OFELIA - Pan-European Test Facility for OpenFlow Experimentation

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November 22, 2011

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Abstract

The demonstration will show the live access to the control framework of a pan-European OpenFlow testbed. The testbed spans five islands all over Europe, allowing experimenters access not only to virtual machines but to the switches interconnecting them. This extends the control of networking experiments beyond best-effort overlays to a real control of the network, its routing and forwarding functions itself. A first video explaining the registration process and the setup of a slice for a new network experiment can be found here: http://www.youtube.com/watch?v=p482T9O9HOg A tutorial explaining (in short video sequences) the registration and use of the testbed will go online on http://www.fp7-ofelia.eu before end of July.

Keywords: OpenFlow, FIRE facility, networking experiments, SFA

OpenFlow test facility in the FIRE context

The limitations of the legacy Internet architecture have been studied by the scientific and industrial community now for a decade leading to a wide variety of proposals for architectural extensions. However, introducing such extensions into the "production" Internet has proven to be a tedious task due to the closed nature of today's network elements' designs. OpenFlow introduces a fundamental split between user and control plane decoupling a networking element's forwarding engine from its controlling logic, thus allowing a separate evolution of user and control plane, and offering an opportunity to study new control architectures in the field.

OFELIA is an FP7 Call 5 project aiming towards creation of an OpenFlow test facility allowing researchers from academia as well as industry to develop new control protocols in controlled networking environments on dedicated OpenFlow enabled carrier-ready hardware devices.[1] However, OFELIA's scope is wider and more diversified than just offering yet another testing environment: the OpenFlow architecture with its flow based approach simplifies network virtualization, allowing various control planes to co-exist in parallel and each control plane to handle flows individually; and, it flattens the differences among

network elements, e.g. switching and routing devices.[2] Thus, a flow's perspective on the network topology may be different from other flows' views and even change dynamically over time. This network virtualization approach is key to deploying experimental control planes in parallel to production control planes on the same physical network infrastructure. OFELIA consists of autonomous OpenFlow enabled islands each intended to serve as a nucleus for an OpenFlow enabled campus network at their local organization and site. These core networks demonstrate maturity and stability of OpenFlow hardware and software components, potentially paving the way towards OpenFlow deployment in NREN operated networks or in the long-term even operator networks.

The control framework to be demonstrated is based on the SFA-oriented Expedient, a tool that was developed at Stanford University in the eGENI project.[3] OFELIA has enhanced this tool by the capability to dynamically create virtual machines and assign these to experimenter-defined slices, improved the work flow and stabilized the implementation. The OFELIA demo as shown at the Service Wave 2011 event is demonstrating these core features of OpenFlow and OFELIA:

1. Dynamic creation of control place slices suitable for deployment of existing or emerging control plane protocols and architectures for the Future Internet.

2. Co-existence and co-operation of different control planes on the same physical network infrastructure including research and production slices.

3. Dynamic creation of virtual machines for acting as data sinks and/or sources or for hosting control plane entities.

4. Assignment of end systems and users to different network slices each controlled by a different control plane based either on user or network decision.

The demonstration will cover the "OpenFlow domain" and the "Virtual technology manager" (VTM) aggregate managers and show their use how to control the OpenFlow domain as well as how to create, deploy and use virtual machines for functional or performance testing.

References

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[2] Nick McKeown, Tom Anderson, Hari Balakrishnan, Guru Parulkar, Larry Peterson, Jennifer Rexford, Scott Shenker, Jonathan Turner: "OpenFlow: Enabling Innovation in Campus Networks", White paper, to be found at http://www.openflow.org/documents/openflow-wp-latest.pdf

[3] Enterprise GENI (eGENI) project: http://groups.geni.net/geni/wiki/EnterpriseGeni