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Outline

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⌘ Current research activity and related publications

COST 290 Action

⌘ Traffic and QoS Management in Wireless Multimedia Networks

⌘ History milestones

☒ Established in fall 2002 as initiative, web pages are put up

☒ <http://www.cs.tut.fi/~yk/cost>

☒ December 2002, the first draft of MoU issued

☒ February 2003, the Initiative resented to COST-TIST TC at 58th meeting in Brussels, EU Commission premises, oral approval is granted

☒ March 2003 - September 2003, the proposal is under internal COST review

☒ October 2003, the Initiative is approved by COST-TIST TC, assigned number is 290

☒ November 2003, COST Action 290 is approved by CSO

☒ Action's dimensioning

☒ 19 EU countries + 1

Motivation: Internet QoS goes mobile

- ⌘ Spectacular growing of mobile communications
- ⌘ The interest to it dramatically increases with each day mainly driven by new services
- ⌘ New services pose new requirements to network design and construction issues
- ⌘ To implement new services within a new-generation mobile network, **a set of novel** network architectures, protocols and traffic-related mechanisms have to be invented
- ⌘ The most important, value-added and revenue-expected new services for the mobile network will be Internet access and IP multimedia applications
- ⌘ On the basis of a plain fixed Internet access it is possible to implement a set of brand-new applications for which certain QoS requirements need to be provided
- ⌘ No doubt, QoS for Internet applications will be heavily demanded by the end-users
- ⌘ "Internet QoS goes mobile" on experience of the implementation of QoS within fixed networks, design, development and implementation of QoS-capable mobile networks is of paramount importance

Peculiarities of the area

⌘ Need of the following approaches arises

☒ Fundamental research

☒ Requires the following issues

- Scientific ideas – born in peer and fair discussions
- Mutual scientific collaboration – born in specific science
- Establishing of the scientific networks – coming from the years and experience
- Scientific experience – coming from the years
- Brainstorms

☒ Applied research

☒ Requires the following

- Better to be independent
- Experience in implementation
- Establishing of the networks to build the necessary testbeds, implementations etc.

☒ Mutually mixed fundamental and applied research

⌘ Area

☒ is becoming of **utmost strategic importance** from both the research perspective and the industrial one

⌘ Results

☒ an expertise is believed will bring significant benefits to all the European research community

Why COST?

- ⌘ What possibilities should an ideal framework provide for a project
 - ⌘ To utilize
 - ⊗ Existing broad experience
 - ⊗ Existing appropriate managerial approaches
 - ⊗ Existing networks of researchers
 - ⌘ Dimensioning
 - ⊗ Quite narrow area of research
 - ⊗ Community should be not very large (comparable to a single-track conference)
 - ⌘ Flexibility
 - ⊗ Easily to build a new communities (on money-independent, but science-oriented basis)
 - ⊗ Easy and fast to organize on-demand workshops and meetings
 - ⊗ Freedom to add specific research tasks “on a fly” (only a direction is given)
 - ⌘ Organizational matters
 - ⊗ To launch a new project when needed
 - ⊗ Easy to join for new participants
 - ⌘ Ways of collaboration
 - ⊗ Meetings and scientific missions
 - to strengthen the collaborative style of research

⌘ Only COST framework has them all

Relations to former recent COST Actions

- ⌘ COST 257 “Impacts of New Services on the Architecture and Performance of Broadband Networks”
 - ☒ ran until September 2000
 - ☒ contributed to network control, traffic characterization, performance measurements and queuing theory for fixed and wireless networks

- ⌘ COST 259 “Wireless Flexible Personalized Communications”
 - ☒ ran until April 2000
 - ☒ contributed to the deployment of DECT and HIPERLAN 1 and to the development of UMTS and HIPERLAN 2 standards, as well as provided initial inputs to the next generations of both HIPERLAN and mobile communication systems

- ⌘ COST 263 “Quality of Future Internet Services”
 - ☒ running until November 2003
 - ☒ is contributing to the area of Internet QoS architectures, protocols and mechanisms

