Experiences of Delivering IPTV to Student Accommodation in the UK

Simon Lockhart

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BACKGROUND ON INUK NETWORKS

• Services:
  – Broadcast quality linear TV and Video on Demand (VoD)
  – VoIP telephony
  – Application aware Broadband

• Target customers:
  – Subscribers - multiple vertical markets; student, residential, military, health etc.
  – Network providers - wholesale to Kingston, Pipex etc.
  – Broadcasters - targeted advertising and carriage to Channel 4, Five etc.

• Partnered with Cable & Wireless as their exclusive IPTV provider

• Contracts with major broadcasters and content owners to deliver their content (BBC, Virgin Media, Setanta etc.)

• Investors include Wesley Clover, S4C, Vantage Point and Cable & Wireless

• Launched free-to-air TV and telephone under Freewire brand in Sept 2006 and will launch premium TV in September 2007

• UK incorporated company employing 50 staff
• Approximately 3.2m students in the UK - 500k live in halls of residence

• Students in halls can not easily receive digital TV today (No cable or satellite distribution within residences, DTT reception poor with portable aerial)

• As analogue signals are switched off many students will be unable to receive even basic channels including BBC, ITV, C4 and Five

• Many Universities blocking access (on a University level) to all other streaming and media websites, including P2P solutions such as iPlayer & 4OD

• All rooms are connected to the JANET network operated by UKERNA
  – JANET connects Universities, Colleges, Schools and other public bodies
  – Over 18 million end-users are currently served by the JANET network
• On a university level the ‘local network’ gatekeepers are implementing blocks on other video services to help manage bandwidth

• Although not blocked in all Universities the growth of online video services is increasing the number of Universities where it is controlled

• Multicast video and audio services are made available via their partner ‘Freewire’, along with a ‘recommended’ VOIP service

• Multicast considered the “network friendly” solution for video over closed networks
HOW IT WORKS (the simple version!)

IPTV Head-End

- Ingest system
- Encryption server
- MPEG H.264 encoder
- VOD platform
- Middleware servers: EPG/CRM/DAM/Billing

Transport/Network

- Router/switch
- Multicast enabled network (e.g., JANET or Cable & Wireless)

Customers

- University halls
- Residential
Inuk delivers Freewire over IP-based multicast enabled closed networks.

Currently Inuk is delivering services over two closed networks:

- JANET for students living on campus
- Cable & Wireless LLU for students living in private accommodation

Channels delivered at full D1 broadcast quality (MPEG4 @ 2.0Mbps) from Inuk’s headend located at London’s Docklands.

Channels ingested using Tandberg professional IRDs, and encoded into H.264 using Skystream encoders.

Zignal middleware servers provide user authentication, channel details, schedule information, and user tracking.

Encryption / conditional access provided by Secure Media.
HOW IT WORKS (the complete picture!)
• Set-Top Box (STB) for delivery to TV sets, including Electronic Programme Guide (EPG)
• Supports HD
• Inuk has developed unique Virtual Set-Top Box (vSTB) application for PCs and Macs called “Igloo”:
  – Viewing experience identical to TV/STB
  – Broadcast quality MPEG4 viewer
  – Mini-view and full screen modes
  – IR-USB remote control
• Multicast delivery identical in stream and quality for TV/STB and PC/vSTB
• PVR functionality using existing internal hard disk
HOW IT WORKS (*the network bits!*)

- **JANET is a 40Gb/s ring around the UK**
  - Links 8 Core PoPs
  - Provides all external connectivity

- **19 Regional Network Operators (RNO)**
  - Each connects to two JANET PoPs (either directly or via another RNO)
  - Provides link between Universities (and other educational establishments) and JANET

- **Inuk interconnects with JANET in London for both Multicast and Unicast traffic**
• For some universities, already experienced with multicast, Freewire “just worked”

• For others, Inuk had to help with deployment:
  – LAN multicast configuration (e.g. IGMP, fast leaves/joins, static joins etc.)
  – Often support for RNOs too (e.g. PIM rendezvous points)

• Local challenges:
  – Various packet shapers (NetEnforcer, Packeteer, Cisco SCE, TippingPoint etc.) and policies
  – Firewall configuration and policy: many universities allow multicast to bypass firewall

• But you need QoS for IPTV, right??
  – QoS on JANET and RNOs has not been necessary
  – Universities take mixed approach but QoS needed more for packet loss (or order!) than for jitter and latency
**NETWORK CHALLENGES**

- **Finger Pointing**
  - University phones us to say it’s not working
  - We diagnose and determine that it’s not the University, so they escalate to RNO
  - RNO says it’s our fault or JANET’s fault
  - We speak to JANET
  - JANET says it’s the RNO’s fault
  - Problem eventually gets fixed (or magically goes away...)

