



Rural Public Access WiFi Service: Satellite Broadband for Remote Rural Areas

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Universal Access and Service Plans

- Plans take different forms in different countries.
 - Very uneven success rates
 - In most cases, inadequate to scale of the problem.
- Prices, tailored for more affluent part of the population
 - Remains unaffordable to many.
 - People invest large proportion of disposable income in communications.
- Approximately 55% of the world's population is rural
 - 78% live in developing countries.
 - Many located in difficult to access geographies.



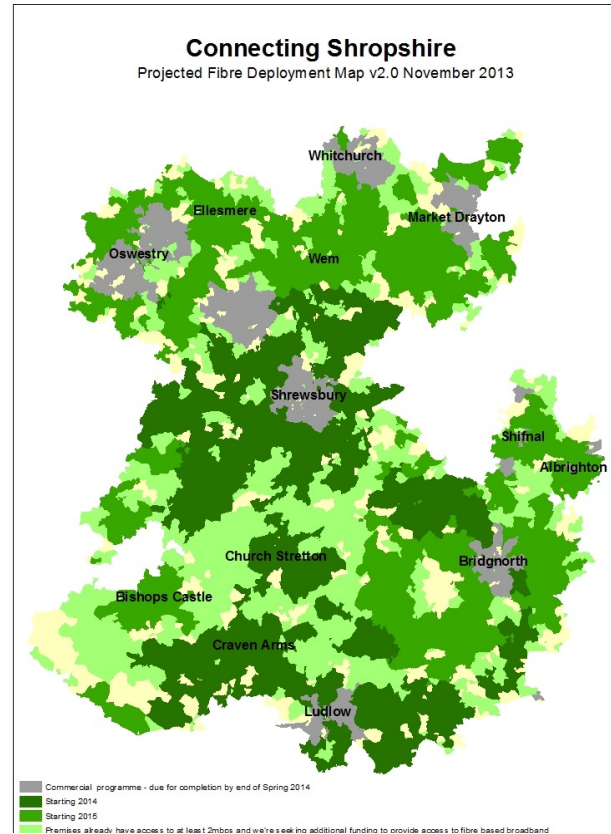
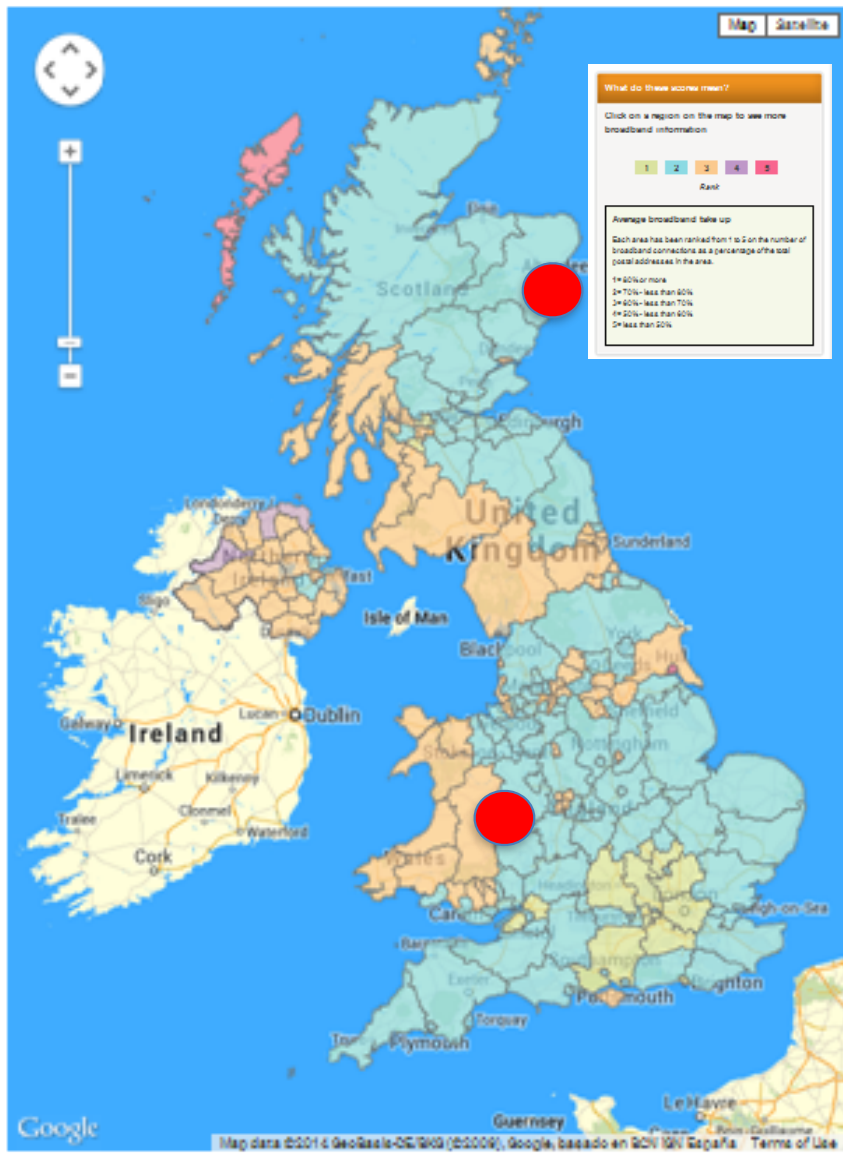
Rural PAWS

