A L I E N

ABSTRACTION LAYER FOR IMPLEMENTATION OF EXTENSIONS IN PROGRAMMABLE NETWORKS

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Deliverable D6.3
Report on the dissemination activities in the first year of the project

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Dissemination Level		
☒	**PU:**	Public
☐	**PP:**	Restricted to other programme participants (including the Commission Services)
☐	**RE:**	Restricted to a group specified by the consortium (including the Commission Services)
☐	**CO:**	Confidential, only for members of the consortium (including the Commission Services)

Abstract

This deliverable provides a summary of dissemination activities that have been performed during the first year of the ALIEN project (since October 2012 till September 2013). It includes all relevant information about events, workshops, conferences and information materials which made the ALIEN project better known in the research community.

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Executive Summary

This deliverable presents dissemination activities in the first year of the ALIEN project (October 2012 to September 2013). In this period two main deliverables were planned:

- Deliverable 6.1 – report on the dissemination plan for the first year of the project;
- Deliverable 6.2 – project website and project description.

In the first year, the ALIEN project was focused mainly on elaborating assumptions for further implementation activities (the guideline for implementation for all available in the ALIEN project devices is included in the deliverable D3.2 recently submitted to the European Commission). Moreover, there were also some publications aimed at the presentation of the actual status of the project developments. The most important item on this list is the HAL whitepaper, which constitutes the background for the further work of the project. ALIEN has been also presented on several conferences with papers and posters.

In this report the two workshops organized by the project have been described. Both of them have been realized as practical tutorials, where the audience came with significant knowledge and experience in network development. The workshops gave the participants the opportunity to exchange ideas, improve their know-how and meet people working in similar areas of interest. A potential reader of this report will be introduced to the workshops, their outcomes and topics discussed there.

This report gives also the impact assessment and conclusions, i.e. what should be improved in order to meet original project objectives, as planned in the project description.

This report constitutes the third deliverable in WP6 in the ALIEN project. The next two deliverables planned to the end of the ALIEN project are:

- Deliverable 6.4 – report on the dissemination plan for the second year of the project;
- Deliverable 6.5 – report on the dissemination activities in the second year of the project.

In the second year of the project duration the project partners plan to continue their efforts towards a better project's visibility and towards publications of project's results in renowned journals.

1 Introduction

In the first year of the project, the ALIEN partners were concentrated on a definition and early implementation of the concept of the Hardware Abstraction Layer [1], which constitutes the most important project goal. The whitepaper describing the HAL is available to the public at the official project website (http://fp7-alien.eu).

During the first year of execution, the ALIEN project presented posters during the TERENA 2012 conference (details can be found in Section 2.3), published two conference papers (Section 2.4) and participated in meetings of standardization bodies and groups (Section 2.6). The ALIEN project organized also two workshops devoted to the hardware, which is considered in the project as "alien" hardware (Section 2.7). These workshops allowed to improve knowledge of project participants.

The first workshop considered network processors and was organized by EITC in Berlin in March 2013. It was attended mainly by the ALIEN consortium partners. Details are presented in Section 2.7.1.

The second workshop was a worldwide event and focused on NetFPGA-related topics. The event was organized by PUT in Poznan, Poland in May 2013. The ALIEN project was the co-organizer of the workshop, which was attended by 25 people from the whole world. For details refer to Section 2.7.2.

In the second year of the project ALIEN will further disseminate the ALIEN project results. The ALIEN project will be engaged in events directly related to project subjects, similarly to NetFPGA-related workshop organized by PUT. The project partners plan to publish the ALIEN project achievements in the top-rated journals and present them at leading conferences. More information about possible publications will be included in the next deliverable D6.4.

The ALIEN project will also continue the cooperation with the telecom industry. The first example of such cooperation was the NetFPGA workshop held at PUT in Poznan, Poland on May 2013. The ALIEN project plans to extend our contacts with operators to check and test some of the ALIEN project solutions. For example, Poznan University of Technology will host of the annual Polish symposium on IT National Symposium on Telecommunications and Teleinformatics in September next year. Each year delegates of the Polish IT sector are involved in this symposium. A special session for the ALIEN project results presentation will be organized.

The detailed plan for dissemination activities in the second year of the project duration will be presented in the deliverable D6.4 "Report on the dissemination plan for the second year of the project.

2 Dissemination Activities

2.1 Project Logo

In the first two weeks of the project execution the official logo of the ALIEN project has been introduced. ALIEN used this logo in all promotional materials during international events, e.g. the TERENA conference, the Network Processors workshop or the NetFPGA workshop. This logo is also included in a template of the project official documents. The final design of the logo is presented in Figure 2.1.

Figure 2.1 The official ALIEN project logo

2.2 Project Website

The ALIEN project launched its public website on October 19th, 2012 upon address: http://www.fp7-alien.eu. The main page is presented in Figure 2.2. The goal of the ALIEN website is to be a central point for all related news, events, publications and more details about the project.

Five sections were defined in the structure of the website:

- **News/Homepage** – up to date information on the highlights of ALIEN;

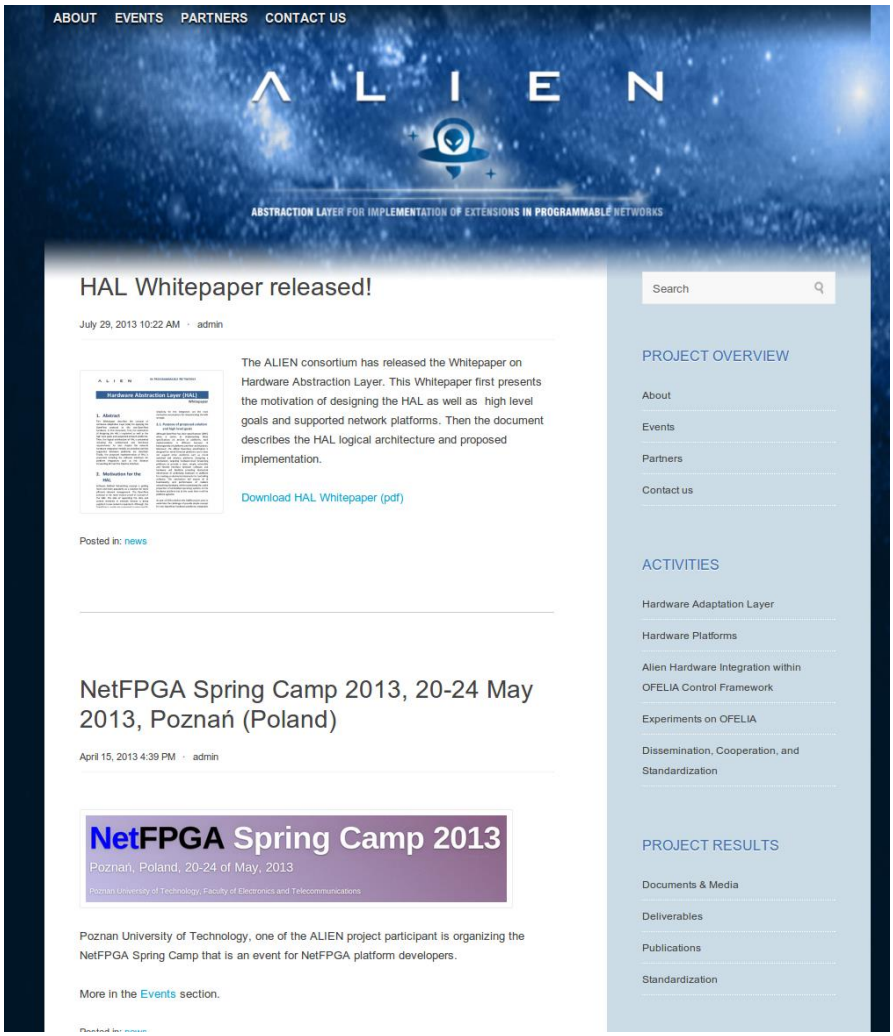

Figure 2.2 ALIEN project website

- **Events** – detailed information on past and future public presence e.g. workshops, public demonstrations or ALIEN participation on conferences;
- **Partners** – information of all participants working in the ALIEN project;
- **Activities** – detailed ALIEN project activities description;
- **Project results** – all ALIEN related publications, access to the work official public deliverables.

The detailed ALIEN website description and section structure has been included into Deliverable D6.1[1].

2.2.1 Visitors Statistics

In order to analyse the ALIEN website activity the visitors statistics tool has been installed. The sections below present more detailed statistics of the ALIEN project website.

2.2.1.1 *Unique Visitors*

A unique visitor is a person or a computer that has made at least 1 hit on 1 page of the web site during the specified period. If the visitor makes several visits during this period, it is counted only once. Visitors are tracked by the IP address, so if multiple users are accessing your site from the same IP (such as a home or office network), they will be counted as a single unique visitor. In Figure 2.3 it can be find a chart with ALIEN website unique visitors statistics.

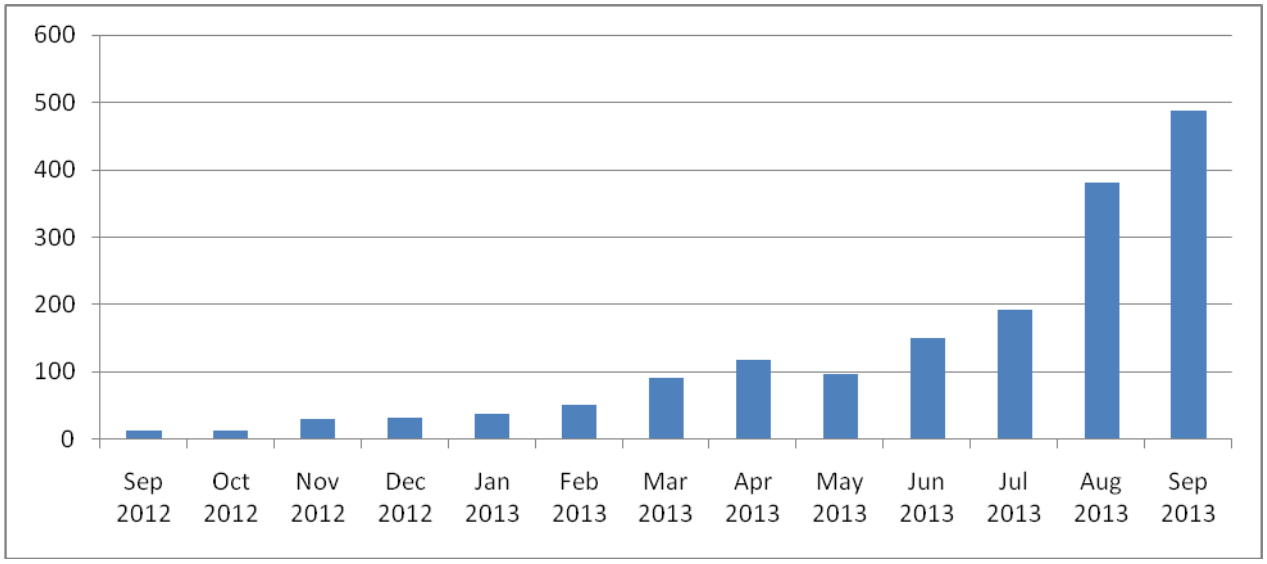

Figure 2.3 Unique visitors

2.2.1.2 *Website Visits*

Definition of the "visit" is a user activity on website on specified period of time – in this case it is 1 hour. During that period all activity (requesting many pages) regards 1 visit. In Figure 2.4 it can be find a chart with ALIEN website visits statistics.

