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“Packet-Oriented Service Delivery via Satellite”

Collectively Mobile Groups in Satellite-Terrestrial Networks

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Introduction

- Collectively mobile group
  - group of users which is collectively on the move
    - trains, ships, planes, buses, ...
    - crossing several coverage areas
  - concept of mobility
    - mobile group
    - mobile user inside the group

- Heterogeneous
  - made from different components
    - heterogeneous segment (network access)
    - heterogeneous user access
Step 1: Mobile Group
Heterogeneous Segments

- Satellite access
- Global coverage
- High data transmission rate
- Mobility of users

Problem: the satellite link can suffer deep fading in some scenarios due to shadowing from buildings, ...

Support the satellite segment with other terrestrial segments such as WLAN, GPRS, UMTS, ...

Heterogeneous Segment Access for a Collectively Mobile Group (SUITED idea, IP services)

Advantages:
- Crossing coverage areas
- More bandwidth

Segment Gateways
Inter Segment Service Provider
User Terminals
Terminal Interworking Unit (T-IWU)
Collectively mobile group
Segment Terminals
SAT
W-LAN
GPRS
...
SUITED Description
System for broadband Ubiquitous access to InTERnet services and Demonstrator

IST project, 2000-2002

Objectives:

- IP mobility within several segments that are mutually complementary
- handover between the access segments transparent to the user
- coverage extension, QoS support, seamless IP connectivity

Idea for user transparency:
- the IP address of the user terminal does not change, while the T-IWU changes the active segment

Results

Segment availability

User segment allocation
Step 2: User Mobility Inside the Mobile Group

Heterogeneous User Access

To obtain user acceptance:

- facilitate the use of personal equipment:
  - laptop (modem, RJ-45, WLAN)
  - mobile phone (GSM, UMTS)
  - PDA
- integrate multiple standards in a collectively mobile group
- allow mobility:
  - wireless access

Keep connection beyond coverage limits:

- ships, planes, long-haul trains
Satellite Access for a Collectively Mobile Group with Heterogeneous User Access

Possible improvements:

- Combine different satellite systems
  - bandwidth asymmetry
- Join the advantages from heterogeneous segments and heterogeneous access
  - high data transmission rate
  - mobility
  - global coverage
  - bandwidth optimisation
  - use of personal equipment
  - simultaneously support of different standards
- Use the support of terrestrial networks
  - trains slowing down or going into station
  - ships near the coast
  - planes in airports
  - buses in urban areas

Step 3: Group and User Mobility
Heterogeneous Segment and User Access
Heterogeneous Segment Access for a Collectively Mobile Group with Heterogeneous User Access

Issues to be solved:

- Connection of the collectively mobile network through the satellite link to the other terrestrial networks
  - satellite link (band, asymmetric up-/down-link)
  - terrestrial infrastructure for service provisioning
  - protocol aspects (e.g., mobility, VPN, AAA, effect of propagation delay on signalling protocols)
- Collectively mobile network dimensioning:
  - network architecture/access points: sockets, antenna locations
  - capacity and coverage
- Interference between the different access in the user side
- Handover between the satellite segment and the terrestrial ones