Enabling efficient and operational mobility in large heterogeneous IP networks

The goal of ENABLE is to research, develop, test, integrate and evaluate mechanisms and technologies for the deployment of efficient and operational mobility as a service in large scale IPv6 network environments, taking into account also the transition scenario from IPv4.

At A Glance: *ENABLE*

Project Coordinator

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Duration: *01/2006 – 12/2007*

Total Cost: *€3,792m*

EC Contribution: *€2,449m*

Main Objectives:

ENABLE will concentrate on the following main areas of work:

- Enhancement of Mobile IPv6 to enable, in the medium term, the offering of transparent terminal mobility in large operational networks including multiple administrative domains, heterogeneous access technologies and a rapidly growing number of users. This activity will address outstanding Mobile IPv6 issues like service authorization, autoconfiguration, interworking with IPv4, coexistence with IPv6 middle-boxes (e.g., firewalls) and protocol reliability.

- Enrichment of the basic mobility service provided by Mobile IPv6 with a set of additional features, enabling the on-demand activation and autoconfiguration of specific "premium" network features (e.g., multihoming, QoS, fast handovers) based on the operator policies and customers profiles.

- Analysis of goals and design principles for the evolution beyond Mobile IPv6 in the long term. This activity will investigate scalability and performance issues that Mobile IPv6 might raise when the vast majority of Internet nodes will become mobile, introducing the requirements for a highly efficient treatment of traffics generated on the move. Moreover, the promising but not yet fully understood mobility management alternatives (e.g., Host Identity Protocol) will be assessed, with the objective to identify possible strategies for their smooth deployment starting from an architecture based on Mobile IPv6.

Towards these, ENABLE objectives are summarized as:

1. Design an overall Mobile IPv6 service enabling architecture, including dynamic mobile IPv6 bootstrapping as a fundamental building block.

2. Develop required technologies to enable the deployment of Mobile IPv6 in real-life environments, including IPv6 middle-boxes (e.g., firewalls, VPN gateways) and the legacy IPv4-only access infrastructures.

3. Investigate solutions to improve the reliability of Mobile IPv6 and enable an optimal usage of network resources for the deployment of Mobile IPv6 in a provider network.

4. Enrich the basic mobility service provided by Mobile IPv6 with a set of additional features, enabling the on-demand activation and autoconfiguration of specific "premium" network features (e.g., multi-homing, QoS, fast handovers) based on the operator policies and customers profiles.

5. Assess and compare the mobility management solutions that could represent viable alternatives to Mobile IPv6 in the long term, and identify a transition path for the smooth deployment of such technologies starting from the Mobile IPv6 environment.

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6. Validate the results of the developed mechanisms and technologies through prototyping and laboratory testing.

7. Disseminate project results, through standardisation activities (with a focus on IETF and 3GPP), public trials and academic conferences and journals, as well as liaison and cooperation with ongoing national, European and other international projects.

Technical Approach

The project activities are distributed into eight Work Packages (WPs):

- WP1 will design the overall network architecture.

- WP2 will develop the solutions needed to enable the deployment of Mo-bile IPv6 in real-life environments (e.g. interworking with firewalls and NATs).

- WP3 will investigate on solutions to improve the reliability of Mobile IPv6 and enable an optimal usage of network resources.

- WP4 will enrich the basic mobility service provided by Mobile IPv6 (i.e. best-effort session survival across subnet changes) with a set of additional features.

ENABLE "Universe"

- WP5 will assess and compare the mobility management solutions that could represent viable alternatives to Mobile IPv6 in the long term (Host Identity Protocol, IKEv2 mobility and multi-homing, etc.).

- WP6 will validate the results of the other technical WPs through prototyping and laboratory testing.

- WP0 and WP7 will be responsible for project management, dissemination, clustering/liaison and standardisation activities.

Key Issues

Today mobility services are being offered using dedicated Radio Access Networks (RANs), each
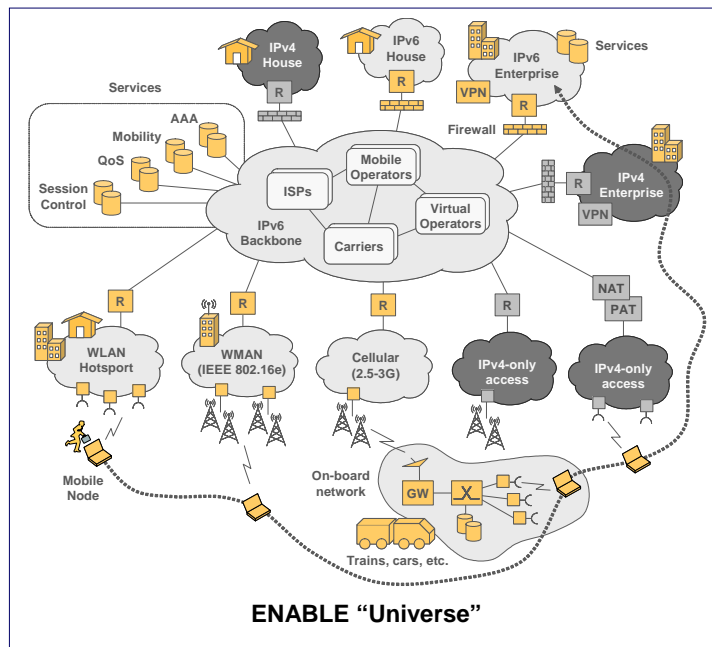
one optimised for a specific application (e.g., voice or data transfer) and coverage (e.g., indoor, metropolitan, national and global). Heterogeneous access technologies are very often operated by different organizations (Wireless ISPs, mobile operators, etc.) and the user is supposed to be smart enough to choose the most suitable alternative based on terminal capabilities, coverage conditions in the visited location, application requirements and available subscriptions. The foreseen evolutionary steps are the following:

1. Integration of heterogeneous access infrastructures to deliver ubiquitous mobility in an efficient and cost-effective way.

2. Smooth migration to an all-IP network infrastructure.

3. Evolution towards a fully mobile Internet, including a fast growing number of IP nodes (sensors, phones, PCs, etc.).

Expected Impact

A high level view of the ENABLE reference scenario is presented as the ENABLE "Universe". The key assumption is that ubiquitous IP mobility will be a service offered by providers (mobile operators, carriers, ISPs, etc.).

Mobile IPv6 as it is today is not suitable to implement this vision.

ENABLE will fill the gaps working in close relation with the IETF, in order to ensure that the solutions developed by the project are in line with the architectural principles devised by the Internet community and can get possibly standardised.

The research in ENABLE will increase the ability to deploy a future-proof mobility infrastructure for the usage of demanding, future applications like pervasive peer-to-peer, audio/video conferencing over IP, emergency services, etc. ENABLE will also contribute to the development of a long-term vision towards the future fully mobile Internet, investigating on possible transition paths towards novel, and not yet fully understood, technologies.