- ⌘ COST 264 “Enabling Networked Multimedia Group Communication”
 - ☒ ran until September 2002
 - ☒ contributed to the area of multimedia fixed and wireless Internet-based networking, and, in particular, to the reliable multicast and the MBONE deployment

Relations to existing COST Actions

⌘ COST 273 “Towards Broadband Multimedia Networks”

- ☒ running until May 2005
- ☒ is working on the radio aspects of future mobile broadband systems
- ☒ major emphasis is given to radio propagation aspects, antenna technologies and radio network aspects of future wireless broadband networks

⌘ COST 279 “Analysis and Design of Advanced Multiservice Networks supporting Mobility, Multimedia and Internetworking”

- ☒ running until June 2005
- ☒ is contributing to the development and application of new and better analytical techniques for the analysis, design and control of advanced multiservice networks supporting mobility, multimedia and interworking

⌘ COST 285 “Modeling and Simulation Tools for Research in Emerging Multi-service Telecommunications”

- ☒ Action is approved but has yet to be launched
- ☒ is aimed at developing new modeling and simulation tools for research in emerging multi-service telecommunications networks in the areas of model performance improvement, air and network interfaces for 3G and 4G mobile radio systems and multilayer traffic modeling and analysis

This Action area of responsibility

⌘ Action 263

- ☑ Completed
- ☑ Fixed-networks oriented

⌘ Actions 273 & 279

- ☑ Do relate to the area of traffic engineering and QoS control in multimedia-enabled wireless networks
- ☑ But they place special bias on physical layer aspects and analytical analysis, and **largely omit** architectural-technical issues and QoS provisioning

⌘ Action 285

- ☑ Is focused on computational tools for modeling and simulation

⌘ **This Action**

- ☑ Is intend to cover a considerable area of research not dealt with by mentioned Actions
- ☑ Moreover, **is intend to fill the gap** between Actions 273 & 279
- ☑ “Traffic and QoS Management in Wireless Multimedia Networks”, i.e. we would carry out a networking Action

Key objectives

- ⌘ Is to
 - ☒ Evolve, develop and investigate new approaches, techniques, methods, models, strategies and tools
- ⌘ For the
 - ☒ Analysis, design, control and evaluation
- ⌘ Of
 - ☒ Future advanced *Multiservice Wireless Networks* (MWNs)
- ⌘ Supporting
 - ☒ User mobility, multimedia applications, and internetworking
- ⌘ Special attention must be given to
 - ☒ QoS and related aspects in
 - ☒ Both access networks and core networks
 - ☒ In the presence of mixed multimedia traffic
- ⌘ To accomplish these tasks
 - ☒ New analytical tools, software implementations and prototypes have to be invented

Key results/benefits

- ⌘ Increase of the knowledge on the MWNs and specifically on traffic nature and behavior and its impact on network architecture, performance and planning
- ⌘ Usage of the Pan-European infrastructure of the COST Action to execute and to perform international test beds and, therefore, to produce valuable outcome
- ⌘ Contributions to standardization bodies on the basis of the obtained achievements by creating inputs leading to well supported decisions
- ⌘ Coordination of the research relations, and foster research networking, between European participating organizations and research groups being active in the field
 - ☒ It's supposed that this COST Action will also contribute its research results to existing and particularly relevant worldwide events, such as conferences and symposia

Scientific Programme

- ⌘ Explained in Technical Annex available on-line
- ⌘ Important broad research tasks to be addressed are
 - ☒ the analysis of the impact of multi-class traffics on network design and dimensioning
 - ☒ the definition of techniques to provide adequate QoS differentiation among traffic classes
 - ☒ the identification of new network planning criteria to cope with the integration of heterogeneous traffic flows
 - ☒ the definition of new services able to provide the requested multimedia contents to users on the move

