

# A Network Architecture for Innovation

*The goal of CHANGE is to reinvigorate innovation on the Internet in order to better support current services and applications and enable those of tomorrow. This will be achieved by introducing a common concept of a flow-processing platform instantiated at critical points in the network.*

## At A Glance: CHANGE

*Enabling Innovation in the Internet Architecture through Flexible Flow-Processing Extensions*



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**EC Contribution:** € 3.9 m

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## Main Objectives

The CHANGE project addresses a central problem of today's Internet: its size and scope make innovation through the introduction of new core network technologies very difficult. In short, the Internet suffers from "ossification". Even minor changes only happen through the accretion of point solutions that embed knowledge in the network, optimizing today's applications at the expense of tomorrow's.

CHANGE proposes to overcome this situation by introducing a common concept of a flow-processing platform, instantiated at critical points in the network. Although the platform and its interfaces are common, the processing performed must be programmable, allowing the network to evolve and support the needs of rapidly-changing applications. Such platforms can be built from commodity hardware – e.g. x86 servers and commodity switching chipsets –, and are both scalable and powerful while retaining the flexibility to quickly introduce processing primitives.

*"We believe the deployment of a general purpose flow-processing architecture is what is required to break the innovation log-jam that has been developing over the last fifteen years."*

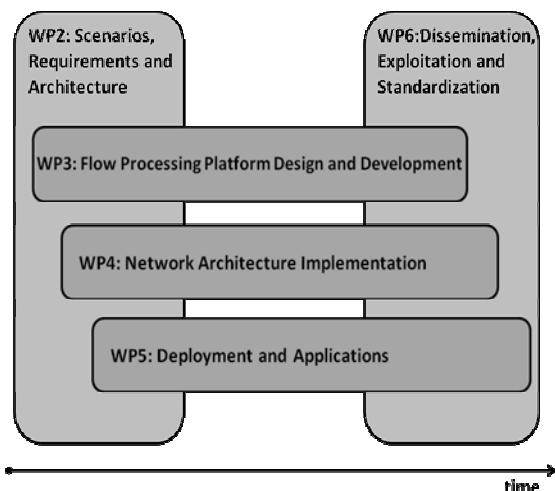
## The CHANGE concept: A Network Architecture for Innovation

To enable innovation, it must be possible to support a wide range of flow processing. At the same time we want to allow rapid innovation and deployment of new flow processing primitives so that flow processors are not locked into the applications of today. Essentially this means that anything more than simple packet forwarding should be a software function, allowing quick deployment. Contrast this with the current Internet, where flow processing is almost always performed in special-purpose boxes sold by vendors to solve a specific problem.

The broader objective of CHANGE is to use flow processing platforms to enable the Internet to reason about flows and to enhance the processing that flows receive in a manner that enables innovation rather than stifles it.

## Technical Approach

CHANGE is organised around three horizontal core technical work packages (WPs 3-5) that represent the bulk of the project's work. In addition, there are two vertical work packages, WP2 and WP6, plus WP1 Management.

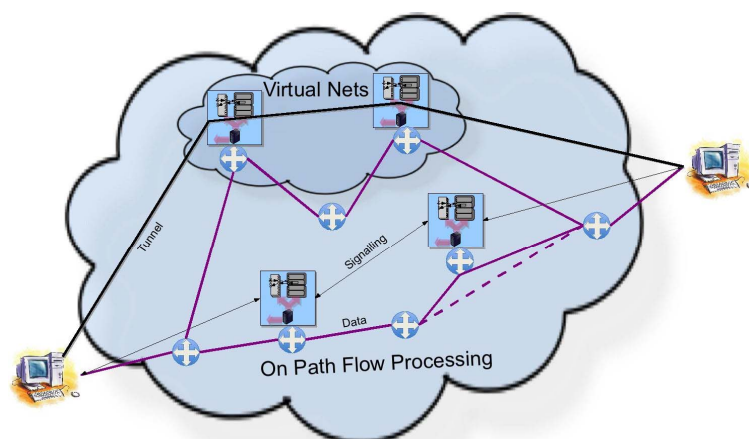


### Key Concepts

- **Programmable virtual networks:** Flows can be classified and processed in one flow processing platform, then sent to another flow processing platform for further processing, and so on. Typically this will be done by tunnelling traffic across the Internet. Such flow-level virtual networks give operators and application writers great flexibility in controlling how their traffic is forwarded and where it is processed. This is in stark contrast to the current Internet architecture, where networks process traffic based only on destination address prefixes.
- **On-path flow processing:** Traffic traversing the network using conventional IP forwarding needs to be processed as a flow at certain points in the network; examples are firewalls and traffic shapers. The kind of flow processing platforms we envisage can provide this conventional functionality, but the real benefits come when such flow processing platforms can communicate. This allows applications to express their requirements, networks to express their constraints, and a much more flexible approach to enabling access control restrictions to be taken. Thus an additional goal of CHANGE is to investigate signalling mechanisms by which this communication can occur.

In reality, we envisage these two different concepts, programmable virtual networks and on-path flow processing, to be commonly used in

combination; however, they are conceptually separate, and the project will address both.



### Internet level flow processing

### Expected Impact

- CHANGE will help the European industry to unlock the business oligopoly and move towards an open-innovation market. It will produce a common set of basic tools to quickly build innovative products and services.
- CHANGE will help dramatically reduce network costs by adopting flow definition and processing as primitives, leading to the goal of Network (processing) as a Service (NaaS).
- CHANGE will foster innovative ideas and generate critical mass to influence the research community and support European competitiveness.
- CHANGE will devise an architecture for innovation, performing network processing on commodity hardware to speed up the evolution of the Internet.

### Potential Application Scenarios

Potential application scenarios of the CHANGE platform include:

- Virtualized ISP
- Dynamic network troubleshooting and re-locatable maintenance
- Targeted, on-demand network monitoring
- Dynamic intra and inter-network traffic shaping
- Workable, targeted QoS
- Shippable attack mitigation