Contributions from beyond the Edge

A report from the BBC's Edge Connectivity project

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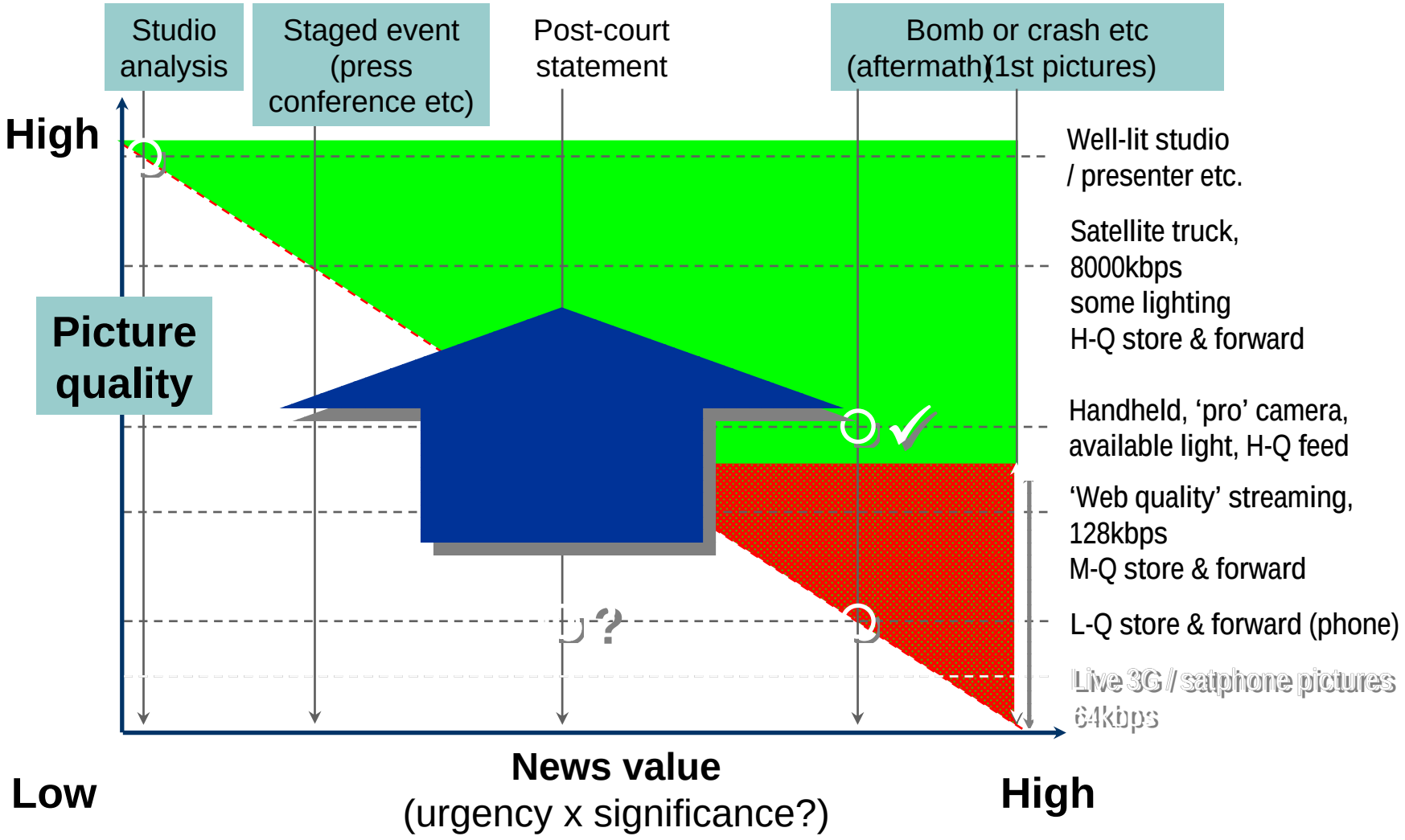
The BBC Edge Project

- Purpose of the Edge Project:-
- Take a short to medium term view of technologies available that will enable our programme makers to stay out on location for longer without returning to base.
- Gather together across the whole organisation all the requirements and attempt to provide some guidance on technologies that are appropriate for any given circumstance.
- Strike up strategic relationships with manufacturers to give us sight of their roadmap, and where appropriate be able to influence their roadmap