Collaborative project - Internet Engineering and Social Sciences:

- To develop and test deployment of new services in currently 'hard-to-reach' rural areas/communities (last 5-10%).
- To understand and analyse the technological challenges and service requirements to realise a very low cost service.
- To evaluate take-up and user perceptions of the service.



R-PAWS Sites



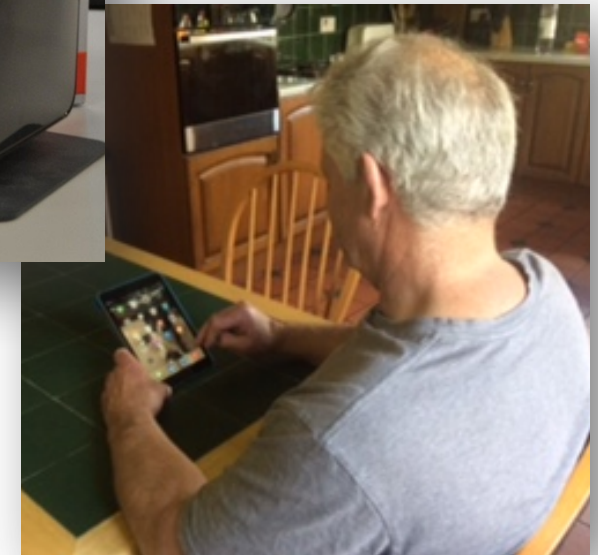
Deployed at each site:



Satellite Terminal
(outdoor dish and indoor unit)



Rural PAWS Router
(policy and wireless access)



CAPEX:

Equipment (could integrate IDU+CPE)
Install + Commission

OPEX:

Capacity costs (can vary by time of day)
Service support costs
User support costs (!!!)
Diverse user equipment?

Some form of government
intervention needed

Must not destroy part of the
commercial market



Rural PAWS differentiated services model

Free (or nearly free) service for 'core' services:



Essential services (to keep net working)



Services important to Government (unlimited service)



Basic Internet connectivity (limited service)

Effective sharing of (limited) capacity:

- What limit is acceptable to a user?
- How do different types of users perceive a 'limited' service?
- What "free" limits are acceptable to an ISP?
- Can we reduce the impact of rate on application latency?

Whitelisted sites (423)

