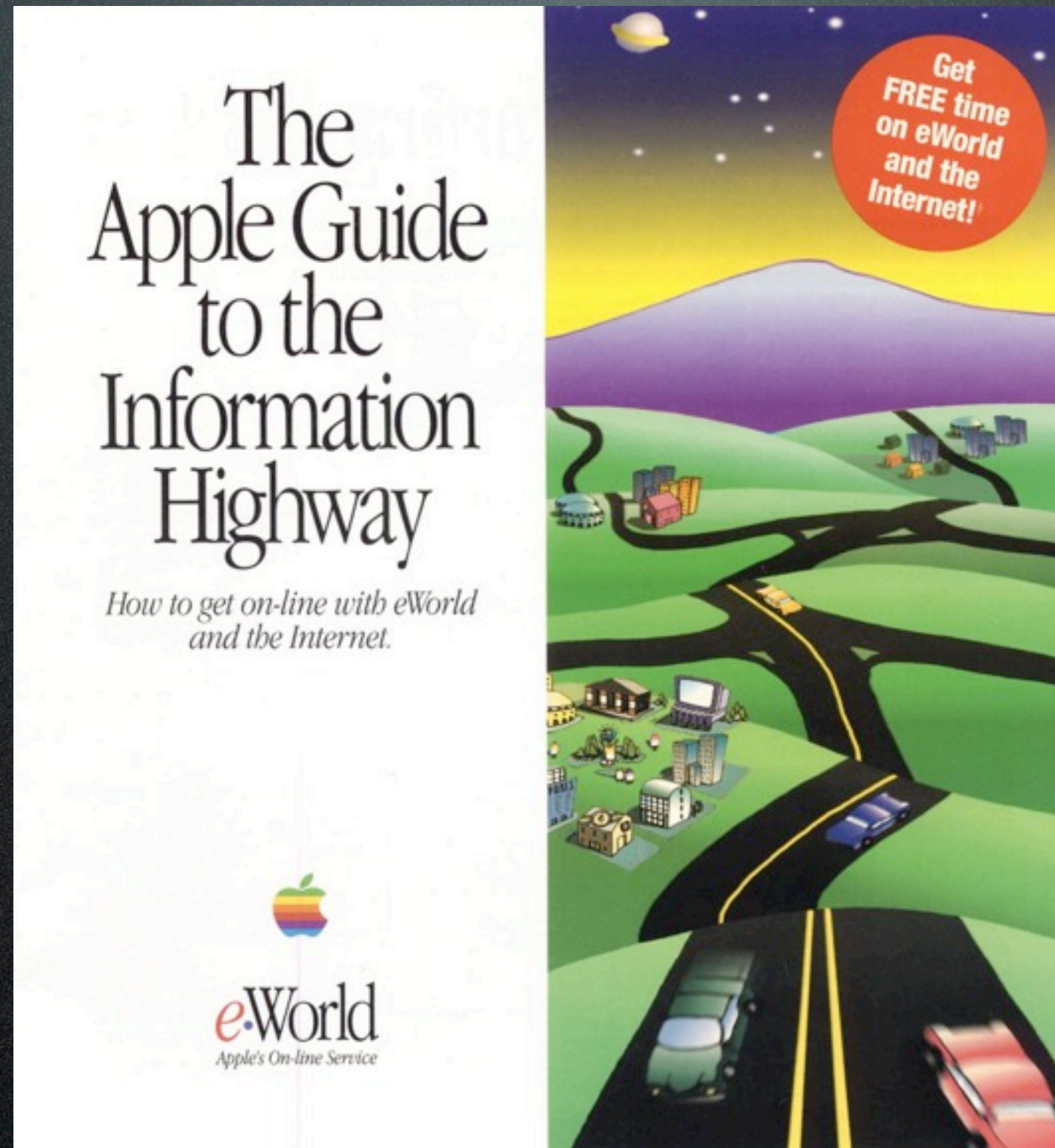


Networks & Routing

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We went from this:



MACTECH

To this:



MACTECH

OSI Model

- Layer 1 - Physical
RS-232, T1, 100BASE-TX,
802.11
- Layer 2 - Data Link
802.3, Frame Relay, PPP,
LocalTalk
- Layer 3 - Network
IP, IPSec, BGP
- Layer 4 - Transport
TCP, UDP
- Layer 5 - Session
Sockets, TCP establishment
- Layer 6 - Presentation /
Encoding
SSL, TLS, ASCII
- Layer 7 - Application
HTTP, FTP, DNS, AFP

What's in a packet?