‘Just Good Enough’



Areas of Technology Investigated

- 3G & HSDPA – For Live Video/Audio
- Vsat – in common use for Audio – but what about Video
- WiFi -
- Wimax – Both for Live and Store & Forward
- HSDPA – For Live Audio Contributions
- ADSL – For Live Television as well as Store & Forward
- COFDM – Existing technology

BBC News

- June 2006
- First live over 3.5G

3G Data Options and Roadmap

3G broadband USB Modem

3G broadband data card

3G broadband Wireless Router

Laptop with Built-in 3G broadband

- BBC Strategic Partner in the UK is Vodafone, but we do use other networks.

Vodafone Data Network Speeds

Vodafone Data Network Name and / or Abbreviations	Max Downlink	Max Uplink
2G / GSM	9.6k	9.6k
2.5G / GPRS	48k	48k
3G	384k	64k
3.5G / 3G Broadband / HSDPA	1.8Mb	384k
*Future: 3G Broadband / HSDPA / HSUPA / 3.5G	7.2Mb	2.1Mb

But Coverage in the UK still Remains a Challenge

- Using commodity networks for Live newsgathering is fine unless it is a big incident or in a rural area.

VSAT - Audio

- 128kbps up & 64kbps down best with Mpeg 2 encoding for mono
- STLip hardware unit proved easiest to use
- Satellite delay was 650ms
- CIR required to guarantee uninterrupted audio
- 6 minutes setup time from arriving onsite to being ready to use
- Clearences required at transmission locations
- Cost is £16,000 for equipment plus £800/mth space segment rental
- Live Video available up to 1.3Mbps

VSAT For Video

- The DCsatnet unit has been on-air with Tunbridge Wells 5 times.
- Envivio encoder at 1.2Mbps

VSAT For Video

- BBC is looking to deploy and initial four vehicles, two in London and two across England.
- Considering upgrading Audio VSAT Vehicles as first response vehicles
- The Challenge will be down-linking so much IP traffic during peak news times. 13 English Regions, 3 Nations and Network News
- Working with our Technology Partners (Siemens) at the feasibility of installation of IP downlink facilities at Television Centre in London

WiMax Usage in Kabul

- November 2006
- Live from Kabul over WiMax
- Store and forward video clips
- 512Kbps
- Great flexibility for moving location quickly

