RiNG
Routing in Next Generation

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Project Objectives

1. Coordinate a community "think tank" on routing aspects (Routing Cluster), providing operational support for the organization of open working meetings and other collaboration tools, such as an email exploder and web site.

2. Surveying both ISP and user (site) requirements for routing in the next generation of networks.

3. Analyze the related state of the art in standardization and policy versus the user/ISP perceived requirements.

4. Development of research and innovation strategies for inter-domain routing evolution.

5. Disseminate the project and related results, including the relevant standardization and policy activities.

Project Motivation

- IPv6, Broadband, 3G and beyond, mobility and next generation fixed and wireless networks expose limitations on the scalability of Internet:
  - Expected explosion of billions of devices, work and home appliances, sensors, etc., to be connected to the Internet, for example considering the new IP Home Platforms, GRID and Ambient Intelligence scenarios.

- This massive deployment raise new challenges.

- The inter-domain routing architecture of next generation networks needs new special attention.

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Routing Issues

- Resilience and scalability (even millions of prefixes) and quick convergence after failures.

- Desire of end-sites to be provider-independent (PI) by having their own prefixes, especially with IPv6 (which currently has no PI address space).

- Inter-domain traffic engineering (or even QoS).

- Security of the routing infrastructure (e.g., protection against prefix hijacking), prevention of configuration errors and mechanisms to better deal with denial of service attacks (DoS).

- Mobile networks. Utilization of IP in airplanes, cars, trains, ships and other transport means not only for Internet connectivity, but also to provide a communication means in between vehicles (e.g., Car to Car communications for eSafety).

- On-demand or dynamic layer 1 or 2 media (e.g., on-demand WDM circuits).

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Approach

- It is not possible to predict whether the current routing infrastructure will be able to evolve to support those requirements or whether the entire inter-domain routing architecture and protocol will need to be replaced.
    - The first thing is to understand which issues should (or should not) be addressed, in which protocol(s), and using what kind of time frame.

- It is not clear if BGP could or should be improved in order to address some or all of the concerns, and in which time frame this may be applicable.
    - However, it seems clear that the best approach could be to try to improve BGP up to a feasible limit and in parallel work on a new candidate protocol.

- If a new routing protocol needs to be built from scratch, it is necessary to do an evaluation now.
    - Need to meet user & operational requirements and business incentives of the network operators.

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The Consortium

- Core experts group, with both extensive operational experience and research skills:
  - Consulintel
  - Telecom Italia
  - Univ. Carlos III
  - CSC
  - Internet Technology Advisors
  - UNINETT
  - Univ. of Southampton
- Sponsors:
  - Muada
  - APNIC
  - CAIDA
  - ISC

The "Think Tank"

- Cooperation with other existing initiatives and experts, in Europe and internationally, acting as a catalyst to achieve a community consensus towards the development of research and innovation strategies.

- By means of supporting a "Routing Cluster" and the required activities (workshops, working meetings) where those experts can meet.

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Contributions to Standards

- IETF
- IRTF
- Other Foras:
  - EOF (European Operators Forum)
  - NANOG (The North American Network Operators' Group)
  - APIA (Asia & Pacific Internet Association)
  - SANOG (South Asia Network Operators Group)
  - RIRs (AfriNIC, APNIC, ARIN, LACNIC, RIPE)

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Work Plan

- WP0: Management & Dissemination
- WP1: Analysis of End-User and Service
  Provider requirements
- WP2: Alternative Approaches
- WP3: Routing Evolution

