

HantsLUG 2013: Improving Home Broadband

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Broadband Recap

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A quick recap:

- What is Broadband?
- Who provides it?
- How is it delivered to us?
- Where does it come from?
- Why do we have it?

What Is Broadband?

- **Narrow Band:**

1991, March: Piped first UK dial-up Internet provider (ITU-T V.90/V.92).

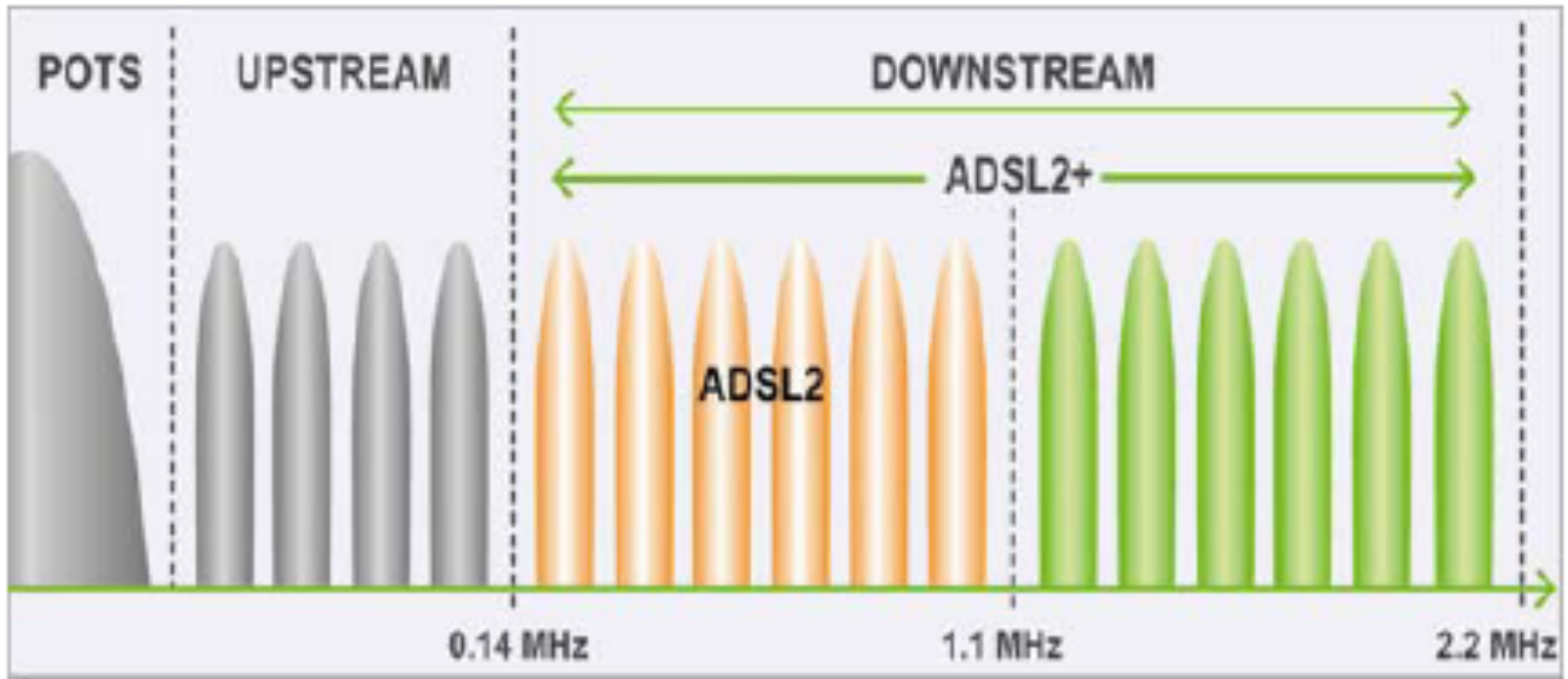
Horrible dying cat noises, picking up the phone could disconnect the connection (pre MoH), billed like a telephone call (i.e. 2p per minute), roughly 5-7Kbps max download speeds. **300Hz to 3.4kHz**.

- **Broadband:**

2000-ish: BTW launch first ADSL offering (ADSL1/ADSL Max). Initial standardisations at **26kHz to 1,100kHz** (ANSI T1.413 Issue 2 and ITU G.992.1 (G.DMT) & G.992.2 (G.Lite).

Achievable download speeds of up to 700-800Kbps, later developed into ADSL2/2+ ITU G.992.3 onwards, Upto 24Mbps download using frequencies up to **2.2MHz**

Broadband Frequencies



Stolen from: <http://en.wikipedia.org/wiki/G.992.3>

Home Broadband

Who provides it?

- **BT Direct** / Kingston (KCOM) / VirginMedia (NTL) Cable
- **BT Wholesale**: AAISP, Clara, Enta, Web Tapestry
- LLU Provider: O2/BE, Sky, TalkTalk, Virgin, Zen



How is it delivered to us?

- Traditional copper technologies: **ADSL**, SDSL, VDSL
- Coax/Cable: DOCSIS
- TDM copper: ISDN2/30, PRI/BRI/E1

Where does it come from?