Back to Basics

BBC Research & Innovation Activities

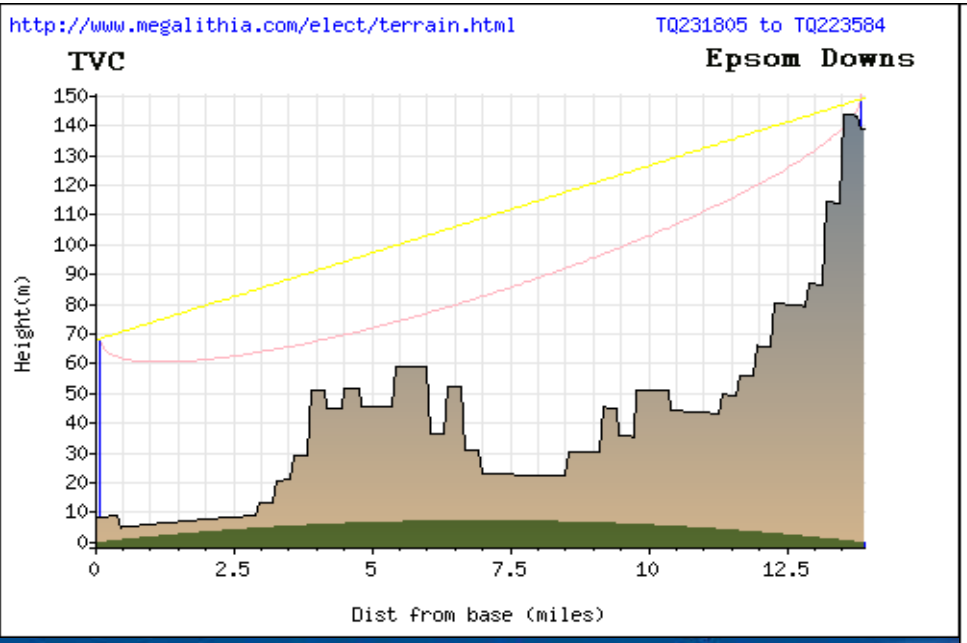
Led by Dr Yuan-Xing Zheng

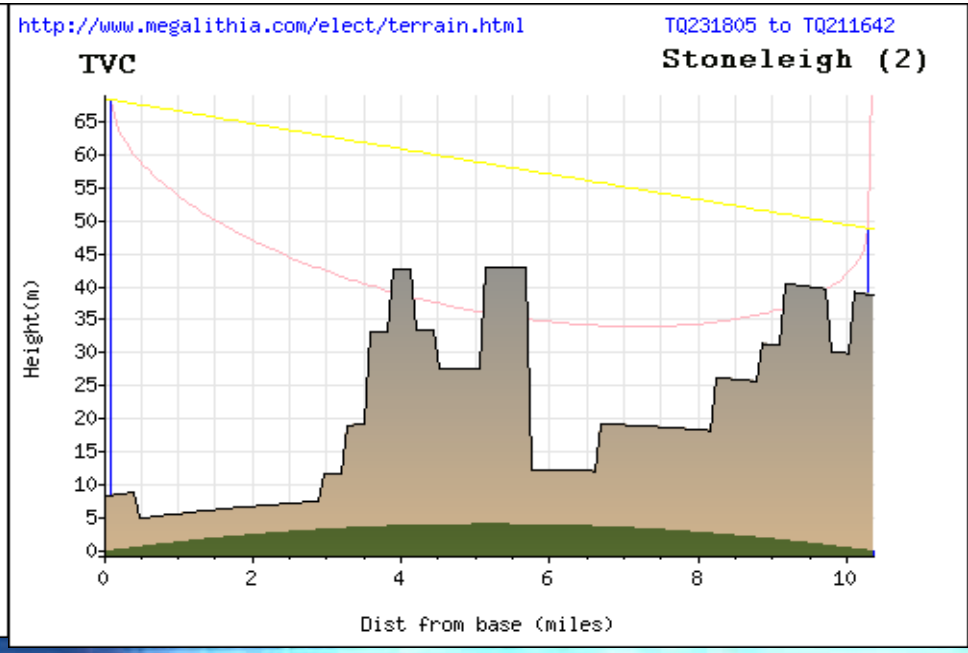
How We did it

- Purchased a pair of Redline pre-WiMax kits for £5000 in 2005
- Antenna mounted on a spectrum planning vehicle which has a 10-metre mast
- Vehicle parks in different locations in London to measure throughput against distance

TVC to Epsom Down Test

- Installed a transmitter on top of East Tower in BBC Television Centre, London
- Line of sight range is encouraging
  - Television Centre to Epsom downs (20 km) up to 20 Mbps
- Trees & buildings have a great negative impact, no data in between two test points