Organization

- ⌘ Working Group 1
 - ☒ “Traffic Engineering, Congestion Control and Parameters Estimation in Packet-Switched Mobile and Wireless Environment for 3G and beyond”
- ⌘ Working Group 2
 - ☒ “Specific issues and QoS for Future Packet-Switched Mobile and Wireless Networks”
- ⌘ Working Group 3
 - ☒ “Network Planning and Architectures”
- ⌘ Working Group 4
 - ☒ “New Services and QoS Mobile Pricing”

- ⌘ Such work breakdown structure has been selected to
 - ☒ increase the efficiency of the research work, by splitting activities into smaller sub-activities whose outputs can be exchanged at the project level during joint meetings of the WGs
- ⌘ There is no overlap among research areas of WGs
 - ☒ some shared topics are addressed from different perspectives

Dissemination Plan

- ⌘ The Action WEB/Portal
 - ☒ Already on-line
- ⌘ White Papers (derived from TDs)
- ⌘ Workshops organization
- ⌘ Final report
- ⌘ Contributions to standardization bodies

Participants

⌘ Up to date:

- ☒ 19 European countries + 1: format - country (number of entities)
 - ☒ Austria (2), Belgium (4), Croatia (2), Cyprus (1), Finland (2), France (3), Germany (5), Greece (2), Ireland (2), Italy (3), Netherlands (2), Norway (1), Portugal (2), Slovakia (1), Slovenia (1 + 1 on pending), Spain (3), Sweden (1 + 1 on pending), Switzerland (1), UK (5) +Russia (2)
 - ☒ Poland is on pending list
- ☒ 42 participants (Prof. or Dr.) + postdocs, PhD students, postgraduates, fellows ...
- ☒ 3 outside-EU professors have expressed an interest
- ☒ TOTAL: currently 60 people are on the e-mail list of this COST initiative

Current Status

- ⌘ Approved by CSO
- ⌘ Budget allocated
- ⌘ Member states signing MoU
- ⌘ Will start in a couple of months

Current Research Activity

- ⌘ Traffic issues for Next Generation Networks (NGN)
 - ☒ cross-layer multiservice traffic modeling with respect to mobility
 - ☒ estimation of NGN multiservice traffic volume and resource optimization
 - ☒ investigating of TCP peculiarities over NGN

Cross-layer Multiservice Traffic ...

⌘ ... Modeling With Respect to Mobility

⌘ Motivation

- ☒ traffic models for conventional 2G mobile systems do not take into account nomadic behavior of users
- ☒ low layers affect heavily to delivery of real-time streams

⌘ Approach

- ☒ mobility model, teletraffic model and low layer model must be accounted

⌘ Achieved results

- ☒ the advanced model (currently under investigation via simulation)

⌘ Related publications

- ☒ NEW2AN 2004
- ☒ 3 submissions

Estimation of NGN Multiservice ...

⌘ ... Traffic Volume and Resource Optimization

⌘ Motivation

- ☒ NGN traffic will be of great diverse
- ☒ traffic estimation and core network parameters optimization must be performed

⌘ Approach

- ☒ advanced teletraffic theory combined with statistical analysis

⌘ Achieved results

- ☒ allow making easier both the requirements to equipment of the internal IP networks, performance of nodes/routers of NGN and the requirements to equipment of nodes providing the interaction between NGN systems and external networks

⌘ Related publications

- ☒ VTC Fall 2003
- ☒ NEW2AN 2004
- ☒ European Wireless 2004
- ☒ ICC 2004

Investigating of TCP peculiarities ...

⌘ ... Over NGN

⌘ Motivation

- ☑ handling of TCP traffic is of paramount importance in NGN, well classified and optimized TCP connection can benefit incredibly

⌘ Approach

- ☑ measurements and statistical analysis

⌘ Obtained results

- ☑ own understanding of short TCP connections influence to performance
- ☑ a new TCP connection classification method based on Markov model is developed and currently under investigation
- ☑ interesting idea on classification of users is delivered

⌘ Related publications

- ☑ started very recently
- ☑ 1 submission for 2004 is planned

Thank you for listening!

Tampere University of Technology, FINLAND
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