- **Telephony line**
- WiMAX/Metro Wifi
- 2G/3G/GPRS/HSDPA
- 4G/LTE

Why Broadband?

Home Internet usage is on the up:

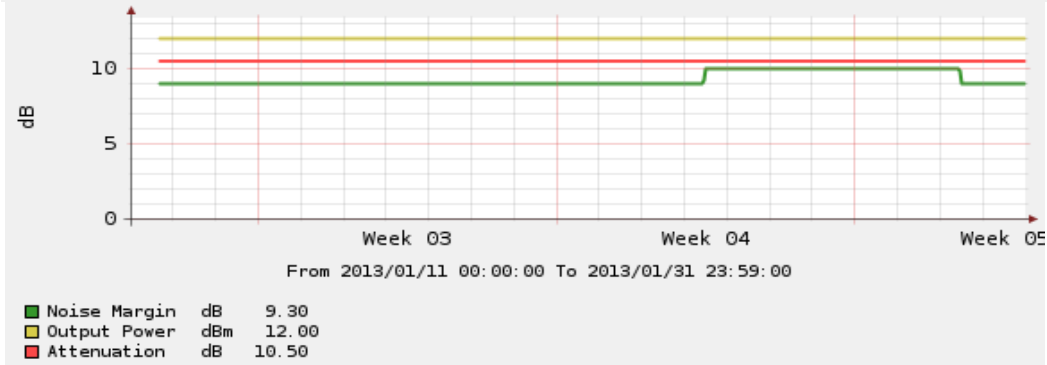
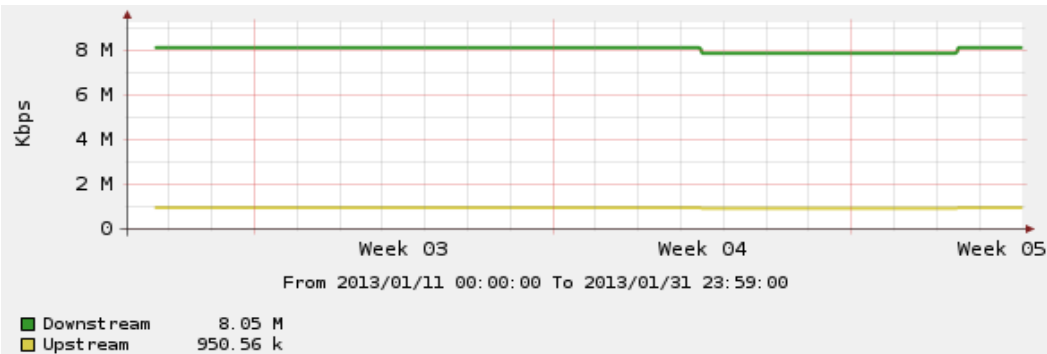
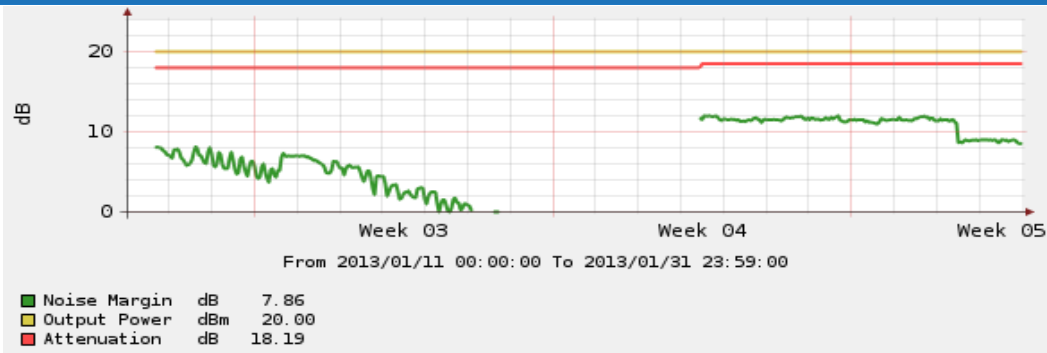
- Triple play services: 1 Provider = Voice, Broadband, TV
- Netflix is now >30% of all North American traffic, single largest Internet traffic source, slowly growing in the UK, Netflix UK < BBC iPlayer < 10% UK traffic
- YouTube >20% all mobile Internet traffic in Europe. 1B page views per day (2009), 72 hours of video uploaded every minute (2012)
- Increase in HD audio/video stream: BBC iPlayer, 4oD, Netflix, Lovefilm. Olympics 2012 Akamai average stream rate of 1,200Kbps. 100m mens final peak traffic for the entire event at 873Gbps. Akamai served 9,300 years of video in two weeks.
- Increase in VoIP: SIP accounts for ~5% of all UK calls between Q3-Q4 2012
- LINX >1.6Tbps peak traffic rate, AMS-IX & DEC-IX >2Tbps