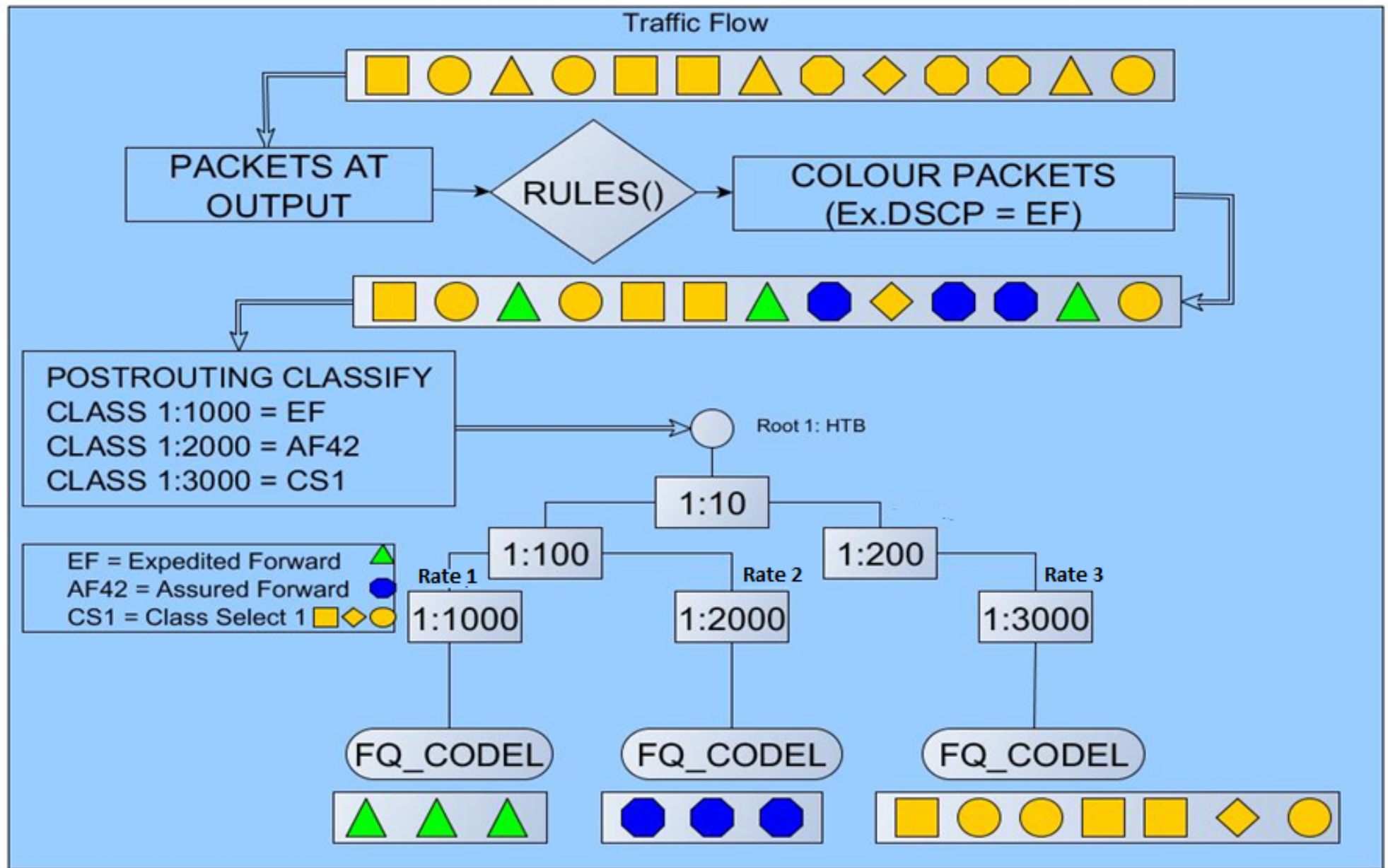
Organisation / Website / Current URL / Parent dept
Crown Prosecution Service, www.cps.gov.uk, AGO
Government Legal Service, www.gls.gov.uk, AGO
HM Crown Prosecution Service Inspectorate, www.hmcpis.gov.uk, AGO
Serious Fraud Office, www.sfo.gov.uk, AGO
ACAS, www.acas.org.uk, BIS
ACAS Training, obs.acas.org.uk, BIS
Apprenticeships, www.apprenticeships.org.uk, BIS
British Business Bank, www.british-business-bank.co.uk, BIS
British Business Club, https://britishbusinessclub.innovateuk.org/, BIS
Capital for Enterprise, www.capitalforenterprise.gov.uk, BIS
Catapult, www.catapult.org.uk, BIS
Central Arbitration Committee, www.cac.gov.uk, BIS
Certification Office, www.certoffice.org, BIS
Companies House, www.companieshouse.gov.uk, BIS
Companies House, www.companies-house.gov.uk, BIS
Competition Appeal Tribunal, www.catribunal.org.uk, BIS
Connect, connect.innovateuk.org, BIS
Consumer Futures, www.consumerfocus.org.uk, BIS
Copyright Tribunal, www.ipc.gov.uk/tribunal.htm, BIS
Great Business (was Business in You), www.greatbusiness.gov.uk, BIS
Growth Accelerator, www.growthaccelerator.com, BIS
HM Land Registry, www.landregistry.gov.uk, BIS
Insolvency Practitioners' Tribunal, www.bis.gov.uk/insolvency, BIS
Insolvency Rules Committee, www.insolvencydirect.bis.gov.uk/insolvencyprofessionandlegislation/irc/irc.htm, BIS
Investors In People, www.investorsinpeople.co.uk, BIS
Knowledge Transfer Partnerships, www.ktponline.org.uk, BIS
Live Work Play Broadband, www.liveworkplaybroadband.org.uk/, BIS
Met Office, www.metoffice.gov.uk, BIS
National Careers Service, https://nationalcareerservice.direct.gov.uk/Pages/Home.aspx, BIS
News, bis.gov.uk, www.news.bis.gov.uk, BIS
Office for Fair Access, www.offa.org.uk, BIS
Ordnance Survey, www.ordnancesurvey.co.uk, BIS
Science & Society, http://scienceandsociety.bis.gov.uk/, BIS
Student Loan Repayment, www.studentloanrepayment.co.uk, BIS
Student Loans Company, www.slc.co.uk, BIS
Tech City UK, www.techcityuk.com/#/home, BIS
Technology Strategy Board, www.innovateuk.org, BIS
The Consumer Rights Bill, http://discuss.bis.gov.uk/consumerrightsbill/, BIS
The Companies Name Tribunal, www.ipc.gov.uk/cna.htm, BIS
The Intellectual Property Office, www.ipc.gov.uk, BIS
The Qualifications and Credit Framework, http://qcfguide.skillsfundingagency.bis.gov.uk/, BIS
UK Green Investment Bank, www.greeninvestmentbank.com, BIS
UKTI - Open to Export, www.opentoelexport.com, BIS
Unistats, www.unistats.com, BIS
Wave Hub, www.wavehub.co.uk/, BIS
Advisory Committee on Business Appointments, acoba.independent.gov.uk/, CO
Big Society Awards, www.bigsocietyawards.org/, CO
Boundary Commission for England, consultation.boundarycommissionforengland.independent.gov.uk/, CO
CERT-UK, cert.gov.uk, CO
Civil Service Commission, civilservicecommission.independent.gov.uk/, CO
Civil Service Faststream, faststream.civilservice.gov.uk/, CO
Commissioner for Public Appointments, publicappointmentscommissioner.independent.gov.uk/, CO
Committee on Standards in Public Life, www.public-standards.gov.uk/, CO
Data, www.data.gov.uk/, CO
Detainee Enquiry, www.detaineeinquiry.org.uk/, CO
European Memoranda, europeanmemoranda.cabinetoffice.gov.uk, CO
Government Communication Network, https://gen.civilservice.gov.uk/, CO
GOV.UK, www.gov.uk, CO/GDS