- Header - identifying info
- Payload - the actual data
- Total size 20-65,535 bytes

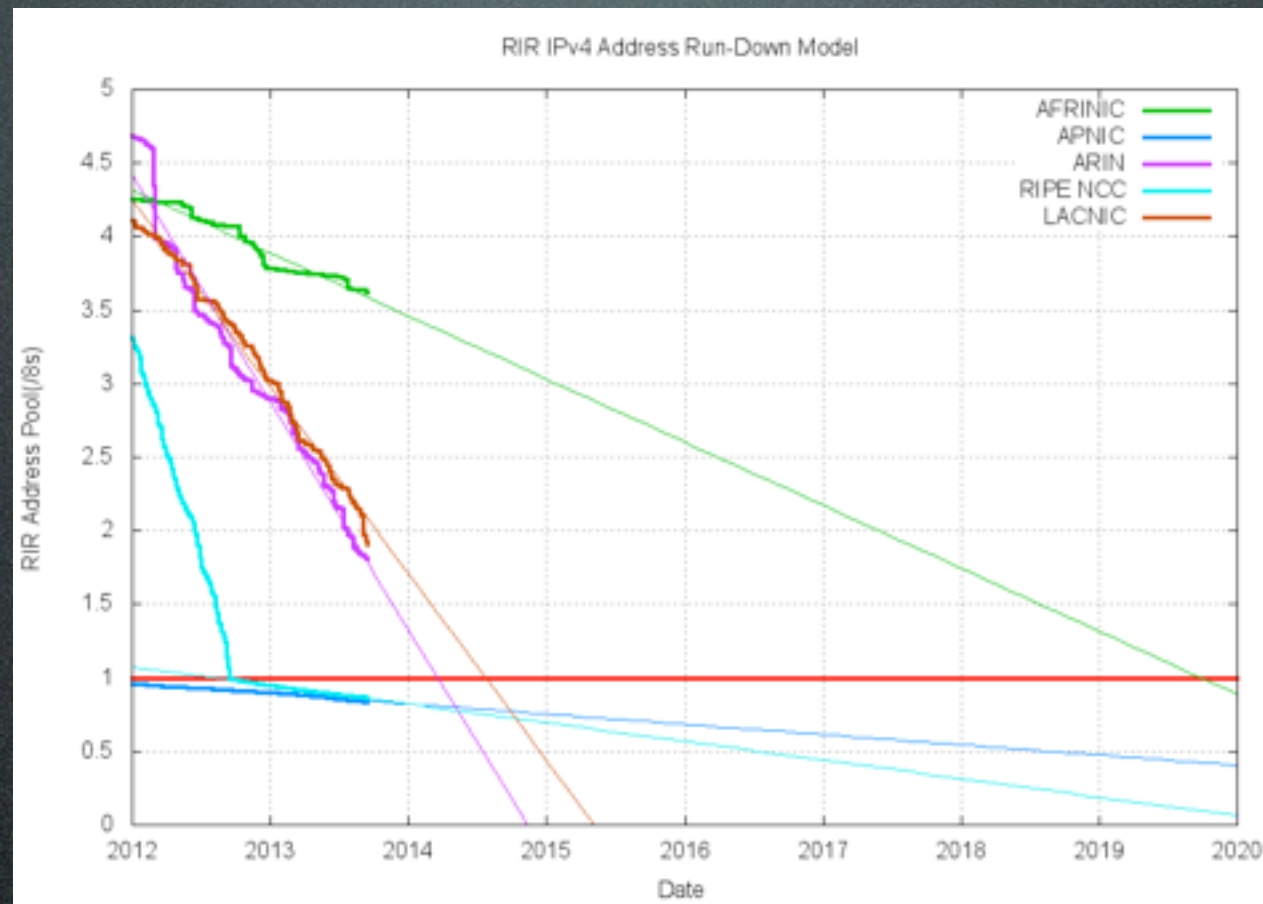
Routers

- How subnets and IP addresses define your LAN
- Function of a router in sending traffic to networks beyond the LAN

