Residential Gateways
(Track #4: Broadband access networks concepts)
AGENDA

1. Introduction to Residential Gateways
2. The end residential user point of view
3. A future with new possibilities
4. Technical challenges
5. Conclusion
INTRODUCTION TO RGW

> “Devices (modem/router/gateway) that connects

  • Residential users
  • Providers (typically ISPs)”
RESIDENTIAL BANDWIDTH

- 300-1200 bps
- V32: 9600 bps
- V32b: 14400 bps
- V34: 28800 bps
- V34+: 36600 bps
- V90: 56000 bps

1980 - 2010

ADSL period
MODEMS PROMOTED TO Routers
Top ten broadband countries subscribers (2005-2006)

Broadband householders by nominal data rate
RESIDENTIAL USER VIEWPOINT
RESIDENTIAL USER VIEWPOINT

[Diagram showing various logos and icons related to software and internet services]
RESIDENTIAL USER VIEWPOINT
A FUTURE WITH NEW POSSIBILITIES
A FUTURE WITH NEW POSSIBILITIES

> **Home networking**
> **Personal communications**
  - Integrated telephone system
  - Videoconferencing
> **Online gaming**
> **Multimedia streaming**
  - Radio service
  - Television service
  - VoD
> **Network integration**
  - FMC
  - Collaborative networks
> **Added value services**
  - Home automation
  - E-care
> Integrated telephone service

- POTS
- DECT
- Bluetooth
- VoIP
- Wireless VoIP
- Cellular

> Video-communication
MULTIMEDIA STREAMING

> Music service
> Radio service
> Television service
> VoD

Source: www.tfi.com
> FMC
> Collaborative networks
ADDED VALUE SERVICES

> **Home automation**

> **E-Care**
ROUTERS PROMOTED TO GATEWAYS

Gateway Residential Gateway
TECHNICAL CHALLENGES EXAMPLES

> QoS
> FMC
> Signalling
> NAT
> Authentication
> Multicast
> Management
HOME NETWORK ADDRESSING

This technology allows a small number of public IP addresses to be shared by a large number of hosts using private addresses.
Most common NAT mechanism in all existing RGW

- If every private address in the home environment is translated into a different public address… no problem
- If all the private addresses are translated into the same public address… many problems

In order to allow the reverse translation

- The mapping cannot be done
  - private address
  - public address
- The mapping is done
  - source (private) address/source port
  - source (public) address/new source port
Network Address Port Translator

192.168.0.1
192.168.0.2
192.168.0.3
192.168.0.4
192.168.0.5
192.168.0.6
192.168.0.7
192.168.0.8
192.168.0.9

163.117.139.5
Src:1234
Src:5213
Src:2000
Src:2001
THE PROBLEM WITH NAT

- **Difficult access to local clients**
- **Performance reduction**
- **Different flavours of NAPT**
- **Compatibility problems with some signalling protocols**
  - SIP, FTP, IPSec, RTCP/RTSP
DIFFERENT FLAVOURS

- **Full cone**
- **Restricted cone**
- **Port-restricted cone**
- **Symmetric**
DIFFERENT FLAVOURS

Network Address Translation

Full cone
- port 1
- port 2

Restricted cone
- port 1
- port 2

Port restricted cone
- port 1
- port 2

Symmetric
- port 1
- port 2

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THE PROBLEM WITH NAT

> **Difficult access to local clients**

> **Performance reduction**

> **Different flavours of NAPT**

> **Compatibility problems with some signalling protocols**

  - SIP, RTCP/RTSP, FTP, IPSec, etc.
EXAMPLE: SIP BASED APPLICATIONS

SIP INVITE
Source: 192.168.1.1
Dest: 176.10.1.3

UDP
Source: 6500
Dest: 5060

INVITE sip:foo@218.2.3.4 SIP/2.0
Via: 192.168.1.1

SDP
v=0
c=IN IP4 192.168.1.1
m=audio 5100 RTP/AVP 0

180 Ringing

INVITE
Source: 176.10.1.3
Dest: 218.30.1.1

UDP
Source: 5609
Dest: 5060

INVITE sip:foo@218.2.3.4 SIP/2.0
Via: 192.168.1.1

SDP
v=0
c=IN IP4 192.168.1.1
m=audio 5100 RTP/AVP 0

180 Ringing
NAT TRAVERSAL ALTERNATIVES

- STUN (Simple Traversal of UDP over NATs)
- ICE (Interactive Connectivity Establishment)
- TURN (Traversal Using NAT Relay)
- Hosted NAT Traversal

- Static management
- UDP hole punching
- ALG (Application Level Gateway)
NAT TRAVERSAL ALTERNATIVES
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CONCLUSIONS

> ‘Broadband’ is a term that has been used for a long time
  • In home and core networks it has been consolidated
  • In access networks it was just marketing….

> Now broadband is really reaching the residential environment
  • Several Mbps are now reaching users’ houses
  • New services are being offered to promote faster penetration
    – P2P is the killer application so far

> However it is not just broadband what matters
  • In order to succeed some technologies have to be adapted into the new framework
  • Provision of QoS, authentication, homogeneous signaling, etc.

> Is this far away from us?
MUSE RGW PROTOTYPES

- HDTV over IP
- Voice over IP
THANK YOU!!

NOTE: electronic version of slides will be available

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