Crown Commercial Service (formerly Gov Procurement Service), gps.cabinetoffice.gov.uk/ (ogchs.gov.uk), CO
Crown Commercial Service, http://ccs.cabinetoffice.gov.uk/, CO
HMGCC - Her Majesty's Government Communications Centre, www.hmccc.gov.uk/, CO
House of Lords Appointments Commission, lordsappointments.independent.gov.uk/, CO
Independent, www.independent.gov.uk, CO
Intelligence and Security Committee, isc.independent.gov.uk/, CO
Iraq Inquiry, www.iraqinquiry.org.uk/, CO
Lords Whips Office, www.lordswhips.org.uk, CO
Mutuals Information Service, mutuals.cabinetoffice.gov.uk, CO
Civil Service, http://my.civilservice.gov.uk/, CO
National Citizen Service, www.ncses.co.uk/, CO
National Survey of Charities and Social Enterprises, www.ncsesurvey.com/, CO
Payroll Giving, http://communitylife.cabinetoffice.gov.uk/, CO
Community Life Survey, http://communitylife.cabinetoffice.gov.uk/, CO
Privy Council Office, privycouncil.independent.gov.uk/, CO
Public Appointments, publicappointments.cabinetoffice.gov.uk, CO
Red Tape Challenge, www.redtapechallenge.cabinetoffice.gov.uk/home/index/, CO
TV Filers, http://communication.cabinetoffice.gov.uk/filers/, CO
Audit Commission, www.auditcommission.gov.uk, DCLG
Audit Commission, www.audit-commission.gov.uk, DCLG
Homes and Communities Agency, www.homesandcommunities.co.uk/, DCLG
Housing Ombudsman, www.housing-ombudsman.org.uk/, DCLG
Infrastructure Planning Commission, infrastructure.planningportal.gov.uk/, DCLG
Infrastructure Planning Commission, infrastructure.independent.gov.uk/, DCLG
Leasehold Advisory Service, www.lease-advice.org, DCLG
Local government finance information for local authorities, www.local.communities.gov.uk, DCLG
Local Government Ombudsman, www.lgo.org.uk, DCLG
Planning Portal / Planning Guidance (on site), planningportal.gov.uk, DCLG
QEII Conference Centre, www.qeicc.co.uk, DCLG
Review of Government Planning Practice Guidance, http://planningguidance.readandcomment.com/, DCLG
Right to Buy, righttobuy.communities.gov.uk/, DCLG
Valuation Tribunal Service for England/Valuation Tribunal Service, www.valuationtribunal.gov.uk/, DCLG
Air Accidents Investigation Branch, www.aab.gov.uk, DfT
Bikeability campaign site, http://bikeability.dft.gov.uk/, DfT
Directly Operated Railways Limited, www.directlyoperatedrailways.co.uk, DfT
Drug Drive campaign site, drugdrive.direct.gov.uk, DfT
English Road Safety Comparison, road-collisions.dft.gov.uk/, DfT
High Speed Two Limited, www.hs2.org.uk/, DfT
Highways Agency, www.highways.gov.uk, DfT
Marine Accident Investigation Branch, www.maib.gov.uk, DfT
Maritime and Coastguard Agency, www.dft.gov.uk/mca/, DfT
Office of Rail Regulation, www.rail-reg.gov.uk, DfT
Office of Rail Regulation, www.orr.gov.uk, DfT
Passenger Focus, www.passengerfocus.org.uk, DfT
Rail Accidents Investigation Branch, www.raib.gov.uk, DfT
Sharp Motorcycle Safety, http://sharp.direct.gov.uk/, DfT
Standards for Highways, www.dft.gov.uk/ha/standards/sitemap.htm, DfT
Tales of the Road campaign site, talesoftheroad.direct.gov.uk/, DfT
Think! Campaign site, http://think.direct.gov.uk/, DfT
Vehicle Certification Agency, www.dft.gov.uk/vca, DfT
Advisory Committee on the Government Art Collection, www.gac.culture.gov.uk/advisory_committee.html, DCMS
Arts Council England, www.artscouncil.org.uk, DCMS
BBC, www.bbc.co.uk, DCMS
British Film Institute, www.bfi.org.uk, DCMS
British Library, www.bl.uk, DCMS

