Platform – Independent IP Transmission over Wireless Networks: The WINE Approach

Outline

- Motivation
- WINE project
  - Architecture
  - Mobility Support
- Discussions
- Conclusions and Future Work
Motivation

- How to enhance the performance of Internet Protocols when operating over WLAN?
  - Implementing a “shim” layer between IP-layer and Link-layer.
WINE

- Wireless Internet Networks project
  - Sponsored by the European Commission.
  - Implementing a wireless adaptation layer (WAL) between IP and link layers.
  - Supporting end-to-end QoS.
WINE Architecture

- **WAL**
  - Adaptation to the observed link conditions
  - IP QoS awareness
WAL Operation

- Each IP datagram is classified into *classes* and *associations*.
  - **class**: type of service
    - Audio/video streaming
    - Bulk transfer
    - Interactive transfer
    - Web
  - **association**:
    - `<WAL_class, MT_ID>`
WINE Internal Architecture

Diagram showing the internal architecture of WINE, with various modules and layers connected by arrows indicating upstream and downstream data exchange.
**WAL Header Format**

- **WAL vers**: The WAL version
- **PDU**: Protocol Data Unit
- **S/D**: A 1-bit field to distinguish between signaling and data PDUs
- **Assoc_ID**: Association identifier
WAL Association Establishment Procedure

The AP saves the assoc_ID in its lookup table.

ASSOC_REQUEST(class, mod_params, assoc_ID)

ASSOC_RESPONSE(class, mod_params, assoc_ID)

ASSOC_CONFIRM(assoc_ID)

Association establishment success

The MT saves the assoc_ID in its lookup table.

ASSOC_REQUEST(class, mod_params, assoc_ID)

ASSOC_RESPONSE(class, mod_params, assoc_ID)

ASSOC_REJECT(assoc_ID)

Association establishment failure
Lookup Tables Format

<table>
<thead>
<tr>
<th>MT lookup</th>
<th>AP lookup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assoc_ID</td>
<td>Class_ID</td>
</tr>
<tr>
<td></td>
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</tbody>
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Mobility Support in WINE

- **Inter-domain mobility**
  - Mobile IPv4, Mobile IPv6…

- **Intra-domain mobility**
  - Providing connectivity, paging and seamless handover support.
    - Cellular IPv4 [Internet draft]
    - Cellular IPv6 [Internet draft]
    - SIMPLE (Scalable Intra-domain Mobility Protocol using Local Encapsulation)
WINE Protocol Stack
Network Topology

MT: Mobile terminal
AP: Access point
FH: Fixed host
CIPv6 GW: Cellular IPv6 gateway
WAL Software Architecture

Central coordinator:
- Dynamic management of generic modules
- Internal and external signaling
- Contextual management and scheduling of modules

Database manager
- Parameters management:
  - Reading config. files
  - Concurrent access to data
  - Statistics calculations
  - /Proc file system management

WAL coordinator

Generic module
- WAL module
- QoS module
- LLCT module

ARQ
- Snoop
- FEC

Other...
- Header compression

Hierarchical scheduler
- IEEE 802.11
- Bluetooth
- HIPERLAN/2
Discussions

- Does it work under Ad Hoc networks?
  - End-to-end QoS support?

- The number of modules should not be too large.

- The processing speed of WAL coordinator?
Conclusions and Future Work

- The WINE project aims to optimize transmission of IP traffic over WLANs.
- One of the key issue of the project is the development of a wireless adaptation layer (WAL) that resides between the IP and WLAN link layers.
- How to cooperate with 3G or other networks?