[1] Deliverable D6.1 is restricted to other programme participants (including the Commission Services) and is not available for the public

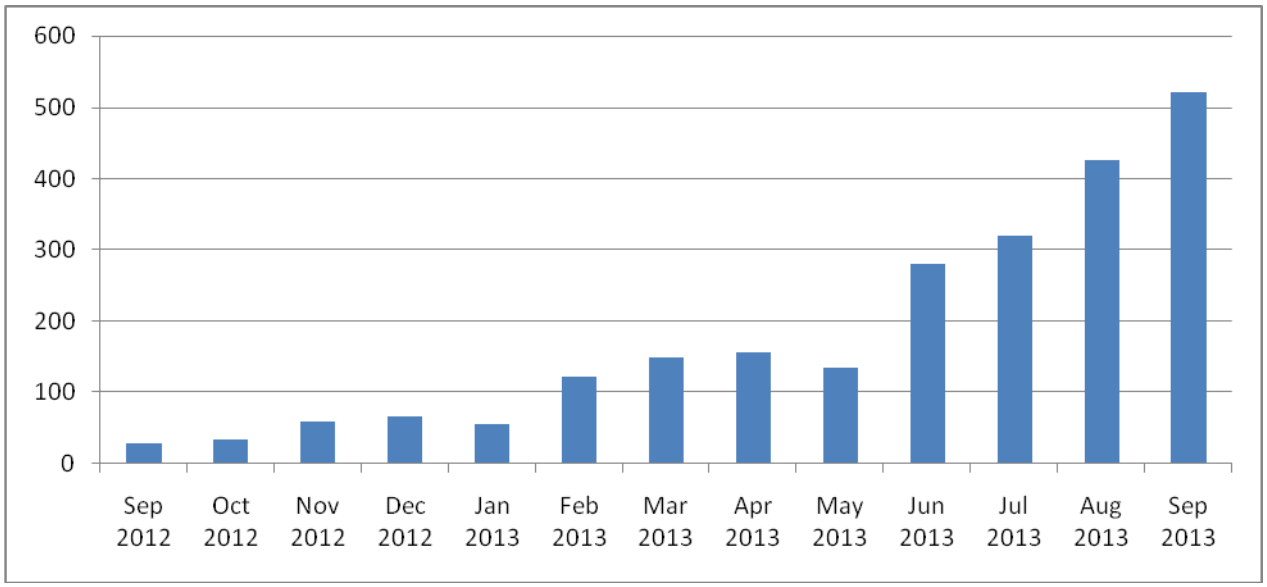

Figure 2.4 Website visits

2.2.1.3 *Average Pages per Visit*

The number of "pages" viewed by visitors. “Pages” are only the HTML and PHP files, not images or other files requested as a result of loading a "Page". In Figure 2.5 it can be find a chart with ALIEN average pages per visit statistics.

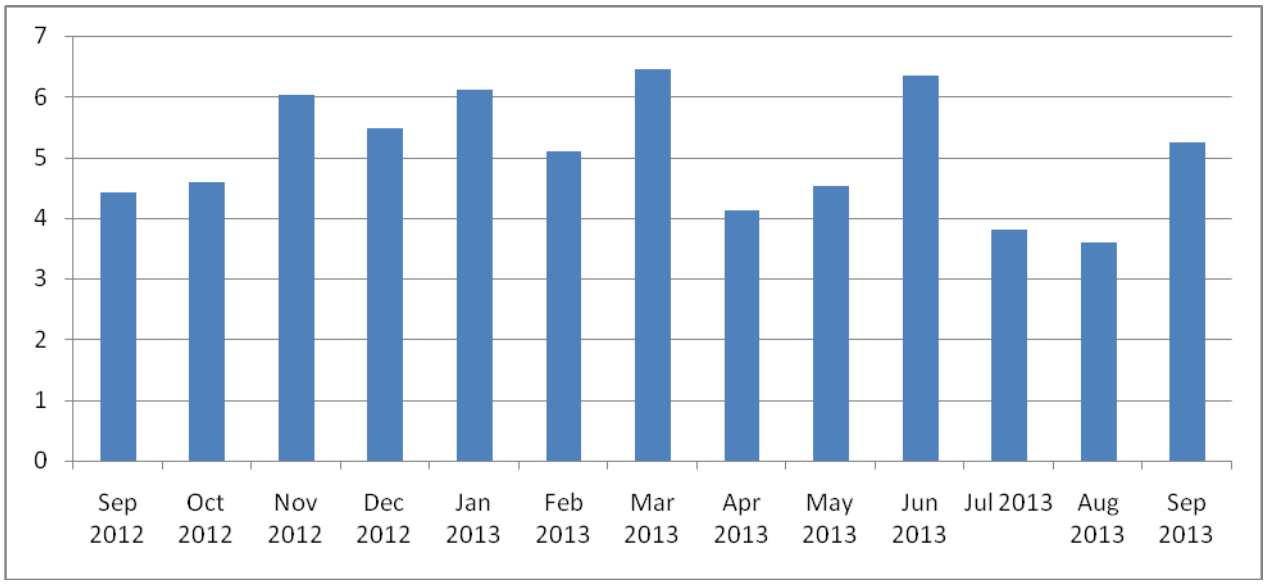

Figure 2.5 Average pages per visit

2.3 Leaflet, Poster, Hand-out

There were no leaflets nor hand-outs designed in the first year of the ALIEN project.

The ALIEN project prepared several posters which have been presented in Figure 2.6 and Figure 2.7. These posters were presented by PSNC for a large audience (~400 persons) during the latest TERENA Networking Conference (TNC 2012) on 3-6 June, 2013 (Maastricht, Netherlands). Both posters have been placed at the ALIEN project booth. The TNC2012 conference itself focuses on the exchange of information between National Research and Education Networks (NRENs) from Europe with representatives from industry, academia, research institutions and the government. It was a good opportunity to introduce ALIEN to many network engineers and researchers what is project's interest and the ideas behind the project.

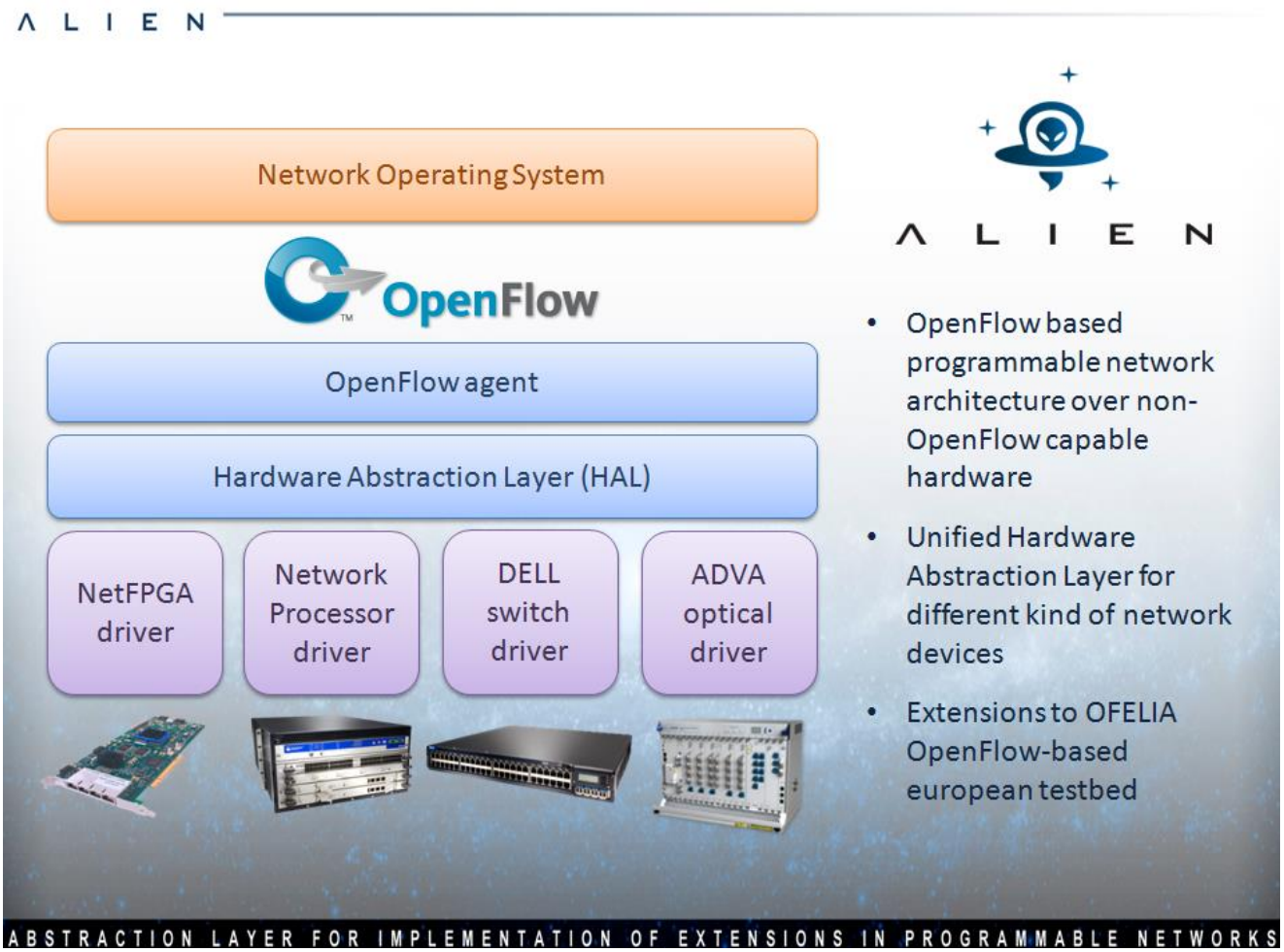

Figure 2.6 The first ALIEN project poster

Figure 2.7 The second ALIEN project poster used at TERENA 2013 conference

2.4 Conferences and Papers

During the first year of the ALIEN project most of time has been allocated to activities aimed at elaboration of common statements for all technologies involved in the project. The task was tricky, due to a nature of these technologies: some of them are close to lower layers of the network stack (NetFPGA card, L0 switch, EZappliance and Cavium OCTEON network processors) and some use higher layers (GEPON, DOCSIS). However, after several f2f meetings and significant amount of e-mails and teleconference calls the project finally converged towards a stable vision of the project architecture. The concept of the HAL has been described in details in the HAL whitepaper [1]. This document is also available for the public use at the official ALIEN project website at http://www.fp7-alien.eu/files/deliverables/ALIEN-HAL-whitepaper.pdf. The HAL architecture allows to use different hardware and run OpenFlow on non-OpenFlow devices.