Measuring Improvement

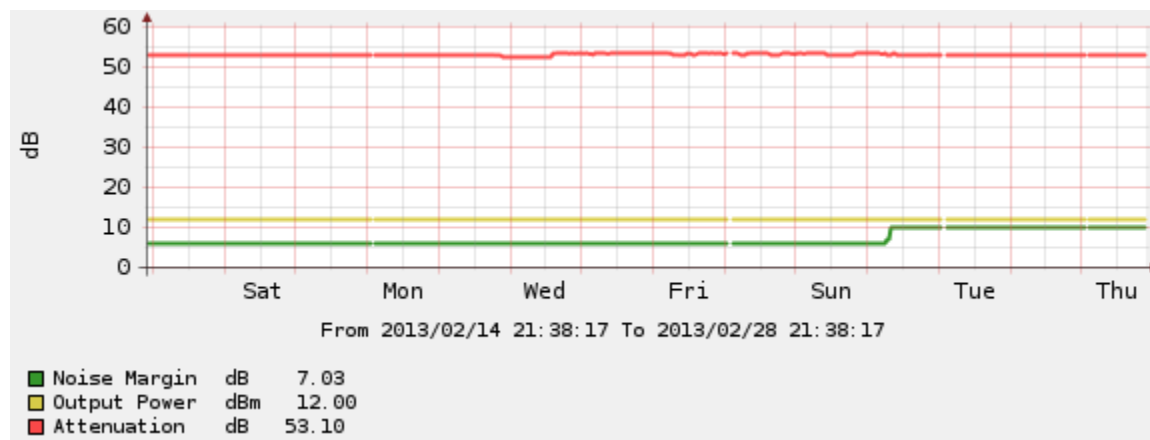
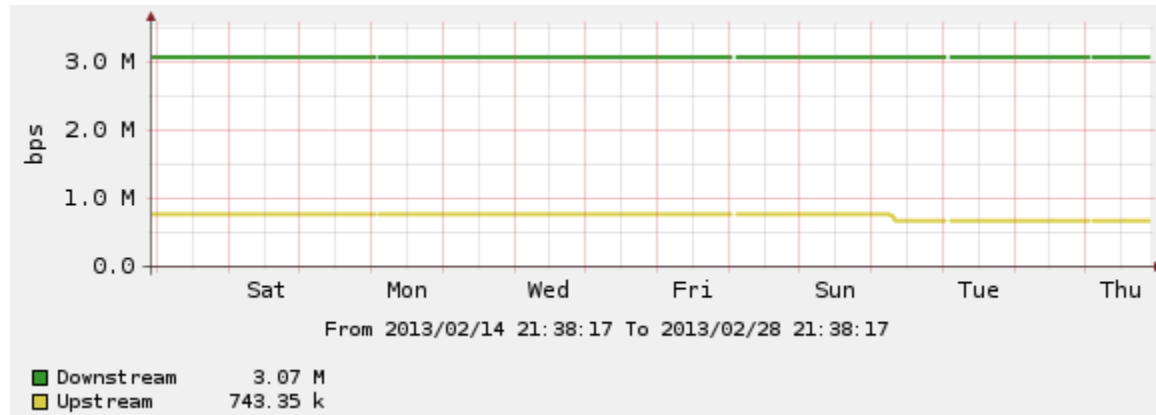
Measuring Improvement

- **Baseline:** If you don't take one, you can't truly benefit
www.speedtest.net
speedtest.vostron.net
traceroute/mtr
ping (icmp/udp)
- **Look at your stats:** http://www.kitz.co.uk/adsl/linestats_explanation.htm
sync rate/line rate
attenuation
signal-to-noise ration/SNR/noise margin
receive/input power
transmit/output power
- **Monitoring:** SNMP stats using Cacti or similar
snmwalk/snmget if you have to
HTTP interface

DSL Line Stats



DSL Line Stats Cont.



