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Abstract:	This document describes the co-operation between the new IST projects in the environment Next Generation Networks. It identifies the projects and explains the areas in which they are active.
Keyword List:	AQUILA, IST, Next Generation Networks, Internet Infrastructure, Concertation

Executive Summary

At the beginning of the new IST Programme work item: "Next Generation Networks (NGN)", it is necessary to ensure that the Commission and all the projects working on this topic are familiar with the scope and objectives of the other projects, in order to exploit areas of synergy and to avoid overlap. After a short *Introduction* to this document, chapter 4 performs precisely this task, by presenting a short description of each selected project addressing Action Line IV.2.3.

All projects working in the area of Next Generation Networks and the related Action Lines covered by Unit INFSO E1, as well as projects from other Units, which have interests in Next Generation Networking, and in particular relevant testbeds, and relevant third parties have been invited by the CEC to participate in related concertation actions.

It is important to note that, although all projects address the same Action Line, this document highlights the fact that the topic of "Internet Infrastructure" is many-faceted.

When also other aspects such as standardisation (including the work in IETF, Internet2 and ETSI), management, charging and trialling of new protocols are included, it can quickly be appreciated that there is room for all the projects mentioned in chapter 4, without a danger of serious overlap.

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1 Introduction

It is important that all the new IST projects within Action Line IV.2.3 (*Network integration, interoperability and interworking*) collaborate to avoid duplication of effort and to remain informed of the latest developments in the relevant fora and standardisation bodies. The co-operation will lead to a sharing of the results and achievements, and may also lead to joint demonstrations and comparison of results, thereby increasing the probability of European consensus being achieved.

2 Scope of the Document

The aim of this deliverable is to highlight potential liaisons between the project AQUILA and other IST projects. Due to the early stage of the project, only a rough classification of related projects can be given.

3 Relationship with the Overall Project Objectives

This document serves as a starting point for establishing the necessary relationships between AQUILA and other IST projects. During the course of the project, the links will be followed more closely. As a first step, a regular exchange of information will be established with the related projects.

The intention is to follow closely the IST concertation activities related to the Action Line, where AQUILA belongs to. The respective EU Information Society Directorate-Generale Unit INFSO E1 already organised a KickOff meeting for the “Concertation of Next Generation Networks Projects (NGN)” in order to clarify the objectives of the IST concertation mechanism and to present a first set of interested projects.

Different topical working groups have been established and projects committed themselves to participate and contribute to these working groups. These groups are “HOME and ACCESS Network”, “Network Management” and “Internet Infrastructure”.

AQUILA and all other projects, mentioned in the following chapter, belong to working group “Internet Infrastructure”.

4 Liaisons with other IST projects

The following projects concentrate on the topic of “Internet Infrastructure” within the “Next Generation Networks” cluster: BRAHMS, CADENUS, GCAP, GEOCAST, TEQUILA, WINE, 6INIT, VideoGateway, NETGATE. This list does not claim to be complete.

In order to get an understanding of the main work area of each project, a short description (abstract and objectives) is given below.

BRAHMS (Broadband Access High data rate Multimedia Satellite):

Abstract: The aim of the BRAHMS project is to define and develop a universal user access interface for Broadband Satellite Multimedia services which is open to different satellite system implementations. The motivation is to open up and expand the market for satellite user terminals by harmonising the majority of common satellite access network functions whilst allowing flexibility for optimised or proprietary air interfaces to satellite systems. The targeted end-user markets for Broadband Multimedia Satellite Systems (BMSS) are mainly those where high speed access is at a premium. Two-way transmission for Direct-to-Office or Direct-to-Home multimedia services will be addressed with bit rates up to 150 Mb/s (forward link) and 20 Mb/s (return), providing the end usr with an effective bandwidth that improves upon state-of-art multimedia systems.

Objectives: The objective of BRAHMS is to define a universal user access interface for Broadband Satellite Multimedia Services which is open to different satellite system implementations, including GEO and LEO constellations.

The rationale for this approach is to open up and expand the market for satellite user terminals, and for satellite systems in general, by harmonising the majority of common satellite access network functions whilst allowing flexibility for optimised or proprietary air interfaces to satellite systems. This commonality and flexibility (e.g. for frequency, access type, orbit) is obtained by separating physically-related functions from common service and access functions.

The concept is dubbed the Broadband Multimedia Satellite System (BMSS) and aims to address a range of multimedia user groups with data rate requirements up to 150Mb/s. This BMSS approach is seen as a vehicle for convergence between fixed and mobile multimedia networks towards the Global Multimedia Mobility (GMM) architecture, by merging service functions derived from the UMTS/IMT 2000 and from fixed broadband access.