During all workshops and conferences in which ALIEN attended, there were questions at the booths to the project, what are the ALIEN goals, what are future steps of the project. The project representatives were glad to answer to all of them and to introduce other the project vision and ideals.

To measure the progress of dissemination activities in the ALIEN project, a set of Key Performance Indicators (KPIs) have been identified per each event, providing a clear indicator of the impact assessment of the activity. Below are described all events which were planned in deliverable D6.1 and which of them were and which were not achieved (and why) in the first year of the project:

- European Workshop on Software Defined Networks (EWSDN), 25-26 October, 2012 – Darmstadt, Germany
    - The main website of this workshop is available at: http://www.ewsdn.eu/
    - The European Workshop on Software Defined Networks 2012 took place in Darmstadt, Germany. The event was organized by members of the OFELIA and SPARC FP7 projects, mainly.
    - As such, OpenFlow was in the centre of the attention of the participants. 120 participants from both academia and industry heard presentations from major industry players on the role of SDN in future carrier networks. A panel discussion on the use and promotion of Open Source software for SDN concluded that chances that OpenFlow opens to really change the market of network devices and operating systems are to be used much more by research projects like OFELIA and ALIEN. In this sense, more coordination towards the development of a "Carrier Operating System" is highly desired.

Figure 2.8 Title slide from the EWSDN 2012 conference

- As a first dissemination event the presentation of ALIEN took place at EWSDN 2012 in Darmstadt. A short presentation of the ALIEN project goals and deliverables was given by A. Binczewski, the coordinator of ALIEN (the first slide could be seen in Figure 2.8). In addition, Rajesh Narayanan of DELL presented the first prototype of an OpenFlow-capable switch that will also be used further in the ALIEN project. EWSDN turned out to be a good platform for discussion of a European academic community around OpenFlow. The participation of speakers from industry helped shaping the discussion towards topics relevant to practical implementation.

- The ALIEN project is going to participate also in the EWSDN 2013 workshop in Berlin and show our presentations about ALIEN results and conceptions. There will be an ALIEN booth available which could host promotion of the ALIEN project (i.e. an ALIEN leaflets placed in table, poster on the wall, presence of a person from ALIEN project consortium near to the booth). This workshop will be a good place to exchange information and points of view with other researchers and scientists working on OpenFlow and SDN.

- Information about this event is available at the ALIEN project website: http://www.fp7-alien.eu/?p=247

- All ALIEN targets and Key Performance Indicators for this workshop were achieved (see Table 1).

Table 1 The KPIs for the EWSDN 2012 conference

Key Performance Indicator (KPI)	ALIEN target	Status
The first public ALIEN presentation during SDN workshop	It was a first ALIEN project presentation – a short presentation with project goals and deliverables was presented to the audience (more than 100 people) involved in SDN.	Achieved
Introduction of the new device which will be used future in the ALIEN project	Presentation of the first prototype of an OpenFlow-capable switch that will also be used further in the ALIEN project. It showed direction of research and open possibilities in the ALIEN project.	Achieved

- Future Internet Research and Experimentation (FIRE) Engineering Workshop, 6-7 November, 2012 – Ghent, Belgium

  - The main website of this workshop is available at: http://www.ict-fire.eu/events/fire-engineering-workshop.html

  - FIRE (Future Internet Research and Experimentation) initiative is approaching experimentation from two angles: the "FIRE facilities", i.e. test beds or groups of test beds that offer services to experimenters for advanced Future Internet related experimentations; and "FIRE research projects", which investigate new concepts and issues in relation with Future Internet, and can also, perform Future Internet experimentations. Supporting a wide range of innovative experimentations allows the right pieces to be put together. In this respect FIRE is a critical enabler.

  - In this context the Future Internet Research and Experimentation (FIRE) initiative under the lead of the FIRESTATION support action organised a two days engineering workshop that had given the opportunity to interested experts meet and discuss the different aspects of the endeavour. Prospective authors from academia and industry were invited to submit extended abstracts of results from research and experimentation work, demonstrating best practices and approaches to experimentation and novel use of experimentation facilities. Experimental facilities providers were invited to submit extended abstracts that demonstrate details of advanced capabilities of their testbeds. Two categories of papers were being accepted:

    - Advanced functions of experimental facilities,

    - Experimentation results from the research community.

  - On the FIRE conference the ALIEN project had been presented by Bartosz Belter (PSNC) during the session called "Presentation of new experimentation projects from call 8" (slide with results can be seen in Figure 2.9). There had been presented the ALIEN project objectives, challenges, proposed

concepts and solution the existing network problems as well as some short introduction to Software Defined Networks, major project milestones and expected results.

- More information about the ALIEN project presentation could be found at: http://fire.creativemediadays.be/speaker/bartosz-belter
- Information about this event is available at the ALIEN project website: http://www.fp7-alien.eu/?p=201
- The ALIEN target and Key Performance Indicators for this workshop was achieved (see Table 2).

Table 2 The KPIs for the FIRE 2012 conference

Key Performance Indicator (KPI)	ALIEN target	Status
The second public presentation of the ALINE project	During the workshop the second public presentation of the project to the FIRE community was provided.	Achieved

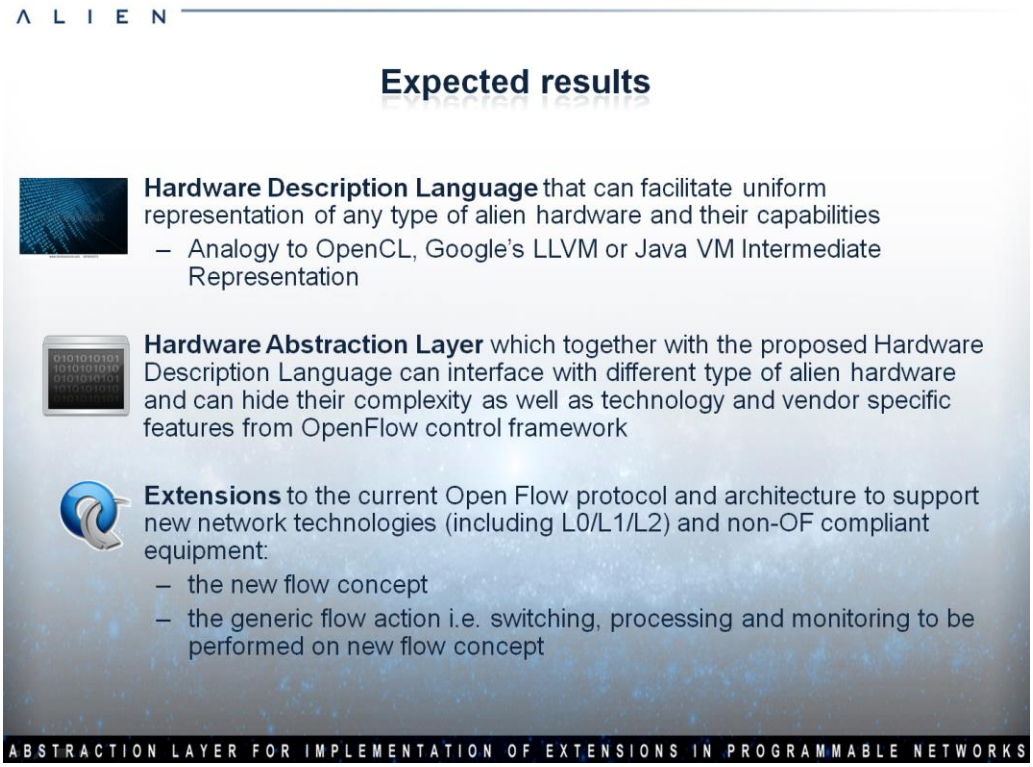

Figure 2.9 Expected results of ALIEN project (slide from FIRE 2012 conference)

- Future Internet Research and Experimentation (FIRE) Engineering Workshop, 7 May, 2013 – Dublin, Ireland

  - http://www.ict-fire.eu/events/fire-engineering-workshop.html

  - The FIRE 2013 workshop was on May, 2013. It was assumed that during this workshop, the ALIEN project will present details of the HAL architecture. However, during that time, the ALIEN project was still working on specifications of HAL. The project members decided to not present the ALIEN HAL architecture until it will finalized. The HAL architecture was finally published on July – two months after this FIRE workshop.

  - The ALIEN target and Key Performance Indicators for this workshop was not achieved (see Table 3).

Table 3 The KPI for the FIRE 2013 conference

Key Performance Indicator (KPI)	ALIEN target	Status
The second public presentation of the ALIEN project	During the workshop the ALIEN project intended to give the second public presentation of the project to the FIRE community. Since the ALIEN partners have not attended the conference, this KPI is marked as "not achieved".	**Not achieved**

- TERENA Networking Conference (TNC), 3-6 June, 2013 – Maastricht, Netherlands

  - https://tnc2013.terena.org/

  - TERENA Networking Conference is the EU organization in the forefront of Internet development. TERENA brings together National Research and Education Networks (NRENs) from across Europe to exchange information between themselves and with representatives from industry, academia, research institutions and the government. The conference presents an overview of the latest developments in research networking, both in the technical field and in the areas of application and management.

  - The ALIEN project was promoted using a poster (see Figure 2.7). All details about the project were presented in order to attract network researchers and network managers from various NRENs in the Europe. There were several visitors from different companies.

  - All ALIEN targets and Key Performance Indicators for this conference were achieved (see Table 4).