Subnets

	Hosts	Netmask	Amount of a Class C
/30	4	255.255.255.252	1 / 64
/29	8	255.255.255.248	1 / 32
/28	16	255.255.255.240	1 / 16
/27	32	255.255.255.224	1 / 8
/26	64	255.255.255.192	1 / 4
/25	128	255.255.255.128	1 / 2
/24	256	255.255.255.0	1
/23	512	255.255.254.0	2
/22	1024	255.255.252.0	4
/21	2048	255.255.248.0	8
/20	4096	255.255.240.0	16
/19	8192	255.255.224.0	32
/18	16384	255.255.192.0	64
/17	32768	255.255.128.0	128
/16	65536	255.255.0.0	256

IPv4



- Out of addresses! Only 4.3billion available

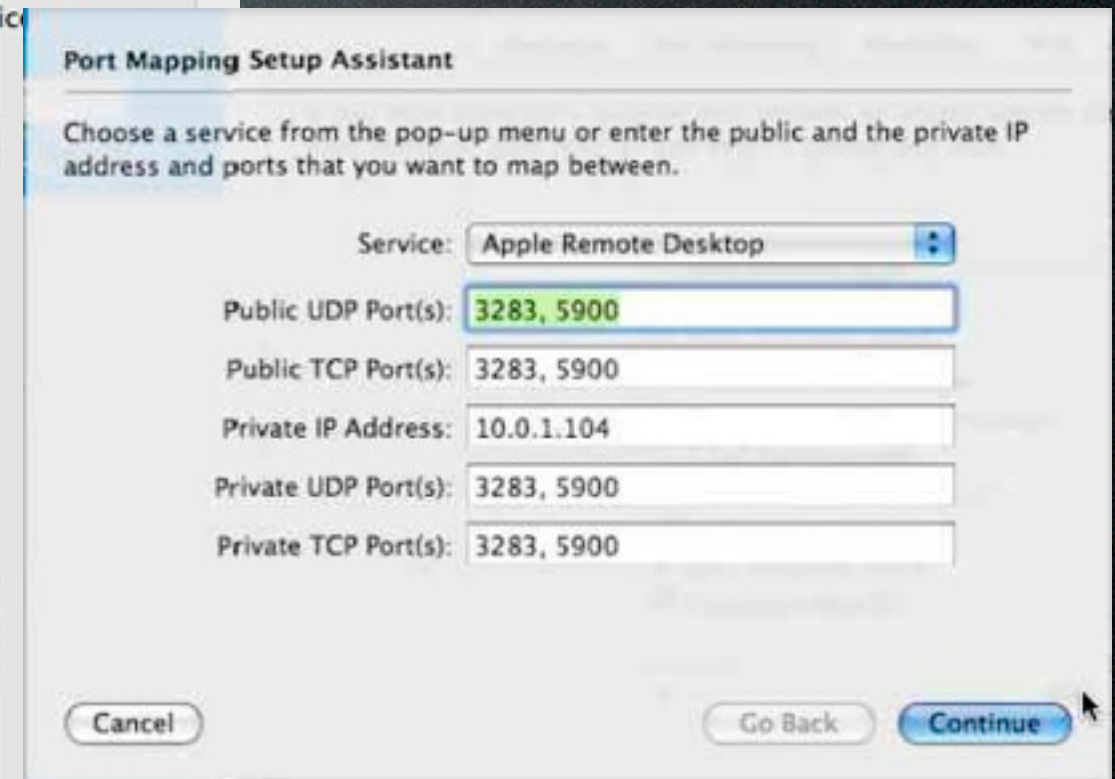
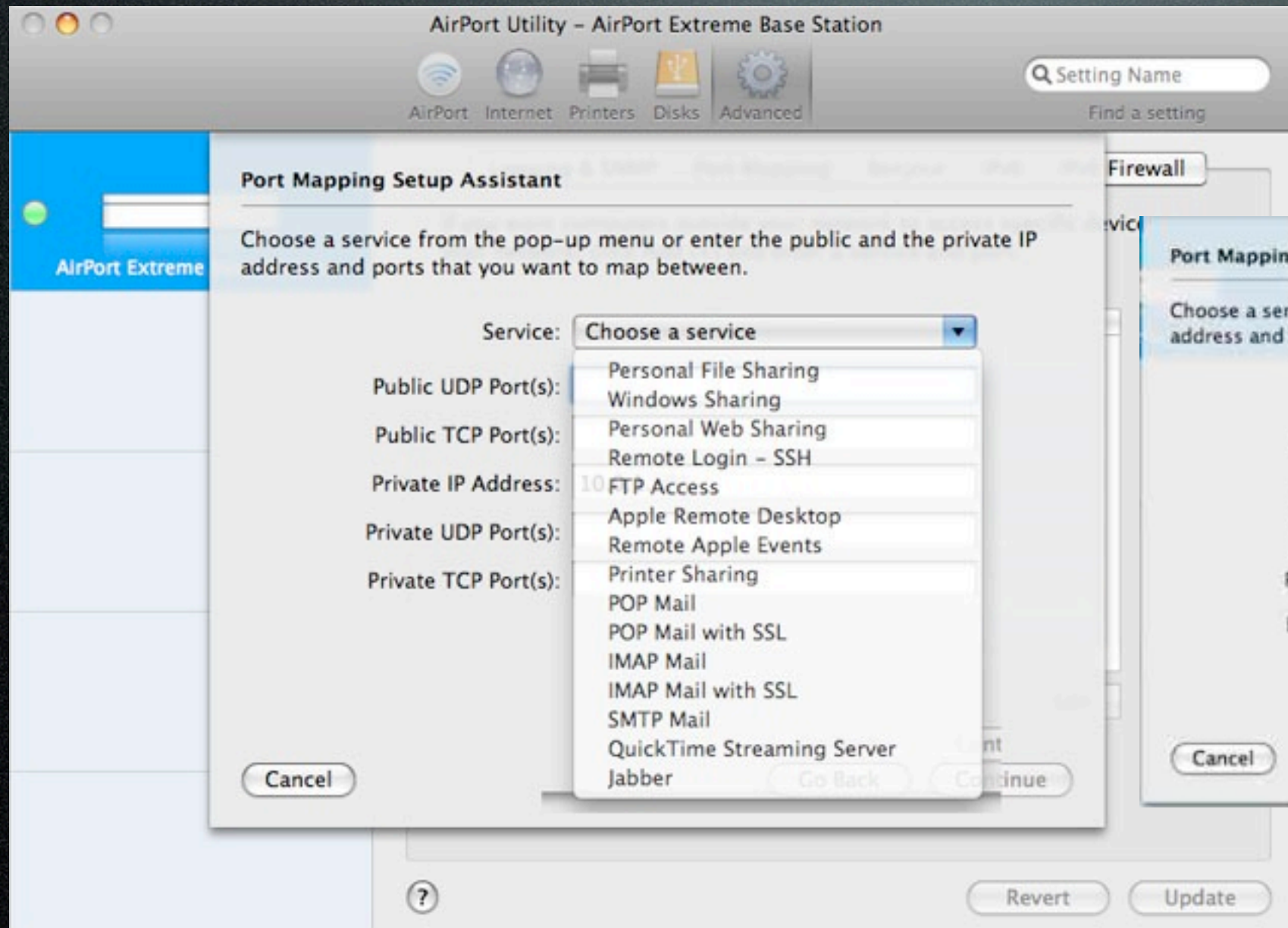
IPv6 networking

- Many, many more unique addresses (32 bit vs 128 bit address)
- 8 groups of 4 hex digits
- Types of addresses - unicast, anycast, multicast
- IPv6 via DHCP
- Are you IPv6 ready?
<http://ipv6now.com.au/tools.php>
- No NAT - all unique addresses, instead ISP provided prefix