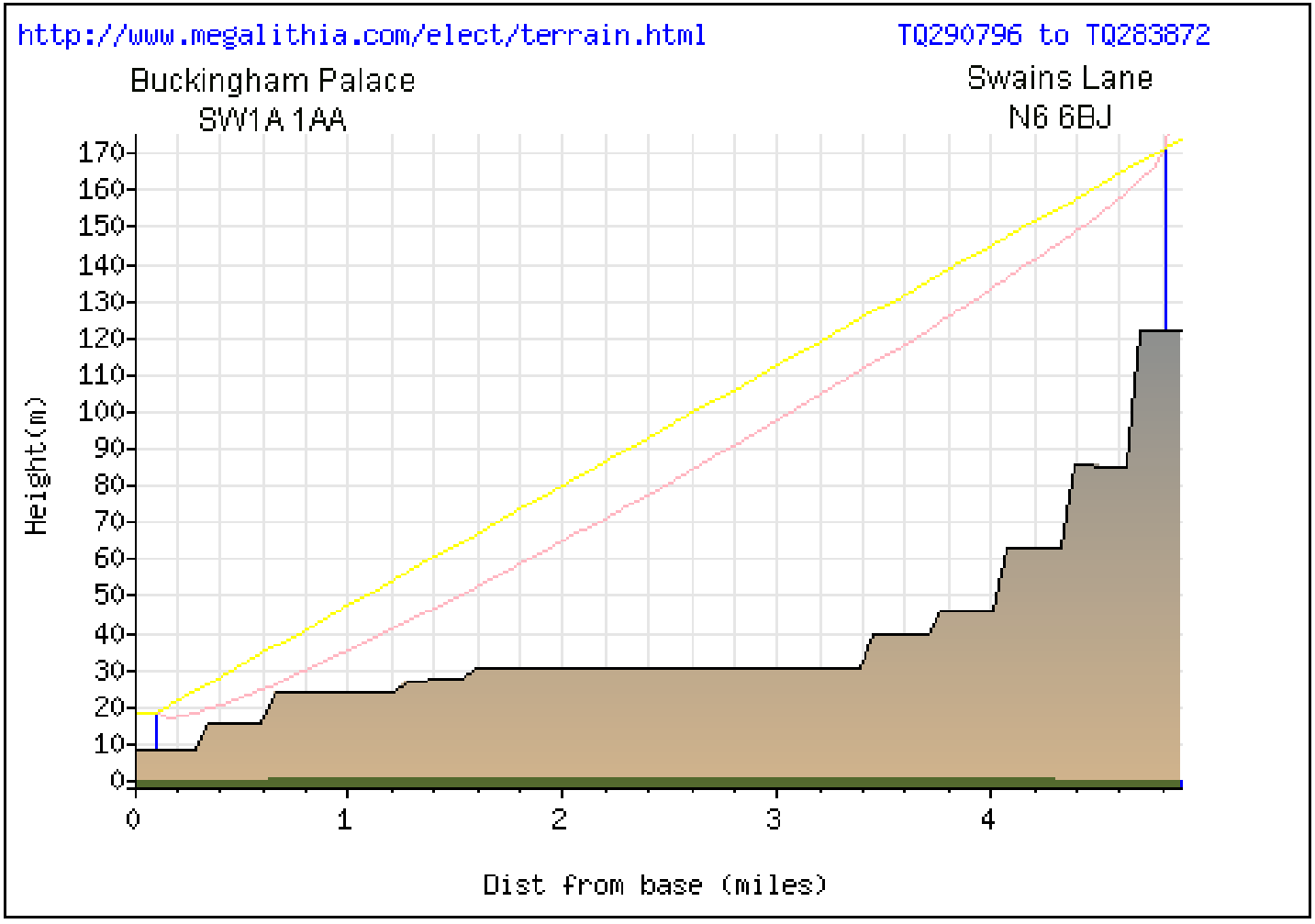


Swains Lane Test

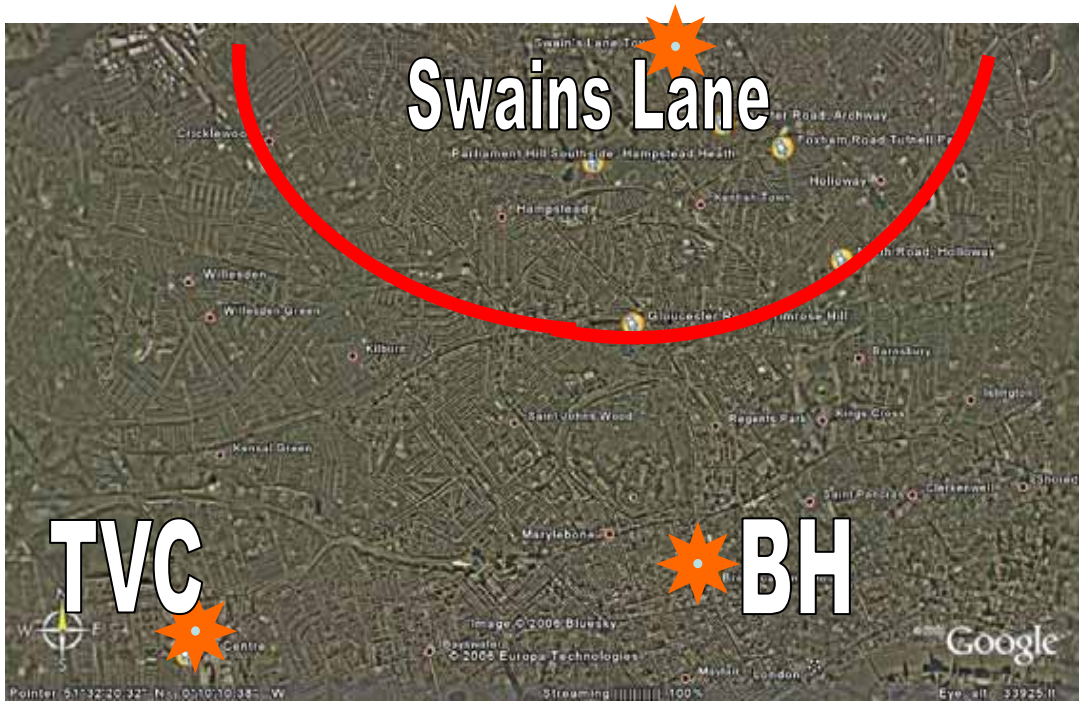
- Site in North London, belongs to National Grid Wireless (NGW)
- BBC paid a one-off charge for installation
- Purchased a separate wide angle antenna to install on tower
- Pointing towards BBC Broadcasting House in central London
- Audio over IP box on site – audio patch to TVC, no IP security risk!