Pert Diagram

WP0
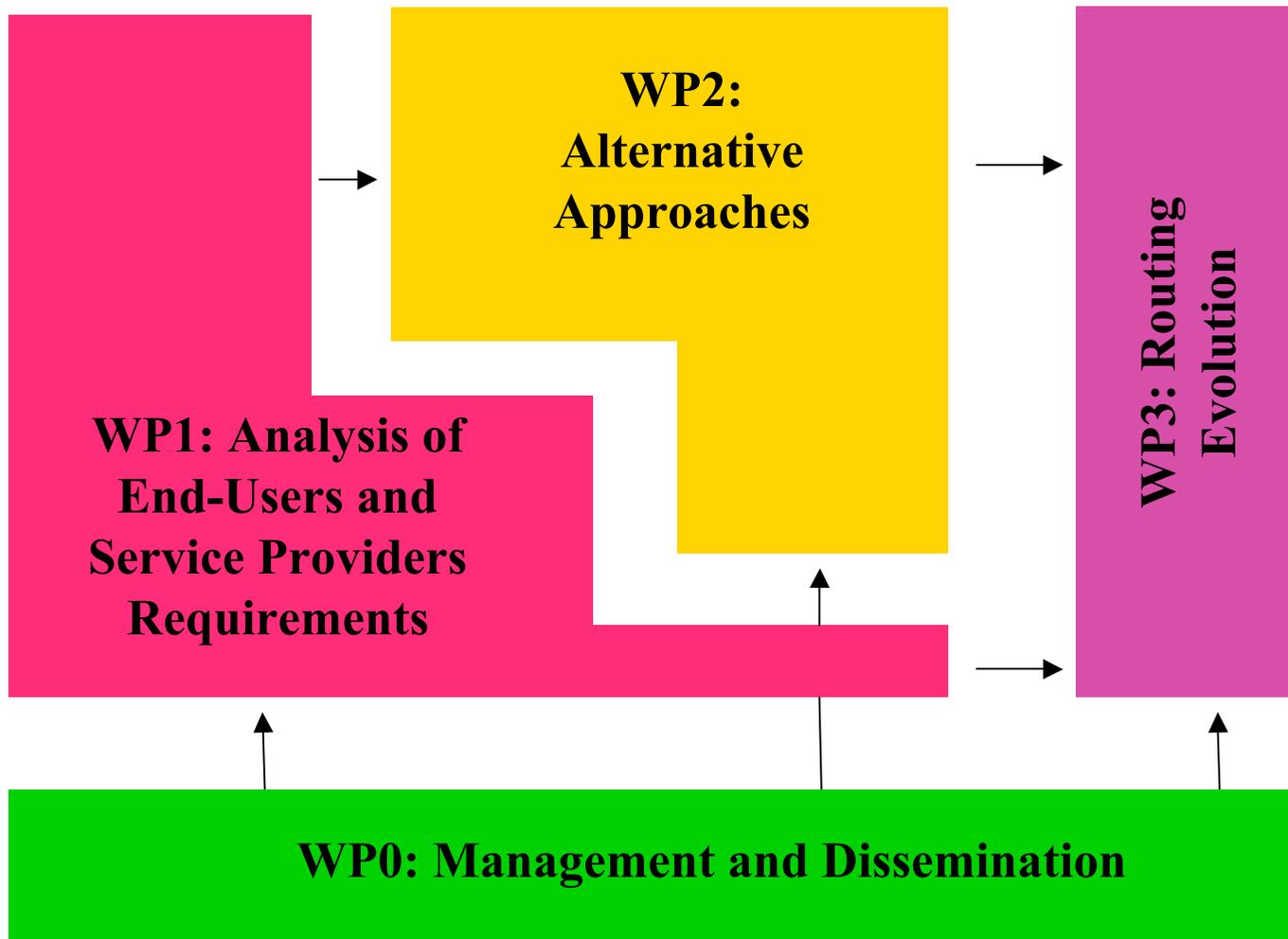
- To outline relevant aspects for the activity of the other work packages.
- To guarantee the technical and administrative coordination among all activities involved in the project.
- To facilitate and support the activities of the Routing Cluster.
- To coordinate the reports that each activity generates.
- To initiate wide publicity for the results of the project and related activities in order to disseminate the work carried out and achievements to the widest possible audience.
- To ensure that the project is exploited to its full potential and dissemination activities are in co-ordination with the exploitation plan.
- To produce publicity materials and to generate awareness of the project work.
- To participate in program-level activities, and in relevant seminars and conferences.
- To participate in EU concerted activities so that transferability and European added value are assured.
- To liaise with standardization bodies and other related fora.

WP1

- To identify End-User and Service Provider requirements for next-generation inter-domain routing.

- To analyze requirements relating to multihoming, investigating End-User motivations behind the need for Provider Independent addresses.

- To analyze the identified requirements and to prioritize them on the basis of their relevance, outlining technical aspects relating to each requirement.

- To outline relevant aspects for the activity of the other work packages (WP2 and WP3).

WP2

- Address the multihoming support in an efficient way.

- Avoid provider captivity due to the reluctant of the network prefix change.

- Provide better QoS information in traffic routes.

- Avoid influence on intra-domain communications due to extra-domain reasons.

- Explore different approaches to give solution for such topics.

WP3

- To analyze the possible evolution scenarios for the inter-domain routing architecture.

- To identify the problems which have not received enough attention.

- To support the research and standardization activities on inter-domain routing.

- To determine whether BGP is sufficient for the next generation networks or whether new inter-domain routing architecture and protocols are required.

- Project web site:
  - http://www.ist-ring.eu

- Reading list wiki:
  - http://wiki.ist-ring.eu