Table 4 The KPIs for the TERENA 2013 confernce

Key Performance Indicator (KPI)	ALIEN target	Status
The first public ALIEN poster presented at the conference	There was a dedicated space on the PIONIER booth to present the ALIEN poster to the network research community (mainly NRENs).	**Achieved**
Number of visitors at the booth	A minimum of 10 unique visitors (company representatives) were visiting the project booth, asking about the project outcomes.	**Achieved**

- Supercomputing Conference (SC), 17-20 November, 2013 – Denver, USA
    - http://sc13.supercomputing.org/
    - It is the premier international conference on a high performance computing, networking and storage. It explores ways in which the High Performance Computing (HPC), networking, storage and analysis lead to advances in research, education and commerce. The SC conference always attracts a very large number of scientists, researchers, department managers, lab directors and decision makers from all corners of HPC and networking industry. It is planned that in Denver there will be 10,000+ attendees from around the world.
    - As in previous years, PSNC will organize the PIONIER (Polish Optical Internet) consortium booth in SC in order to present the latest PIONIER's achievements. It is planned that the presentation of the ALIEN project will take place within the PIONIER booth where ALIEN posters and leaflets will be available for attendees. There will be also possible to show the ALIEN slideshow presenting the project overview in a big display. This event is a great chance to share and discuss the ALIEN ideas in the large world-wide community, especially with US partners, which will be the way to establish new cooperation agreements with similar US projects.
    - ALIEN is planning to participate to this conference.
    - The ALIEN targets and Key Performance Indicators for this conference were not achieved yet (see Table 5).

Table 5 The KPIs for the SC 2013 conference

Key Performance Indicator (KPI)	ALIEN target	Status
The first demo of ALIEN outcomes is performed	It is planned to have the first public demonstration of ALIEN outcomes at the conference. The demonstration will be supported by a leaflet or a poster, providing complementary information to the audience.	*This is an upcoming event therefore it is not achieved yet*
Number of visitors at the booth	A minimum of 10 unique visitors (company representatives) are expected at the booth, interested in project outcomes.	*This is an upcoming event therefore it is not achieved yet*

The current state of the ALIEN project is in the first phase of implementation. Therefore, it gives an opportunity to collect some new results and show them to the public. In the next deliverable D6.4, an information about all potential conferences and possible publications in journals will be provided.

2.5 Whitepapers

2.5.1 The HAL Whitepaper

During the first year of the ALIEN project, the ALIEN project has elaborated the target architecture in the first whitepaper [1]. This document is available to the public at the official ALIEN project website at http://www.fp7-alien.eu/files/deliverables/ALIEN-HAL-whitepaper.pdf. The first page of this whitepaper can be seen in Figure 2.10. In this paper, it is described in detail the proposition which allows to use the OpenFlow protocol on the non-OpenFlow devices. Up to now, it was possible only on OpenFlow devices (devices specially dedicated to it). The solution is a great opportunity for a commercial world to modify current solutions and used them to extend commercial offers. It also enhances the competition between different companies which in turn gives new directions of a future development in the area of switching and routing devices. For the normal (end-point) user such a situation gives him a wide range of available devices on the market that he can use at home and at work in a normal day of life.

In the whitepaper [1] the Hardware Abstract Layer (HAL) is described. This layer allows to use an OpenFlow protocol at all devices used in the ALIEN project. More information about how HAL will be implemented and what functionality it will provide on each device is described in deliverable D3.2 [2]. This deliverable was recently submitted to the European Commission. It constitutes also a guidelines for an implementation stage of the ALIEN project.

The HAL whitepaper constitutes a new approach taken by the project in the networking society. It opens a new possibility and new point of view to already known and commonly used devices. It gives an opportunity to test a new network protocols on current available devices. Most of the ALIEN developments will be open source which should help and speed up the development process in future projects, commercial applications, scientific solutions.

ABSTRACTION LAYER
FOR IMPLEMENTATION OF EXTENSIONS
IN PROGRAMMABLE NETWORKS

Hardware Abstraction Layer (HAL)

Whitepaper

1. Abstract

This Whitepaper describes the concept of Hardware Adaptation Layer (HAL) for applying the OpenFlow protocol to the non-OpenFlow hardware. In this document, first, the motivation of designing the HAL is explained as well as the high level goals and supported network platforms. Then, the logical architecture of HAL is presented including the architectural and functional requirements. As next chapter the network hardware integration models are provided and the supported hardware platforms are classified. Finally, the proposed implementation of HAL is presented including the software interfaces for platform integrators such as the Abstract Forwarding API and the Pipeline Interface.

2. Motivation for the HAL

Software Defined Networking concept is getting more and more popularity as a solution for more efficient network management. The OpenFlow protocol is the most mature proof of concept of the SDN. The idea of separating the data and control elements in network devices is being supplied in new network equipment. Although, the OpenFlow is usually not supported in many specific network equipments e.g. the optical devices, hardware without possibility to be upgraded or without packet processing API. Enabling OpenFlow on all those non-OpenFlow devices with possible simplicity for the integrators are the main motivation assumptions for disseminating the HAL concept.

2.1. Purpose of proposed solution and high level goals

Although OpenFlow has clear specifications [ONF], when it comes to implementing those specifications on devices or platforms, each implementation is different because of heterogeneity of platforms and their architectures. Moreover, the official OpenFlow specification is designed for wired Ethernet platforms and it does not support other platforms such as circuit switched and wireless platforms. Designing a mechanism, targeting hardware-level forwarding platforms to provide a clean, simple, extensible and flexible interface between software and hardware will facilitate providing abstracted information of underlying hardware or platform for creating an abstracted elements for controlling software. This mechanism will expose all of functionality and performance of modern networking hardware, while maintaining the useful properties of embedded operating systems on the hardware platform but at the same time it will be platform agnostic.

As part of SDN activities the ALIEN project aims to undertake the challenge of provide simple concept for non-OpenFlow hardware platforms integrators by designing and defining functions of a Hardware Abstraction Layer (HAL). This abstraction mechanism aims to hide hardware complexity as

Figure 2.10 First page of the HAL whitepaper

2.6 Standardization

There are variety of discussions around the importance of Software Defined Networking (SDN) in standardization bodies. And the more this issue is poked, the more there is clarity around the need for strong standards and common interfaces to help network professionals start implementing the SDN concept in practice.

One of the most interesting developments in the OpenFlow initiative is the Southbound APIs (from the controller to the physical network). OpenFlow, as an open standard driven by the university community, has the benefit of being fairly vendor agnostic.

The OpenFlow protocol is a great opportunity for developers to bring the Southbound interface as a key standard. The larger and more dominant switch vendors are investigating this open standard on Southbound APIs. All of them are supporting OpenFlow so far, however, a concern for these vendors has to be if a level playing field is really in their best business interest. After all, if a single vendor standard became dominant for the Southbound APIs, that would be a huge competitive advantage.

The ALIEN project's HAL is broad base and has large chances of finding market-viable "killer app" sooner. It will break the vicious cycle by moving to a simpler framework.

The ALIEN project's HAL can provide Northbound APIs to the Internet eXchange Point (IXP) and have IXP evolve to a local traffic exchange place to a local network service marketplace.

DELL, which is one of the ALIEN project's participant, is an active member of different standardization organization: Open Network Foundation (ONF), Object Management Group (OMG), and Institute of Electrical and Electronics Engineers (IEEE).

2.6.1 Open Networking Summit 2013

Rajesh Narayanan and Marc Bruyere (both from DELL) were present at the Open Networking Summit 2013 at Santa Clara for the Open Networking Summit (ONS). The ONS was a sold-out success, attracting 3200 attendees. Inventors, innovators, and leaders from different parts of the worldwide Software-Defined Networks ecosystem spoke about implementations and deployments of SDN and the OpenFlow protocol. One of the strongest themes, amongst the speakers, was the alignment of the network with business priorities.

The expo hall brought more than 40 company exhibitors and demonstrations, along with 11 academic demonstrations and 12 academic posters showing advances in both development and application. ONS effectively highlighted the successful deployments of SDN and the OpenFlow protocol.

The ALIEN project HAL definition was discussed with different attendees during ONS collecting their feedback and for preparing for next year a presentation in the academics tracks.

2.6.2 ONS Member Working Day

On Thursday April 19th, 2013, immediately following the Open Networking Summit, the Open Networking Foundation (ONF) held its third face-to-face ONF Member Workday at the Santa Clara, Marriott.

The obvious benefit of meeting like the member workday is putting faces to the names. The biggest benefit is that they end up being milestones inside the working groups.

Rajesh Narayanan and Marc Bruyere (both from DELL) were participating as observer at working group meetings of the Forwarding Abstraction and Architecture & Framework.

Working group chair were presenting each WG's progress on stage and in-person versus over a mailing list to give an immediate and personal sense of engagement.

Discussions performed during the meeting showed the right direction for ALIEN HAL design that is coherent with standardization efforts taken inside ONF.

2.6.3 OMG Presentation of the ALIEN Project Whitepaper

In the middle of August 2013 the internal meeting at DELL was conducted with Manish Patil chairman of the SDN OMG working group to present the ALIEN project HAL idea. Manish is seeing the ALIEN project's HAL as a great opportunity for the standardization work. He proposed to create a new OMG SDN working group focused on Hardware Abstraction subject. The working group is under internal decision making process.

2.6.4 IEEE

After the first year of the ALIEN project there is not well-identified IEEE working group where ALIEN can go to defend the HAL architecture. The ALIEN project will continue to look for any opportunity to take cooperation with the IEEE standardization working groups.

2.6.5 The Open Compute Foundation

The Open Compute Foundation group has advance open designs for everything from racks and storage boxes to motherboards and interconnects and has created an initiative about networking device.

ALIEN does not cooperate with this standardization group. However, it still need to observe and identify a real opportunity in this new foundation. If there will such an opportunity, the ALIEN members will try to cooperate with this group.

2.7 Workshops

During the first year of the ALIEN project two workshops were organized. The first one concentrated at network processor platforms which are used in the project (NP-3 network processors in EZappliance platform and OCTEON Plus AMC network processors in Cavium Networks platform) and the second workshop was concentrate on the NetFPGA cards.

2.7.1 Network Processors Workshop

The ALIEN consortium organized the Network Processors Workshop that was held on 27th and 28th March 2013 in EICT premises (Berlin, Germany). The workshop goals were to present an overview of network processors platforms available on the market and used in the ALIEN project, discuss their architecture, comparison, programming models and development tools. Two such a platforms were discussed:

- NP-3 – network processor from EZChip,

Figure 2.11 Group photography of Network Processor Workshop attendees

Figure 2.12 Welcome message and presentation of the agenda (Bartosz Belter, PSNC)

- OCTEON – network processor from Cavium Networks.

This workshop was opened for participants mainly from the ALIEN project. In Figure 2.11 is group photography of all attendees.