External Wiring

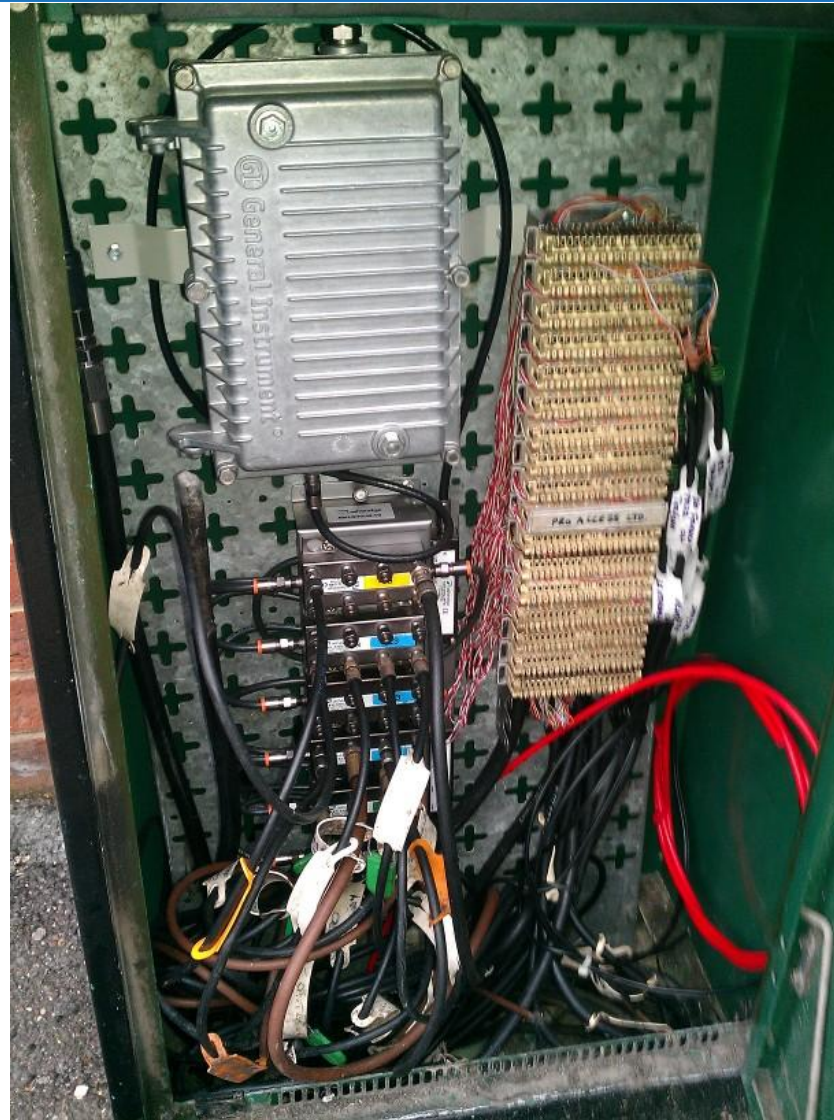
External Wiring

- **Check for damaged street furniture**
- **Check at the premises partition** between internal and external divide
- **Storms and bad weather** can and will affect your service due to the obvious, interference, additionally power surges can damage your modem/router and demolish telegraph poles!
- **BT MBORC** - Good ISP will relay this

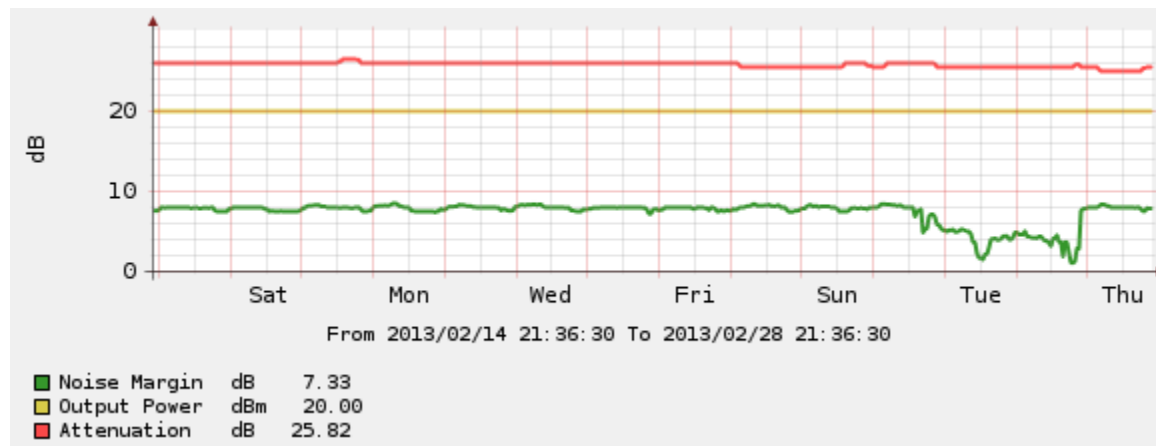


Damaged Street Furniture

Open VM Cab



Storms And Bad Weather



Storm affected ADSL line

Last Mile Wiring

Last Mile Improvements

- All wiring, sockets, DPs, krone bays etc belong to BT.
BT must look after them in accordance with their SLAs, NOT YOU!
- Check internal wiring
- Check bell wiring
- Check external wiring