NAT

- Only 1 global address but many devices?
 - Translates IP without changing state
 - The reason IPv4 lasted this long! Creates more local addresses
- Port Forwarding
 - Allows services on local addresses to be accessible to the world

Some examples:



Some examples:

The screenshot shows the NETGEAR Router WNR2000v2 web interface. The browser address bar shows `http://10.0.0.1/start.htm`. The page title is "NETGEAR SMARTWIZARD router manager N300 Wireless Router model WNR2000v2". The left sidebar contains a navigation menu with categories: Wireless Settings, Guest Network, Content Filtering, Logs, Block Sites, Block Services, Schedule, E-mail, Maintenance, Router Status, Attached Devices, Backup Settings, Set Password, Router Upgrade, Advanced, Wireless Settings, Wireless Repeating Function, Port Forwarding / Port Triggering (selected), WAN Setup, LAN Setup, QoS Setup, Dynamic DNS, Static Routes, Remote Management, UPnP, Traffic Meter, Web Support, Knowledge Base, Documentation, and Logout.

The main content area is titled "Port Forwarding / Port Triggering". It has a sub-header "Please select the service type." with two radio buttons: "Port Forwarding" (selected) and "Port Triggering". Below this, there is a "Service Name" dropdown menu with "AIM" selected, and a "Server IP Address" field with "10.0.0.2" entered. An "Add" button is next to the IP field.

Below the form is a table with the following data:

#	Service Name	Start Port	End Port	Server IP Address
1	Minecraft	25565	25565	10.0.0.2
2	Gmod 1	4380	4380	10.0.0.2
3	Gmod 2	27000	27050	10.0.0.2

Below the table are buttons: "Edit Service", "Delete Service", and "Add Custom Service".

On the right side of the page, there is a "Port Forwarding / Port Triggering Help" section. It contains text explaining the difference between port forwarding and port triggering, and how to use the configuration screen. It also includes a "Port Assignment" section with instructions on how to make up to 20 different port assignments for Internet services, applications, or games.

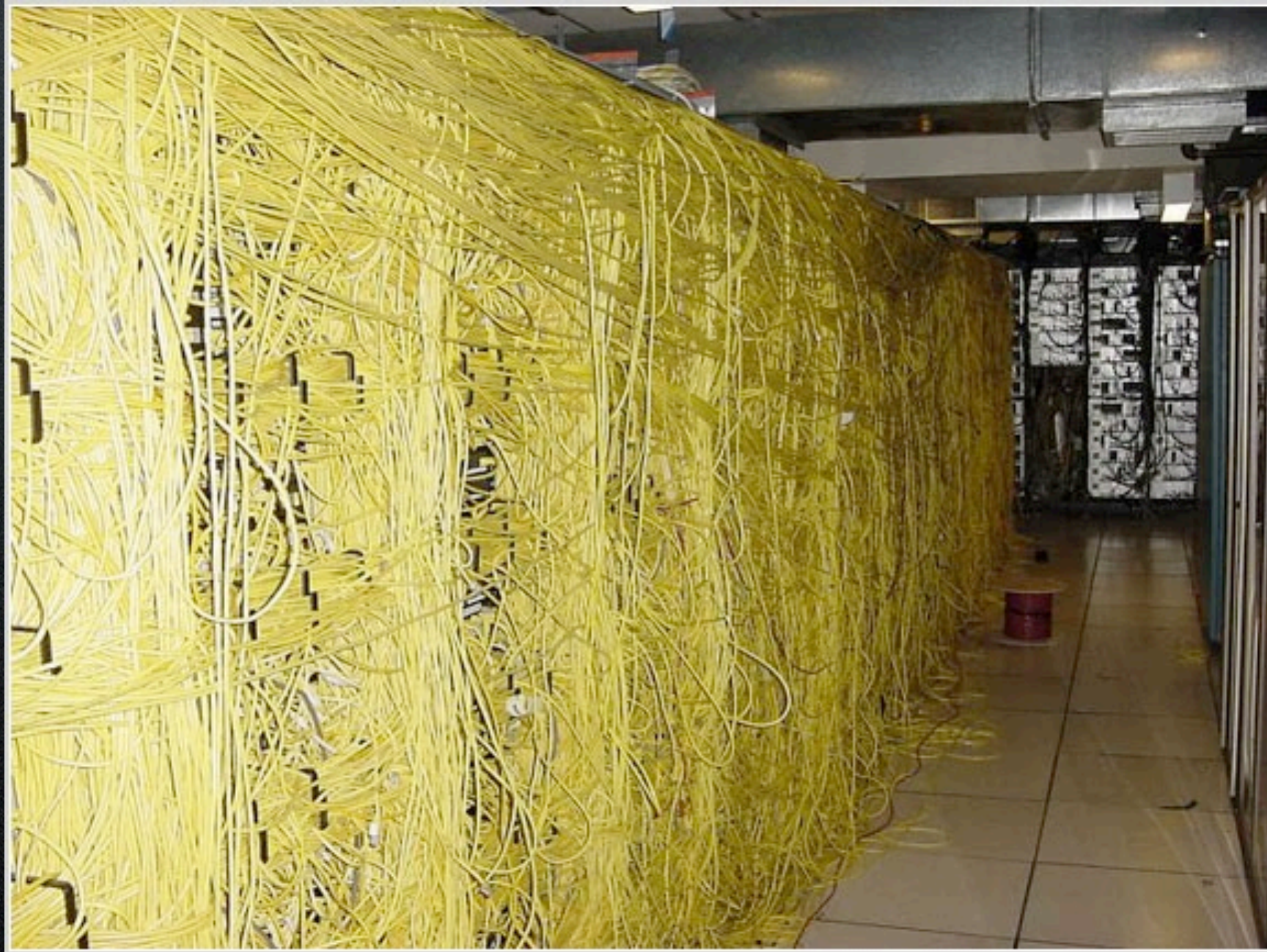
‘Black boxes’

