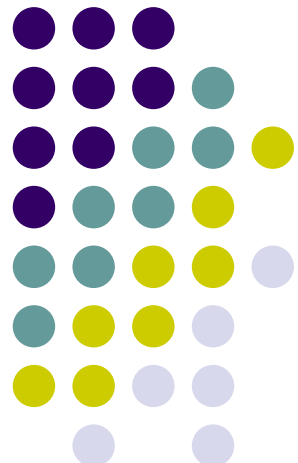
Integration of Wireless LAN and 3G Wireless

徐延源

2003/12/12



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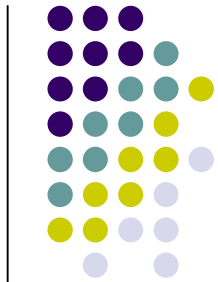
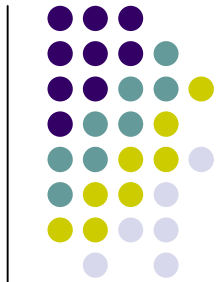


- Interworking Architecture Between 3GPP and WLAN Systems, *Nokia Corporation*
- Security Aspects of 3G-WLAN Interworking, *Telenor R&D*
- Design and Implementation of a WLAN/CDMA2000 Interworking Architecture, *Lucent Technologies*
- Efficient Mobility Management for Vertical Handoff between WWAN and WLAN, *Microsoft Research Asia*
- Seamless Handover in Terrestrial Radio Access Networks: A Case Study, *Bouygues Telecom*
- Policy-Based QoS Management Architecture in an Integrated UMTS and WLAN Environment, *Siemens Singapore*

Outline

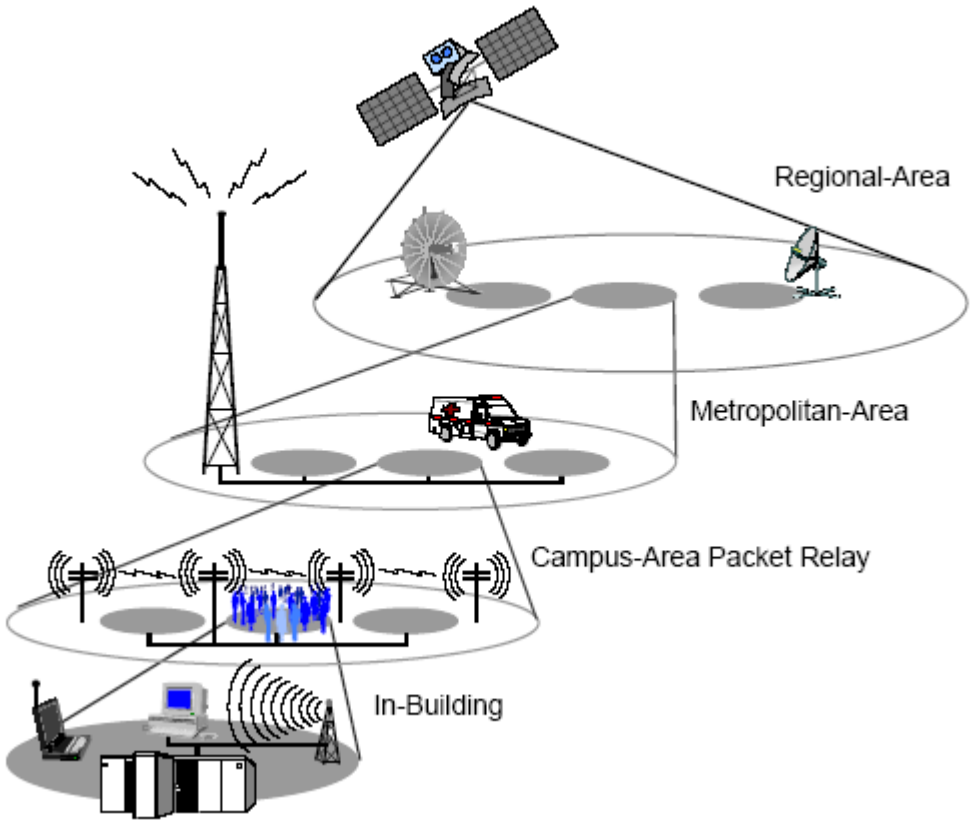
- Introduction
- Integration of WLAN and 3G
  - Architecture
  - Security
  - Mobility Management
  - QoS
- Conclusion
- Reference