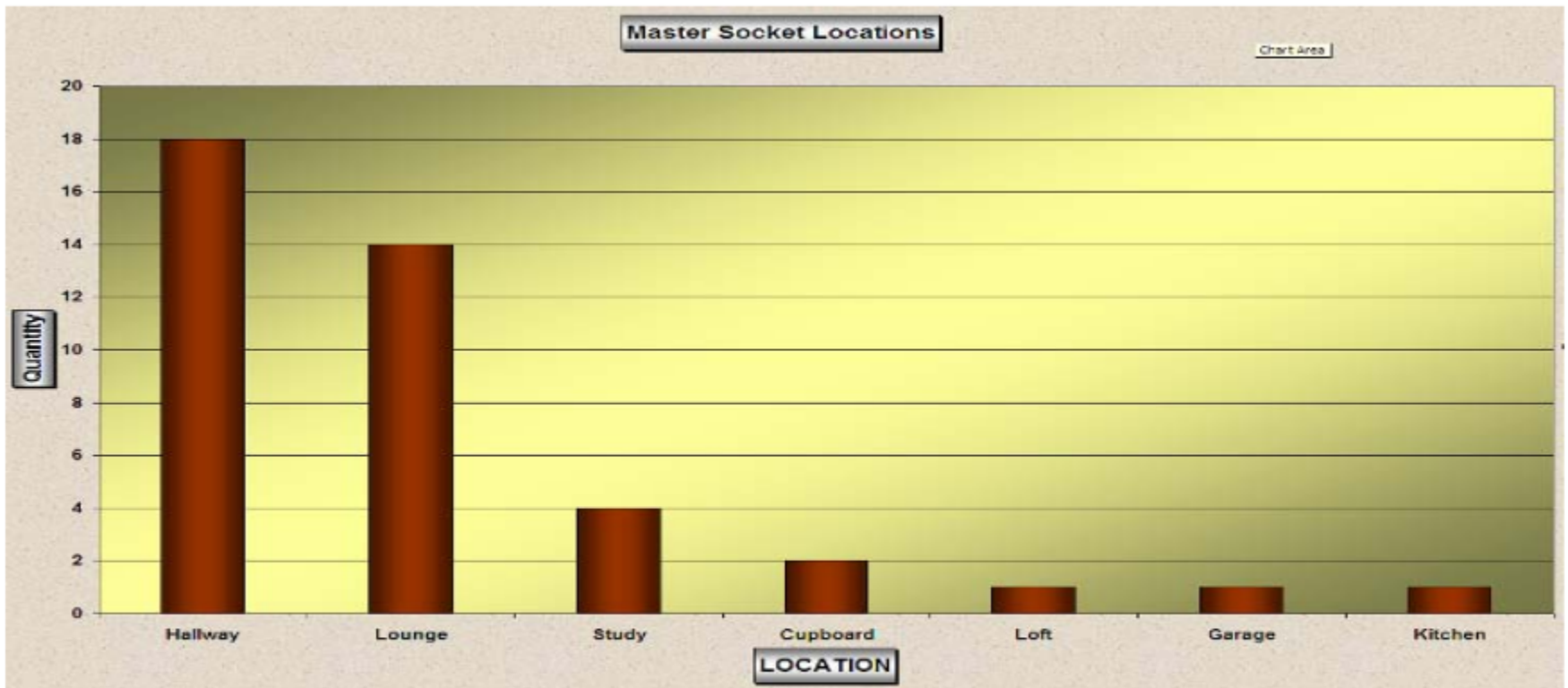


Internal Wiring

- The "master socket" is the first socket the incoming BT line connects to upon entering the premises or breaking out from a DP
- **Always use the master socket**
- Disconnect secondary sockets
- **Disconnect fax machines**
- **Avoid RedCare or Alarm Services**



Master Socket Location



Your master socket is usually located close to where your telephone wire enters your house

BT Sockets



Typical BT/RedCare Connection



Typical BT Openreach Socket

Worst Case Scenario



Typical extension/junction
box

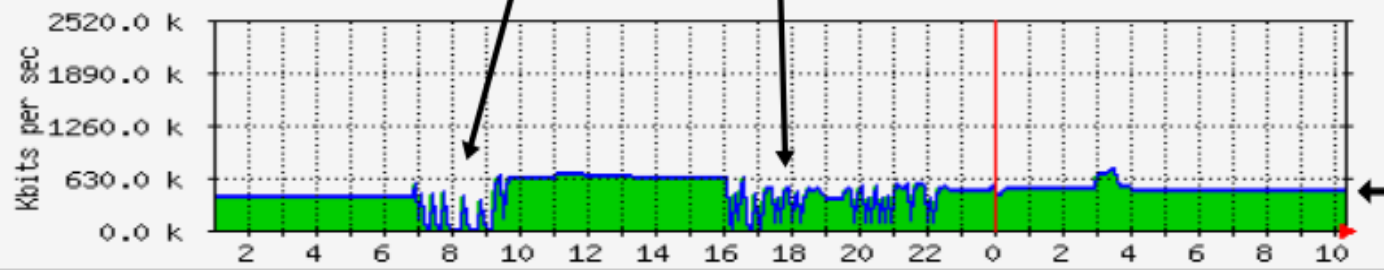
Bell Wire

- "The Bell Wire picks up electrical interference that suppresses line speed and reduces stability of Broadband service. This problem impacts all homes with extension wiring to some degree"
- Remove the faceplate and **remove the ring wire** (typically pin 3), carefully to allow for later replace!
- Retrain can take 3-5 days for ADSL max/rate adaptive products

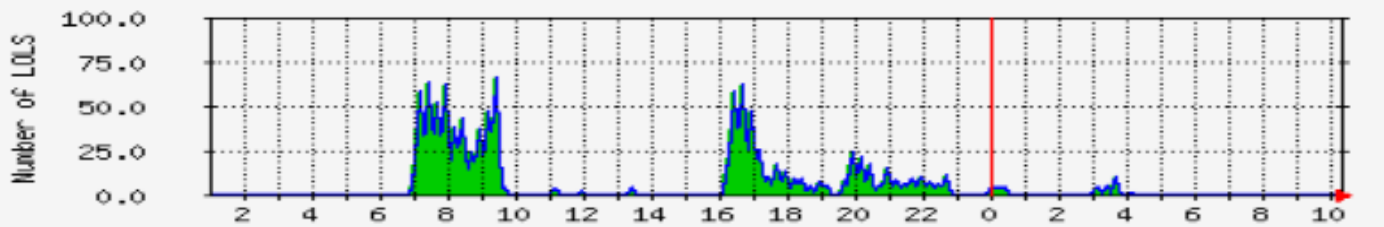


No Bell Filter

Multiple re-trains in morning and evening resulting in a significant amount of service downtime