The workshop has been preceded by the welcome message from PSNC – the ALIEN project coordinator (see Figure 2.12). After an introduction the Keynote speeches followed. The Keynote that was given by Andreas Köpsel (EICT) had scoped on OpenFlow datapath implementation that had been done by EICT together with BISDN. The next Keynote had presented the Travelping CAROS SDN solution and was commented by Hagen Woesner (EICT) on behalf of Tino Breddin (Travelping). The last Keynote speech had been given by Iwo Olszewski from PSNC and introduced the data plane processing technologies (see Figure 2.13). After the introduction the three platform-specific sessions taken place. These sessions presented the platform overview, detailed architecture, available developers tools (EDK, SDK, simulators, analyzers – see Figure 2.14) as well as live demonstrations. The discussed hardware platforms were the platforms that the ALIEN project participants are working on therefore even hard question were answered with details. PCSS was responsible for presentation about NP-3 network processors and PUT prepared presentation about OCTEON network processors. Due to some formal restrictions (non-disclosure agreements with software providers), all materials for presentation are available only for partners of the ALIEN project at internal sections of Wiki pages. The detailed agenda of this Network Processors workshop is presented below.

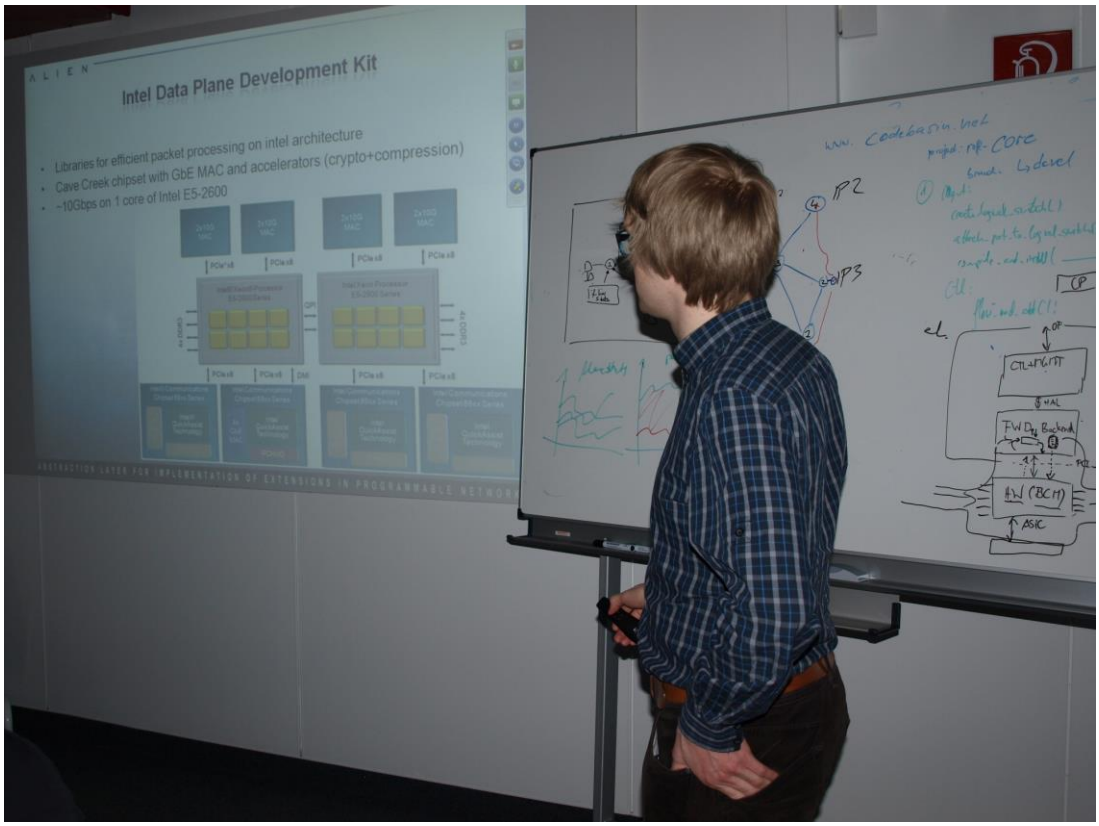

Figure 2.13 Introduction to Network Processors (Iwo Olszewski, PSNC)

It is worth to mentioned that during this workshop xDPd and ROFL libraries and they possibility were discussed. It gives us information and conclusions for the direction of our future work in the ALIEN project. One of the result from this workshop was very first version of the Hardware Adaptation Layer model, which was later updated to the newest version [1] (discussed also in details later in this report).

DAY 1 – 27 March 2013

13:30 – 15:30 – Welcome/Introduction/Keynote

- Welcome (Bartosz Belter [PSNC])
- Introduction to OpenFlow datapath implementation of BISDN/EICT (Andreas Köpsel [EICT], Marc Sune [BISDN])
- Introduction to CAROS (Hagen Woesner [EICT] on behalf of Tino Breddin [Travelping])
- Data plane processing – technology overview (Iwo Olszewski [PSNC])
    - custom architectures

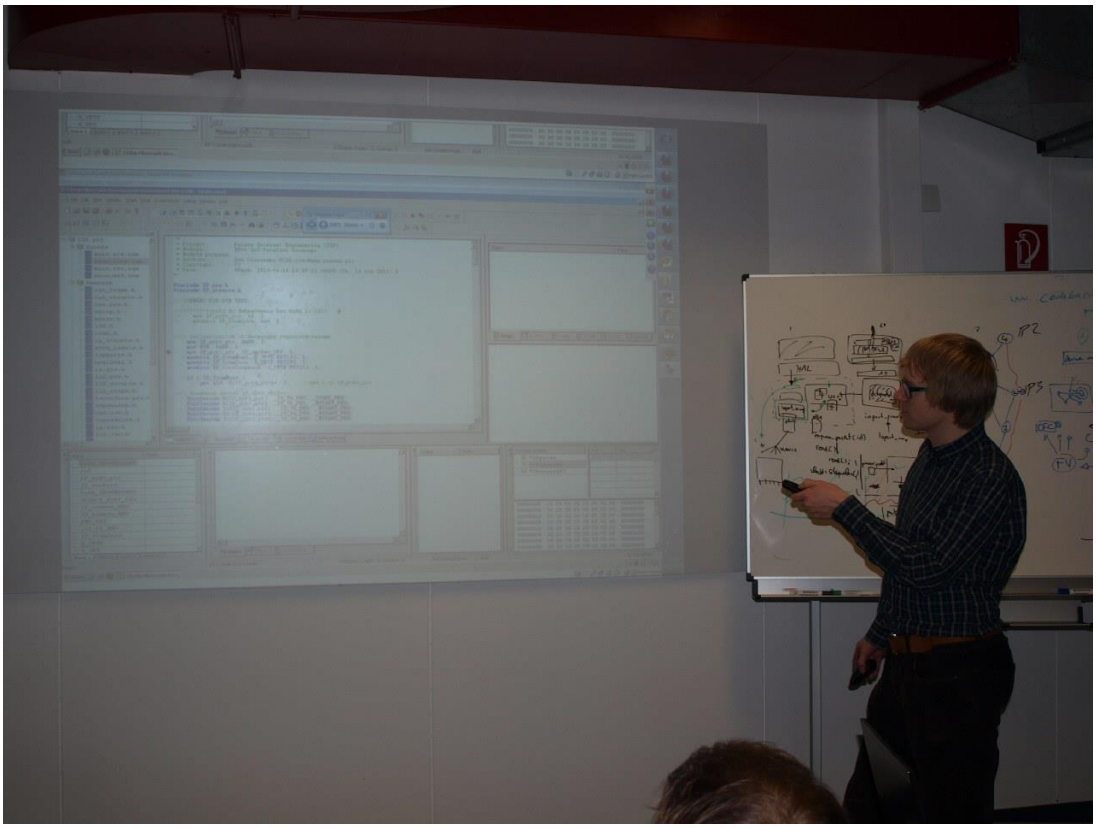

Figure 2.14 Demonstration of working project for NP3 processor in its native SDK (Iwo Olszewski, PSNC)

- multicore processors
- comparison, summary

16:00 – 18:00 – Session 1 – EZChip NP-3 network processor

- EZchip NP-3 and development tools (PSNC)
  - Introduction
  - Sample network applications
  - NP-3 architecture
  - NP-3 management and relation with the control plane
  - TOPs assembler

- EZchip development tools
- Live example on how to program the EZchip network processor

DAY 2 – 28 March 2013

9:00 – 11:00 – Session 2 – Cavium OCTEON network processor

- Cavium OCTEON and development tools (PUT)
  - Introduction
  - Packet Flow – packet processing using OCTEON
  - Software Overview
  - SDK
  - Demo

11:30 – 13:00 – Session 3 – Dell split data plane and summary

- Dell split data plane (DELL)
- Workshop summary

After this workshop each participant had gathered a necessary knowledge to choose a suitable network processor for a given application. The workshop participants are now also familiar with the architecture and capabilities of EZchip and OCTEON network processors as well as learned how to develop advanced network applications using their features. As an additional, the Dell's Split Data Plane concept was presented and discussed as a potential solution for heterogeneous devices combining the advantages of presented circuits.

Information about Network Processors workshop is also available at the official ALIEN project website at: http://www.fp7-alien.eu/?p=274.

For the Network Processors workshop all of the planned KPIs in the first year of the ALIEN project were achieved. They can be seen in Table 6.

Table 6 The KPIs for the Network Processors workshop

Key Performance Indicator (KPI)	ALIEN target	Status
Get familiar with details of architecture of network processors platform	Structure of all network processors platforms (NP-3 and OCTEON Plus AMC) available in the ALIEN project were introduced and discussed at the workshop.	Achieved
Get familiar with functionality of network processors platforms	During lectures at Network Processors workshop there was presented the functionality of all important blocks of the NP-3 and the OCTEON Plus AMC network processors have been described.	Achieved

2.7.2 NetFPGA Workshop

In May 2013 there was another workshop organized under an umbrella of the ALIEN project. It was 5 days long NetFPGA Spring Camp. This event was publicly available, there was 10 participants form ALIEN partners institutions and 15 from other organizations: both academia and science. The NetFPGA card was developed by researchers from Stanford University (USA) and University of Cambridge (UK) under netfpga.org project. Each year they organize these types of camps at Stanford and Cambridge universities. This year, European edition of such camp was hosted in Poznan. It was organized by PUT and Cambridge NetFPGA group (directed by Andrew Moore – see Figure 2.15). The participants implemented projects under supervision of six instructors from University of Cambridge (UK). The first two days were organized as hands on tutorials (lectures with practical demonstrations). During the next three days attendees worked on their own projects.