Introduction



- WLAN and 3G possess complementary characteristics
  - WLAN: faster short-distance access
  - 3G: slower long-range access
- Integration of WLAN and 3G is a special case of Wireless Overlay Networks (WON) which is the trend of next-generation wireless networks

Introduction

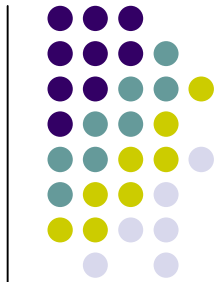


Wireless Overlay Networks structure

Introduction

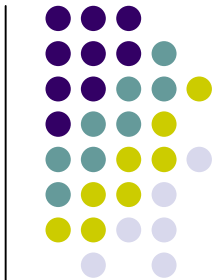
- Benefits of the integration
  - For 3G service provider: economically offload data traffic to WLAN in areas with high user density
  - For WLAN service provider: bring a larger user base from partner 3G networks
  - For end user: enhanced performance through the greater coverage, higher data rate and lower overall cost

Integration of WLAN and 3G
Architecture



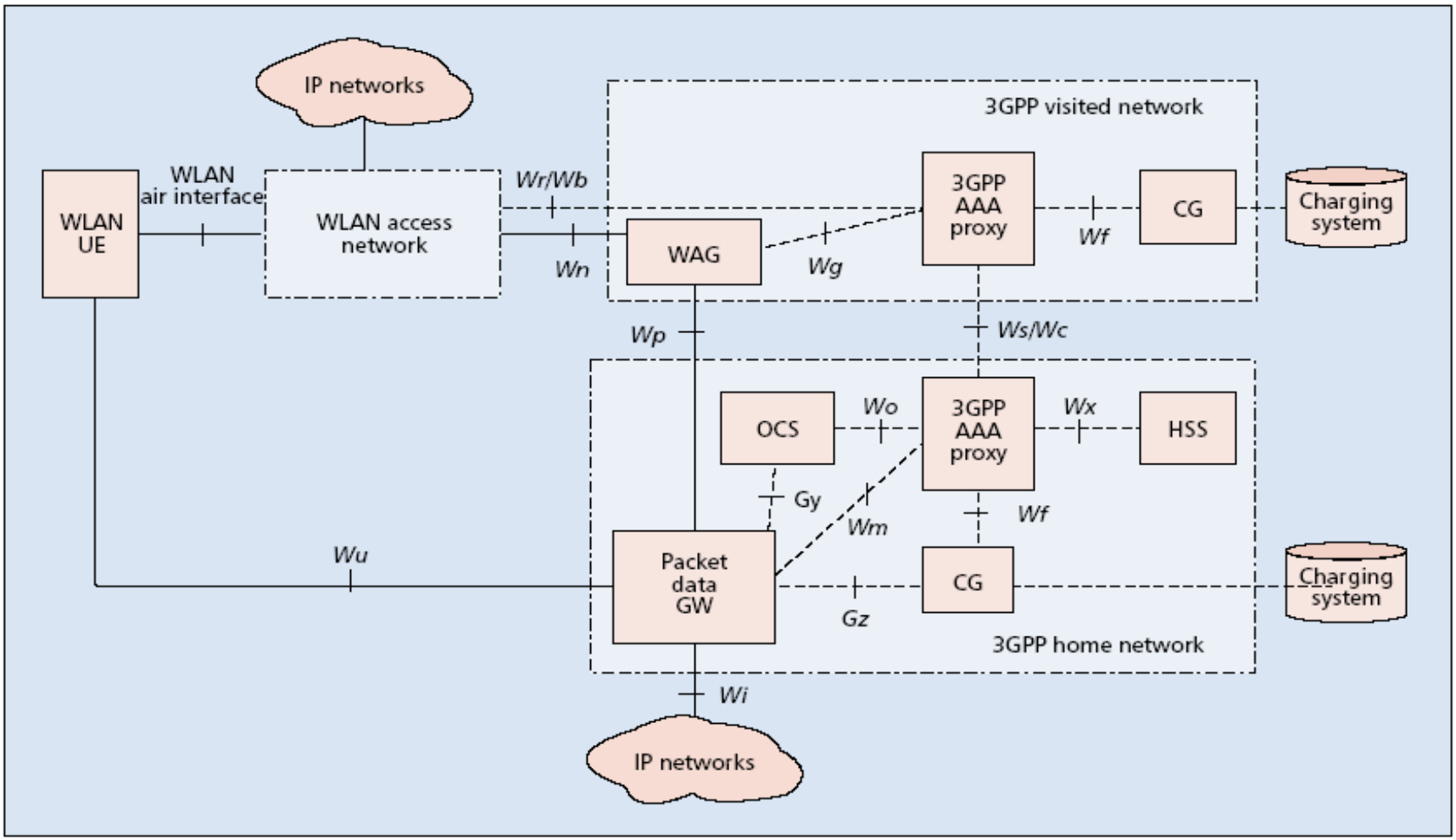
- The interworking architecture is being defined by the 3GPP workgroups (1st version spec. at end of 2003)
- Loosely-coupled integration
  - Independent deployment and traffic engineering of WLAN and 3G networks
  - Less painful than tightly-coupled approach

