

Split architecture carrier class networks

At A Glance: SPARC

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- European Center for Information & Communication Technologies GmbH (D),
- Interdisciplinary institute for BroadBand Technology vzw (B),
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The project SPARC “Split architecture carrier grade networks” aims at the investigation and implementation of a new split in the architecture of the Future Internet and its building blocks. The design of the new architecture will focus on the split of control, forwarding and data processing elements.

Main Objectives

The project “Split architecture for carrier grade networks” aims at implementing a new split in the architecture of Internet components. The project will investigate splitting the traditionally monolithic router/switch architecture into separate forwarding and control elements. This functional split supports network design and operation in large scale networks with multi-million customers which require a high degree of automation and reliability.

The development of a Split Architecture blueprint for carrier grade networks is motivated by:

- A Split Architecture is needed in order to break the vendor lock and make use of scaling effects for (commodity) hardware
- OpenFlow provides an expandable platform for the development and demonstration of such a Split Architecture
- Current proposals, including OpenFlow, do not address issues related to large scale deployment and do not meet operator requirements on manageability, service level monitoring, robustness, etc.

“Flexible and open access to hardware will accelerate the development and adoption of new services”

Based on these motivations, a set of seven challenging objectives for the development of a Split Architecture is defined

- Definition of Split Architecture blueprint
- Definition of typical use cases for Split Architecture
- Description and analysis of business potential
- Definition of extension of the OpenFlow protocol
- Development of SPARC prototype
- Validation of SPARC prototype
- Exploitation of results

Technical Approach

The project work is organised in five work packages. An additional work package is dedicated to the project management.

WP1 ensures efficient project management.

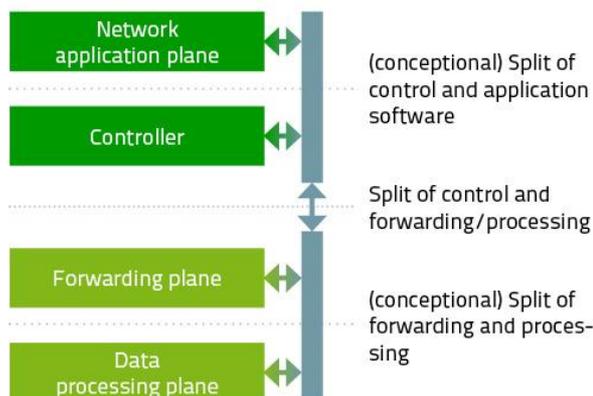
WP2 will describe the use cases of Split Architecture and the related carrier requirements at a qualitative level. It provides input for the detailed development of the architecture. WP2 defines and analyses the new business opportunities based on a Split Architecture.

WP3 will define the Split Architecture, taking use cases and requirements of WP2 into account. This work package will analyze technical issues related to the Split Architecture. The architecture will be evaluated using certain architectural trade-offs.

WP4 will implement a new OpenFlow controller for carrier grade applications capable of interacting both with an underlying OpenFlow switching data plane and with other OpenFlow controllers and technology domains via a (Generalised) Multiprotocol label switching (G)MPLS control plane. The controller will be structured to have a (G)MPLS capable layer and a "plugin-layer" in charge of the interaction with the switching hardware. The two layers will interwork with each other through specific APIs.

WP5 will carry out the functional and performance evaluations of the prototyped components of the Split Architecture.

WP6 will give the project results the proper visibility through dissemination actions (e.g. conferences, concertation meetings, standardization) and will manage the international cooperation.



Key Issues

The SPARC project has four key issues which challenge the development.

Future Internet research demands virtualised ICT resources. The OpenFlow approach provides virtualisation by nature and is, therefore, a good basis for test-beds in the area of network research. Due to the possibility of integration in a number of network devices and the advancements in the area of GMPLS, there will exist an economic way for interconnection of different test-beds enabling large scale experiments.

Carriers migrate to Next Generation Networks with a number of technical challenges ahead. The Split Architecture concept of SPARC will tackle the issues of increasing complexity and define a carrier grade architecture with modular parts. This architecture and its modularity will be open to allow extensions of functions where necessary and facilitating system manufacturers to develop products on top of commoditized hardware.

New players emerge in the Internet landscape and demand more flexible ways of infrastructure sharing. Network services might provide potentials

in the increasing complex value network of the Internet, but a sensitive analysis could highlight break points and show potential for Split Architecture approaches.

The current network-centric service production shifts to an IT-based one. Due to the high volumes of equipment being required for the expansion of data centres, we envisage that data centre requirements could largely influence the development of

telecommunication equipment too – leading to shifting paradigms and new architectures with respect to carrier networks.

Expected Impact

The SPARC project through its numerous realisations will:

- Overcome structural limitations of the current Internet architecture resulting from an increasingly larger set of applications and of devices and edge networks to be supported
- Enable dynamic and efficient support of various traffic patterns for synchronism, end-to-end quality, location independence, mobility and future service architectures
- Contribute to new concepts for flexible and cognitive network management and operation frameworks for dynamic, ad-hoc and optimised resource allocation and control, administration with accounting that ensures both a fair return-on-investment and expansion of usage, differentiated performance levels that can be accurately monitored, fault-tolerance and robustness associated with real-time trouble shooting capabilities
- Participate and realise standardisation of the OpenFlow protocol from a European perspective