The use of IP-based satellite transmission will be considered as a solution to convergence towards seamless broadband service provision.

CADENUS (Creation and Deployment of End-User Services in Premium IP Networks):

Abstract : The CADENUS project will propose an integrated solution for the creation, configuration and provisioning of end-user services with QoS guarantees in Premium IP networks. The solution is based on the CADENUS framework, which is a structuring set of core functional blocks at the user - provider interface. It will provide service creation and configuration in a dynamic way through the appropriate linking of user related service components (authorisation, registration, etc.) to network related service components (QoS control, accounting, etc.). For the provisioning of end-user services with QoS guarantees, a number of components are required. Some of them have been developed or are under development in standardisation bodies. Other QoS related issues, will be developed in the project. Also, the project will produce recommendations, architectures, mechanisms and policies concerning service configuration and provisioning for both network operators and service providers.

Objectives : The primary goal of the project is to develop, implement, validate and demonstrate a framework for the configuration and provisioning of end-user services with QoS guarantees in Premium IP networks (e.g. for voice over IP). Sub-objectives are: To investigate the system-related architectures for implementing Premium IP network transport services to deliver end-user services with QoS. To specify and realise a framework for end-user services having a range of call features and with QoS guarantees. To develop a system implementing the framework which enables the efficient delivery of services by new enterprises and traditional operators. To trial and demonstrate end-user services with QoS guarantees via this framework. To disseminate the results in standards bodies and to the industry in general.

GCAP (Global Communication Architecture and Protocols for new QoS services over IPv6 networks):

Abstract : High performance networking with guaranteed Quality of Service is one of the major challenges of the next decade. It mandates very important efforts to provide multimedia and multicast communications to wide area advanced users, because the limited mechanisms of UDP and TCP cannot adequately support innovative distributed applications. Furthermore, future architectures will involve heterogeneous networks, as new satellite and terrestrial networks having sophisticated services. As a consequence, GCAP aims at developing for the future Internet two new end-to-end multicast and multimedia transport protocols, embedded in a new global architecture to provide a guaranteed QoS to advanced Multimedia Multipeer Multinetwork applications. In order to rapidly experiment the proposed solutions, an efficient deployment of the communication software will be developed over an industrial IPv6 layer by using a programmable active network based technology.

Objectives : The objectives of the project are : - to define and evaluate a new end-to-end multicast transport protocol and a new end-to-end multimedia multicast transport protocol for supporting dedicated or specialised applications having guaranteed QoS requirements ; - to define and evaluate a new integrated global multinetwork end-to-end architecture for supporting multimedia and co-operative applications needing guaranteed Quality of Service ; - to propose a design approach to rapidly deploy and use such new protocols, that will be developed on top of the new QoS architecture based on IPv6 and DiffServ, by means of an active

network based technology ; - to illustrate the feasibility and evaluate the potential of the advocated approach by conducting two experiments using the national research networks and their European interconnection.

GEOCAST (Multicast over geostationary EHF Satellites):

Abstract: The satellite plays an increasingly more important role in the Global Information Infrastructure. Differing from the LEO (low earth orbit) revolutionary constellations that intend to perform a worldwide multipurpose coverage, GEO (geostationary) satellites can leverage their geographical advantageous position by completing the one-way TV broadcast services they already perform with two-way IP multicast services.

In parallel with this service evolution, geostationary satellites systems are evolving towards higher frequencies (Ka and EHF) and more complex missions (e.g. multi-beam coverage, inter satellites links, regenerative payloads with on-board processing) in order to increase their capacity.

GEOCAST intends then to help defining next generation multicast systems by marrying multicast services with next generation satellite systems through a progressive and well-adapted strategy.

Objectives: Due to the satellite evolution, a separate definition of ground and space segments is not any more possible. On-board processing on the one hand, higher frequencies on the other hand, have impacts on the definitions of all segments and all layers of the communications links. The purpose of GEOCAST is then to come up to a better definition of such systems, encompassing building blocks (terminals, gateways, satellite) as well as protocols (network, medium and physical layers) which can match the needs of such multicast systems. The objectives are then to define next generation systems, demonstrate their feasibility and optimise their performance thanks to an emulator realisation, and validate their performance thanks to live experiments, which can only bring the best practice experience necessary for a wide adoption by operators. Successful deployment of such systems can be measured by contributions to normalisation bodies (Internet Engineering Task Force - IETF- and European Telecommunications Standardisation Industry - ETSI-), as well by a wide participation from early participants.

