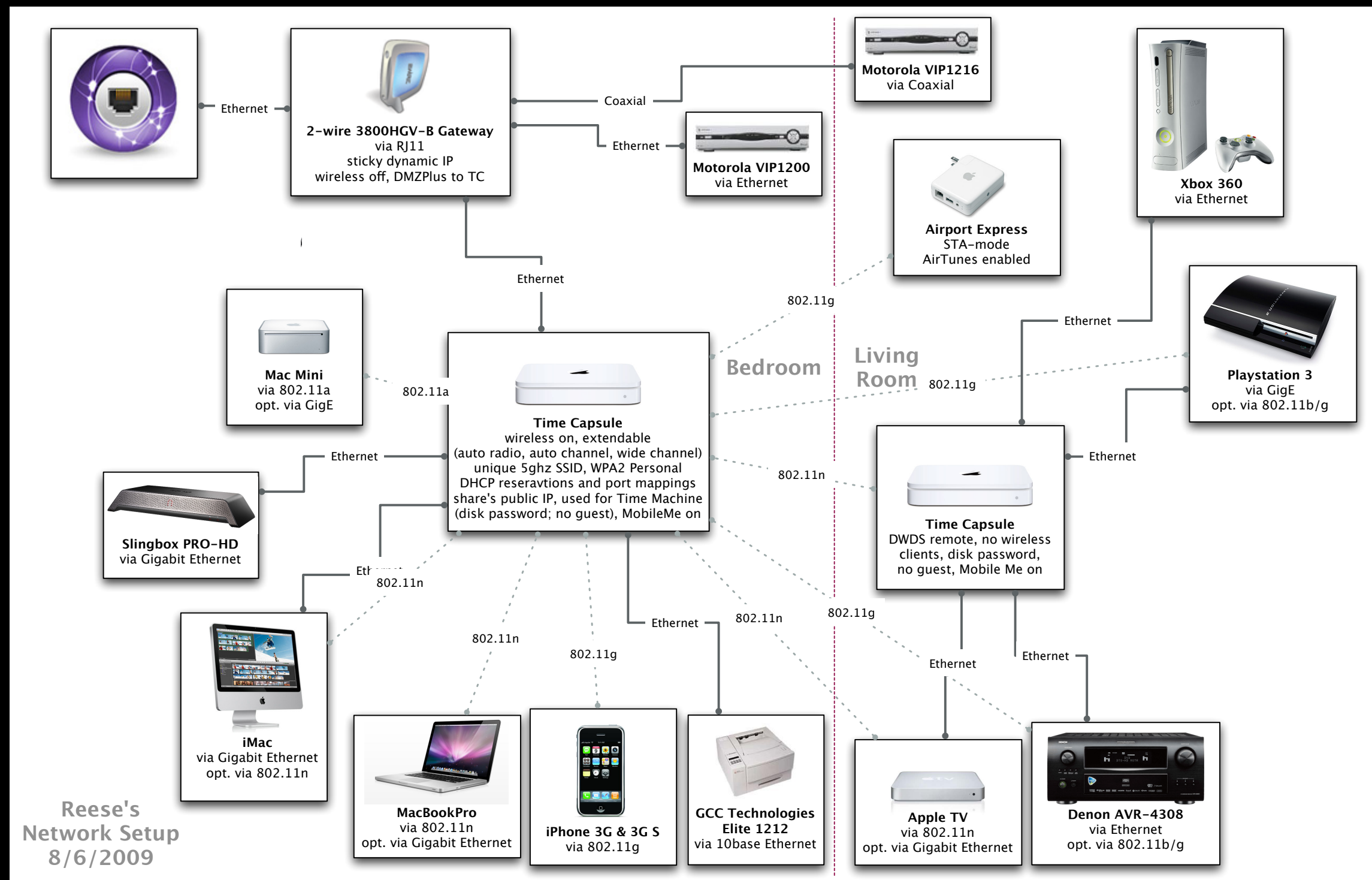
Back To My Mac



- Easy virtual private networking.
- Tunnels over IPv4 with NAT-traversal.
- Uses IPv6 **unique-local** addressing.
- Uses wide-area Bonjour™ for service discovery.



The establishment



Example home network



Router ListPort ListPort CheckerOther GuidesGame GuidesStoreSupport Forum
Ads by Google Netgear Linksys Router ADSL Broadband Router Wireless LAN Router Uninstall Belkin Router

Click here to Automatically Forward ports with PFCConfig!
• Select your router from a list
• Select the programs you want
• Click 'Update Router'
• You're Done!