View from Swains Lane Tower

Terrain Profile from Swains Lane



Swains Lane Throughput & Coverage



- Maximum range 3 miles
- Throughput 10Mbps
- Primrose Hill is a problem
- Plus trees …
- **Results will be improved from mast to direct line-of-sight**

Millbank Urban WiMax Tests

- BBC Radio is going to lose their VHF news reporting frequency in 2007 in London
- Urban WiMax has 4.9GHz license with a transmitter in the Westminster area
- BBC Millbank office (near the Palace of Westminster) has a good line-of-sight to this base
- WiMax network covers most of political hot spots we are interested in

Millbank Test Coverage

- **Labour HQ**
- **Home Office**
- **Scotland Yard**
- **Millbank office**
- **Vauxhall bridge**

- **Conference Hall**
- **Lambeth House**
- **College green**

Millbank Tests – Audio/Video over WiMax

- UrbanWiMax provides
  - 4Mbps up and 4Mbps down link
  - near real time QoS
- Audio over WiMax – MP2, loop back from BBC Television Centre
  - 64 kbps
  - 128 kbps
- Video over WiMax
  - Recorded in transport stream
  - Video: 700kbps, 1Mbps, 2Mbps, 2.7 Mbps
  - Audio: 192 kbps

Audio over IP

- From the Field, using WiFi, Broadband, 3G, HSDPA, both Live and FTP.
- Various Codecs, STL-IP, Luci Edit and Luci Live.
- Comrex Access Portable

Audio over IP

- Using Luci Live software on a standard laptop, connected to an open (insecure) Residential Wireless Network.

Edge On-Air - Examples

- Spring Watch using live nest cameras each night from three remote locations using DSLmax broadband video streaming.
- Newsnight live each night from Germany World Cup 2006 using 3G data card and Vpoint video software.
- Points West store and forward video of Bath Rugby team using wifi hotspots in France.
- Brighton Festival using 3G phones to add new content and reviews to Southern counties website.
- Live in Kabul using a wimax link
- Radio Cornwall live each day using VSAT vehicle.
- BBC Bristol live two way inserts from a COFDM car driving through the streets of Bristol
- Nokia N90 video clips sent by John Kay first video from Trowbridge of incident.
- BBC London live each night with COFDM car.
- BBC Lincolnshire recording and sending back high quality audio using handheld XDA phone.
- Tunbridge Wells to broadcast space Shuttle launch commentary from Kennedy space centre using audio over the internet.
- UGC video play out unit in each English Region site
- Live video facility from Guernsey to Jersey using fibre and wimax

Opportunities for the BBC

- Commodity networks and technology are offering multiple solutions that will enable our programme makers to do more out on location.
- Plenty of solutions for different situations.
- Quicker to Air for developing situations
- Reduced level of Engineering knowledge required

The Challenges the BBC faces

- A large organisation with many journalists/programme makers out in the field.
- Commodity technology may be relatively cheap, but the scale of the numbers gives us significant financial challenges.
- Technology is moving at a greater pace than we can afford to take maximum competitive advantage
- We need to be careful not to solely rely on public networks for Newsgathering.
- Bringing in so much Streamed IP traffic and getting it across the Corporate Network
- Limited resource for continuous testing of the techniques becoming available