Channel 4, www.channel4.com, DCMS
English Heritage, www.english-heritage.org.uk, DCMS
Equality and Human Rights Commission, www.equalityhumanrights.com/, DCMS
Gambling Commission, www.gamblingcommission.gov.uk, DCMS
Government Art Collection, www.gac.culture.gov.uk/, DCMS
Heritage Lottery Fund, www.hlf.org.uk, DCMS
Historic Royal Palaces, www.hrp.org.uk, DCMS
Inspiring Learning, www.inspiringlearning.gov.uk/, DCMS
National Heritage Memorial Fund, www.nhmf.org.uk, DCMS
National Lottery Commission, www.natlotcomm.gov.uk, DCMS
Ofcom, www.ofcom.org.uk, DCMS
S4C, www.s4c.co.uk, DCMS
Sport England, www.sportengland.org/, DCMS
Sports Grounds Safety Authority, www.safetysportsgrounds.org.uk, DCMS
The Royal Parks, www.royalpalaces.gov.uk, DCMS
The Theatres Trust, www.theatrestrust.org.uk/, DCMS
UK Anti-Doping, www.ukad.org.uk, DCMS
UK Sport, www.uksport.gov.uk, DCMS
VisitBritain, www.visitbritain.com, DCMS
VisitEngland, www.visitengland.com, DCMS
Building Energy Performance Assessment, www.ncm-pcgb.org.uk/sap/index.jsp, DECC
CHP Focus, chp.decc.gov.uk/cms/, DECC
CHPQA - Quality Assurance for Combined Heat and Power, chpqa.decc.gov.uk/, DECC
Coal Authority, coal.decc.gov.uk/, DECC
Committee on Climate Change, www.theccc.org.uk/, DECC
DECC Blog, blog.decc.gov.uk/, DECC
Energy Technology List, etl.decc.gov.uk/etl/, DECC
EU Energy Focus, euenergyfocus.co.uk/, DECC
Green Deal Advisory Body, www.greendealorb.co.uk/, DECC
Green Deal Cashback, https://gdcashback.decc.gov.uk, DECC
Green Deal Cashback, gdcashback.gov.uk, DECC
Nuclear Decommissioning Authority, www.nda.gov.uk/, DECC
Ofgem, www.ofgem.gov.uk, DECC
Restats, https://restats.decc.gov.uk, DECC
Advisory Committee on Pesticides, www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp, DEFRA
Agricultural Land Tribunal * archive, defra.gov.uk/foodfarm/farmanagement/alt/, DEFRA
AHVLA Scientific, www.ahvascientific.com, DEFRA
Animal Health & Veterinary Laboratories Agency - ESNIP3, www.esnip3.eu, DEFRA
Animal Health & Veterinary Laboratories Agency - Flulab, www.flu-lab-net.eu, DEFRA
Animal Health and Veterinary Laboratories Agency *, www.defra.gov.uk/ahva-en/, DEFRA
Animal Health and Veterinary Laboratories Agency *, animalhealth.defra.gov.uk, DEFRA
Archive, defra.gov.uk, DEFRA
Board of Trustees of the Royal Botanic Gardens Kew, www.kew.org/about-kew/who-we-are/board-of-trustees/index.htm, DEFRA
Broads Authority, www.broads-authority.gov.uk, DEFRA
Centre for Environment Fisheries and Aquaculture Science, www.cefas.defra.gov.uk/, DEFRA
Covent Garden Market Authority, www.newcoventgardenmarket.com, DEFRA
Dartmoor National Park Authority, www.dartmoor-npa.gov.uk, DEFRA
Drinking Water Inspectorate, www.dwi.gov.uk, DEFRA
Ecosystems Knowledge Network, www.naturalcapitalinitiative.org.uk/ekn/form, DEFRA
Ecosystem Markets Task Force, www.defra.gov.uk/ecosystem-markets, DEFRA
Environment Agency *, http://evidence.environment-agency.gov.uk/, DEFRA
EU Ecolabel, http://ecolabel.defra.gov.uk/, DEFRA
Exmoor National Park Authority, www.exmoor-nationalpark.gov.uk/, DEFRA
Farm Animal Welfare Committee *, www.defra.gov.uk/fawc/, DEFRA
Farming Advice Service, www.defra.gov.uk/farming-advice/, DEFRA
Flood Forecasting Centre, www.defra.gov.uk/ffc-environment-agency.metoffice.gov.uk, DEFRA
Geomatics Web Portal, https://www.geomatics-group.co.uk, DEFRA
Government Veterinary Surgeons *, www.defra.gov.uk/gvs/, DEFRA
Government Veterinary Surgeons *, gvs.gov.uk, DEFRA
Horizon Scanning & Futures Home, http://horizonscanning.defra.gov.uk/default.aspx, DEFRA
Joint Nature Conservation Committee, jncc.defra.gov.uk/, DEFRA
Lake District National Park Authority, www.lakedistrict.gov.uk/, DEFRA
Marine Management Organisation, www.marinemangement.org.uk/, DEFRA
Marine Science Coordination Committee, www.defra.gov.uk/mscc/, DEFRA

