인터넷 QoS 프로토콜을 이용한 멀티미디어 적응 기술

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- All IP
  - in IMP-2000 and beyond
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Last 1 mile of broadband networks

- CATV cable*
- Telephone line
- Power line
- Satellite dish*
- Terrestrial TV*
- Personal cellular phone

* TV channels

Issues

- Busy hours for each
  - Telephone : office hours
  - TV : after office our
- Compatibility of techniques for
  - Manufacturing
  - Maintenance
  - Software sharing
- Needs for unification of techniques

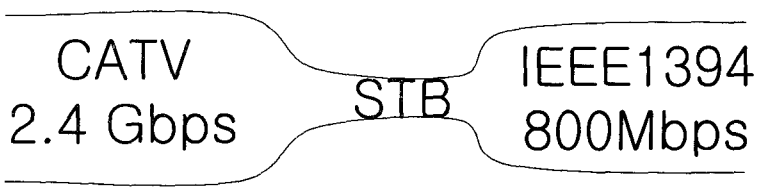
TV channels : analog to digital

- Shannon's theorem of channel capacity
  C [bps] = W [Hz] $\log_2$ (1+SNR)

- Analog bandwidth is 5MHz.
  - CATV 6 bps/Hz 30Mbps/5MHz
  - Terrestrial TV 2 bps/Hz 10Mbps/5MHz
- Analog bandwidth is meaningless!

CATV in total

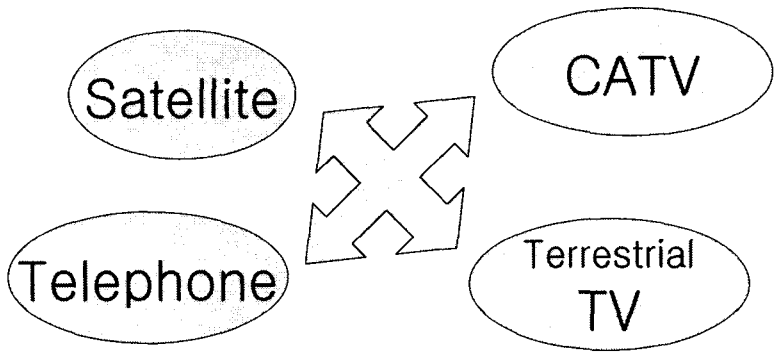
- 400MHz X 6bps/Hz = 2.4Gbps
- Backbone : tree (not good for interactivity)
- STB = bottleneck ???



The Telecommunication Act of 1996

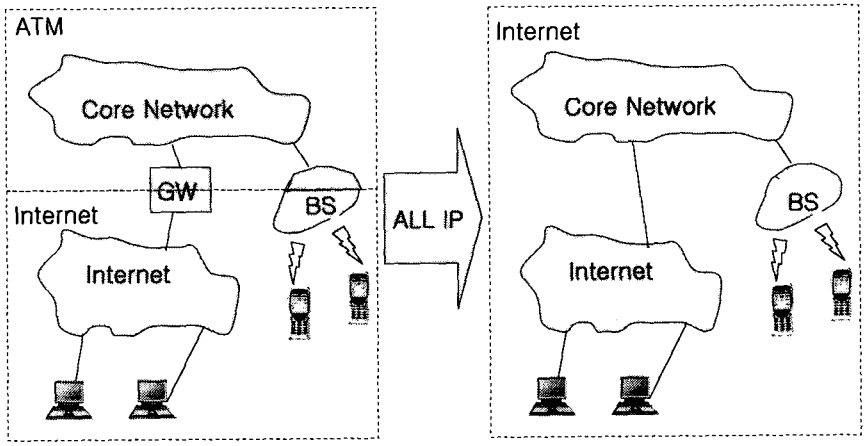
- The Telecommunications Act of 1996 is the first major overhaul of telecommunications law in almost 62 years. The goal of this anyone enter any communications business new law is to let -- to let any communications business compete in any market against any other.