Below you see a list of routers and [firewalls](#). These are the devices that we have written support documents for. These documents provide step-by-step guides on how to setup port forwarding.

If you do not feel like figuring out how to forward ports manually, we have a simple [software solution](#) called PFCConfig that can forward your ports for you automatically. We offer complete support for our product and will help you get your ports forwarded.

Our ultimate goal is to have a write up for every hardware router and firewall available and instructions for every [application](#) that Internet users have difficulty getting to work through their router or firewall so that you can do simple port forwarding. These guides are provided to help you, but we are in no way responsible for the state of your network. If you encounter any errors in our guides, please let us know by using our [Comments](#) page.

If you do not know exactly what you are doing or are having problems, [Start Here](#).

CLICK HERE
TO LEARN MORE ABOUT THIS GREAT OFFER



CLICK HERE TO LEARN MORE ABOUT THIS GREAT OFFER



VYATTA
Open Networking

ROUTER FIREWALL VPN

- ▶ Software
- ▶ Appliances
- ▶ Runs in VMWare & Xen

FREE SOFTWARE

www.vyatta.com
Ads by Google

Your external IP is 67.218.105.231

- 2wire
- 1000hg
 - 1000hw
 - 1000s
 - 1000sw
 - 1070-B
 - 1700hw
 - 1701HG
 - 1800hg
 - 1800hw
 - 2071
 - 2700hg
 - 2700HG-B
 - 2700HG-D
 - 2700HG-E
 - 2700HG-S
 - 2700HG-V2
 - 2701HG-B
 - 2701HG-D

- Dlink
- DFL-200
 - DGL-4100
 - DGL-4300
 - DGL-4500
 - DI-514
 - DI-524
 - DI-524UP
 - DI-604
 - DI-604v2
 - DI-614+
 - DI-624
 - DI-624+
 - DI-624M
 - DI-634M
 - DI-634Mv1
 - DI-704
 - DI-704P-revA
 - DI-704P-revB

- Longshine
- LCS-883-DSL-4F
- Loopcomm
- LP-8186
 - LP-AL2011
 - LP-AL2014P
 - LP-AL5011P
- Lucent Technologies
- CELL-22A-FX-CZ
- MacSense
- MIH-130A

- SMC
- 1244TX
 - 2404WBR
 - 2804WBR
 - 2804WBRP-G
 - 2804WBRV2
 - 2804WBRv3
 - 7004ABR
 - 7004ABRv2
 - 7004AWBR
 - 7004BR
 - 7004BRV2
 - 7004FW
 - 7004VBR
 - 7004VBRv2
 - 7004VBRv2EU
 - 7004VWBR
 - 7004WBR
 - 7004WFW

Port Forwarding

A service to help you configure your NAT gateway with **application-specific** port forwarding.

- The list of routers alone goes on for sixteen pages.
- After that you get step-by-step instructions for configuring your router for your application.
- This is the **opposite of simple**.



Like sands through the hourglass...