TEQUILA (Traffic Engineering for Quality of Service in the Internet, at Large Scale):

Abstract : The objective of the project is to study, specify, implement and validate a set of service definition and traffic engineering tools to obtain quantitative end-to-end Quality of Service guarantees through careful planning, dimensioning and dynamic control of scaleable and simple qualitative traffic management techniques within the Internet (i.e., DiffServ). The following technical areas will be addressed: (a) Specification of static and dynamic, intra- and inter-domain SLSs to support both fixed and nomadic users. (b) Protocols and mechanisms for negotiating, monitoring and enforcing SLSs. (c) Intra- and inter-domain traffic engineering schemes to ensure that the network can cope with the contracted SLSs - within domains, and in the Internet at large. All specified functionality will be validated through simulation, prototype development and network experiments.

Objectives : The project has five key objectives: (1) Study the issues behind, develop architectures for, and propose algorithms and protocols to enable: negotiation, monitoring and enforcement of Service Level Specifications between service providers and their customers and between peer providers in the Internet. (2) Develop a functional model of co-operating components, related algorithms and mechanisms to offer a complete solution for intra-domain traffic engineering to meet contracted SLSs in a cost effective manner. (3) Develop a scalable approach, architecture and set of protocols for interdomain SLS negotiation and QoS-based routing to enforce end-to-end quality across the Internet. (4) Validate the above through both simulation and/or testbed experimentation . (5) Use, enhance and contribute to drafts, specifications and standards of the wider international community, participate in IST consensus activities and disseminate TEQUILA results.

WINE (Wireless Internet Networks):

Abstract : In WINE we study necessary technologies to build fully IP-based optimised QoS aware wireless Internet. We believe that true wireless Internet system should be optimised without underlying wireless ATM and as far as possible independent from media. The unique goal of WINE is to study all needed issues in protocol layers to find globally optimised end-to-end solution. Starting from theoretical issues for W-IP networks, we conduct simulations and large case studies over research networks to verify theoretical basis. We will then implement the results into three platforms. To facilitate independence of wireless media a W-IP adaptation layer is built that is configurable allowing optimisation for different wireless media. The test-beds are Bluetooth, IEEE 802.11 and Hiperlan.

Objectives : WINE´s main aim is to build fully IPv6-based globally optimised wireless Internet environment with QoS awareness. To reach this, WINE will have sub-tasks heading to the main aim. First, we aim to implement three testbeds with simulation models dedicated for specific environments and current IPv4/v6 implementations. Second, we aim for solid theoretical understanding of wireless Internet environments. This knowledge will be verified and based on practical tests on testbeds and simulation models and large scale research networks. Based on previous results we aim to implement true wireless Internet solution that is as far as possible radiolink independent. We are building wireless IP adaptation layer, that is configurable so that it can be optimised for different platforms and links. Above the layer objective is to implement wireless Internet protocol fully compatible to current Internet world.

6INIT (IPv6 INternet IniTiative):

Abstract: The objective of the 6INIT project is to prove the business case for Euro-IPv6 by defining implementation and set-up procedures for European IP Networks to offer production IPv6-based Internet services.

The primary areas addressed within this project will be to:

- define operational procedures for IPv6 networks and for IPv4 to IPv6 network and application migration
- interconnection of IPv6 native applications and IPv6/IPv4 networks.
- set up IP telephony services

- implement IPv6 applications (Stock Exchange, Remote Newspaper printing, household Internet IP Plug access).

- initiate the implementation of an IPv6 Internet Service Provider.

Objectives: The objective of the 6INIT project is to validate the introduction of the NEW INTERNET in Europe based on the new Internet Protocol version 6 (IPv6), which offers a solution for current problems in space address limitation, quality of service, mobility and security. The 6INIT project will lead to the set-up of a first European operational platform providing customers with native IPv6 access points and native IPv6 services.

6INIT is a co-ordinated initiative of the major European Telecom companies, equipment manufacturers, solutions / software providers and research labs that will lead to provide production IPv6 transit service to facilitate high quality, high performance, and operationally robust and secure IPv6 networks in view of wider deployment of European E-commerce and convergence.

VideoGateway (A video gateway between the next generation broadband Internet and the current narrowband Internet for live and on-demand access):

Abstract: The proposal is for a system that functions as a gateway between the next generation Internet streaming video standards and the narrowband Internet with its own video streaming standards. The proposed video gateway will also serve as a gateway between different video sources coming from analogue video, DVB (Digital Video Broadcasting) compressed video, stored MPEG (Motion Pictures Experts Group) video coming off video servers and DVD (Digital Video Disc) video to the narrow-band Internet. Since the world is moving to digital at an accelerated rate, there is a real need to develop such a gateway with capabilities to handle compressed video already in MPEG format and transcode it efficiently with maximum quality.

