

Survey on QoS issues in Heterogeneous Networks

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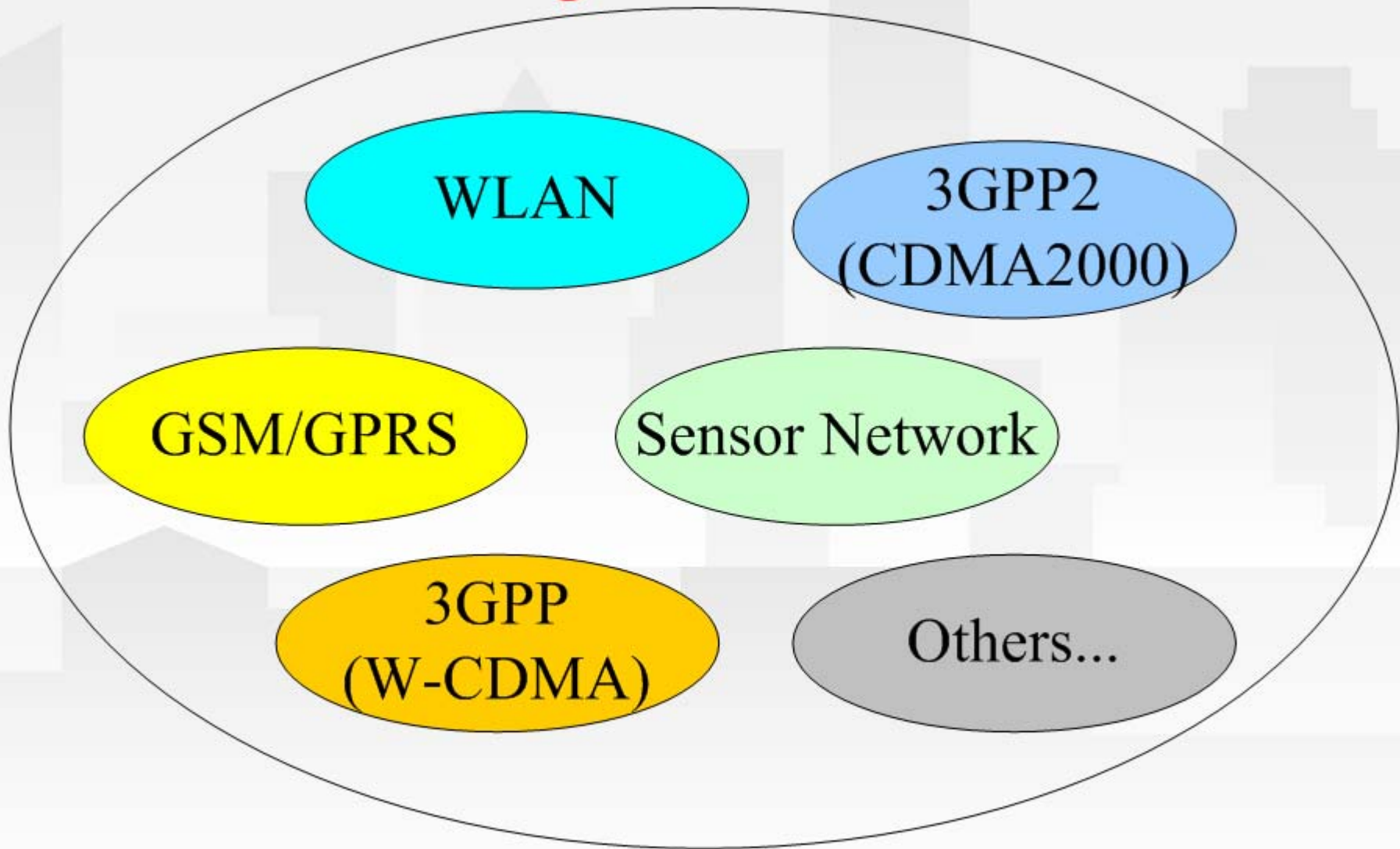
Outline

