Multimedia Services for Fast Moving Mobile Users

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IBCN - General

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EC/FP6 projects

- IP MUSE: Multi Service Access Everywhere
  (Commissariat a l'Énergie Atomique, 19 partners)
- IP NOBEL: Next generation Optical Networks for Broadband in Europe
  (Coordinator: IBCN, 19 partners)
- IP MEGAMASTER: Multi-access Optical Global Net
  (Coordinator: IBCN, 19 partners, 7 other partners)
- STREP LASAGNE: All-optical Label-Swapping employing optical logic gates in k-levels nodes
  (Coordinator: Universitat Politècnica de València, 13 partners)

Outline

- Fixed Broadband Access
- Mobile communications today
- Broadband for mobile users: Why?
- Broadband for mobile users: How?

Fixed Broadband Access

High Capacity Transmission?

But what does this mean?

- 20 tubes/street
- 5 fibres/Tube
- 10 TiB/s fiber
- Total: 10 Pibs
- 8 billion people
- More conceptually: 100% total traffic: 10 Pibs
The problem of handover: UMTS

- Soft handover:
  - Works only in highly loaded system, when there is full coverage
  - Soft handover leads to capacity (double capacity in overlap region)
  - Limited coverage for UMTS in GSM provides some capacity for GSM
    800 users
  - No handover from GSM to UMTS

- Conclusions:
  - Limited data services (max. 96 kbps)
  - Limited coverage (no GSM coverage)
  - No call for data traffic (very low effect)
  - Soft handover possible, but not guaranteed

The problem of handover: IEEE 802.11

- Maximum cell capacity: 11 - 44 Mbps/channel (5 available channels)
- Cell size: 50 m (interior) – 300 m (outside)
- Limited coverage:
  - Fading
  - Interference
  - Noise
  - Handoffs

- Handoffs:
  - The 802.11 as hardware standard
  - Change of macro cell increases the inter-interference of cs. 1
  - 802.11 is not suited for study of time Attendance Protocol
  (TAP)
  - No overlapping to other networks
  - Authentication & changings not standardized
  - Cell support not standardized (related to WIRELESS)

Handover - car scenario

- Case: Train

- Handover - train scenario

- Hop: The moveable cell concept
  - Reduced cost & improved performance
  - Possible implementation of moving cells.

Broadband communications for mobile users: HOCN

Fast Handover: Testbed
Solution 2: APACHE protocol

APACHE: results

Packet trace: APACHE vs Cellular IP

Packet trace for different prediction errors

APACHE: results

Buffer size vs prediction error

APACHE: results

Broadband Communications for Mobile Users (BCM)
The Fixed Network

What about the fixed network? Traffic engineering and Ethernet

Schematic Overview of network and Management System

Management System

Statically dimensioning versus ILP Algorithm

- Results of
  - Information on train company's data
  - Train capacities
  - QoS
  - Duration
  - Formulation of path for the trains and exact traffic based on
    available data
  - Exit or in for parks
- Offline: for overall capacities planning and tunnel capacity
  - Online: for tunnel acquisition, for handling data
  - Tunnel maintenance
- Online part uses dynamic tunnel setup mechanism
- Offline part uses dynamic tunnel setup mechanism
- Final Results:
  - Satisfactory dimensioning versus ILP Algorithm versus 'Sander'-metric

7
ILP Algorithm versus 'Steiner' heuristic

- Scenario: two starting points and one train exit

Cost, different # of QoS choices

Virtual Node Trains

The E2E QoS problem

Problem + Solution

IP-Routing

Overlay-Routing

Optimal server location

Optimal server placement

Unicast algorithm Evaluation

Overlay networking is able to support more connections than standard IP

Overlay networking is able to route around congestion data

Concept Of QoS Overlay Network

- Construct Overlay Network by placing servers in the Internet
- Achieve QoS by routing multimedia traffic between these servers
- Results:
  - 50 node networks with 2000 apps
  - Connections are generated between a subset of the nodes and put to the network. Minimal number of servers to support realistic number of connections is evaluated + points of servers + cost area.
Belgian Broadband Platform

April 29, 2004

LOCATION: Diamant Conference Center
Room Einstein
Bd. Reyerslaan 80
Diamant Building
1030 Brussels

14:00  Welcome Coffee

14:15  Fixed wireless broadband finally takes off in Brussels
Matthew Ridgwell – Mac Telecom
How MAC Telecom has been delivering more bandwidth and better value to business customers in Belgium over the last 18 months. Initially focused on leased line and Fast Internet Access, MAC Telecom has expanded its product portfolio to include both voice and WAN services while its network has been operating above its SLA of 99.95%.

15:00  Multimedia services for fast moving mobile users
Prof. Ingrid Moerman / Prof. Piet Demeester - Universiteit Gent
In order to support interactive multimedia services for fast moving mobile users (e.g. in train, car or truck), new network technologies need to be developed that are able to support both the large bandwidths for multimedia services and the fast movement of the terminals. This requires innovative solutions for the wireless access part but also the fixed access network and the backbone network need new features to support the required end-to-end quality of service. This presentation will discuss a number of these technical issues, illustrated by sample solutions.