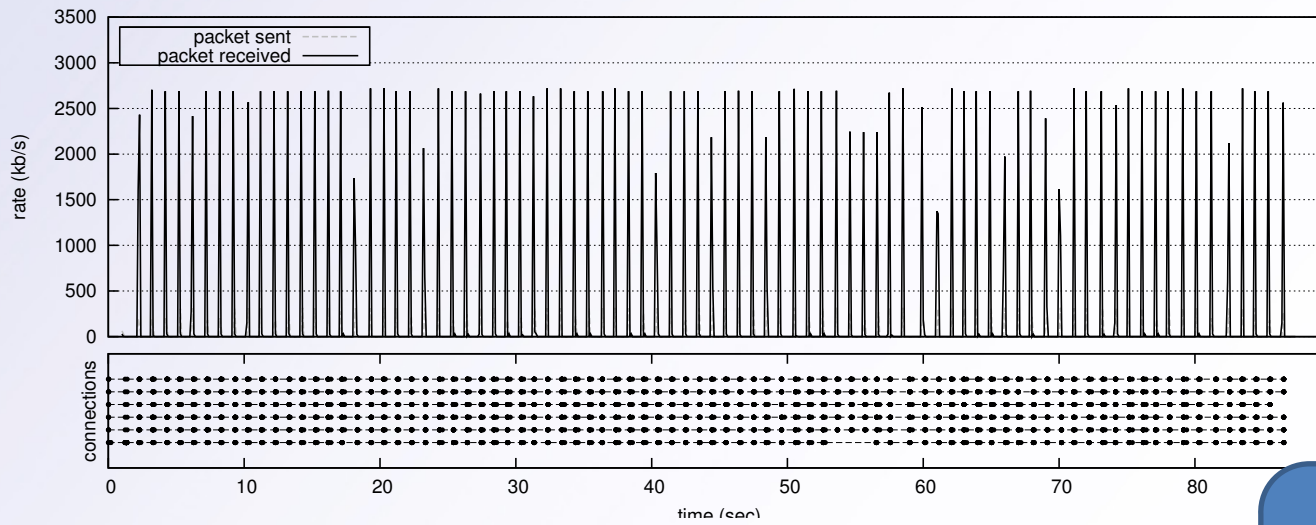
www.gov.uk open-central-government-websites-june-2014

