Project Information

Road to Media-Aware User-Dependant Self-Adaptive Networks

The main outcome of R2D2Networks will be a user-dependant media-aware self-adaptive network management system that will help the network to learn What, When, Where and How different services and resources are to be used. It will evolve the current home and access/ aggregation networks towards an architecture with a better use of the connectivity resources and an optimization of the provided service quality. The proposed solution is based on a resource manager that dynamically optimizes the network resources, and also the Quality of Experience (QoE) of the customers.

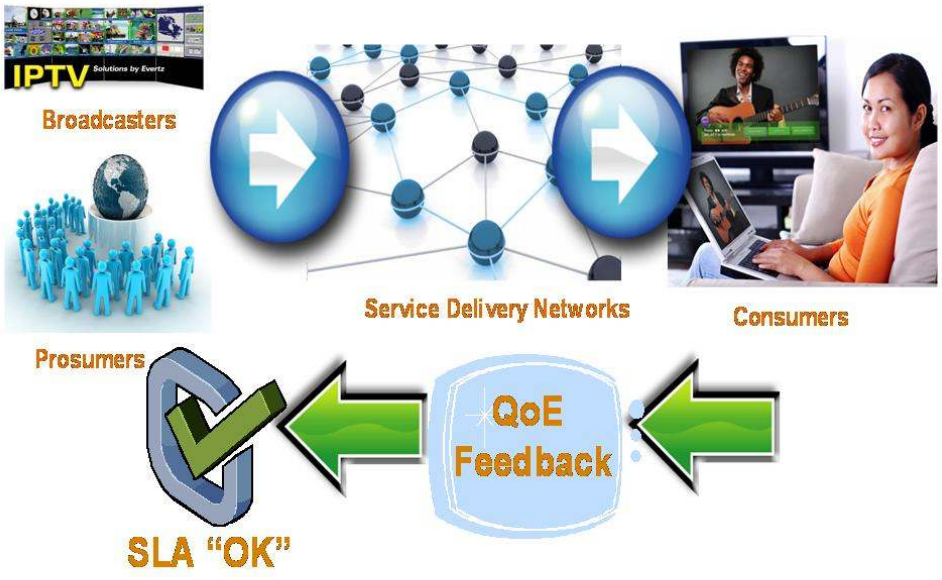
Main focus

Current access network architectures do not allow operators or household owners to dynamically control which services at what quality level should be delivered to the access link (i.e. static virtual circuits are used for IPTV). Services are delivered in a best-effort fashion, and in case of bandwidth failures or link congestion, all services used by the household are impacted, presenting long delays and decreased user experience, referred to as QoE.

The main focus of this project is to develop a network management system that automatically optimizes the service delivery to the households independent of specific content provision architectures. Within this concept, the user and access/ aggregation networks will be continuously monitored regarding the provided service QoE. Tools to monitor the network and the perceived QoE of users in real-time will be developed to check that the services are offered as agreed. These monitoring data and user feedback will form the basis for the decisions made in the network manager entities.

Approach

For tackling the objectives of the project, a number of issues have been analysed,



R2D2 Networks

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Project Website

www.celtic-initiative.org/projects/r2d2networks

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which will be addressed in the corresponding work packages. First of all, a formal and complete definition of the requirements and specifications of the R2D2 system will be produced, following an innovative methodology aiming at a *user-dependant* and *self-adaptive* system.

Special attention will be paid to the design of specific *network and QoE monitoring tools*, and its integration within in-home and access/ aggregation network elements.

The in-home network design will fit the R2D2 home network components, like the QoS/QoE monitoring home agent, based on the most prominent home network architectures and standards, e.g. HGI and ETSI TISPAN. The in-home networks will use advanced resource allocation algorithms to enhance the system QoS and QoE by adaption of the transmitting scheme (power, spatial multiplexing, code, etc) to the instantaneous channel characteristics as well as to the needs of the user and traffic load of the system. Tools like DAO (DSL Automatic Optimiser) for xDSL and DBA (Dynamic Bandwidth Allocation Mechanism) for GPON will be investigated and developed.

In this area, standards like TR-101 (Migration to Ethernet based DSL Aggregation) and its extension to GPON (TR-156), TR-126 (Triple-play QoE requirements), TR-069 and amendments (CPE WAN management protocol) from the Broadband forum will be considered as design guidelines.

Regarding the network management system, its design will target the implementation of all the modules and interfaces for the Network Resource Manager (NRM) and deploying a prototype that will be included in the R2D2 test bed. An objective is to integrate the procedures for the management of transport and access networks (NGN TISPAN Resource and Admission Control Subsystem - RACS), with the protocols and procedures defined in the access and aggregation network for the control and dynamic reconfiguration of their elements like the Access Node (TR-147 Layer-2 Control Mechanism L2C from BBForum, Access Node Control Protocol ANCP from IETF). This task will exploit techniques such as hierarchical scheduling and multicast management among others.

These procedures enable different features like policies management over Border Nodes of the aggregation network, dynamic reconfiguration of the network elements, resources provisioning end-to-end, etc. Thus, the integration will be developed following the approach as being defined in the WT-134 (Policy Management Framework) from BBForum.

Finally a test bed using PanLab resources is planned, where the corresponding tests and validation activities will be carried out.

Main results

Main results from R2D2Networks project include:

- User's profile, able to identify the real needs of a family in terms of service consumption during the day.
- Tools for QoE monitoring and its retrofitting to the resource manager.
- Prioritize services on the home and access links, with fair scheduling mechanism based on QoS requirements and household preferences.
- An optimal solution for managing in-home and access/aggregation networks, with regards to high resource deployment with simplified protocols architecture.
- A distributed Test Bed where close to real network scenarios can be practically implemented and tested.

Impact

The future holds a multitude of new services that will be delivered over the telecommunication networks. The evolution is not limited by creativity or customer requirements, but by technical and economical obstacles. There are architecture and security constraints that need to be addressed, but also user-oriented impediments.

The many advanced technologies provided in R2D2Networks will enable the exploitation of the already deployed European infrastructures cost-effectiveness, whilst applying research into the User-centric based services environment, with specific attention to the efficient management of connectivity resources among the home, in-building and access networks.

R2D2Networks content provider's independent network management system will reduce the time to market, and also allow smaller operators to benefit from our solution in the way towards a real "Service Delivery Network".

About Celtic

Celtic is a European research and development programme, designed to strengthen Europe's competitiveness in telecommunications through short and medium term collaborative R&D projects. Celtic is currently the only European R&D programme fully dedicated to end-to-end telecommunication solutions.

Timeframe: 8 years, from 2004 to 2011

Clusterbudget: in the range of 1 billion euro, shared between governments and private participants

Participants: small, medium and large companies from telecommunications industry, universities, research institutes, and local authorities from all 35 Eureka countries.

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