Objectives: While today's Internet is evolving quickly, the next generation broadband Internet will evolve at an even more accelerated pace. Based on evolving technologies such as cable modems, xDSL (Digital Subscriber Line), Gigabit Ethernet and ATM (Asynchronous Transfer Mode), it will enable high quality, MPEG-based video communication. This type of broadband network will transport high quality video content that cannot be streamed over today's Internet, so the Internet will be composed of heterogeneous networks with different bandwidth and protocol capabilities. Our video gateway will function as a gateway between video streaming standards currently in use on the narrowband Internet and those to be used by the next generation Internet. It will serve as a gateway between different video sources originating from analogue video (DVB compressed video, stored MPEG video and DVD) and the narrowband Internet. The system will perform dynamic bit-rate adaptation and protocol conversion between networks for live and on-demand audio video applications.

NETGATE (Advanced Network Adapter for the new Generation of mobile and IP based Networks):

Abstract: The NETGATE project aims to design and develop a novel, low cost, flexible, highly efficient and scaleable system able to operate as a high performance protocol gateway,

which will bridge the 'compatibility' gap between different telecommunication networks such as SS7, IN, ATM, GSM, GPRS and also provide interfaces to IP based networks. The solution that NETGATE suggests will be able to provide interoperability between wireless platforms (GSM, GPRS) and wired platforms (ISDN, ATM, IP as well as an open architecture for future technologies. Moreover NETGATE solution is meant to be fully flexible, as it will provide a single node, which combines different interfaces and makes possible, through the adequate hardware and software components, the inter-working between various telecommunication protocol stacks.

Objectives : To design and develop a novel, low-cost, flexible, highly efficient and scaleable system able to operate as a high performance protocol gateway, which will bridge the 'compatibility' gap between different telecommunication networks such as SS7, IN, ATM, GSM, GPRS and also provide interfaces to IP based networks. To provide a high performance protocol execution engine which will be based on a robust run-time executive optimised for protocol execution. To provide generic protocol translation models for inter-working between the different interfaces and resource management techniques based on standard technologies. To integrate different networking protocol stacks and interface with them in live networks. To provide instantiations of the NETGATE system as an GPRS support node combining the SGSN & GGSN functionality and an enhanced VoIP gatekeeper. To assess the migration of telecom operators to the new types of services and networks.

5 Standardisation Bodies

The project will provide the effort for liaising with organisations outside the IST Programme, for an exchange of views and documentation and for significantly enhanced contributions to jointly developed and widely supported standards. The following fora and standards bodies have already been identified:

- ETSI
- IETF
- Internet2
- EURESCOM.

The activities include providing contributions to these organisations, based on consensus opinions from the consortium and the concertation working group, or addressing specific technical issues as well as summarising the meetings, for reporting at project/cluster meetings and/or workshops.

A major impact of IST RTD projects will be on the harmonisation of standards through their contribution. The early knowledge of the upcoming standards, and experience with corresponding implementations, can give European manufacturers a strong time advantage in reaching the market. Partners in the AQUILA consortium have already established contacts with the IETF, Internet 2, as well as with ETSI and EURESCOM. In this way, AQUILA will ensure that inputs from the RTD projects are submitted at the appropriate level. This procedure has already been used in the ACTS Programme with success.

Understandings have been reached with members of relevant ETSI and EURESCOM groups, regarding the importance of such co-operation and flow of information. Similar agreements are being sought with the Forums (IETF and Internet2) to get the results of IST projects flowing into the standards work (especially the Internet-related standards) at a global level.

6 Glossary and Acronyms

BMSS	Broadband Multimedia Satellite Systems
CEC	Commission of the European Communities
DVB	Digital Video Broadcasting
EHF	Frequencies in the 40/50 GHz band
ETSI	European Telecommunications Standardisation Institute
EURESCOM	European Institute for Research and Strategic Studies in Telecommunications
GEO	Geostationary Orbit
GMM	Global Multimedia Mobility
GSM	Groupe Spécial Mobile
IETF	Internet Engineering Task Force
IN	Intelligent Networks
INFSO	Information Society
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IST	Information Society Technologies
ITU	International Telecommunications Union
LEO	Low Earth Orbit
NGN	Next Generation Networks
QoS	Quality of Service
RTD	Research and Technology Development
SLS	Service Level Specification
SS7	Signalling System number 7
UMTS	Universal Mobile Telecommunication System