Integration of WLAN and 3G
Architecture



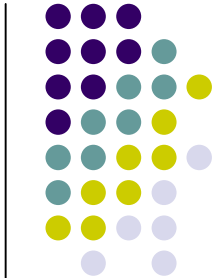
- Reusing of 3G subscription for interworking WLAN access (roaming)
  - One subscription for all networks
- Permit user to use services provided by the home network (tunneling)
- Unified charging system
  - Single bill

Integration of WLAN and 3G
Architecture



3G-WLAN interworking architecture

Integration of WLAN and 3G
Architecture

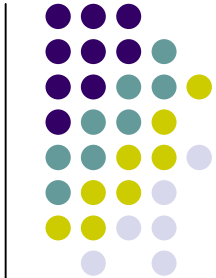


- Open issues
  - Roaming agreements between different network operators
    - Business concern
  - When more than two types of network are involved

Integration of WLAN and 3G
Security

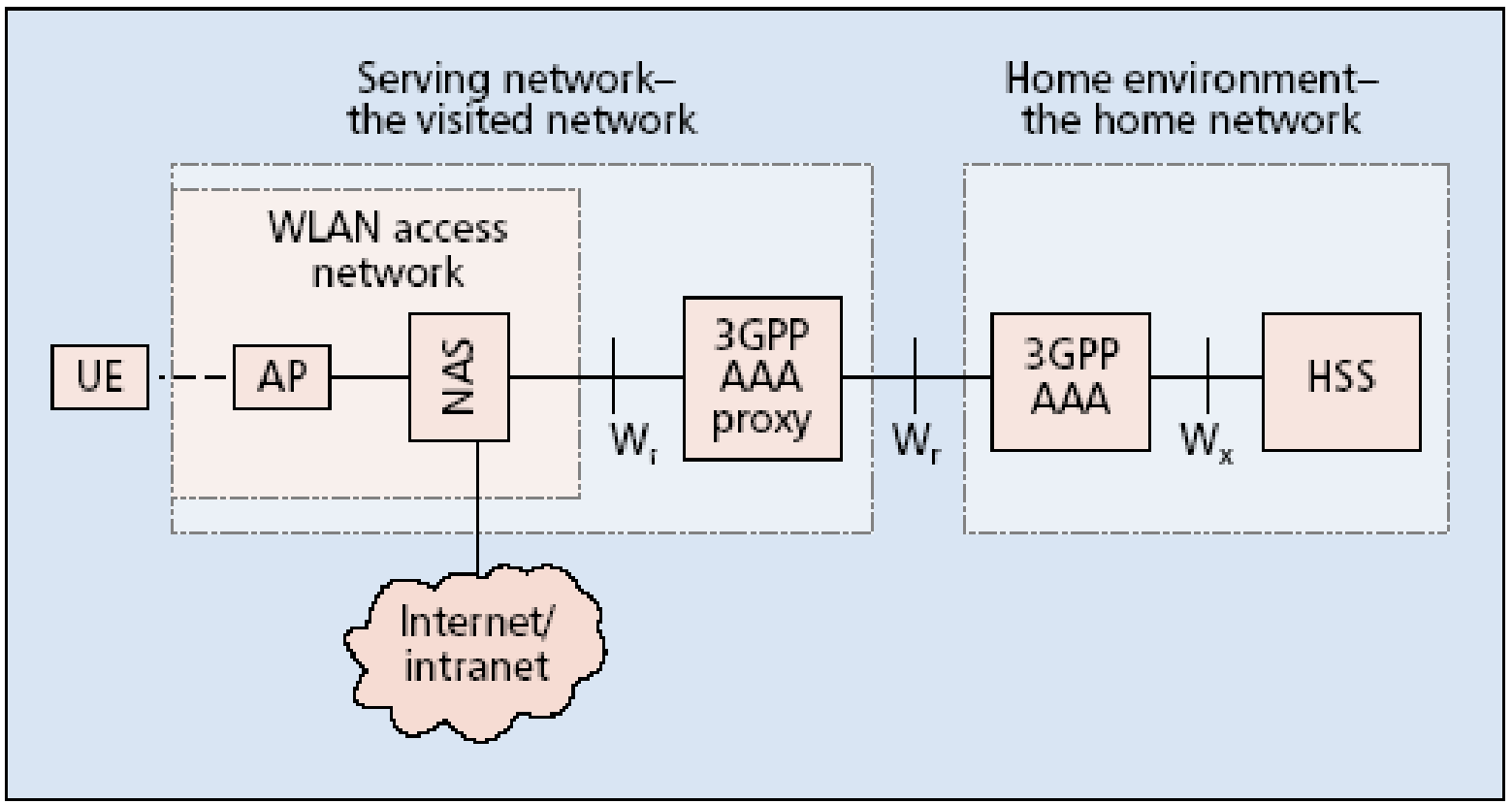
- Currently WLAN (802.11a/b/g) is not very secure compared to 2G/3G
  - Wired Equivalency Privacy (WEP) is unable to meet the design goal of *confidentiality, integrity and access control*
- New security scheme is needed for easier implementation of AAA in the integration of WLAN and 3G

Integration of WLAN and 3G
Security



- 802.11i
  - Enhanced security for WLAN
  - Dynamic per-user per-session authentication and encryption keys and stronger packet encryption
- Wi-Fi Protected Access (WPA)
  - Standardized by Wi-Fi alliance
  - An interim solution