Figure 2.15 The NetFPGA Workshop instructor Andrew Moore (University of Cambridge, UK) presenting to the audience

Lectures and laboratories were done in the same room, in the Network Laboratory of PUT (see Figure 2.16). For this camp dedicated network was prepared, it was a ring of 10 hardware IP/Ethernet routers, each of them was based on 10G NetFPGA card. They were connected with optical fibers and each had its own client (based on 10G card from Solarflare). The part of equipment was delivered by University of Cambridge, part belongs to PUT. All possible operations were done on laboratory network with the speed of 10Gbps. This workshop was the first NetFPGA camp in the world fully based on 10G equipment. All the time attendees had full access to well trained tutors, their knowledge and wide experience. The goal of this camp was to show with details how the NetFPGA card works, how it is build, what is the structure of its hardware and software for complete working project, and mainly, to show the people how to design, to implement, and to test a whole project – from the idea, through the design, and testing to the final release of product, which works as fully functional network equipment.

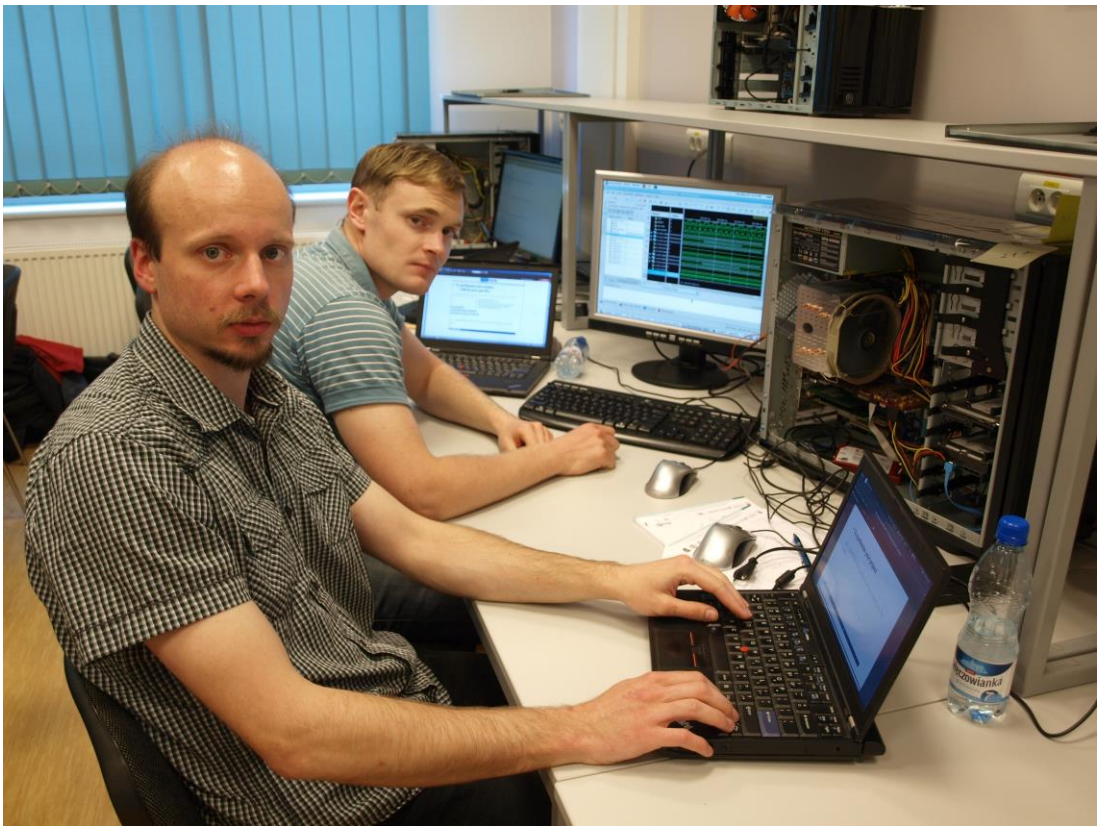

Figure 2.16 Participants from ALIEN project (Remigiusz Rajewski and Marcin Dziuba, both PUT) during preparation and tests of their own project

All materials from the camp are publicly available at the official NetFPGA workshop website http://netfpga.pl. At this site could be found also more information about each instructor. This site is also available strictly from the http://netfpga.org

website – the main site of the NetFPGA. Among participants were people from all the world (Spain, Germany, UK, Ireland, Poland, Finland, Singapore, France, Switzerland, Brazil and India) from companies like PGNiG, CERN, ST Electronics. It was possible thanks to information which was putted on the Xilinx website available at http://www.xilinx.com/university (see Figure 2.17) and at http://japan.xilinx.com/university (see Figure 2.18).

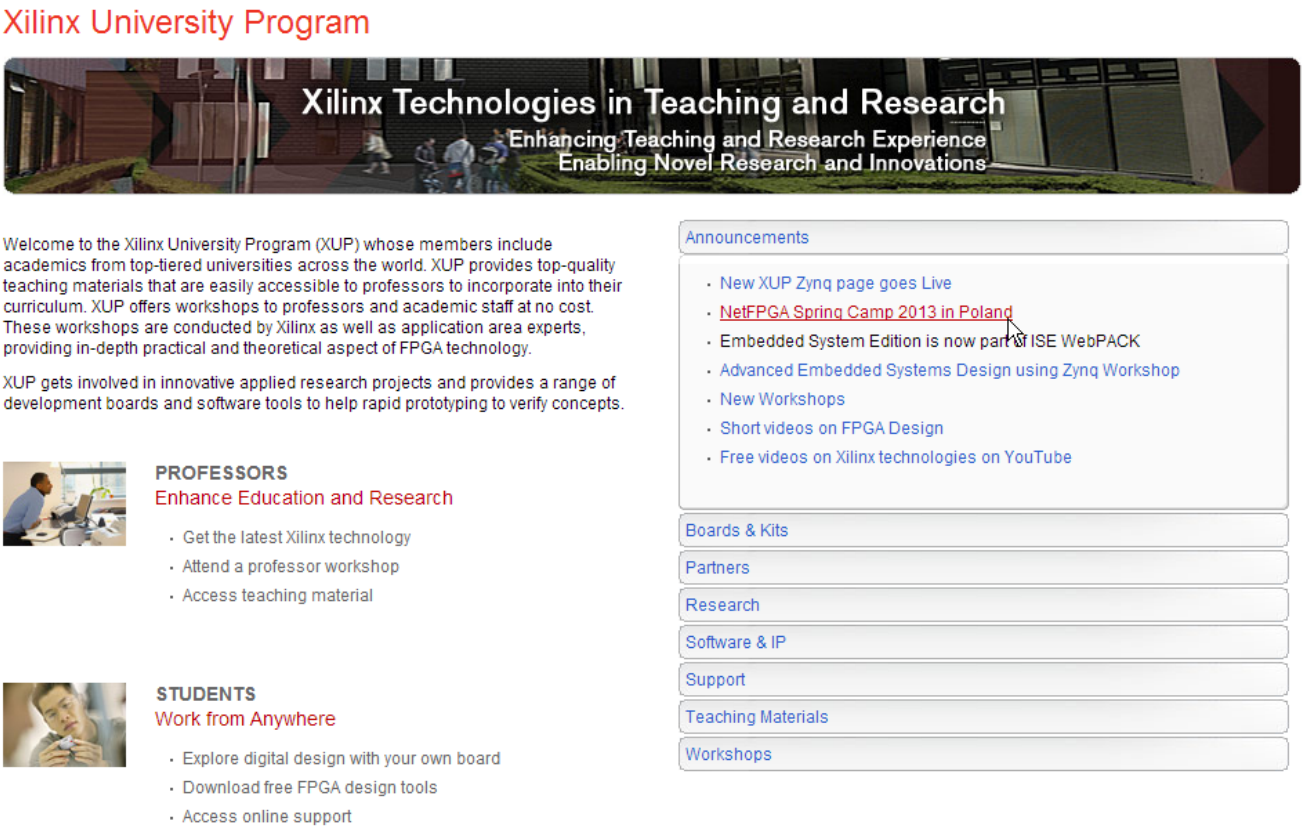

Figure 2.17 Announcement about NetFPGA workshop at the official Xilinx website[2]

[2] Printscreen done on 30 March 2013.

Figure 2.18 Announcement about NetFPGA workshop at the official Japan Xilinx website[3]

In the last day of the NetFPGA workshop each group presented their project which was done in previous days. One of project prepared by attendees was very close to the ALIEN project works. It was project prepared by participant from the ALIEN project partner. This project was about NetFPGA openflow_switch evaluation and xDPd extensions. Example slide

[3] Printscreen done on 30 March 2013.

of this project is presented in Figure 2.19. The content of his project was much wider than just run something on the NetFPGA card. It was deep analysis of possibility and detailed assumptions for future implementation of xDPd/ROFL libraries in order to run them on NetFPGA cards. It was very helpful to have a direct access to well trained instructors which offered their knowledge and experience in NetFPGA technology. In the last day of NetFPGA workshop this project was presented to all attendees and instructors (see Figure 2.20). There was also performed an intensive discussion with instructors. This project was much more advanced than others, because it was about integration existing OpenFlow and advanced libraries.

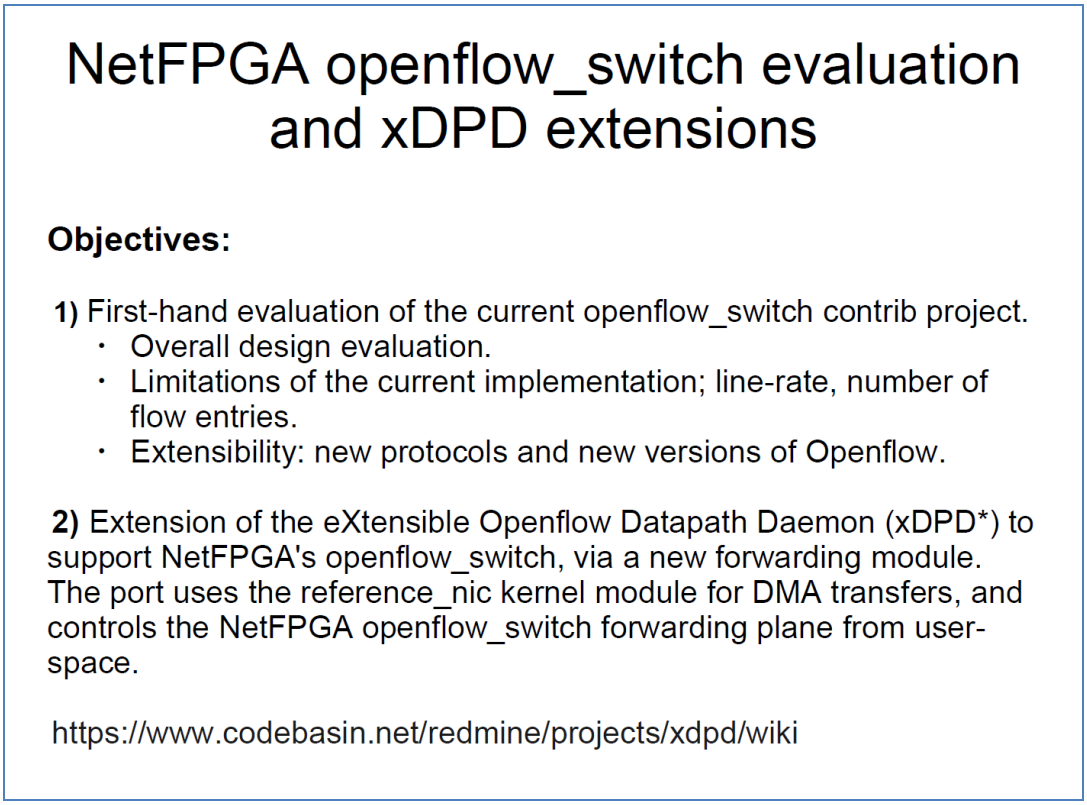

Figure 2.19 One slide from Mark Sune's presentation about xDPd and NetFPGA evaluation