- Vonage, Ooma, other VoIP
- Security systems, video monitoring
- PROBLEMS:
Limited config
Dual NAT

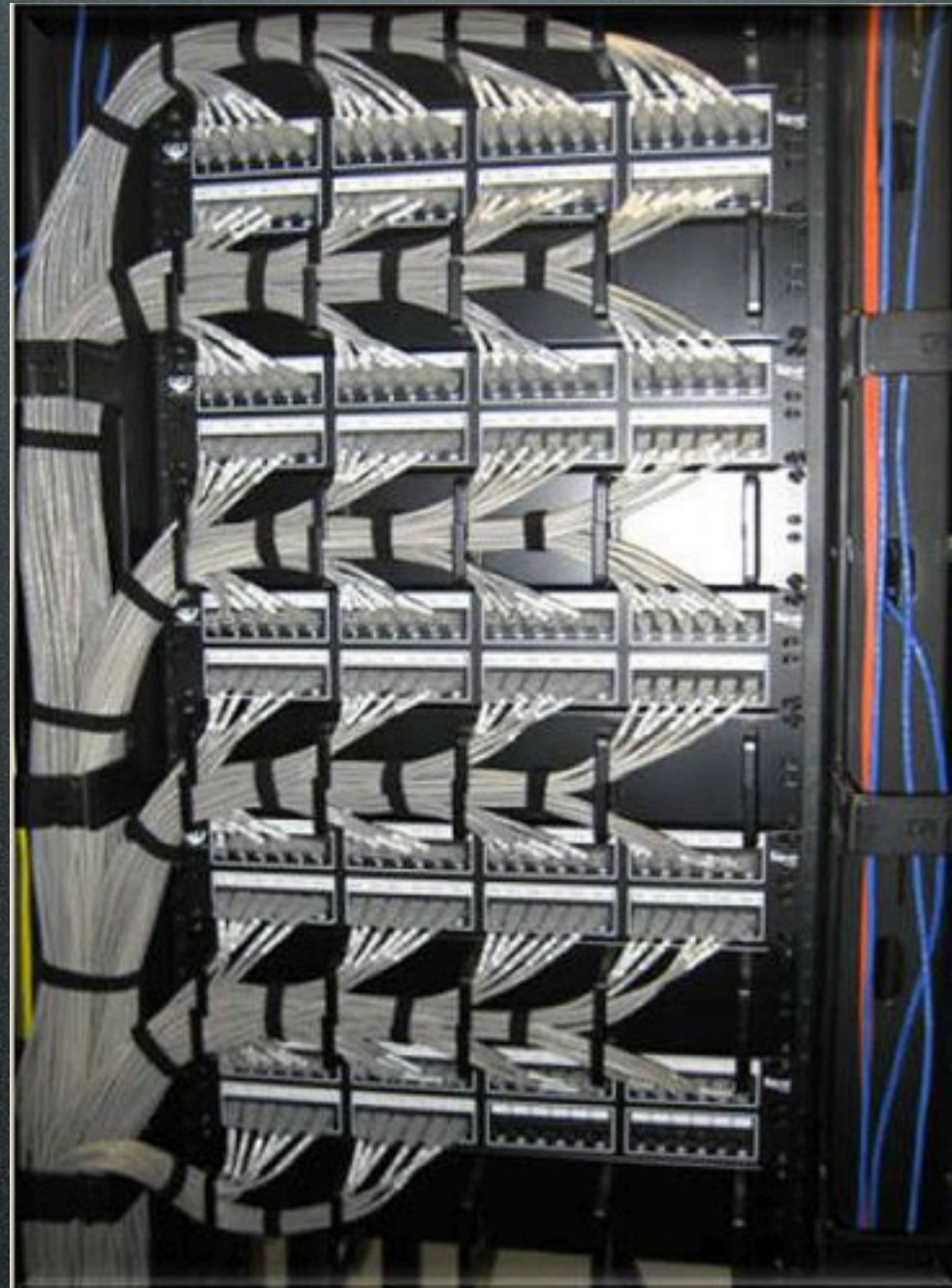
Higher end options:



