Project Achievements

CELTIC Telecommunication Solutions

Easy Wireless 2

The main objective of the project is to enhance user experience of mobile users in heterogeneous networking environment.

Main focus

With the increasing popularity of multimedia applications, QoS has become an important issue. There are various ways to increase the user's Quality of Experience (QoE), for example, we can

1. enhance and use the Quality of Service (QoS) mechanims in the core and/or access network technologies,

2. perform vertical handovers to avoid the badly performing networks,

3. perform load balancing / offloading in order to avoid the network congestions,

4. adapt the application traffic stream to the prevailing network conditions.

The aim is in methods, which are easily deployable, i.e., do not require modifications to the existing protocols & routing hardware. One of the key component in reaching the goal is first to understand the user's QoS / QoE, which is obtained by QoS measurements. Real-time QoS measurements provide also a way to get immediate feedback of the network path performance, which can be used to trigger the potential QoS improving mechanisms.

Approach

As shown in Figure 1, EW-2 focused on various aspects. The work of EW-2 was driven by a market & business model analysis performed in the beginning of the project to expose the need. The main technical driver was to develop the real-time QoS measurement solutions forward, and to exploit the results in real-time in enhancing the user experience. Particular attention was given to the QoS-guided vertical handover mechanisms and Regressive Access

Control (REAC) solutions, which are both examples of enhancing QoE of a user without requiring a special QoS support from the network. Effort was put also to mobile network performance analysis, QoS performance information gathering and visualization, QoS-enabled network management, and wireless network planning especially in the context of 3G femtocells.

Achieved results

EW-2 produced several demonstration and prototype level deployments and some new features to existing products. The project's goal was approached from several points of view, and the main technical achievments are the following:
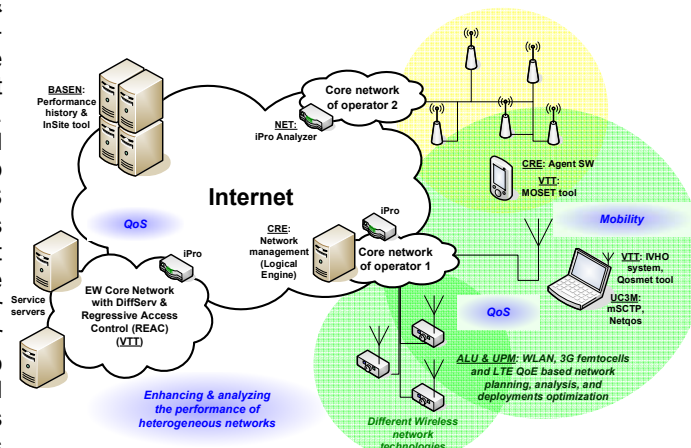
Regressive Admission Control, REAC (a demonstration)

♦ Enables guaranteed QoS for practically any network path

♦ Bases the decisions on real QoS

♦ Enabling REAC needs extra intelligence only to the path's end points

Intelligent Mobility

♦ QoS-guided Intelligent Vertical Handovers (IVHO) (a demonstration)

♦ Network side assistance/control option (a demonstration)

Understanding QoS

♦ Two-phased traffic classification (a demonstration)

- Generic QoS Measure (a prototype of a new kind of metric)
- Indoor wireless channel assessment, planning, and optimization (a demonstration)

Real-Time Passive QoS measurements (Qosmet, a product prototype)

- End-to-end & multipoint application flow QoS measurements
- Light-weight QoS agents allow measurements in almost anywhere
- Measurements over NATs
- QoS Measurement Control Protocol (QMCP) allows fully distributed and remote controlled measurements
- Easy access for 3rd party listeners

  - E.g., optimize your application/service performance based on the real easured QoS.
- Manage large scale measurement data with a network analyzer (iPro, a product).
- Visualize results on a QoS heat map (InSite, a product prototype)

Impact

The execution of the EW-2 project had various impacts:

- Industrial partners got a chance to develop new products in the project. For example, NetHawk was able add a new application, enabling QoS monitoring of high speed networks, in their iPro tool. Creativ IT was able to develop

further their agent based network management solution, which is on a track to become a new product in near future. BaseN developed a new visualization tool, potentially becoming a new product to their portfolio in later phase.

- Industrial partners were also able to enhance their existing products. For example, NetHawk enhanced their M5's monitoring capabilities: A new user plane analyzer has been developed based on project results. The tool integrates M5 with iPro and offers flow/QoS monitoring for user plane connections. Also, the partners validated solutions and tools in their portfolios to allow ways to compete profitably in a demanding market where innovation is an important asset of the companies. Visibility, being an important aspect, has increased due to the projects dissemination activities.

- Considering return of investment (RoI), NetHawk's new applications that are based on EW-2 results form the basis of high speed network monitoring, and have industry's best performance. All M5 product sales for Ethernet based network monitoring (LTE, PS core) are based on project results. When counting only the features based

on the project results, a 10x RoI is expected.

- For the research centres and universities, the project increased core competence of the research personnel, provided with a mean to develop further their research platforms and new algoritms, and opened new technical areas. The project also increased visibility through publications and demonstration opportunities and provided with new contacts to industry.

- A new company (MOS4 Oy) was found in Finland in 2009. One of its founders was working in EW-2, and the topics of the company were partially based on the EW-2 work.

- An important point for visibility are publications, which EW-2 produced over 20, including mostly international scientific conference articles, but also journal papers and theses (M.Sc. and Dr.Tech.). In addition, the project produced several invention reports and patent applications. Finally, over 20 research reports were produced, leaving material to be published also after EW-2's official ending.

- The EW-2 project had a lot of cooperation with other projects. Some of the potential work was not possible to do in EW-2, e.g., application flow adaptation based on the prevailing QoS was done in co-operation of Celtic SCALNET project. Also, project cooperation, mostly related to the QoS measurement tools of EW-2, was done with EU Games@Large, EU TALOS, ITEA CAM4Home, and Celtic IPQNSIS.

- For many partners, the results of the project opened new business oportunities, increasing profit. For example, because of the increased knowledge, VTT has got new QoS related contract research projects with industry. In addition, pilots for commercializing the EW-2 QoS measurement tools, being already in prototype phase, are under work in Finland.