- Introduction
- QoS issues in heterogeneous networks
- Services in internetworking 3G and WLAN environments
- Discussion
- References
- Appendix

Introduction

- In the future, we desire to connect to networks “any time, anywhere, and anyway.”
- Heterogeneous networks include
 - Heterogeneous systems, applications, devices, and services providers.
 - Mobile Internet
 - IP acts as a common platform
 - All-IP network layer

Heterogeneous Networks



Introduction

- QoS: Quality of Service
 - When a user moving from one network to another, the user may interact with a variety of service providers with different
 - Service level agreement (SLA) terms
 - Network capacity
 - topology
 - policies
 - Seamless and adaptive QoS

Introduction

- Most of the early works in this field focus on developing QoS frameworks
 - Example: IntServ and DiffServ
- The main research is still in the context of individual architectural components
 - Wireless access
 - Mobility management
 - Portable devices

QoS issues in heterogeneous networks

The current status of QoS research

- Application and user layer
 - Specifications
 - Mapping of application and user QoS preferences
- Middleware level
 - New middleware lies between applications and the OS
- Transport layer
 - To improve TCP's performance over a wireless link

The current status of QoS research

- Network layer
 - resource allocation architecture
 - IntServ and DiffServ
 - Routing schemes
 - MPLS, Traffic Engineering (TE)...
- Link layer
 - QoS MAC
 - Wireless scheduling

QoS issues in heterogeneous networks

- Administration domain
 - Policy
 - Network topology and traffic
 - Available services
- Access technology
 - Mobility support
 - Coverage area
 - QoS support
 - Bandwidth, loss and delay
 - Security
 - Cost

QoS issues in heterogeneous networks

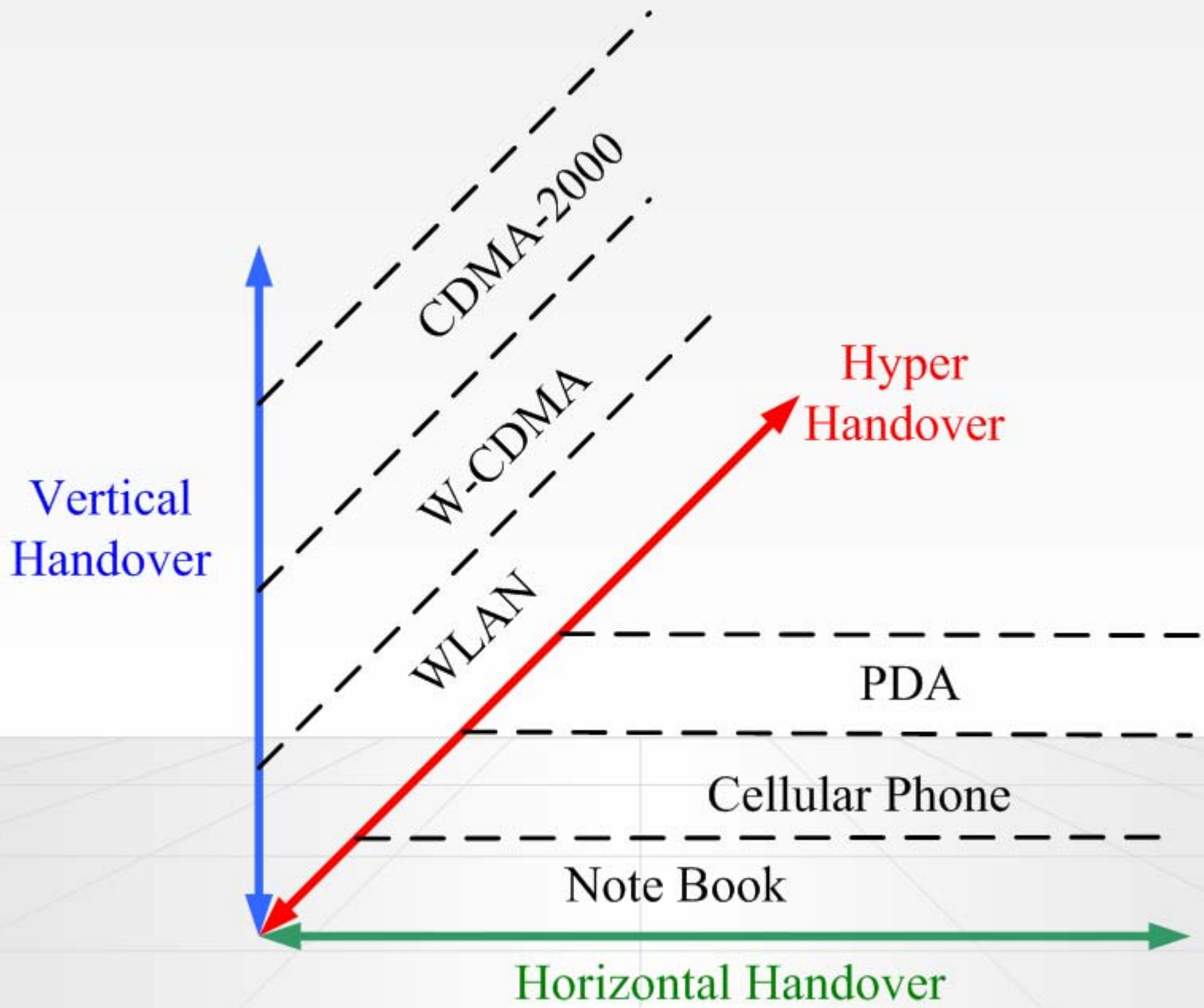
- Terminal
 - Network interface
 - Software platform
- Application
 - Network connection
 - QoS requirement