- **Remote Monitoring is very useful!**
  - We’ve deployed a number of remote monitoring nodes (1U Linux PCs)
  - Running in-house software which detects and analyses transport streams
  - Allows us to pin-point problems

[All] (Root) / Iruk Infrastructure / Multicast Streams at Customer Sites / University of Leeds /

```
mc_leeds 98.96%
mcl_leeds_bbcl_em 100.00%
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STUDENTS VOTE WITH THEIR TIME!

- Freewire viewing is Television...not Internet TV
- Comparison is difficult – data from Internet sources of questionable validity – but Inuk behaviour is very much TV based

Sources: Hitwise Nov ’07, Comscore Dec ’07, BARB Q4 ’07, Inuk Data Reporting, Zattoo Corporate Releases 2H ’07
• But how do we know that?
  – Multicast is unidirectional
  – But, it’s IP so we’ve got a backchannel
  – Client reports channel changes back to middleware server

• Broadcasters love this!
  – Far more accurate than current sample-based audience figures

• Advertisers love it too…
Freewire provides a platform for truly targeted interactive TV Advertising

Partnering with PacketVision, Inuk began delivering targeted ad insertion with Channel 4 during Oct 2007

Personalisation allows demographic ad insertion at the “edge” which is more efficient in terms of bandwidth

Initial campaigns have replaced “mainstream” ads with student focussed advertising

Inuk reporting actual viewed impacts, by gender and geography

Next phase will deliver different commercials based on gender, location and degree subject

Brand: NatWest  Creative Agency: M&CSAATCHI  Media Agency: MEDIACOM  Channel:  Platform: freewire
TARGETED ADVERTISING

Step 1: Channel 4's playout automation system sends the original broadcast to the Packet Vision Encoder as well as the signal to mark the start of an advert break.

Step 2: The Packet Vision encoder converts the video stream into the required format including the advert break markers known as cue tones.

Step 3: The PV1000 waits for a cue tone. Once received it replaces the video stream with a video asset stored in its database. After the asset has played it resumes the broadcast stream.

Step 4: A single broadcast stream is distributed over the JANET network regardless of whether the stream is coming from PV1000 or C4.

Step 5: The student simply tunes into the C4 multicast stream totally unaware that the advert they are watching is a replacement for one in the original stream.

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<th>Channel 4</th>
<th>Inuk Head End</th>
<th>Student's Room</th>
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<td>C4 Playout Automation</td>
<td>Packet Vision Encoder</td>
<td>PV1000</td>
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<td>Original Broadcast Stream</td>
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<td>Original Adverts</td>
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<td>Interconnect between C4 and Inuk</td>
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• Video on Demand proposition required to deliver entertainment content but also university and student generated content
• Linear TV solution uses “network friendly” multicast but how can a unicast service exist on closed networks?
• Inuk building distributed VOD architecture, with 1U Edgeware servers:
  – 8,192 fully concurrent streams
  – 4 TBytes NAND Flash
  – up to 1,850 hours of video @ 3.7 Mbps (SDTV)
• Plus we’re working on multicast trickle-feed for prime content...
• Inuk developing “in-bound” and “out-bound” widgets to integrate new functionality into the Freewire interface and to export viewing data into third party sites & applications

• Out-bound example:
  – Facebook widget allows a student to see what their friends are watching, what are the most popular programs at any given time (“real time ratings”) and to initiate VoIP conversations

• In-bound examples:
  – Facebook “pokes” displayed on screen
  – Chat room functionality
Anything Technical (i.e. me!):
Simon Lockhart
Simon.lockhart@inuknetworks.com
+44 1443 743850

Anything non-technical (i.e. you’re interested in working with us…)
Shaun Illingworth
Shaun.illingworth@inuknetworks.com
613-271-8314