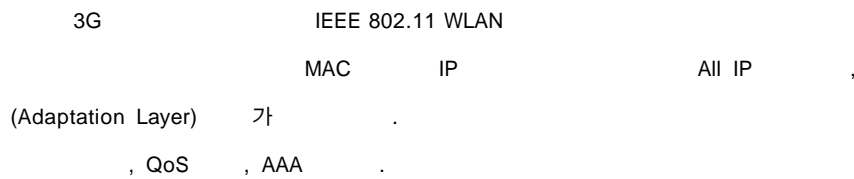


802.11 WLAN 3G

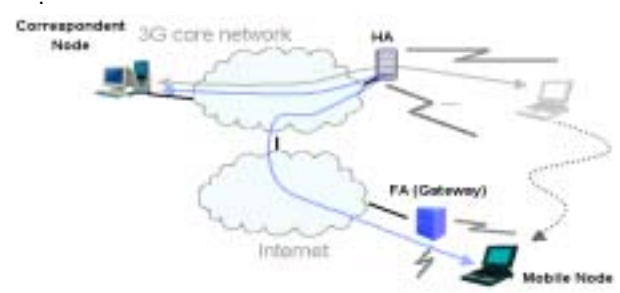
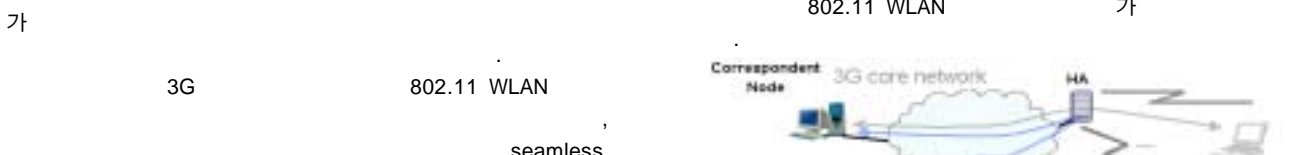
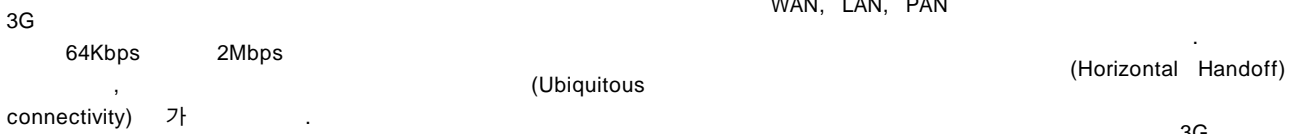
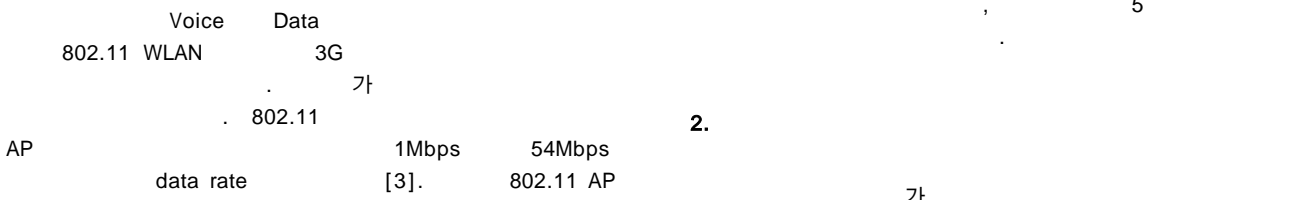
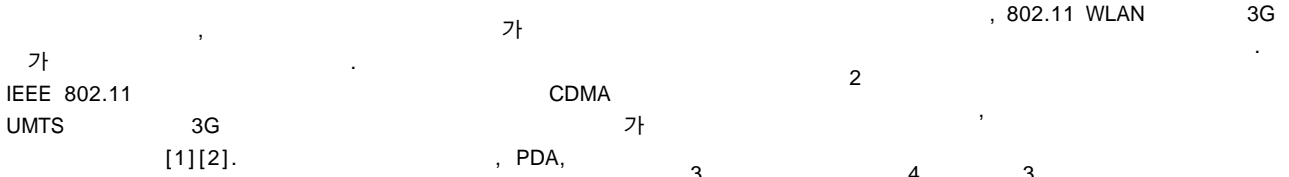
Vertical Handoff Algorithm between IEEE 802.11 WLAN and 3G Network

Minji Nam, Nakjung Choi, Youngsam Park, Yongho Seok and Yanghee Choi

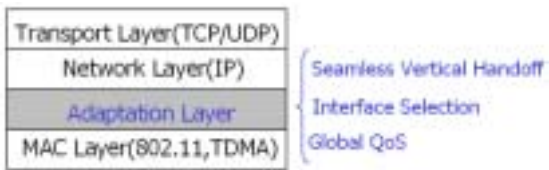
School of Computer Science and Engineering, Seoul National University



1.