QoS issues in heterogeneous networks

Administration domain	ISP, ASP, AAA, SLA, policy, network topology, application context, network traffic, available services
Access technology	Bandwidth, loss, delay, coverage area. Mobility support, QoS support, suitable application, cost, security
Terminal	CPU, memory size, display, input/output, battery, network interface, built-in applications
Application	Traffic specification, QoS requirements, user preference, user sensitivity, adaptation ability, network connection

QoS issues in hyper handovers

- Horizontal handover
 - Users move in the same administrative domain
- Vertical handover
 - Users move between different administrative domains
- Hyper handover
 - Handover between different administrative domains, access technologies, user terminals, or applications



QoS issues in hyper handovers

- Unlike horizontal handovers (static QoS functions), hyper handovers (dynamic functions) introduce large-grained changes in QoS.
 - Dynamic QoS functions allow the contract to be fulfilled on an ongoing basis.

QoS issues in hyper handovers

- Mobility support
 - Fast handover Mobile IP (FMIP)
 - Hierarchy Mobile IP
 - Cellular IP
- These protocols do not currently support the QoS parameters required by specific applications
- Current mobility support schemes treat applications the same way

QoS issues in hyper handovers

- Dynamic QoS functionalities
 - Resource reservation protocol
 - Admission control protocol
- Handover differentiation
 - Fast handover
 - A handover that can satisfy strict delay bounds
 - For real-time services
 - Smooth handover
 - A handover that can minimize loss of packets
 - Seamless handover
 - A handover with minimum perceptible interruption of services

Discussion

- Interaction between application layer, mobility, and QoS signaling
 - How to integrate these signaling schemes together is a big problem.
- Security
- Flow identification
 - IP is no longer a good way to identify flows and related QoS reservation information along the path.
 - IPv6?
- QoS during handover
 - How to systematically support different handover requirements is an open problem.

References

- [1] DoCoMo Comm. LAB USA, “END-to-END QoS Provisioning in Mobile Heterogeneous Networks,” IEEE Wireless Communications., June 2004.
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- [3] IEEE Wireless Communications. June 2004
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