

Providing Internet Service for Multi Dwelling Units - Technical Challenges and Solutions

Thesis seminar 21.05.2008

heikki.winberg@iki.fi

Agenda

- background
- objectives
- shared broadband
 - terminology
 - network components
 - common problems
- solutions
- implementation
- conclusions

Background

- MDU = block of flats, office hotel, hotel, etc.
 - large highly concentrated potential customer base
 - ideal place to provide Internet connection cost efficiently
 - working solutions were not available, so we had to develop one

Objectives

- Providing Internet service for MDUs
 - cost efficient solution
 - fast, reliable and problem free Internet connections
 - technology agnostic
 - future proof
 - high availability

Shared broadband

- What does shared broadband mean?
 - the uplink of the MDU is shared fairly among the users
 - one user can get all the capacity of the uplink if there is no other concurrent users in the network
 - one user downloading large files can get 99% of the uplink capacity while neighbours are having good quality VoIP calls
 - over 50Mbit/s download speeds possible through xDSL
 - usually housing co-operative or business park initiates
 - expenses shared among the users, no profit taken
 - fee/apartment usually 5-10€/month, 'free' Internet possible

Network components

- switches
 - Ethernet/ADSL/HPNA/VDSL/mixed
 - other than Ethernet technologies need a CPE device
- uplink: fiber/xDSL/WiMAX/microwave/etc.
- intelligence needed somewhere
 - extra box
 - bridged (and centralized)
 - intelligent switches
- central management system + gateways

Common problems

- bandwidth sharing
 - one user can fill the uplink and especially NAT tables
 - P2P users can block and even kill the MDU network
- limited capacity of the uplink
 - network is slow and heavily overbooked
- network maintenance
 - solving the problems of the individual users is expensive and many times impossible
 - truck rolls needed to boot/fix the networks

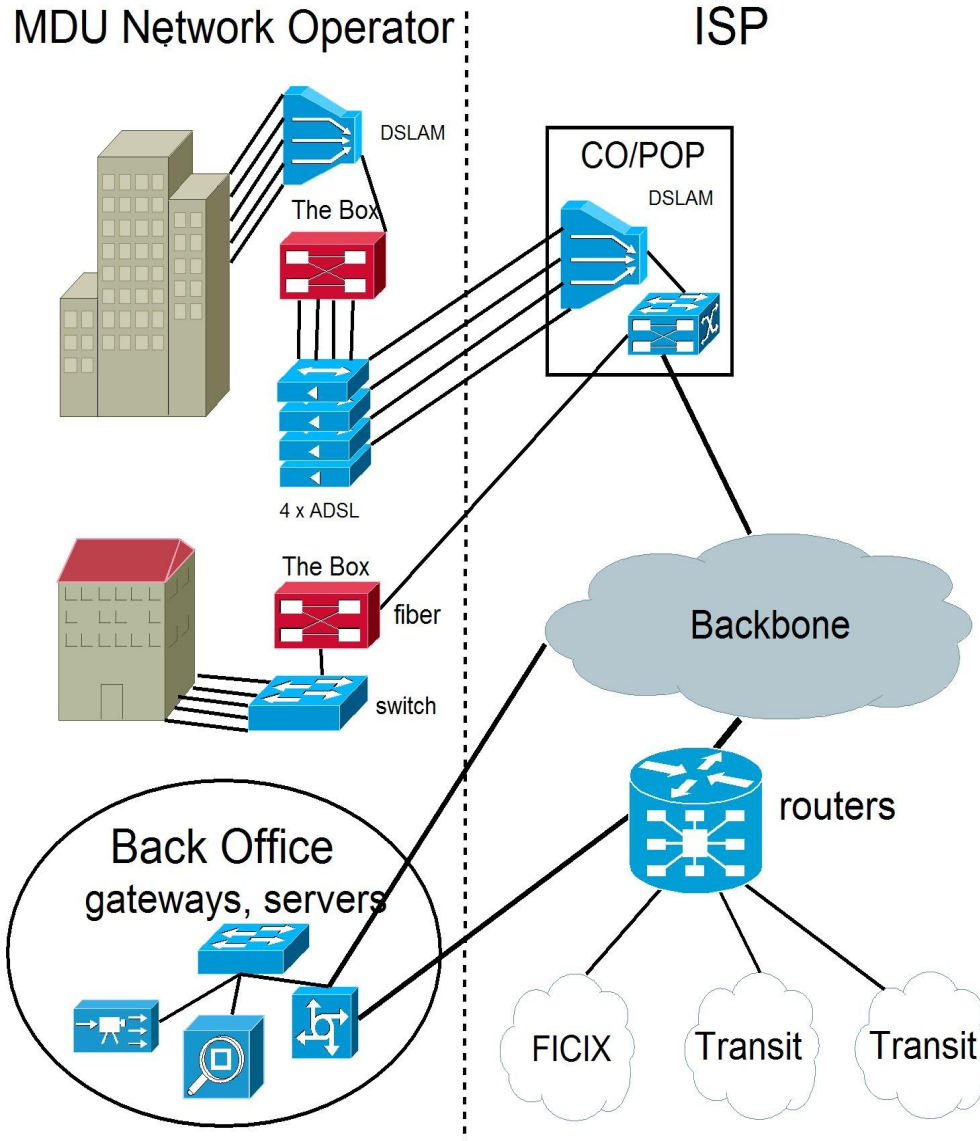
Solutions

- sharing the limited bandwidth among 100 users
 - FreeBSD ja Linux can do fair bandwidth straight out of the box, but some tuning needed
 - prioritization of the most important traffic (VoIP) and users (high paying business users)
 - slight bandwidth throttling might be needed, when the uplink is heavily congested
 - TCP is not a problem, but UDP is
 - it makes no sense to over classify traffic in heavily overbooked environment with equal users

Solutions

- uplink capacity
 - fiber is the best solution, but many times too expensive
 - channel bundling/bonding is usually enough
 - even ten times cheaper monthly fees compared to the fiber
 - bonding 4 x 24M/3M makes 96M/12M bit pipe
 - backwards compatible VDSL2+ coming Q1/2009, still a problem with the range
 - wireless solutions (WiMAX/Microwave 5-52GHz/etc.) cannot yet compete with the fiber and xDSL
 - capacity costs money, Internet traffic is not free

Implementation



• extra box

- between the uplink and the access switches
- fully programmable router
- implements the channel bundling feature as well as fair bandwidth sharing, load balancing, traffic shaping, etc.
- modular software makes it easy to implement new features
- makes the system as technology agnostic as possible
- not bound by any specific hardware

Conclusions

- fiber is not the only alternative for uplink, bundled xDSL lines are still extremely competitive
- extra box makes it possible to use and manage standard off-the-shelf switches
- distributed approach and intelligence on the edge lowers the initial investment of the operators
- fair bandwidth sharing is a 'must' in large MDU networks