Open to All

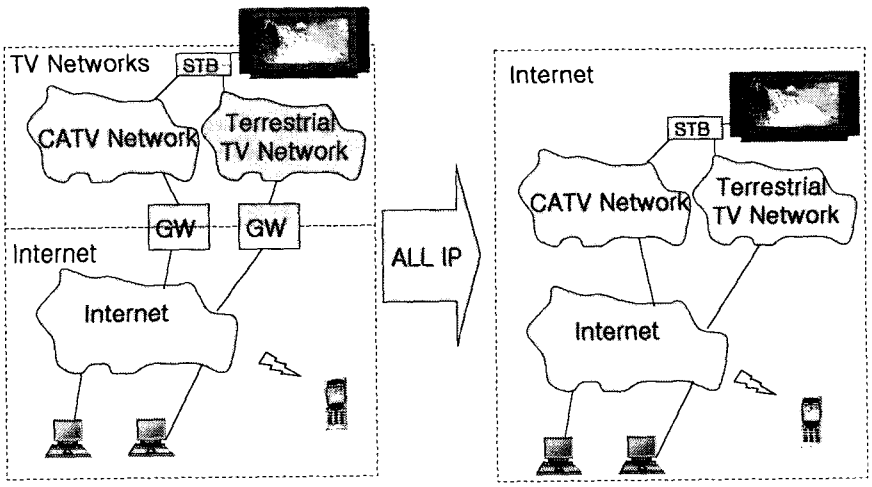


- Needs a common protocol :
  "Which protocol is ready to be used?"

All IP in IMT-2000 and beyond

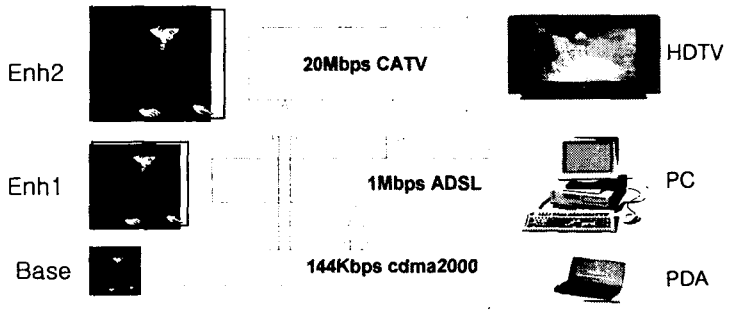


All IP in TV Networks



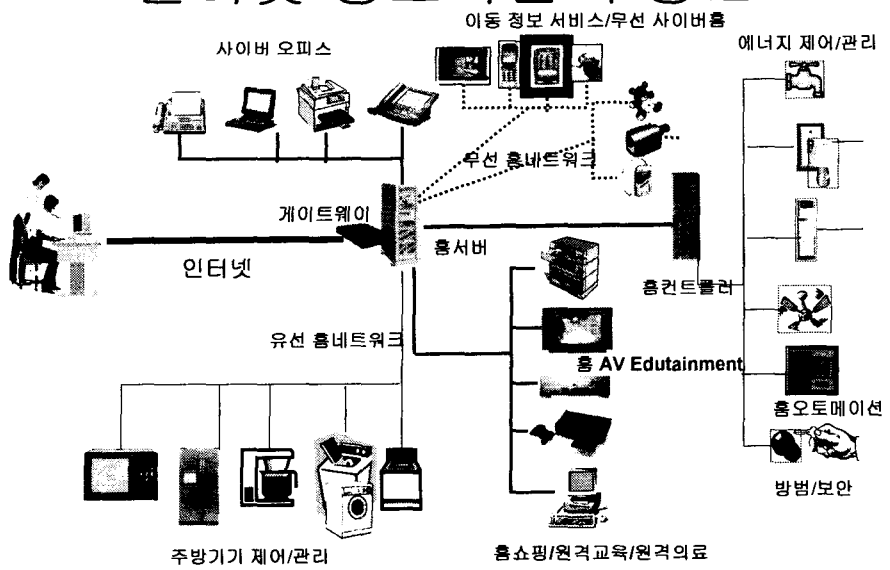
Heterogeneous networks and Scalable coding

- adaptive to
  - time-varying network condition
  - user preference
  - terminal type