(Adaptation Layer) 3G 가
802.11 WLAN



2

802.11b WLAN 가
CDMA 1x

1.

Orinoco IEEE 802.11b NIC

Transmit	Receive	Idle
1.3(W)	909(mW)	740(mW)

CDMA 1x Wireless Modem NIC

Transmit	Receive	Idle
2.8(W)	495(mW)	82(mW)

가

가 WLAN 가

QoS - Fairness QoS 가 WLAN MAC QoS

WALN 가 WALN 가

AAA - Authentication, Authorization, Account
3G 가 nomadic system AAA

가

3.

QoS

가

가



3.

3

가

(Lifetime) - 가
가 (Total Price) - 가

4.

가

가
가
가

가

2.

TxPower(i)	0~Inf	i
RxPower(i)	0~Inf	i
IdlePower(i)	0~Inf	i

SetupPower(i)	0~Inf	i	on/off
DataRate(i,t)	0~Inf	t	i
SNR(i,t)	0~Inf	t	i SNR (Signal to noise ratio)
Price(i)	0~Inf	i	

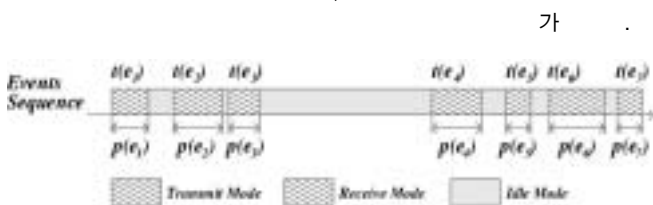
3.

Energy	0~Inf	
Latency	0~Inf	
QueueLength	0~Inf	

4.1 Formulation

3 가
가

가 ()



4.

4

가
가
(Lifetime) (Total Price) 가
가

Objective

Maximize $w(l) \cdot Lifetime - w(p) \cdot TotalPrice$

Subject to

TotalPower =

$$\sum_{i \in InterfaceSet} \sum_{k \in TransmitEvents} \frac{TxPower(i) \cdot p(e_k)}{DataRate(i,t)} \cdot Selection(i, e_k) +$$

$$\sum_{i \in InterfaceSet} \sum_{k \in ReceiveEvents} \frac{RxPower(i) \cdot p(e_k)}{DataRate(i,t)} \cdot Selection(i, e_k) +$$

$$\sum_{i \in InterfaceSet} \sum_{k \in TotalTime} IdlePower(i) \cdot \left\{ t(e_{k+1}) - \frac{p(e_k)}{DataRate(i,t)} \right\} \cdot Selection(i, e_k)$$

Energy - TotalPower · TotalTime ≥ 0

$$Lifetime = \sum_{i \in InterfaceSet} \sum_{k \in TotalEvents} Selection(i, e_k)$$

$$\sum_{i \in InterfaceSet} Selection(i, e_k) - \sum_{i \in InterfaceSet} Selection(i, e_{k+1}) \geq 0$$

$$TotalPrice = \sum_{i \in InterfaceSet} \sum_{k \in TotalEvents} Price(i) \cdot Selection(i, e_k)$$

$$\sum_{i \in InterfaceSet} Latency \cdot \{ Selection(i, e_k) - Selection(i, e_{k+1}) \} \leq t(e_{k+1}) - t(e_k)$$

4.2.

ILP formulation NP

/ 가

SNR

approximation algorithm

ISP 가

(Lifetime)

formulation

(Total Price),

가

w(p) ISP

approximation 가

가 w(l)

objective function 가

가

approximation

algorithm

가

가 w'

가

w'

가

가

가 ISP

가

가

가

(s_i)

802.11 WLAN

3G

(P_i)

$$w'_i = \begin{cases} 500 \times p_i + s_i & \text{if } s_i \geq T_i \\ s_i & \text{if } s_i \leq T_i \\ T_i & \end{cases}$$

threshold

802.11WLAN

W_{wlan} = high, 3G

W_{3G} = low

가 w'

가

가

5.

future work

IEEE 802.11 WLAN 3G

3G

WLAN

QoS,

가

approximation

algorithm

가

Future work

6.

[1] M. Buddhikot, G. Chandranmenon, S. Han, Y. W. Lee, S. Miller, L. Salarelli, "Integration of 802.11 and Third-Generation Wireless Data Networks," infocom 2003, April 2003.

[2] M. Inoue, G. Wu, "Development of MIRAI system for heterogeneous wireless networks," PIMRC 2002, Sept. 2002.

[3] IEEE Computer Society, "802.11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications," June 1997.