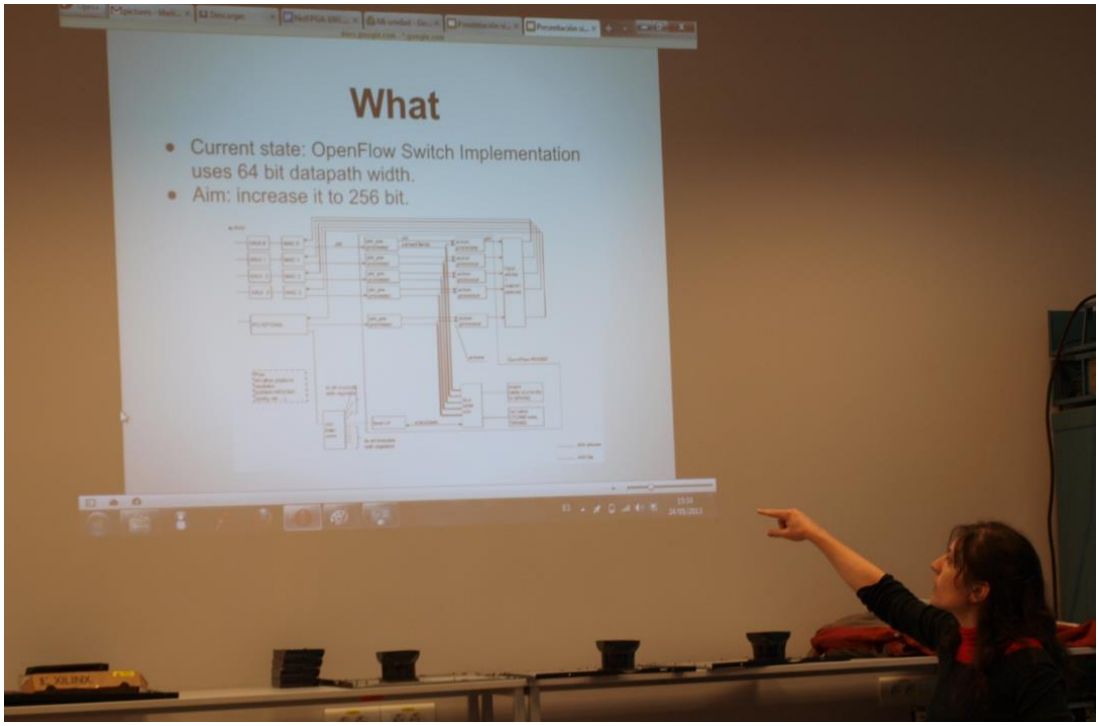

Figure 2.20 Final presentation of the project about OpenFlow at NetFPGA which was prepared and presented during the NetFPGA workshop

The workshop coordinator collected statistics of visitor of the official NetFPGA workshop website. In Figure 2.21, Figure 2.22 and Figure 2.23 it could be seen that almost 2000 people visit our site from 67 countries. In these three Figures it could be also seen percent of all visits per each country.

Country ▲	Date of Last Visit	Percent & Number of Visits	
-	May 22, 2013	0.26%	5
Albania	Sept 24, 2013	0.05%	1
Algeria	June 20, 2013	0.05%	1
Argentina	Sept 10, 2013	0.10%	2
Australia	Aug 28, 2013	0.10%	2
Austria	Apr 18, 2013	0.05%	1
Azerbaijan	Apr 8, 2013	0.05%	1
Belarus	July 5, 2013	0.05%	1
Belgium	June 13, 2013	0.82%	16
Bosnia and Herzegovina	June 19, 2013	0.05%	1
Brazil	Sept 27, 2013	0.82%	16
Burundi	Apr 7, 2013	0.05%	1
Canada	Sept 23, 2013	0.31%	6
Chile	June 5, 2013	0.15%	3
China	Sept 11, 2013	2.81%	55
Colombia	Aug 2, 2013	0.20%	4
Costa Rica	Apr 12, 2013	0.05%	1
Croatia	May 7, 2013	0.36%	7
Czech Republic	July 9, 2013	0.31%	6
Denmark	May 12, 2013	0.05%	1
Egypt	Mar 30, 2013	0.05%	1
Europe	June 19, 2013	0.31%	6
Finland	May 19, 2013	0.82%	16

Figure 2.21 The NetFPGA workshop website visits – part 1

France	Sept 15, 2013	2.14%	42
Germany	Oct 1, 2013	4.44%	87
Ghana	Aug 6, 2013	0.20%	4
Greece	May 21, 2013	0.36%	7
Guatemala	May 30, 2013	0.05%	1
Hong Kong	July 3, 2013	0.20%	4
Hungary	Sept 24, 2013	0.82%	16
India	Aug 22, 2013	2.30%	45
Indonesia	Apr 4, 2013	0.05%	1
Iran, Islamic Republic of	Aug 25, 2013	0.82%	16
Ireland	Aug 30, 2013	2.60%	51
Israel	May 6, 2013	0.15%	3
Italy	Sept 6, 2013	3.22%	63
Japan	Sept 5, 2013	0.71%	14
Korea, Republic of	Sept 12, 2013	0.41%	8
Lithuania	May 13, 2013	0.05%	1
Malaysia	June 21, 2013	0.15%	3
Mexico	July 8, 2013	0.10%	2
Montenegro	Mar 27, 2013	0.05%	1
Nepal	June 16, 2013	0.05%	1
Netherlands	Sept 4, 2013	0.71%	14
New Zealand	Mar 30, 2013	0.05%	1
Oman	May 22, 2013	0.15%	3
Pakistan	June 6, 2013	0.05%	1

Figure 2.22 The NetFPGA workshop website visits – part 2

Pakistan	June 6, 2013		0.05%	1
Peru	June 23, 2013		0.10%	2
Poland	Oct 1, 2013		45.53%	892
Portugal	July 12, 2013		0.20%	4
Qatar	Apr 29, 2013		0.05%	1
Romania	July 1, 2013		0.46%	9
Russian Federation	Sept 6, 2013		0.46%	9
Saudi Arabia	June 22, 2013		0.05%	1
Serbia	July 4, 2013		0.15%	3
Singapore	July 17, 2013		1.79%	35
Slovakia	May 9, 2013		0.05%	1
Spain	Sept 10, 2013		2.45%	48
Switzerland	June 13, 2013		1.74%	34
Taiwan	Aug 15, 2013		1.12%	22
Thailand	Apr 7, 2013		0.05%	1
Turkey	July 1, 2013		0.41%	8
Ukraine	July 15, 2013		0.20%	4
United Arab Emirates	Aug 28, 2013		0.20%	4
United Kingdom	Sept 25, 2013		8.98%	176
United States	Oct 1, 2013		7.91%	155
Vietnam	Sept 27, 2013		0.36%	7

Figure 2.23 The NetFPGA workshop website visits – part 3

During the workshop there was also one lecture opened to the public presented by the Andrew Moore from University of Cambridge (see Figure 2.24). This lecture was sponsored by the INEA – one of the sponsor of this workshop.

Figure 2.24 NetFPGA workshop lecture opened to the public presented by the Andrew Moore from University of Cambridge

There is also available an official video made and produced by the polish television. It is a short interview with Marek Michalski (PUT) and Andrew Moore from the University of Cambridge (UK) and it includes also a general information about the NetFPGA workshop hosted by the Poznan University of Technology. This video is available on-line at YouTube service at: http://www.youtube.com/watch?v=Xvmc4W90DSY.

Information about NetFPGA workshop is also available at the official ALIEN project website at: http://www.fp7-alien.eu/?p=354.

Below it could be find detailed agenda of the NetFPGA workshop.

DAY 1 (Monday, May 20, 9:00 – 17:00)

- Welcome and introductions
- NetFPGA
  - Infrastructure
    - Tree
    - Build System

        - Scripts
    - Life of a packet through the NetFPGA
        - Data and control planes
        - Interface to software: Exceptions and Host I/O
    - Implementation
        - Module Template
        - User Data Path
        - Write crypto NIC using a static key
    - Simulation and Debug
        - Simulation Functions
        - Write and Run Simulations for crypto NIC

DAY 2 (Tuesday, May 21, 9:00 – 17:00)

- NetFPGA (cont.)
    - Registers
        - Explain Register System
        - Add XML to define crypto NIC encryption key
        - Use Generic Register Module to implement register
        - Update Simulations
    - Build and Test Hardware
        - Build
        - Explanation of Hardware Tests
        - Write and run Hardware Tests

- Verify value: 0xFFFFFFFF (would invert every bit of every byte of payload)
- Verify value: 0xFF00FF00 (would invert every other byte of payload)
- Verify value: 0x55555555 (would invert every other bit of payload)

  - Writing Software and Integration
    - Write setkey.c/getkey.c to write/read registers
    - Test between adjacent computers

- Group discussion
  - Projects ideas
  - Scope of work that can be accomplished in 2-3 days
- Team up for Projects
  - Project leaders will describe projects
  - Group will provide feedback on the scope
  - Be sure to have one hardware designer per team
- Example Hardware Design
  - Background and review of block diagrams
  - Show design running on nf-test machines
  - Discuss relevant Verilog Code

DAY 3 (Wednesday, May 22, 9:00 – 17:00)

- Work on Projects, examples from Summer Camp 2008 & 2010
  - 802.1q VLANs
  - Hardware-Accelerated Mathematics Library for NetFPGA
  - MACinMAC

- Heavy Hitter Identification using Multistage filters
- Layer 2 Load Balancing
- Pattern Matching/Mini-IDS
- TCP Traffic Analysis for Passive End-to-End Bandwidth Measurement
- Assessment of Prototyping an AFDX Policy Switch Leveraging NetFPGA, Ethane, and OpenFlow Switch
- ntop on NetFPGA
- Universal Hash Function

- NetFPGA group available for Questions and Answers
- Dinner: TBD

DAY 4 (Thursday, May 23)

- Complete Projects

DAY 5 (Friday, May 24, 9:00 – 17:00)

- Complete Projects
- 10-minute project presentations
- Live demonstrations
- Award prizes to winning projects
- Dinner: TBD

This workshop was done with a help of several partners (ALIEN among them) and sponsors (Cisco, Xilinx, Huawei, Juniper, Digilent, Broadcom and Micron). The full list of sponsors and partners can be found at the official workshop website http://netfpga.pl (see Figure 2.25). It should be noted that one of the sponsors was INEA – polish Internet, television, phone and VOD (Voice on Demand) provider which is very interested in the SDN technology. This company is planning to implement new solutions based on the SDN idea. It was one of the reason why it becomes sponsor of the NetFPAG workshop. More information about INEA could be found at the official website at http://www.inea.pl.