Traffic flows

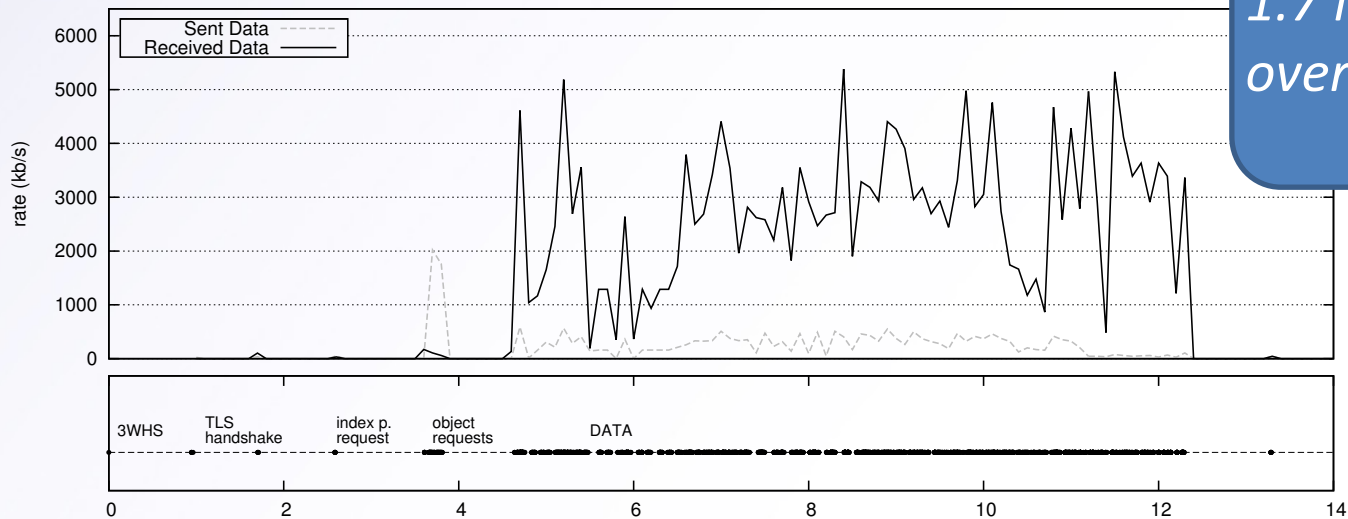


Traffic Analysis: 2 Mbps (500 objects/5KB)

HTTP/1.1



HTTP/2



1.7 Mbps
over 2 Mbps cap

Findings: broad categories of user

I haven't been using it that much anyway.

Ambivalent



Accepting



Not working ... never thought I'd say this , I quite miss it!

It puts you off, if it's not working, why bother?

