QoS Requirements: from Applications' Aspects

MNET Lab, NTHU
Jen-Chu Liu
March 9, 2006

Outline

- QoS service classes definition
  - 802.16, 802.11e, UMTS, ATM
- Classification of popular applications
  - According to service requirements
  - According to QoS classes
- QoS classes mapping
- Related works
- Next steps

QoS Service Classes

WiMAX (802.16)	3G (UMTS)	WiFi (802.11e/802.1d)	ATM
UGS rt-PS nrt-PS BE	Conversational Streaming Interactive Background	Voice Video Controlled Load Excellent Effort Best Effort Background	CBR rt-VBR nrt-VBR ABR UBR

Popular Applications

Category	Application types	BW-requirement
Voice of IP	Skype SIP Phone	3~16kBps 8kbps (G.729)~64kbps(G.711)
Video Conference	320*240 (H.26L)	160kbps ~
Streaming	Live Audio IPTV	8KBps (16bit, 44MHz, single) 2Mbps ~
File Transfer	FTP, BT, Emule	unspecified
Web Browsing	HTML, Blog, Dynamic Web Pages, Flash...	unspecified
Instant Message	MSN, Yahoo Messenger	unspecified
E-mail	Outlook, Web mail	unspecified
E-Commerce	Stock transaction, Online order, Online sell...	unspecified
On-line Game	Play in turn or time critical	unspecified

QoS Requirements

Category	Loss-tolerant	Real-time	BW-requirement
Voice of IP	Skype ➔ Yes SIP Phone ➔ Yes	Yes	Low ~ Medium
Video Conference	Yes	Yes	Medium ~ High
Streaming	Live Audio ➔ Yes IPTV ➔ Yes	Yes	Live Audio ➔ Low IPTV ➔ High
File Transfer	FTP, BT, Emule ➔ No	No	Low ~ High
Web Browsing	HTML, Blog, Dynamic Web Pages, Flash… ➔ No	No	Low ~ Medium
Instant Message	MSN, Yahoo Messenger ➔No	Yes / No	Low ~ Medium
E-mail	Outlook, Web mail ➔ No	No	Low
E-Commerce	Stock transaction, Online order, Online sell… ➔ No	Yes / No	Low ~ Medium
On-line Game	Play in turn or time critical ➔ No	Yes / No	Medium

