QoS in the home

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Agenda

- The problem
- What applications need QoS?
- Current state of in-home QoS
- Further out
The problem

- How does QoS/prioritization by an ISP interact with QoS/prioritization within the home?

Let’s answer this question in these steps:
- Why do users want QoS in the home?
- What does QoS in the home look like?
- How would this interact with provider QoS?
What home traffic needs QoS?

- **VoIP**
  - SP-provided (Comcast), Over-the-top managed (Vonage), OTT ad-hoc (Skype)
  - User cares about quality, SP may or may not
  - Small BW requirement, easy solutions apply

- **Videoconferencing**
  - Low-end (Skype) has no real quality requirements
  - High-end needs something better
What home traffic needs QoS?

- Streaming video in home
  - In home (NAS/PC to Digital Media Adapte r), OTT managed/ad-hoc (Apple TV, Netflix/Roku)
  - User cares about quality, SP doesn’t

- Streaming video from service provider
  - Converged access link and/or home network for TV and data
  - SP cares about quality
Flow categorization

- **In-home**
  - Source & sink in home network
  - e.g. video playout from NAS/PC to DMA

- **External, incoming**
  - Source outside the home, sink inside
  - e.g. VoD (either SP-run or Vudu/Netflix)

- **External, in+out**
  - Bidirectional flow in & out of home
  - E.g. videoconferencing or VoIP
Access link upstream QoS

- Diffserv for outgoing traffic on the router
- Prioritize voice over data
  - Linksys/Vonage PAP2 or WRT54G-P2
  - Plug-and-play, but only for that application
- Sophisticated bandwidth management
  - Queuing/shaping on Residential Gateway (RG)
  - Handles multiple applications
  - Needs configuration
Access link upstream QoS

- Problem: RG must know upstream bandwidth
  - Bandwidth a property of Access Network Terminating device
  - Hard to determine exactly *a priori*
    - DSL: line can retrain
    - Cable: upstream bandwidth shared with other customers
  - What to do if bandwidth changes? 😞
  - Solution: Integrated router/access device
    - Who administrates QoS policy on this device?
  - Solution: Export bandwidth from ANT to RG (and anybody else)
    - What protocol? DSL modems use TR-69, others?

- Other issues
  - *Unprovisioned* local QoS can give *fairness* to applications
  - *Provisioned* QoS can be hard to manage
  - *Auto-provisioning* QoS (e.g. via signalling proxies) very complex
In-home QoS

- In the home today: no real QoS
- Options at Layer 3
  - Diffserv via queueing/shaping
- Options at Layer 2
  - Wired Ethernet (100Mb/s or 1 Gb/s)
  - MoCA (coax cable)
  - HPNA (powerline)
  - WiFi (802.11b/g/n)
- WiFi is the real bear!!
  - Convenient, so people want to use it
  - Complicated to get good QoS
- Must be idiot-proof
Standards efforts – UPnP QoS

- UPnP QoS specified by UPnP Forum
  - Support QoS requests using XML/SOAP
  - V2.0: Prioritized QoS
  - V3.0 (currently draft): Parameterized QoS
- Source/sink devices (control points) request QoS services for flows
- QoS Manager (QM) services requests for QoS by
  - Determining the topology of the network
  - Identifying the nodes between the source and sink devices
  - Issuing QoS requests to each of the devices
- QoS Policy Holder (QPH) advises QM on relative priority of request and traffic
  - Indicates relative reservation priority, and marking for endpoint to use
- Home network devices export QoS Device profile
  - Implements QoS requests by prioritizing traffic with signalled marking
Standards efforts - other

- Digital Living Network Alliance (DLNA)
  - Certification program for manufacturers
  - Built around UPnP QoS 2.0
  - Describes a more specific, “conformable” standard
- CableLabs Reserved Service Domain (RSD)
  - Built around UPnP QoS 3.0
  - Specific guidelines & rules for implementation
  - Supports QoS 2.0-style “Prioritized Service Domain”
- Digital Video Broadcasting project (DVB)
  - Home Networking (DVB-HN) QoS
  - Based around DLNA guidelines, prioritized QoS
Other in-home QoS efforts

- **Windows Rally**
  - Microsoft’s “successor” to UPnP
  - Built around Web Services model
  - Proposed to OASIS for standardization

- **Vendor QoS solutions**
  - e.g. Linksys/Cisco Entertainment Grade Home Network (EGHN)
  - UPnP QoS 2.0 + enhancements

- **Provisioning software**
  - e.g. “Network Magic” from Pure Networks/Cisco
    - Cisco Home Network Administration Protocol (HNAP), built around XML+SOAP services
  - Device administration/configuration
  - Bandwidth monitoring
Access link downstream QoS

- Interesting for SP video delivery
- DiffServ for packet marking
- Admission control?
  - In-home: clients co-operate and divide up fixed bandwidth pool
  - Sender-driven: Admission control within the provider network, including the access link
  - Receiver-driven: In-home device signals access link bandwidth/flow requirement to network
Summary

- In-home QoS is coming!
- Benefits:
  - It enables some useful applications
    - Converged home network for data, voice, video
    - Interesting user video applications
  - WiFi especially is interesting here
  - It has value for service providers too
- Challenges
  - Figuring out what to build!
    - Getting heterogeneous equipment to interoperate
    - Making sophisticated features easy to use
    - Building these into lightweight equipment
  - Figuring out how to do QoS across WiFi sensibly