Disgruntled



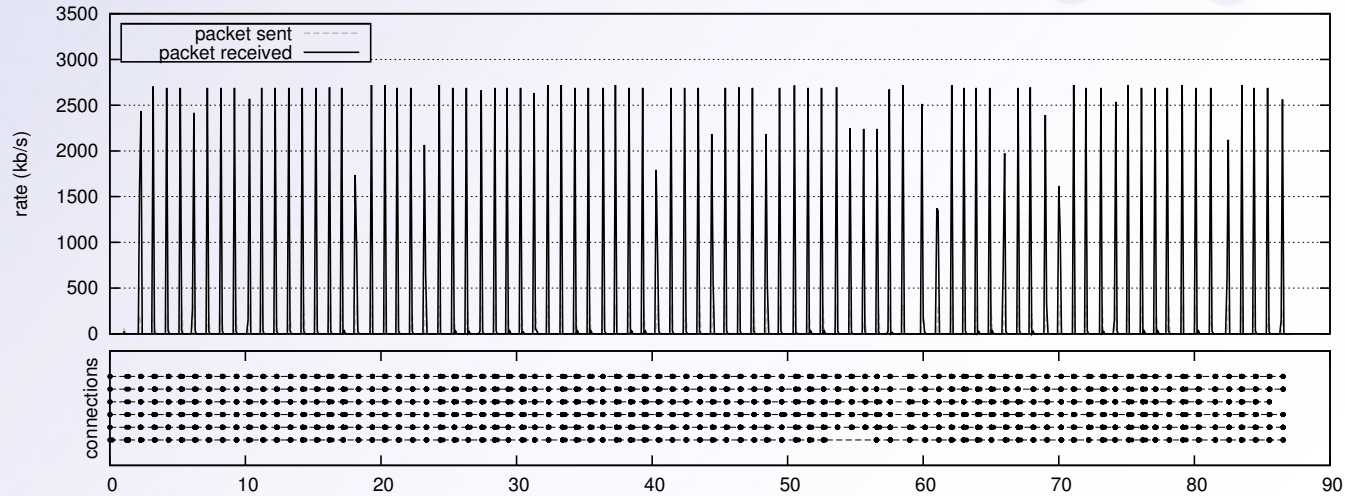
Potential payers



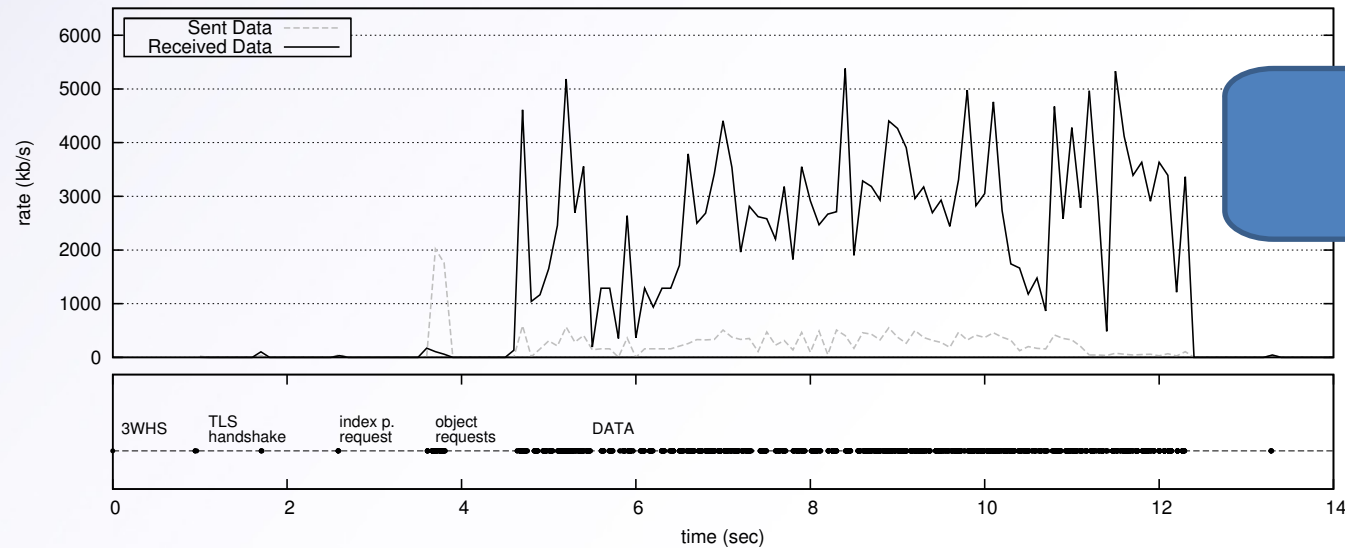
Revolutionised [...] We'd miss it too much now because we do everything online.

Traffic Analysis: 8 Mbps (500 objects/5KB)

HTTP/1.1



HTTP/2



What can the IETF do to help?

Average broadband speed is increasing...

Keep in mind the increasing *heterogeneity* of access

ng cellular promises for 10ms or so.... but not for all

Avoid assumptions about RTT

protocol implications e.g., AQM, HTTP 2.0 flow control

Almost ~90% availability isn't 100% able to use

Avoid assumptions about capacity for the "remainder"

e.g., TCP IW=10, HTTP2.0 Push

Remember for many, the Internet isn't getting faster



Thank you.
Any questions?