QoS Classes Mapping

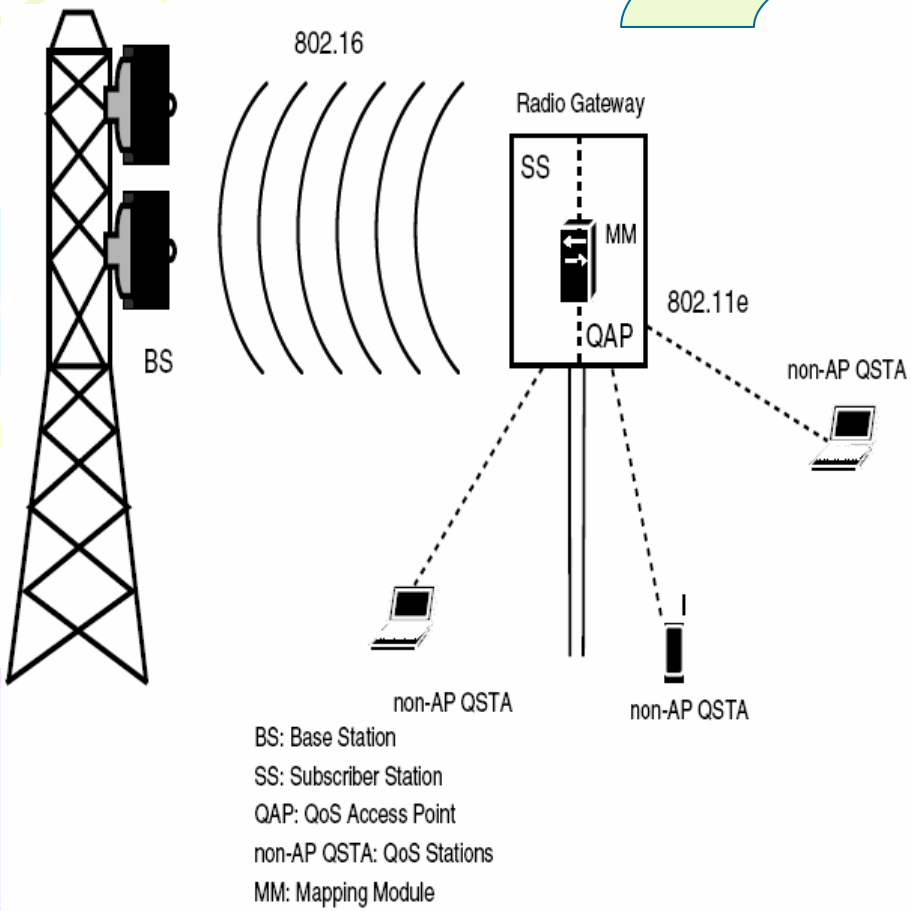
	WiMAX	UMTS	WiFi (802.11e)
VoIP (Skype, SIP Phone)	UGS	Conversational	Voice
Video Conference	UGS	Conversational	Video
Streaming	UGS	Streaming	Voice/Video
File Transfer	BE	Background	Background
Web Browsing	nrt-PS	Interactive	Best Effort
Instant Message	rt-PS/nrt-PS	Interactive ?	Best Effort / Video
E-mail	BE	Background	Background
E-Commerce	rt-PS/nrt-PS	Interactive ?	Best Effort / Video
On-line Game	rt-PS/nrt-PS	Interactive ?	Best Effort / Video

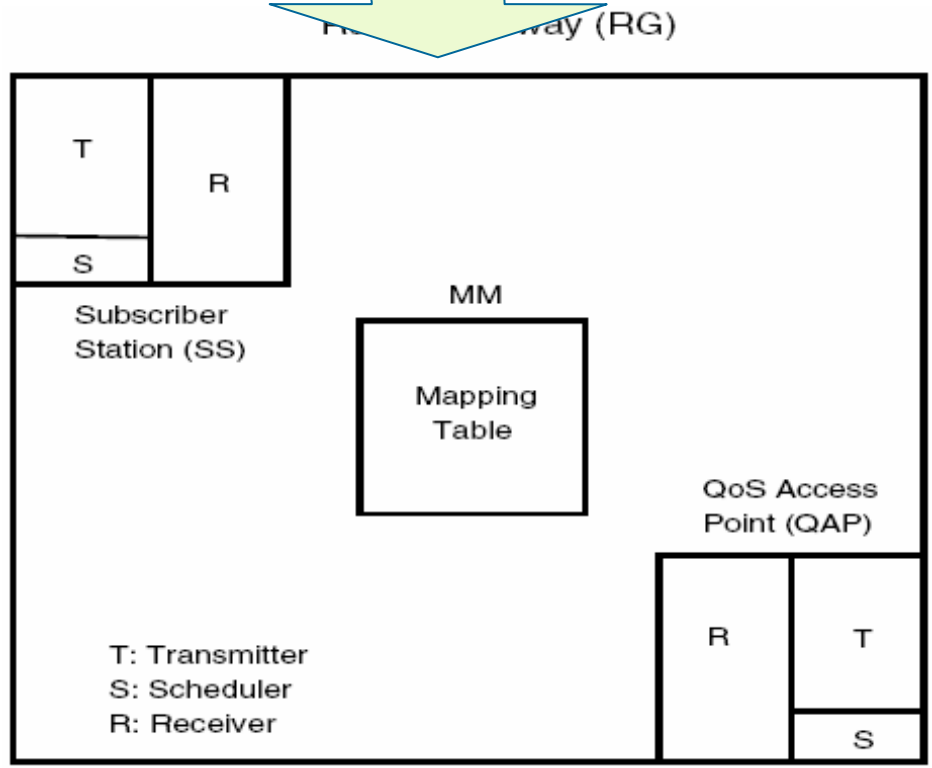
802.16 & 802.11e Interworking

- K. Gakhar, A. Gravey,and A. Leroy, "**IROISE: a new QoS architecture for IEEE 802.16 and IEEE 802.11e interworking**," in *IEEE Proc. Int'l Conf. on Broadband Networks*, pp.607 – 612, Oct. 3-7, 2005.