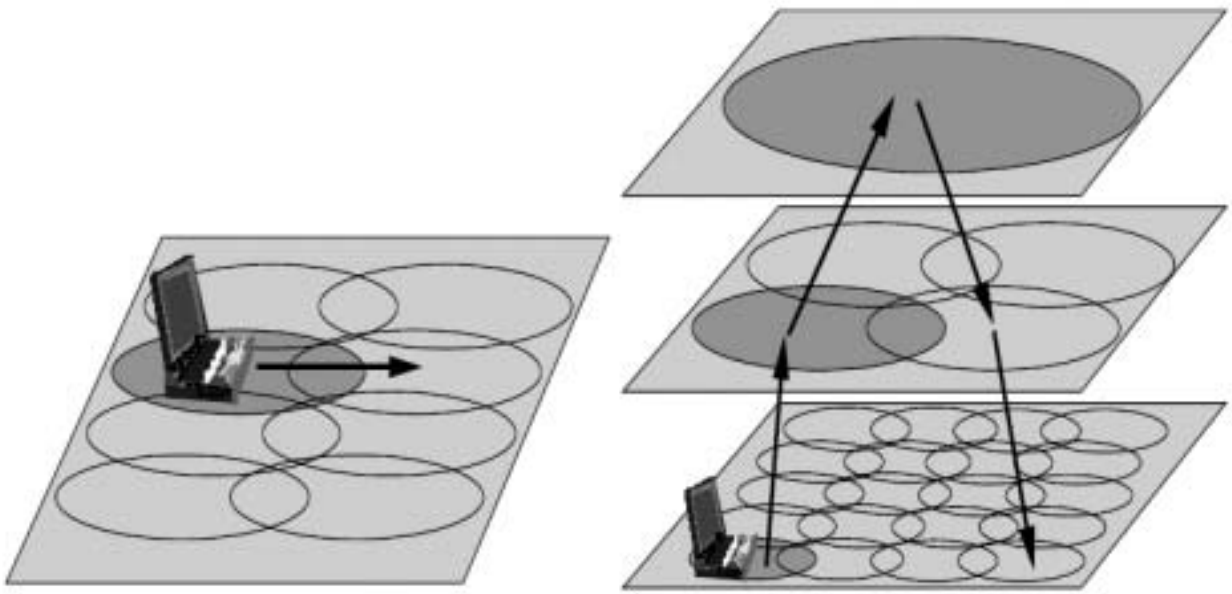
Integration of WLAN and 3G
Security



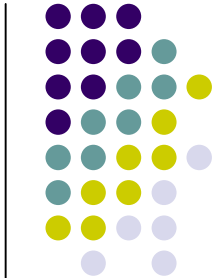
3G-WLAN security architecture

Integration of WLAN and 3G
Mobility management

- Mobile IP is used for mobility management
- Switching between different type of network is called *vertical handoff*



Integration of WLAN and 3G
Mobility management



- Handoff decision
  - Received Signal Strength (RSS)
    - Basic handoff decision method
    - Not suitable for WON
  - When a more suitable network is available
- Packet multicasting to avoid data loss

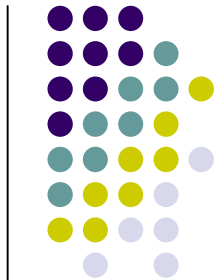
Integration of WLAN and 3G
Mobility management

- Open issues
  - MN's interface management
    - System discovery
    - Turn all interface on → waste of power, get worse when the number of involved networks increases
  - Vertical handoff
    - Handoff decision

Integration of WLAN and 3G
QoS

- Handoff to a more suitable network to get improved performance
  - Handoff to WLAN when running data intensive application
- Minimize the handoff latency
- Avoid data loss during the handoff process

Integration of WLAN and 3G
QoS



- Policy-Based Network (PBN)
  - Network management by policy (rules)
  - Provide high-abstraction view of network to make QoS deployment easier
    - PBN related entities need to be implemented
  - Being incorporated into 3G spec

Integration of WLAN and 3G
QoS

- Open issues
  - Mapping of resources between different networks
  - The policy parameter must be standardized to provide the basis for negotiation
  - Security of communication channels between policy entities
  - Policy negotiation may be slow if the chain of participating networks is long

Conclusion

- The integration must permit independent deployment and growth of each network while being as painless as possible
- The user just need one service subscription with one service provider to be able to use different networks

Reference

- 3GPP TR 22.934 (version 6.0.0), “Feasibility Study on 3GPP System to Wireless Local Area Network (WLAN) Interworking (Rel. 6),” May 2002
- 3G TS 23.234, “3GPP System to Wireless Local Area Network (WLAN) Interworking System Description,” Release 6, work in progress.
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- 3GPP TR 23.917 (v. 0.4.0), “Dynamic Policy Control Enhancements for End-to-end QoS (Rel. 6),” Dec. 2002.