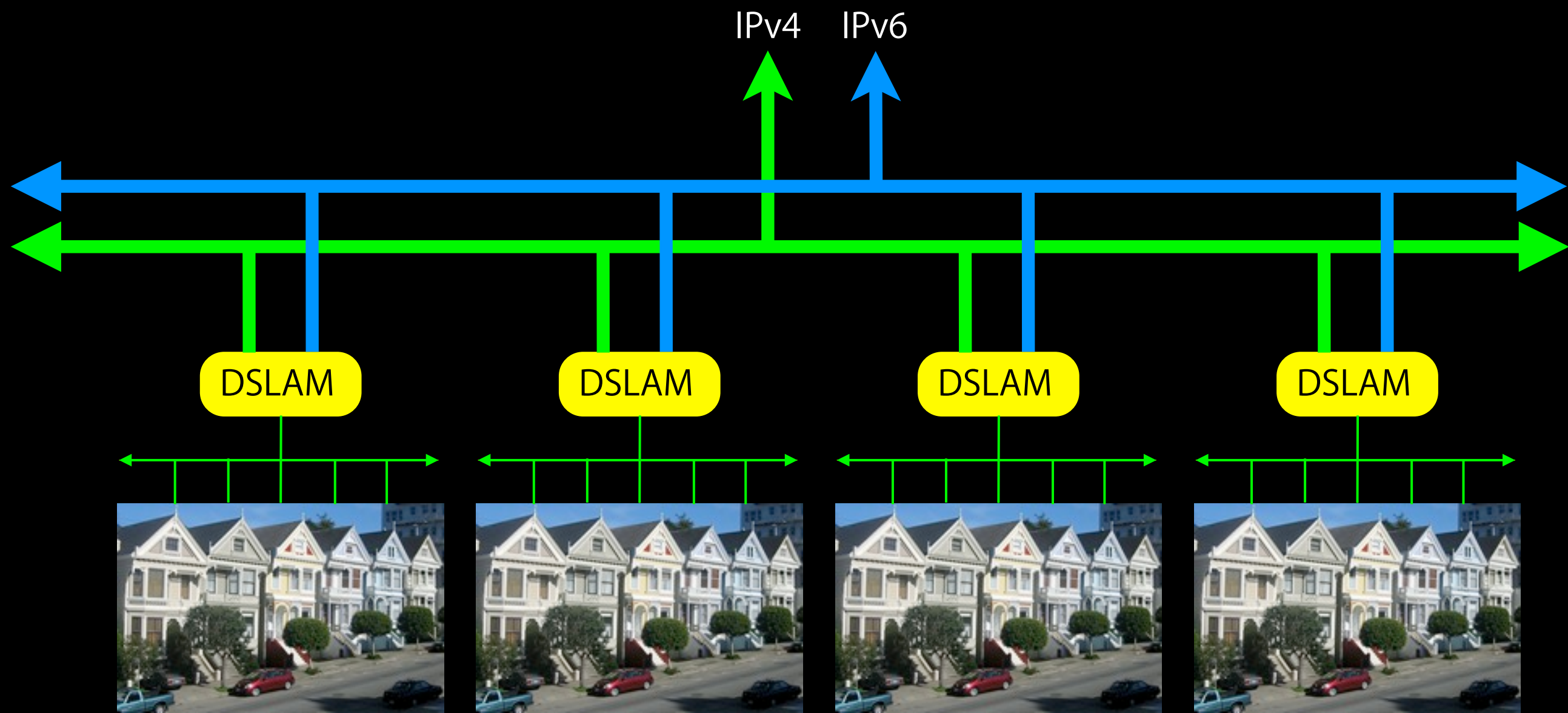
The establishment (in decline)