Source: ETRI 황승구, skhwang@computer.etri.re.kr

인터넷 정보가전 구성도

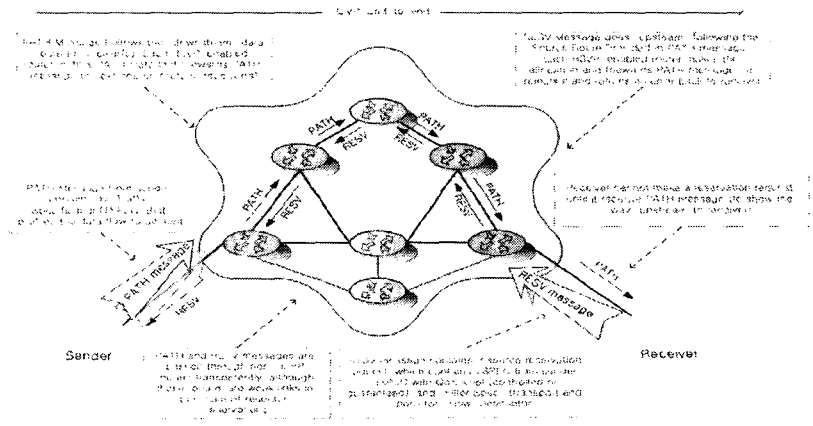


Why Internet?

- The most popular = the most compatible
- Flexibility
  - Shared bandwidth
  - QoS control : RSVP, diffServ, MPLS
  - Security : IPsec
- Universal technology innovation
- Proven technology

RSVP/intServ

- CAC by RSVP, call control by intServ



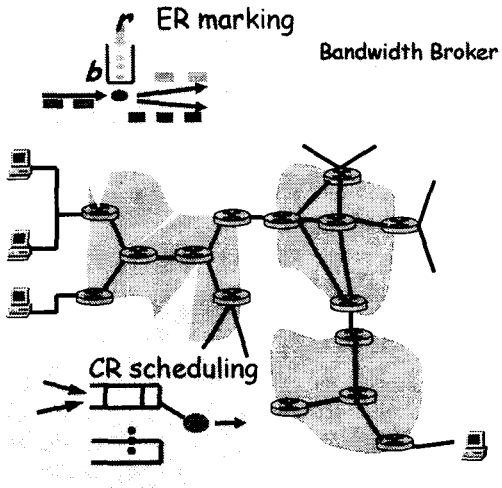
Diffserv Architecture

Edge router:

- per-flow service
- marks packets of in- or out-profile

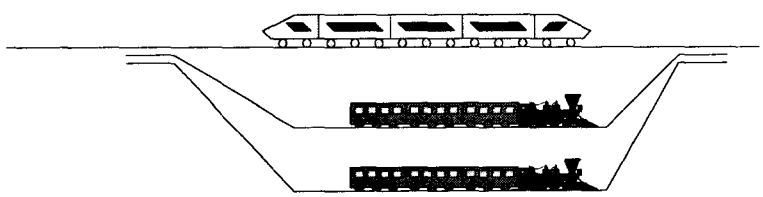
Core router:

- per class service
- buffering and scheduling
- preference to in-profile packets
- Assured Forwarding

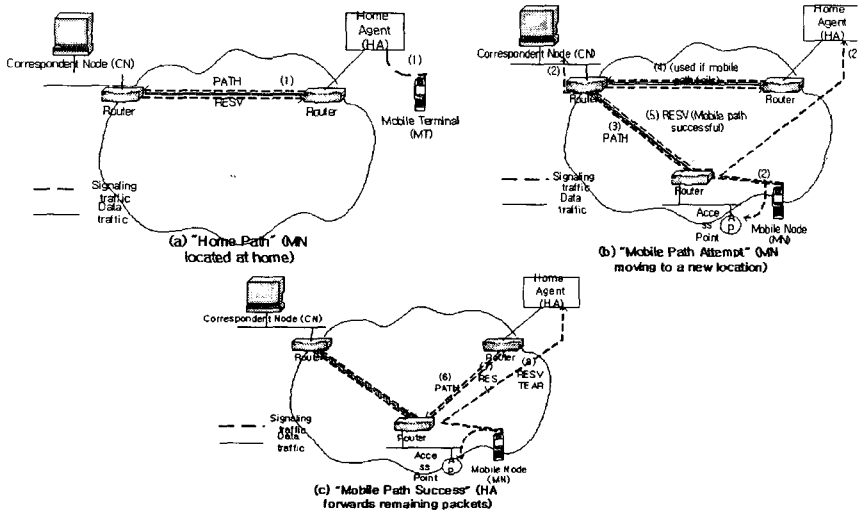


QoS reservation

- When realtime service needs excess bandwidth, non-realtime service packets are buffered.