Figure 2.25 The NetFPGA workshop partners and sponsors

In deliverable D6.1 several KPIs for this event have been planned:

- to improve project participants qualification – there was 6 instructors (planned number was 5),
- to exchange experience between project participants and other NetFPGA users – there was 25 participants, 10 from ALIEN project and 15 others (planned number was 15 participants).

ALIEN achieved all of them and a also a few more (they can be seen in Table 7). Such a NetFPGA workshop gives a good overview of NetFPGA technology and a huge portion of knowledge for attendees. It allows also to get in touch with another people using the NetFPGA cards. To exchange our experience and to find a solution when some of ALIEN participant is in trouble (just stack with some error) NetFPGA workshop mailing list is used.

Table 7 The KPIs for the NetFPGA workshop

Key Performance Indicator (KPI)	ALIEN target	Status
To improve project participants qualification	A minimum 5 instructors well experienced in NetFPGA 10G card are expected at the workshop. The workshop should take five days.	Achieved
Exchange experience between project participants and other NetFPGA users	A minimum 15 participants from all the world and from different places (industry and university environment) are expected at the workshop.	Achieved
Get familiar with details of architecture of NetFPGA cards	During lectures at NetFPGA Spring Camp there was presented the structure of NetFPGA card, the functionality of all important blocks have been described.	Achieved
Get familiar with open part of software code provided by NetFPGA developers	During laboratories and tutorials the structure and functionality of software have been widely described and discussed. This software is available under BSD licence, however, to use its full functionality, it is required to understand how it works and how it cooperates with other software and hardware modules.	Achieved
Get practical experience with preparing own project for NetFPGA cards	The best experience is our own experience, hence, during laboratories attendees of NetFPGA camp prepared their own projects, from clean state to working project (they prepared both software and hardware part of final project).	Achieved

Get practical knowledge about performing software and hardware tests for NetFPGA cards	The programmable hardware is very complicated, it is very important to be sure that programmed functionality is realized exactly in assumed way and obtained project behaves fully predictable. With advanced mechanism of tests it is possible to verify particular functionality, each function has to be tested separately, during laboratories methodology for software and hardware testing was presented.	**Achieved**
Met people which use the NetFPGA card as well	It was very interesting to hear from advanced users of NetFPGA cards about difficulties and way of overcoming them during process of developing their projects.	**Achieved**
Get in touch people from NetFPGA forum	Direct contact with people which create NetFPGA forum allowed attendees to find better contact, to understand working procedures and, in the future, it allows to easier find a solution for their problems.	**Achieved**

3 Impact Assessment of Dissemination Activities

PSNC presented the first ALIEN project presentation during the European Workshop on Software Defined Networks (EWSDN), 25-26 October, 2012 in Darmstadt, Germany. This presentation showed the main ALIEN project goals and ideas to the public. This presentation attracted a good audience – at least 120 people attended the presentation which was followed by a lively series of questions and discussions. The outcome from the questions and the discussion is that this scientific approach is promising.

PSNC presented also the second ALIEN project presentation during the Future Internet Research and Experimentation (FIRE) Engineering Workshop, 6-7 November, 2012. This workshop was placed in Ghent, Belgium. This presentation introduced the ALIEN project assumptions, ideas and vision. There was about 100 people at the audience. After presentation, several questions appeared and a short discussion was done. The result from the discussion and the question is, similarly as in the previous case that scientific approach is promising.

PSNC attended the TERENA Networking Conference (TNC), 3-6 June, 2013 in Maastricht, Netherlands. During this conference the booth of the ALIEN project was available and project's poster was on the wall near the booth. At the booth it was possible to get information about the ALIEN project. There were more than 10 companies representatives asking about the ALEIN project: about the vision, about the assumption, about what solutions were done and which will be done, and so on. All of them were very interested what confirmed that ALIEN is on the good way and our solutions could be useful for the commercial world. There were also more than 400 people from scientific and research environment. The has also a lot of questions. The outcome from these questions, explanations and discussions is that scientific approach of our project is promising.

An overview of the conferences and poster is provided in Table 8. As it can be seen the presentations of the ALIEN project reached well over 600 people.

Table 8 Impact assessment of the ALIEN project conference presentations and posters

Conference	Countries Addressed	Size of Audience
European Workshop on Software Defined Networks (EWSDN), 25-26 October, 2012	European	120
Future Internet Research and Experimentation (FIRE) Engineering Workshop, 6-7 November, 2012	Worldwide	100
TERENA Networking Conference (TNC), 3-6 June, 2013	European	400

In the first year of the ALIEN project a workshop on network processors was organized. This workshop was hosted by EICT on 27-28 March, 2013 in Berlin, Germany. The workshop goals have been defined as follows: 1) present an overview of network processors platforms available on the market and used in the ALIEN project, 2) discuss their architecture, 3) comparison, 4) programming models and 5) development tools. This workshop was only for the ALIEN participants and there were 24 attendees representing all institutions involved in the project. Beyond all presentations there was a significant amount of time allocated to live discussions and brainstorming. As a results the very first concept of the HAL was elaborated. ALIEN also adjusted what parts and in which way the xDPd and ROFL libraries can be used in our project.

The second workshop dedicated to the NetFPGA cards has been also organized by ALIEN – it touches directly technologies used in the ALIEN project. This workshop was hosted be PUT and it was on 20-24 May, 2013 in Poznan, Poland. It was exactly the first NetFPGA camp in the world fully based on the 10G equipment (the previous ones were based on NetFPGA cards with 1G interfaces). There were six instructors knowing the topic very well. All the time 25 attendees had the full access to well-trained tutors, their knowledge and wide experience. It really speed up the learning process, finding and resolving errors. During this workshop all ALIEN project participants have opportunity to improve their qualification. It allows us to use NetFPGA cards in a better way and allows also to design better solutions – ALIEN is planning to publish our code as an open source.

An overview of the workshops is provided in Table 9 and, as it can be seen, the audience reached around 50 people.

Table 9 Impact assessment of the ALIEN project workshops

Workshop	Countries Addressed	Size of Audience
Network Processors workshop, 27-28 March, 2013	ALIEN project participant only	24
NetFPGA workshop, 20-24 May, 2013	Worldwide	25

4 Conclusions

This deliverable clarifies what has been done by each partner during the first year of the ALIEN project. Moreover, it helps to plan dissemination actions for the remaining part of the project. Besides standard administrative actions, such as proposition and elections the official logo of the ALIEN project and project website creation, project partners were involved in the project dissemination on workshops and conferences. It is worth to mention that the ALIEN project website proved to be interesting and helpful for SDN developers as a valuable source of information. This is expressed by the number of unique visitors (almost 2000 persons from 67 countries).

During the first year of the ALIEN project most time was spent to elaborate common statement for all technologies involved in the project. It was complicated task because some technologies are very close to lower layer and some use higher layers. The result of this work was presented as the HAL whitepaper and constitutes a starting point for future tasks. The main concept of this project, called Hardware Abstraction Layer (HAL), was presented on following conferences:

- European Workshop on Software Defined Networks (EWSDN), 25-26 October, 2012 – Darmstadt, Germany;
- Future Internet Research and Experimentation (FIRE) Engineering Workshop, 6-7 November, 2012 – Ghent, Belgium;
- TERENA Networking Conference (TNC), 3-6 June, 2013 – Maastricht, Netherlands;
- Supercomputing Conference (SC), 17-20 November, 2013 – Denver, USA (planned).

The progress of dissemination activities in the ALIEN project is expressed by accomplishment requirements of Key Performance Indicators (KPIs). For the first three conferences listed above all KPIs were achieved. Since Supercomputing Conference is the upcoming event, the KPI are not yet evaluated. The dissemination plan for the first year of project contained one additional conference, however, since the HAL idea was established on July (i.e. two months after the FIRE workshop) ALIEN hasn't attended this conference.

During the first year of the ALIEN project also two workshops were organized. The first one concentrates at network processor platforms which are used in the project while the second workshop was concentrated on the NetFPGA cards (also used in the ALIEN project). It is worth to mention that our workshop on NetFPGA cards it was the first in the world workshop which based on cards with 10G interfaces. The number of participants (25 persons from: Spain, Germany, UK, Ireland, Poland, Finland, Singapore, France, Switzerland, Brazil and India) exceeded the laboratory capacity.

After the first year, the ALIEN project have defined architecture and functionality of Hardware Abstraction Layer. And now, ALIEN is able to bring a new standard for the future commercial solutions. The ALIEN project is trying and still want to cooperate with a standardization bodies and standardization working groups like ONF, OMG, IEEE or Open Compute Foundation. There is also an opportunity to create a new standardization group concentrated at SDN topic, however, this is under arrangement right now and it is not certain yet. Our ideas could show a new direction or could modify current approach to switching and routing devices.

Recently, the deliverable D3.2 "Specification of hardware specific parts" [2] has been submitted and another deliverable D4.2 "Functional specification of management software" is being prepared. Both of them contain results of the project partners research work which will be a good source of knowledge and information for future publications.

Publications on conferences, posters and all other information at the website allow the ALIEN project to be significantly recognizable and visible in the SDN world. Our main publication (HAL whitepaper) is very highly indexed by Google search and it is very good material about abstraction layer for the OpenFlow. Also, the monitoring of visitors of project official website activity shows that this project is strongly associated with the abstraction layer for the OpenFlow.

5 References

[1] HAL whitepaper; ALIEN project; http://www.fp7-alien.eu/files/deliverables/ALIEN-HAL-whitepaper.pdf

[2] Deliverable D3.2, ALIEN project; http://www.fp7-alien.eu/files/deliverables/D3.2-ALIEN-final.pdf

6 Acronyms

HAL	Hardware Abstraction Layer
OCF	OpenFlow Control Framework
SDN	Software Defined Networks