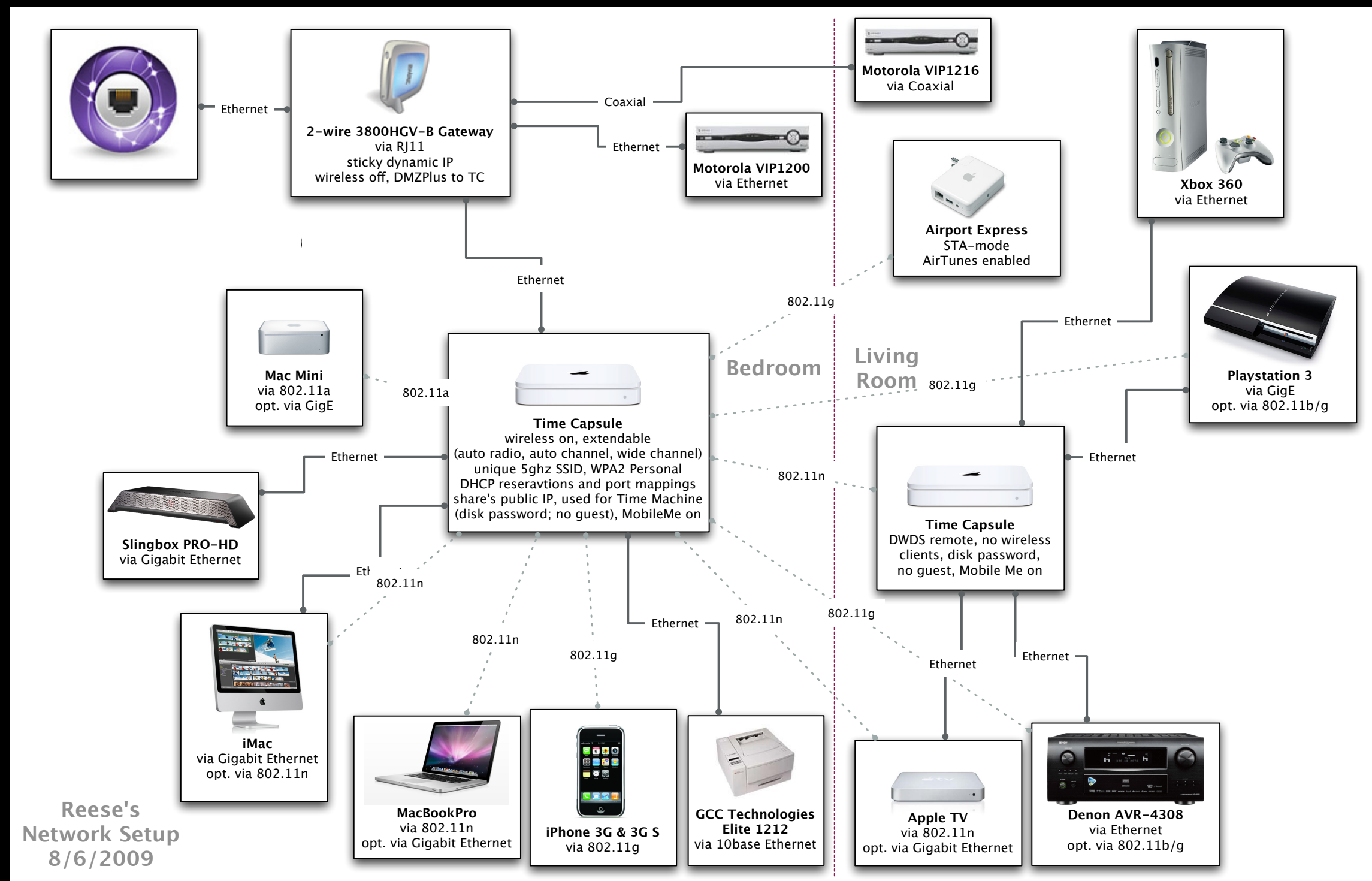
The writing is on the wall...

“Revolutions are not made: they come. A revolution is as **natural** a growth as an oak. It comes out of the past. Its **foundations** are laid far back.”

—Wendell Phillips (orator, abolitionist and advocate for First Americans)



When the revolution comes...



Example IPv6 home network



“Surely, you must be **joking...**”

6RD

<http://tools.ietf.org/html/draft-ietf-softwire-ipv6-6rd>

Tunnel IPv6 over your **existing IPv4** networks.

- Like 6to4 tunneling [RFC 3056], but you control both the forward and reverse paths for your subscribers.
- Requires **incremental upgrade** to home gateways and a minimal investment in IPv6 peering.
- Proven **commercial viability**. Free, an ISP in France, has been providing IPv6 to all their customers for over a year with it.

DS-Lite

<http://tools.ietf.org/html/draft-ietf-softwire-dual-stack-lite>

Tunneling IPv4 through **large-scale NAT** over IPv6.

- An **exit strategy** for providing IPv4 to home networks while you switch to an IPv6-only core.
- Requires incremental upgrades to home gateways, assuming they already support full dual-stack.
- Simple DHCP option to configure the tunnel.
- Open-source reference implementation of the DS-Lite NAT is available from the **Internet Software Consortium**.
- Open-source reference implementation of the home gateway implementation is also available for **Open-WRT**.

Or not...

"How may I direct your call?"

- Native dual-stack IPv4/IPv6.
- Provider managed tunnels.
- 3rd-party IPv6 over IPv4 service.



**"EVER SEEN
YOUR TELEPHONE
SWITCHBOARD?"**

It's a fascinating sight — the inside of a telephone central office where your telephone may be connected with the whole Bell System.

Would you like to know more about the telephone and what happens when you make a call?

Your Bell Telephone Company will be glad to show you. Visitors are welcome and we believe you will have a most interesting time. Why not call the Business Office and arrange a visit?

BELL TELEPHONE SYSTEM  *You are cordially invited to visit the Bell System exhibit at Golden Gate International Exposition, San Francisco*

MAY, 1939 *Please mention POPULAR SCIENCE MONTHLY when writing to advertisers.* 5

“The time to stop a revolution is at the beginning, not **the end.**”

—Adlai E. Stevenson



TM and © 2010 Apple Inc. All rights reserved.