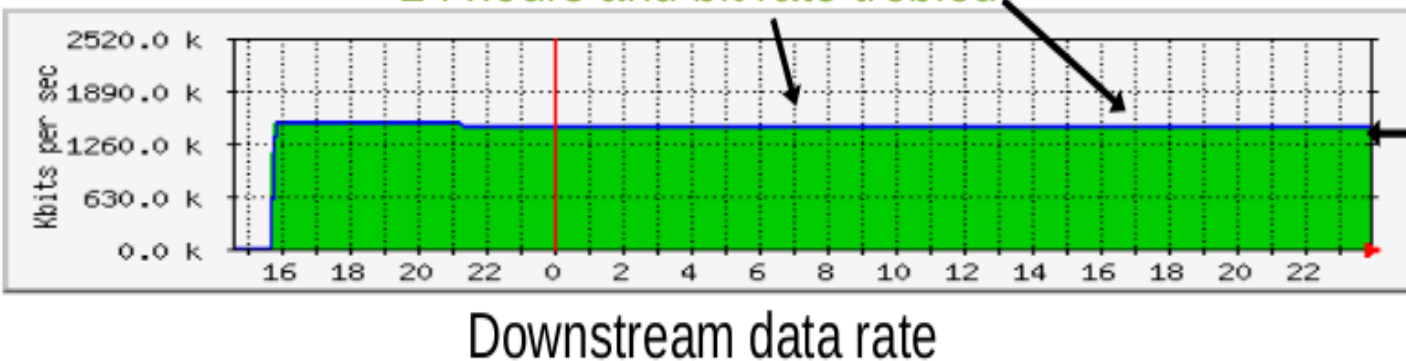
Downstream data rate



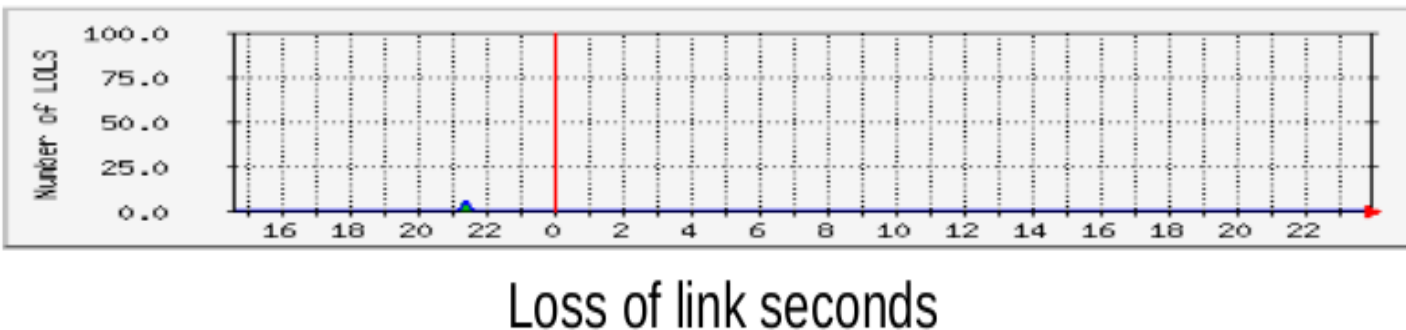
Loss of link seconds

Bell Filter

Significantly more stable, only a single re-train in almost 24 hours and bit rate trebled