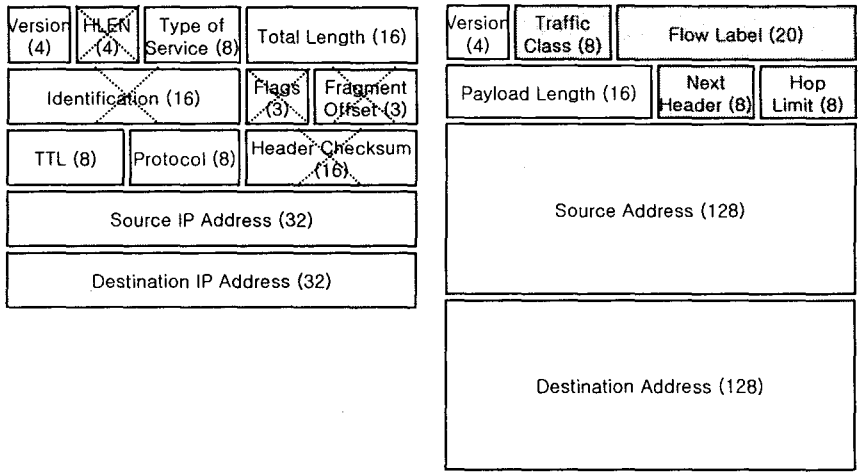
MIPv6 multimedia service



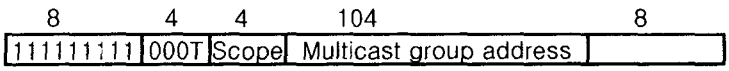
IPv6 (IPng)

- 128 bit address => 18×10^{18}nodes, 4 nodes/cm^2
  - Ubiquitous networks
  - Hierarchical addresses
  - multicast, anycast => QoS aware broadcasting
- Simplified header (for realtime sevice)
- Improved security
- Auto-configuration
  - plug-play network access (DHCP, ND)
  - micro-mobility
- QoS awareness
  - traffic class (8 bits)
  - flow label (20 bits, cf. VC of ATM)

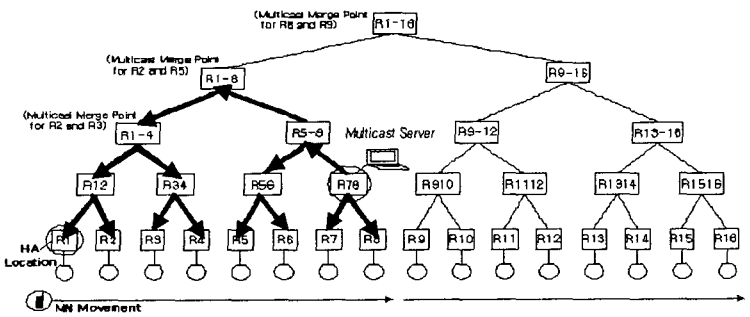
Header formats of IPv4/IPv6



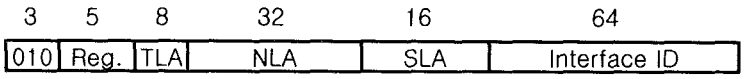
Multicast in IPv6



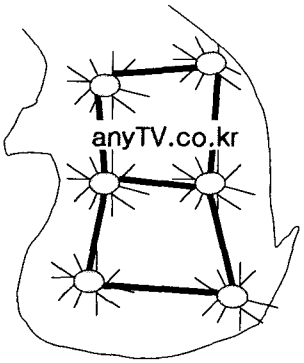
- T : permanent (0) or transient (1)
- Scope : geographic scope (within node~global)



Anycast in IPv6



- TLA, NLA, SLA : aggregators
- Anycast : A group of hosts or routers can have **the same address** and provide the same service. Clients are connected to the **nearest** server. (cf: local broadcasting stations)



Conclusion

- Analog TV communication channels can serve as broadband digital channels.
  - Problems with asymmetric property
- Internet is the most popular and connects all.
- Internet has proven, flexible, and efficient tools for delivery of realtime multimedia.
- Internet is self-innovating technology.
- Compatible to other interactive applications.