- CBR with Real-Time Traffic (C1)
  - Real-time audio/video
- VBR with Real-Time Traffic (C2)
  - streaming
- VBR with Precious Data (C3)
  - Data file
- Unspecified Type (C4)
  - Other traffic

Architecture





- Parameterized Mapping
  - Per-flow mapping

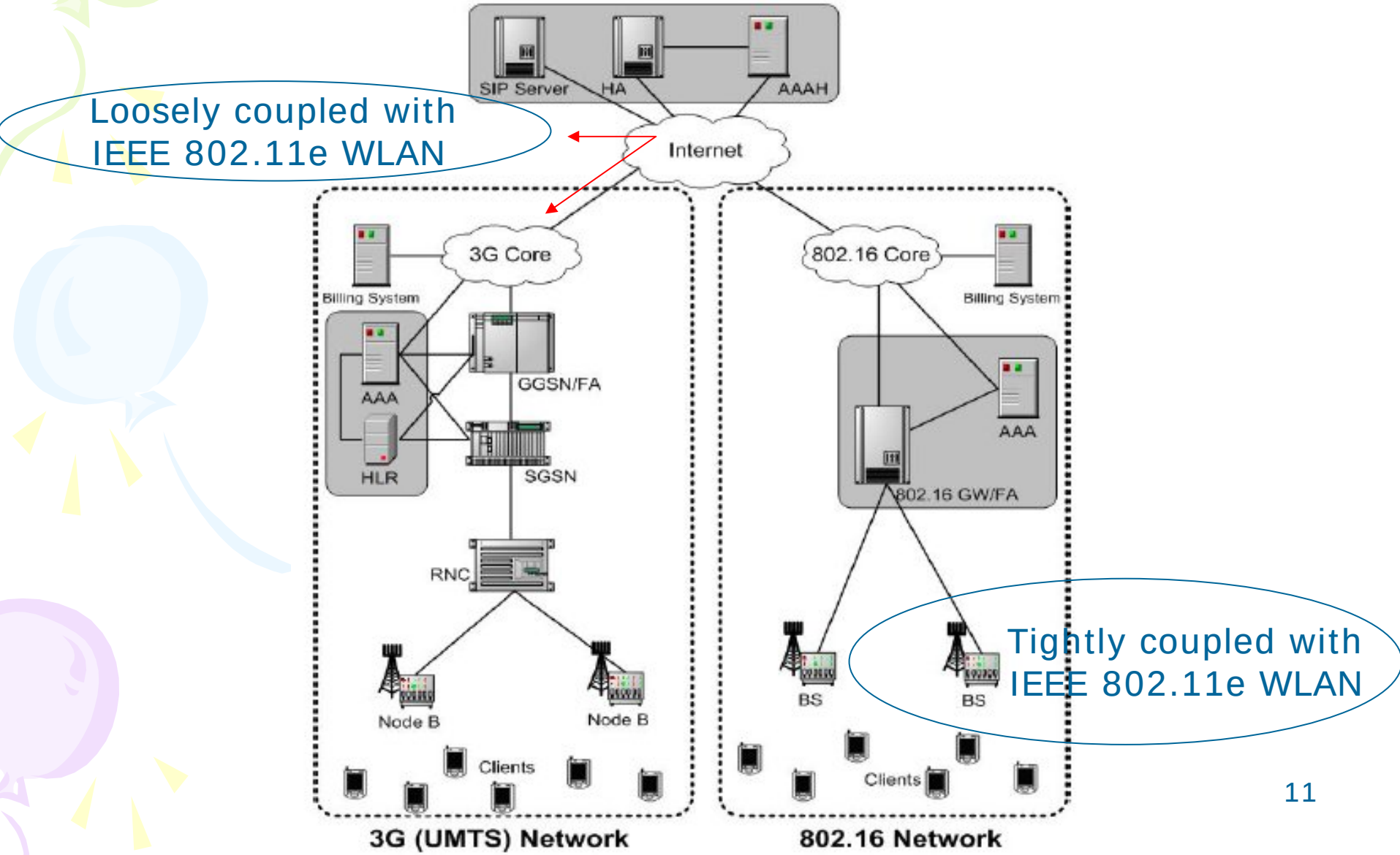
IEEE 802.11e	IEEE 802.16
Traffic Class C1	Traffic Class C1
Peak Data Rate Delay Bound (DataRate + Delay Bound)	Maximum Sustained Traffic Rate Maximum Latency Tolerated Jitter
Traffic Class C2	Traffic Class C2
Minimum Data Rate Peak Data Rate Delay Bound Burst Size	Minimum Reserved Traffic Rate Maximum Sustained Traffic Rate Maximum Latency Maximum Traffic Burst
Traffic Class C3	Traffic Class C3
Minimum Data Rate Peak Data Rate User Priority Burst Size	Minimum Reserved Traffic Rate Maximum Sustained Traffic Rate Traffic Priority Maximum Traffic Burst
Traffic Class C4	Traffic Class C4
Peak Data Rate User Priority	Maximum Sustained Traffic Rate Traffic Priority