Good luck with this one...

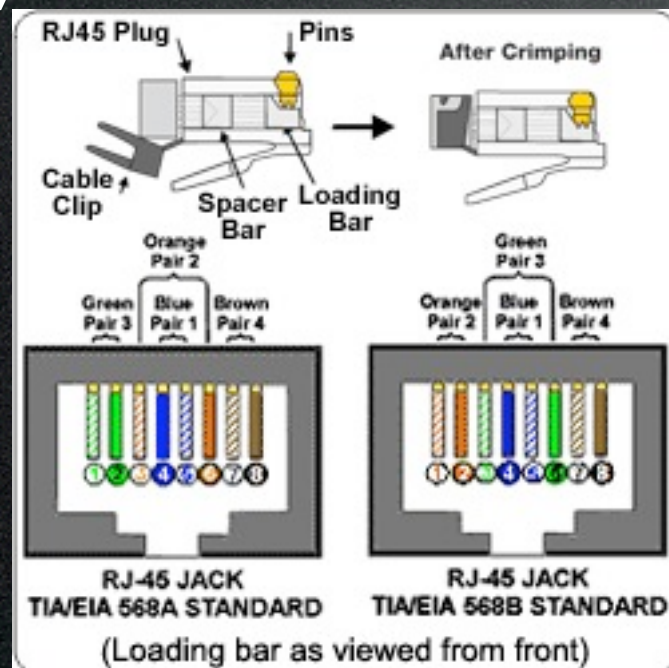


A bit better...



Wires, Wires & More Wires

- Cat 3, 5, 5e, 6, 6a - which one to use?
- Your network is only as fast as its weakest link! Watch your patch panels for rating!
- Test your cables!
- Make your own?
Or buy online?



Useful Tools:

- **Intermapper** - Network discovery, status, traffic & more
<http://www.intermapper.com>
- **Debookee** - Troubleshooting / Traffic Analysis (ie sniffing...)
<http://www.iwaxx.com/debookee/>
- **iNet (Mac & iOS)** - What devices?
<http://www.bananaglue.de/index.php>
- **SmallNetBuilder** - hardware reviews & more
<http://www.smallnetbuilder.com>
- **Monoprice** - great source for cheap cables (better than interns!!!)
<http://www.monoprice.com>