Average bit rate
now around **1500**
kbps



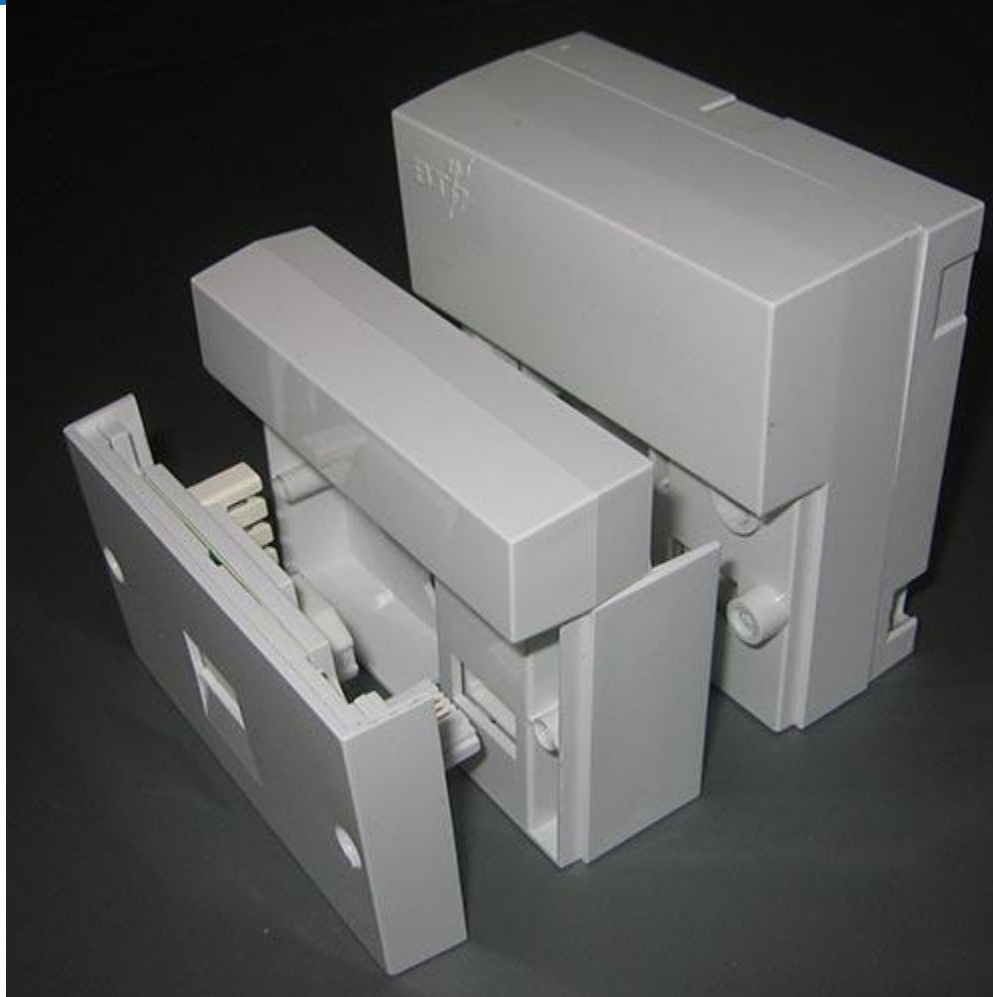
Home Wiring

Home Wiring Improvements

- **Shorten the ADSL cable** (1 or 2 pair RJ11 cable)
- **Try different filter** or faceplate filter
- **Avoid running Ethernet next to power**
- **Avoid installing poor quality cable and poorly terminating it**



iPlate



£10 (Max) for iPlate to circumvent the
Bell/Ring wire

Microfilter

Standard filter



Low quality filter



NTE5 filter

Wireless Improvements

Wireless Improvements

- **Wireless standards:** IEEE 802.11 A/B/G/N
- **Wireless frequencies:** 5GHz, 2.4GHz, 2.4GHz, 2.4GHz & 5 GHz
- **Wireless interference:** Alien devices, rogue access points
- **Wireless channels (in Europe):** 14 channels (11 usable) from 2.401GHz-2.495 GHz, Upto 300 channels (~20 usable) from 5.15GHz-5.725GHz.
- **Wireless vendors & hardware:** Reputable vendors, regular firmware & driver updates

Wireless Standards

802.11n, every time

- 802.11a: 5GHz @ 54Mbps, short distance/low barrier penetration
- 802.11b: 2.4GHz @ 11Mbps, longer distance/higher barrier penetration
- 802.11g: 2.4GHz @ 54Mbps, longer distance/higher barrier penetration
- 802.11n: 2.4GHz & 5GHz @ from 54Mbps, to 300Mbps, now upto 600Mbps (not domestic yet), multi-antenna multi-frequency combo gives longer distance/higher barrier penetration

Wireless Frequencies

2.4GHz is cheap and commonly used, but it's better for wall penetrations, yet slower (802.11b offers up to 54Mbps, average is much lower). Many household items operate on the same/similar 2.4GHz frequency ranges:

- Other access points/routers!
- Amateur radio equipment
- Bluetooth
- Car alarms
- Garage door openers, drive-way gate controls
- Microwaves
- Non-SSID-broadcasting networks
- Walkie talkies & Baby monitors

Wireless Interference

- **Position within your premises in a central location:** Think about walls and their composite materials (sheet metal), and their obstructions, radiators, filing cabinets, metal shelves. Raise it off the floor.
- 5GHz is a smaller wavelength and has more difficulties penetrating walls, **switch from 802.11n 5Ghz to 802.11n 2.4Ghz, or run mixed**
- **Point the antenna(s) up vertically:** Vertical plane has greater coverage than horizontal

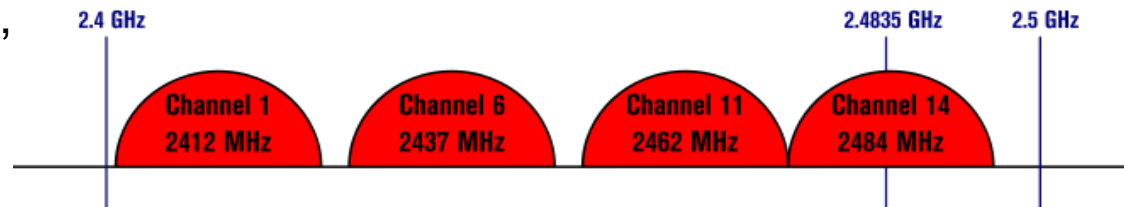
Wireless Channels

- **Change wireless channel:**
Check for overlapping channels, or simply jumpy around.