WiMAX / 3G Integration

- Daehyon Kim and A. Ganz, "**Architecture for 3G and 802.16 Wireless Networks Integration with QoS Support,"** in *IEEE Proc. Int'l Conf.* on QShine 2005, Aug. 22-24, 2005

- This paper provides an architecture for 3G and 802.16 wireless networks integration with QoS support.
  - Loosely-coupled
  - Mobility manager and session manager

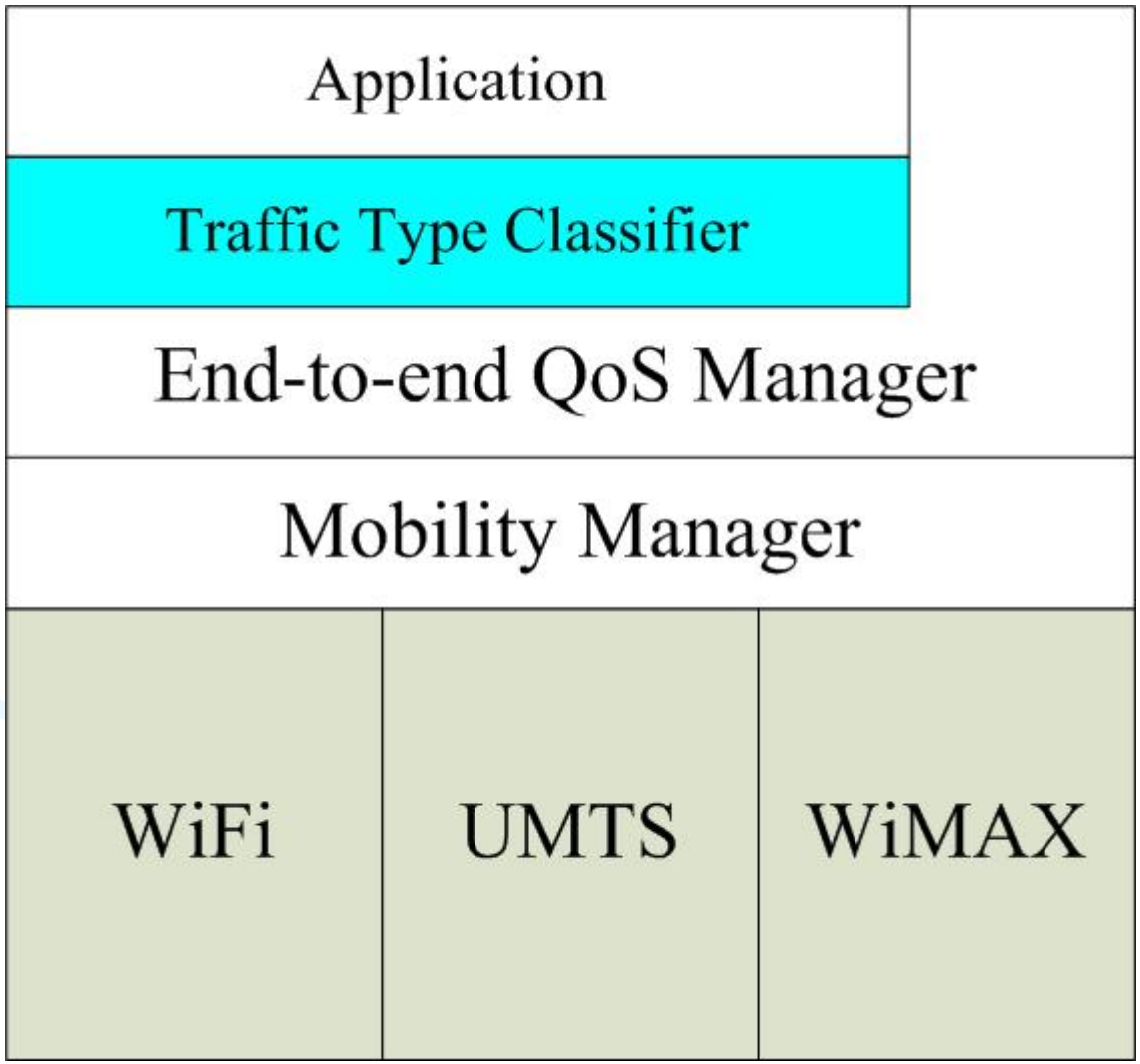
Integrated Network Architecture



Next Steps

- New classification
  - CBR with Real-Time Traffic (C1)
    - Real-time audio/video
  - VBR with Loss Tolerant(C2)
    - Real-time (C21)
    - Non real-time (C22)
  - VBR with Precious Data (C3)
    - Real-time (C31)
    - Non real-time (C32)
  - Unspecified Type (C4)
    - Other traffic

Next Steps


Application
Traffic Type Classifier
End-to-end QoS Manager
Mobility Manager
WiFi
UMTS
WiMAX

Next Steps

- Traffic Type Classifier
  - Identify the generated traffic type
- End-to-end QoS Manager
  - Deal with QoS
  - A feedback system of the network characteristics to the application.
- Mobility Manager
  - It is responsible for providing transparent switching between the networks.

Summary

- We classified most popular applications
  - According to service requirements
  - According to QoS classes
- QoS classes mapping
  - Different definitions in bandwidth and services
  - Network capability

References

- K. Gakhar, A. Gravey,and A. Leroy, "**IROISE: a new QoS architecture for IEEE 802.16 and IEEE 802.11e interworking**," in *IEEE Proc. Int'l Conf. on Broadband Networks*, pp.607 – 612, Oct. 3-7, 2005.
- Daehyon Kim and A. Ganz, "**Architecture for 3G and 802.16 Wireless Networks Integration with QoS Support,"** in *IEEE Proc. Int'l Conf.* on QShine 2005, Aug. 22-24, 2005
- **3GPP System to Wireless Local Area Network (WLAN) Internetworking: System Description**, 3GPP TS 23.234 v6.3.0 Dec. 2004.
- T. Bu, M. C. Chan, and R, Ramjee "**Designing wireless radio access networks for third generation cellular networks**," IEEE INFOCOM, March 2005.
- http://www.skype.com