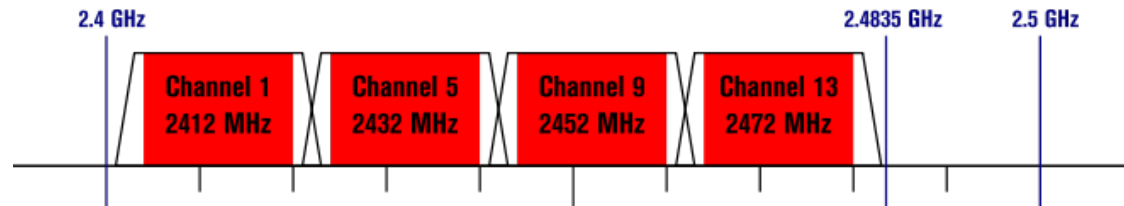
NOTE: These are not always fixed!

Non-Overlapping Channels for 2.4 GHz WLAN

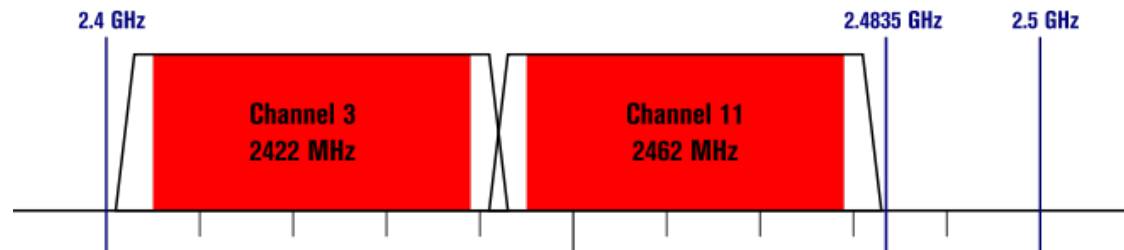
802.11b (DSSS) channel width 22 MHz



802.11g/n (OFDM) 20 MHz ch. width – 16.25 MHz used by sub-carriers



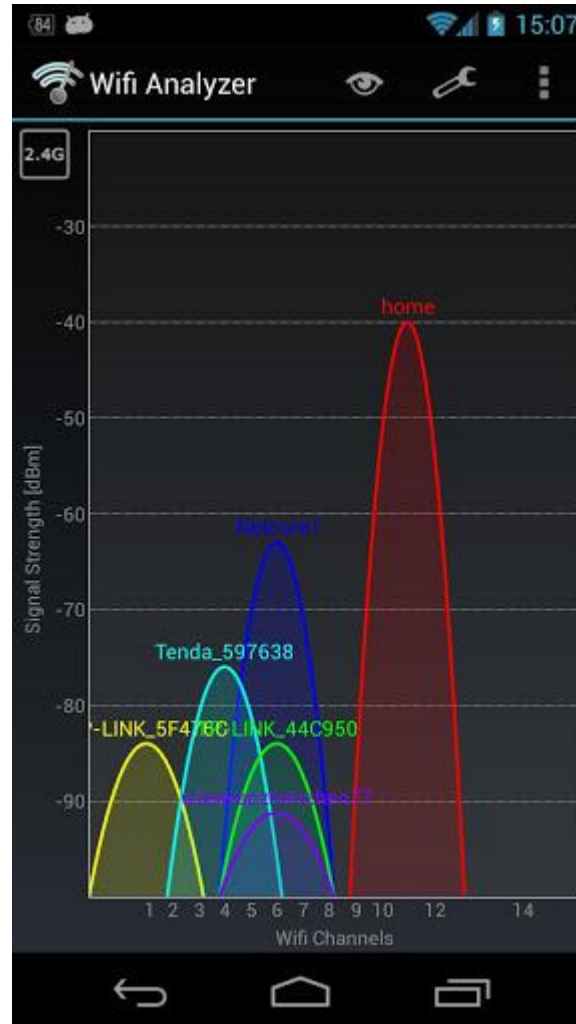
802.11n (OFDM) 40 MHz ch. width – 33.75 MHz used by sub-carriers



Wifi Analyzer App

Free Android App:

- "Wifi Analyzer" by farproc
- "Shows the Wi-Fi channels around you. Helps you to find a less crowded channel for your wireless router."



Wireless Vendors & Hardware

- **Reputable Vendors:**
Ubiquiti UniFi - <http://linitx.com/product/13542>
Technicolor TG582n - <http://www.technicolor.com/en/hi/digital-home/mediaaccess/dsl/wireless/adsl/technicolor-tg582n>
Routerboard products
- **High gain** and directional antennas: <http://www.draytek.co.uk/products/aerials.html>
- **Update firmware** of router/access point
- **Software update:** Update kernel, compile proprietary drivers, update wifi adapter firmware

Wireless Summary

- Switch to 802.11n/2.4GHz & 5GHz
- Adjust router positioning
- Check for interfering devices
- Change channels
- Use wireless extender
- Good hardware vendor
- Software updates
- Correct measurements (signal strength, throughput, delay)

Questions?

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